Sun StorageTek™ 2500 Arrays

Sun StorageTek 2540 FC Array
Sun StorageTek 2530 SAS Array
Sun StorageTek 2510 iSCSI Array
Sun StorageTek 2501 SAS Expansion Array

Just the Facts

Mechanical Information

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Positioning

Figure 1. Sun StorageTek 2500 Array

Introduction

Enterprise and Workgroup customers each face their own distinct challenges. The current Workgroup administrator, with either overburdened internal storage or an external DAS configuration, is requiring a more efficient and consolidated storage solution. The Enterprise buyer, on the other hand, with departmental and remote offices, is searching for a reliable and self-administrable storage system from a name they can trust. While each of these organizations face their own unique storage demands, Sun can satisfy both of these markets' data requirements with the affordable, available and high-performance Sun StorageTek 2500 Series.

Sun expertise in external storage system development was the intellectual ground work for the Sun StorageTek 2500 Series - assuring best-of-breed technology and reliability**.** By combining this proven technology with next-generation SAS drive and expansion technology, growing organizations can take advantage of improved performance and reliable data protection in a single array.

With a choice of Fibre Channel (FC), Serial-attach SCSI (SAS), or iSCSI host interface options, the Sun StorageTek series of arrays family of systems will satisfy a wide range of storage requirements. The Sun StorageTek 2500 Arrays are ideal solutions for end users struggling with managing data growth within the limits of their IT systems by utilizing the Sun StorageTek SAS Expansion Array and/or wide variety of disk drive options.

Sun StorageTek 2540 Fibre Channel Array (also referred to as ST2540 or 2540)
Sun StorageTek 2530 SAS Array (also referred to as ST2530 or 2530)
Sun StorageTek 2510 iSCSI Array (also referred to as ST2510 or 2510)
Sun StorageTek 2501 SAS Expansion Array (also referred to as ST2501 or 2501)

The Sun StorageTek 2500 Series storage systems continue Sun's heritage of modular, building block design providing minimal initial investment and scalability to the Entry/Workgroup market. With two primary components, controller and drive enclosures, configurations can be customized to address any organization's specific requirements.

Sun StorageTek Common Array Manager

Common Array Manager for the Sun StorageTek 2500 Arrays provides a powerful, yet easy to use, Java-based GUI for administering the Sun StorageTek 2500 Arrays. Common Array Manager software enables online administration, a consistent interface across all operating systems, and the ability to monitor and manage one or all Sun StorageTek 2500 Arrays from any location on the network.

Key Features

Key features of the Sun StorageTek 2500 series of arrays include:

Dual controller specs	ST2540 (FC)	ST2530 (SAS)	ST2510 (iSCSI)
Host ports	4 FC ports	6 SAS ports	4 GE ports
RAID	0, 1, 3, 5, 10, 6 P+Q		
Cache memory	512MB or 1GB per controller, Max 2 GB per system		
Drive trays	2U, 12-drive		
Max. drives per system	Up to 48 drives		
Disk types	SAS / SATA		
SAS/SATA intermix	Yes*		
Cache Performance	104,000 IOPS 1,600 MB/sec	103,000 IOPS 1,500 MB/sec	63,300 IOPS 470 MB/sec
Sustained Reads (SAS drives)	21,800 IOPS 940 MB/sec	19,900 IOPS 920 MB/sec	21,400 IOPS 400 MB/sec
Data services	Sun StorageTek Storage Domains – 2 domains included 4,16 or 32 (optional) Sun StorageTek Local Copy (optional) supports eight snaps per volume, 128 per array supports independent volume copies		
Management (included)	CAM		
O/S	Solaris 9 (ST2540), 10, x86 Windows 2003, 2008 Linux Red Hat 4, 5 SUSE Linux 9,10 VMWare ESX 3.0.2 (2540), 3.5 (2540/2510), 3.5U4 (2530)		
Ruggedization	NEBs Level 3 Certification and DC Power Versions		

* SAS and SATA drives should not be intermixed within the same volume group

Key Messages

The Sun StorageTek 2500 series of arrays are storage solutions which directly respond to growing organizations data requirements from the entry-level to the enterprise user.

1. Simple and Affordable
2. Leverages Enterprise-class Engineering and Development
3. Data Protection
4. Easy to Implement and Manage
5. Solution of Choice for Clustered Topologies
6. “Start Small, Grow Big” Scalability

1. Simple and Affordable

Limited IT budgets and administrator IT expertise play a key role for the many organizations’ purchasing decisions. By developing the Sun StorageTek 2500 Series storage systems from the baseline of this perspective, only features and tools were fashioned to benefit these organizations’ specific data requirements at an attractive price point.

2. Leverages Enterprise-class Engineering and Development

Sun's legacy in enterprise storage systems was the intellectual ground work for the Sun StorageTek 2500 Series development assuring “best-of-breed” technology and reliability.

3. Data Protection

High availability is achieved with hot-swappable CRUs, disk-scrubbing, non-disruptive firmware upgrades, and automated I/O path protection with host-based, multi-path failover drivers. The dual-active controllers also have mirrored cache which in a rare case of a controller failure, the surviving controller takes ownership of the failed controller’s disks and continues processing I/O without interruption. A battery backup is included with each controller in the case of complete power outage.

4. Easy to Implement and Manage

Common Array Manager (CAM) software was designed to be an un-intimidating implementation for an unseasoned administrator, and leverages the same look and feel from Sun's server management software. The appearance and experience with CAM provides a familiar user experience for those customers who have purchased the ST6140 and/or ST6540 arrays.

5. Solution of Choice for Clustered Topologies

Clustering allows for multiple servers, typically two, to share access to data stored on a single storage system. Clustering also allows a user's application to keep running on a secondary server should the primary server fail. By utilizing two active-active RAID controllers with mirrored cache, redundant components and automated IO path failover, the Sun StorageTek 2500 Series are well suited for two and three-node clusters where continuous application and data availability, ease of use and affordability are key requirements. Failover cluster solutions also cannot be built on HBAs where cache and/or RAID configuration is node-specific for future releases with Windows Failover Cluster Requirements. Therefore, IT administrators will no longer have the option to utilize clustering with future internal DAS configurations further positioning the Sun StorageTek 2500 Series as a primary solution for clustered topologies.

6. “Start Small, Grow Big” Scalability

Scalability in the storage domain allows IT managers to respond to their constantly changing storage environment. By starting small, with the flexibility to dynamically grow, the Sun StorageTek 2500 Series storage systems allow users to make additional investments in their infrastructure only when their data growth necessitates it. Designed with replaceable components and key-enabled software features, organizations can easily increase capacity and storage capabilities if, and when, they need to.

Interface Technologies Overview

By offering several host interface options, an administrator can select the appropriate storage system to fit what their specific business needs necessitate.

iSCSI Interface Technology and the Sun StorageTek 2510

iSCSI allows customers the ability to deploy storage management over an existing Ethernet, when ease of use and less complex network infrastructures are desired.

- Simple and commonplace technology
- Low cost Ethernet equipment
- SANs will utilize existing reliable Internet Protocol (IP) networks for connectivity around the globe
- No cable length restrictions
- 1 Gb/s bandwidth

SAS Interface Technology and the Sun StorageTek 2530

SAS offers customers more choice with the ability to deploy a diverse range of system capabilities through a common storage connection interface. With its full duplexing capabilities, data can receive and transmitted at the same time providing increase bandwidth. SAS also breaks free of the 15-drive barrier per channel that parallel SCSI technology offered. With its high addressability and connectivity, the SAS interface dynamically increases connectivity to attached nodes.

Additional SAS features include:

- Port and bandwidth aggregation will connect storage devices via x4 wide-ports
    - Integrated full-duplexing allows simultaneous in-bound and out-bound communication that effectively doubles performance over traditional SCSI
    - 3Gb/s wide-ports combine x4 links providing a burst cumulative bandwidth of 12Gb/s using all lanes to ship frames comprising I/O and data
    - When connecting a server to an Sun StorageTek 2530 storage system, wide ports offer higher bandwidth then its parallel SCSI predecessor
- 8 meters maximum cabling length between devices
- Preserves SCSI middleware -
- Middleware, the software that uses an interface commands such as applications, custom utilities or scripts has not changed from parallel SCSI with SAS
- Simple Storage Consolidation without the Need of a Storage Network. The Sun StorageTek 2530 can support up to three hosts with high availability or up to six hosts when redundancy is not a critical factor.

FC Interface Technology and the Sun StorageTek 2540

While both SAS and FC are geared towards serving online storage and transactional data, FC, an optical interconnect technology, is the clear choice for bandwidth-intensive applications.

FC features include, but are not limited to:

- Mature and proven technology (development started in 1988)
- Low latency and high IOPs
- 10,000 meters maximum cabling length
- Ability to auto-negotiate FC link speeds allowing for seamless integration into an existing 1Gb/s or 2 Gb/s environment providing the buyer with investment protection when the SAN inevitably becomes 4Gb/s
- Congestion free with credit-based flow control delivering data as fast as the destination buffer is able to receive it.

SAS and SATA Drive Overview

SAS Drives

As the next chapter of SCSI technology, SAS benefits from more then 20 years of SCSI technology incorporating SCSI command sets while taking full advantage of serial architecture and bringing FC class capabilities to the table. Comparatively priced to SCSI drives, SAS enables users to scale and add drives for their critical and transaction-based applications without extending their budget.

SAS has several key benefits:

- Universal connection – interoperability with SATA drives supporting SAS and SATA on the same controller
- 3Gb/s throughput
- Improved RPM with 10,000 and 15,000 RPM options
- Dual-porting - Provides redundancy capabilities increasing availability with each drive having an alternate link and maintaining that connectivity in the case that one link fails
- Point-to-Point Architecture
    - Provides direct contact with each drive enabling the locating of problem drives more quickly then parallel loop topology where communication travels through each node

SATA Drives

Serial ATA is the latest generation of the ATA (Advanced Technology Attachment) disk interface. SATA is based on serial signaling technology, unlike IDE drive that use parallel signaling. SATA uses a less expensive protocol and is less expensive to implement. With a new emerging market compromising unique applications where low-cost storage is a priority, such as near-line storage, virtual tape, tape replacement, fixed content and web caching, SATA technology fits the bill. The Sun StorageTek 2500 Series systems are ideally suited for the specific workload, capacity and cost requirements for entry-level and secondary storage. With SATA technology, Workgroup organizations can enable data that would otherwise be archived on tape, to be cost effectively brought online, therefore, improving reliability, access rates and service levels. In addition, with SATA's larger drive capacity, fewer drives are needed to reach a desired system capacity resulting in bigger savings for secondary storage applications.

SAS and SATA Drive Technology Differentiators

Feature	SATA		SAS
Data Types	Secondary : • Online access necessary with periodic access	Entry-level: • Sporadic access with cost presiding over performance	Business Critical and transaction-based: • Online, high availability • Random reads
Business Applications	Fixed Content, reference data, D2D	1st External RAID, file and print server	ERP, OLTP, Oracle, Exchange
Performance	Low IOPS and MB/s		High IOPS and MB/s
Specifications			
Protocol	ATA commands		SCSI commands
Dual-Porting	No*		Yes
Duplex	Half		Full

* Redundancy **(**dual port capabilities) made available via the drive interposer card

Product Family Placement

The Sun StorageTek Modular family of arrays offer a cost-effective combination of performance, data, availability, scalability and data management features from Enterprise to Entry-level Workgroup customers. The new Sun StorageTek 2500 arrays – are the entry-level line of Sun disk arrays positioned at the entry point of the the Modular family supplementing the ST6140 and ST6540 arrays. The following are key attributes, applications and target customers for each.

Positioning with ST6140

The Sun StorageTek 6140 array is the perfect array for growing businesses to step up to enterprise-class data protection at a great price. Great performance, high-reliability and data protection are key attributes of the 6140. This advanced, cost effective array also provides high-capacity and drive intermix with up to 112 SATA and Fibre Channel drives meets growing backup and archiving requirements. Applications and organizations will benefit from departmental-scale storage consolidation and data protection. With additional data services like Remote Volume Mirroring, the 6140 adds additional levels of data protection in and across SAN's. The 6140 also provides users future options to upgrade into larger 6540, 6580, or 6780 platforms.

Summary

	ST6140	ST2500
Max Drives	112	48
Max Cache (per array)	4GB	1GB (2GB optional)
Drive Options	FC and SATA	SAS and SATA
Management	CAM	CAM
Data Snapshots	Yes (optional)	Yes (optional)
Data Volume Copy	Yes (optional)	Yes (optional)
Data Replication	Yes (optional)	No
Designed for Consolidation Multiple Applications	No	No
Warranty	3 years	3 years (parts only)

Target Users

The primary customers for the Sun StorageTek 2500 Arrays are Sun network storage direct accounts, storage-only resellers, solution resellers, server resellers, OEMs, distributors, and system integrators. The Sun StorageTek 2500 Arrays meet the needs of a variety of users, as shown in the table below.

Individual User	Buying Needs
Corporate Buyer	Self-administrable storage system from a name they can trust to support departmental storage.
Remote Office Manager	Cost-effective and self-administrable storage system with the flexibility to grow.
System Administrator	Familiar GUI with a choice of interface technologies and flexibility to add premium software features
Office Manager	Cost effective and simple interface to consolidate internal or external DAS for highly available and performance-optimized shared storage requiring minimal expertise and time investment
MIS Manager	Flexible, configurable and scalable storage

Target Markets

Below is an example of the end-user scenarios the Sun StorageTek 2500 Arrays are suitable for as well as a listing of the key features that are especially well-suited for them.

End-user Scenario	Key Feature(s)
Growing beyond the constraints of internal or external DAS storage	• Shared/consolidated storage from a single storage system • Full and efficient utilization of drives and storage resources • Higher availability with redundant components • Increased performance (external arrays can accommodate more drives = more spindles)
Need low cost, task and business critical application storage	• Cost-effective arrays with “start small, grow big” scalability including drive expansion up to 48 drives and optional Snapshot, Volume Copy, and Storage Domain features

Have rack space utilization requirements that need to be met	• Dense array accommodates up to 12 3.5-inch drives in a single 2U enclosure supporting up to 5.4TB with 450 GB SAS drives
Want to refresh their current workgroup solution/install base	• Leverages the same software manager – Common Array Manage (CAM) – familiar user interface and feature set with existing Sun StorageTek arrays
Require solutions for rugged environments (NEP/Telco and Gov't)	• "Carrier-class" NEBS Level 3-certified for the most pristine data centers.

Enterprise Department/Workgroup

For Enterprise departmental and workgroup environments, the Sun ST2500 provides highly available consolidated storage. The ST2500 systems will be an optimal solution for organizations looking to support 4-32 server(s). The ST2540 with FC connectivity, will be especially well suited for storage and system administrators familiar with CAM software and existing SAN installations. Adjunct to existing storage for new segmented workloads and distributed applications, the ST2540 allows work groups and remote offices to be self-administrable as well as be connected to a storage centric management framework.

Workgroups, SMB/SME, Remote Sites

The Sun StorageTek 2500 Arrays, with iSCSI, SAS, or FC host connect, will be key solutions for workgroups, SMB and SMEs with 1 to 32 servers (up to 6 with the ST2530) and limited storage expertise on-site. As shared DAS configurations, the 2500 arrays consolidate internal and external DAS environments where storage is currently spread across islands of unconsolidated storage which creates wasted capacity, duplicated functions, inefficiencies and data protection inconsistencies across the organization. The Sun StorageTek 2500 Arrays provides increased availability, performance and better usage of available storage.

Affordable Storage Entry Point (Without Sacrificing Availability or Performance)

The Sun StorageTek 2500 Arrays are scalable and flexible design enables lower initial acquisition costs and supports growth with drive expansion and additional features available if and when needed. Its modular design helps avoid over-configuration – creating an affordable entry-point without sacrificing future scalability. With this “start small, grow big” scalability, the ST2500 keeps growth costs down through optimal just-in-time purchasing. Companies can purchase what they need, when they need it, match the storage to the application, add storage without impacting data availability, and create an affordable entry-point without sacrificing future scalability.

Selling Highlights

Market Value Propositions

The Sun StorageTek 2500 Arrays leverage Sun's expertise in array development to assure best-of-breed technology and robustness. By combining this with next generation SAS technology, growing organizations can take advantage of both improved performance and data protection in a single array. The Sun StorageTek 2500 Arrays are ideal solutions for businesses struggling with managing data growth within in the limits of their current IT configurations. The ST2500 series of arrays are strategically positioned with the following value propositions:

Sun StorageTek 2500 Series Value Propositions

- Industry leading Value - a trusted, reliable solution with enterprise-class RAID and highest availability in its class
- Simple, server oriented management (CAM)- storage that's tailor made for Sun servers
- Flexibility - easy to deploy with FC, SAS, and iSCSI
- Cost-saving storage tiers* for primary and near-line storage
- Density - Optimized for rack intensive, horizontal scaling server environments
- "Start small, grow big" scalability - Affordable entry-point that allows users to start small and add drives and premium features as their business demands grow

Sun StorageTek 2510 Value Propositions

- Storage consolidation using iSCSI host connectivity allows simple, rapid set-up of IP Storage Area Networks (SANs), without the cost and complexity of Fibre Channel switches
- Your new SANs will utilize existing reliable Internet Protocol (IP) networks for connectivity around the globe, with great expansion capabilities and no distance limitations.
- Very affordable price for businesses looking to move from Direct Attached Storage (DAS) to their first SANs, those with remote offices needing to be networked, or businesses looking for cost-effective business continuity/disaster recovery (BC/DR) solutions
- Scalable by using up to four Ethernet switches for support of up to 48 SAS and/or SATA disks - intermix SAS and SATA drives allows you to set-up tiered storage in a single system! Use your SAS drives for Input/Output (I/O) intensive applications and SATA for second tier (back-up) or large volume storage needs.
- Infrastructure costs of IP SANs can be 25% that of FC SANs (Cost Comparison Of iSCSI Versus Fibre Channel SAN Components, Forrester Research, Inc., February 7, 2008). And leveraging general network administrators, additional savings can be realized in labor costs as well.

Sun StorageTek 2530 Value Propositions

- First "shared DAS" solution for an internal DAS user
    - Higher availability to data – redundant I/O paths and components
    - Great performance / performance value
    - Entry-point for 2 and 3-node clusters
- Excellent for directly attaching local servers to a single storage device
    - Shared-storage benefits – consolidation, single management, increased efficiencies within the IT infrastructure

- Facilitates one-room storage configurations
- Offers outstanding performance and exceptional scalability on a local level.

Sun StorageTek 2540 Value Propositions

- Departmental storage
  - High availability – redundant I/O paths and components
  - Shared-storage benefits – consolidation, single management, increased efficiencies within the IT infrastructure
  - Brand / midrange legacy – common underlying technology
  - Investment protection with auto-negotiating 4Gb/s FC connectivity which can be easily integrated into 1, 2 and 4Gb/s infrastructures

- FC SAN-ready
  - Low-cost additional storage for an existing SAN
  - Initially deploy the ST2540 as a DAS array and seamlessly transition to a SAN when ready
  - The best storage for your entry-level SAN
  - Greater connectivity / larger consolidations

Target Customers

The Sun StorageTek 2500 Arrays support a range of customer's unique data requirements from enterprise organizations to Entry/Workgroup environments. For the enterprise buyer with departmental and remote offices, the ST2540 is a reliable and self-administrable array from a name they can trust. For the entry-level user, the ST2540, ST2530, or ST2510, replaces over-burdened and inefficient internal storage or external DAS with a highly available shared storage solution.

Target customers for the Sun StorageTek 2500 Arrays include:

- Need low cost, task and business-critical application storage
- Single dedicated applications
- Would like to migrate from internal storage to a shared DAS or a DAS to a SAN environment or as an adjunct to an existing SAN
- Require "start small, grow big scalability"
- Have rack space utilization requirements that need to be met
- Want to refresh their current workgroup/ install base
- Require solutions for ruggedized environments (NEBS/Telco and Gov't)
- Needing additional storage capacity for a virtualized server environment

Target Applications

With a choice of FC, SAS, iSCSI interfaces, the Sun StorageTek 2500 Arrays satisfy a wide range of application data requirements.

Key applications for these users include (Sun StorageTek 2510, 2530 and 2540 arrays):

- File and print
- Email

- Distributed database
- Web/edge, and compute centric
- Server based HPTC/Grid
- Smaller Virtualized environments

Key applications for the enterprise department and workgroups include (Sun StorageTek 2540 array):

- Local storage (scratch/files) and content distribution
- Tier 2 database
- Secondary storage
- Digital assets (video/images documentation)
- D2D2T
- Smaller Virtualized environments

Optional Replication Features for Backup/Recovery and Duplication

Integrated data services maximize application availability. Sun StorageTek Data Snapshot software is ideal for backups because it enables the administrator to create real-time copies of critical volumes with minimal disruption to applications. Sun StorageTek Data Volume Copy software provides the ability to quickly and securely duplicate full volumes, making it ideal for data mining, analysis, or enhanced backup operations.

Enabling Technology

Technology Overview

The Sun StorageTek 2500 Arrays are a modular, rack-mountable, and scalable arrays with SAS back-end and expansion technology with the option of 1 GB/s iSCSI host interfaces, 3Gb/s SAS host interfaces or 4Gb/s FC host interfaces. The standard configuration consists of an integrated controller tray with dual (active/active) or simplex RAID controllers. It can support up to 3 expansion trays (Sun StrorageTek 2501) for a total of 48 drives which can be dynamically added to the base controller tray. A variety of SAS and SATA drives are supported.

The Sun StorageTek 2500 Arrays come with the Sun StorageTek Common Array Manager which is common across the Sun StorageTek 6000 and 2500 families. The Sun StorageTek Common Array Manager software helps reduce the complexity and lowers storage management costs with centralized management, run-anywhere flexibility, and a single interface across the Sun StorageTek 6000 and 2500 arrays. The Sun StorageTek Common Array Manager software improves storage utilization through configuration flexibility, incremental capacity scaling, storage consolidation and capacity-efficient data services. This robust array management software helps enable an organization to easily scale storage resources without increasing administration costs or complexity.

The Sun StorageTek Common Array Manager software controls the Sun StorageTek 2500 Arrays and provides administrators a powerful, yet easy-to-use management interface. With the Sun StorageTek Common Array Manager software, all administrative tasks including configuration, re-configuration, expansion, maintenance, and performance data gathering can be performed with no system downtime and no interruption to system I/O. The Sun StorageTek Common Array Manager software's configuration flexibility includes the ability to change RAID levels, segment sizes, virtual disk sizes, volume characteristics, and cache policies all within a single storage array. And, its centralized administration and run-anywhere GUI enables management of Sun StorageTek 6000 and 2500 arrays from any location on the network, regardless of host platform.

Optional StorageTek Common Array Manager features provide additional functionality to an organization's storage system only when and if their storage demands call for it. As businesses continue to grow, administrators have the flexibility to add premium features to support data utilization and protection requirements. These optional features include storage domains and Data Snapshot. Storage domains logically divide a single system into multiple systems by defining which host or host group can access each volume in your storage system. This enables a range of hosts with different capacity, performance, or data protection demands to effectively share a single system. The Sun StorageTek 2500 Arrays are bundled with 2 domains. A licensable upgrade up to 32 domains can be purchased. A separate Enhanced Data Snapshot upgrade creates capacity-efficient, point-in-time volume images, providing a logical volume for such uses as file restoration and backup. A single licensable upgrade for up to 8 snaps per volume and 128 snaps/system can be purchased. Lastly, Volume Copy is a great solution to create copies of data for test and development environments.

The Storage Automated Diagnostic Environment component of the Sun StorageTek Common Array Manager software offers proactive health checking, intelligent diagnosis, fault isolation, event notification, and fault management reporting for the Sun StorageTek 2500 Arrays from a single management console. This software helps improve the time to recover and increases infrastructure uptime, thus contributing to the overall improved application service levels.

The Sun StorageTek Common Array Manager software also offers a wide support of various operating platforms for heterogeneous data center environments. The supported operating platforms include:

- Solaris
  - Solaris 10 x86 Operating Environments
  - Solaris 10
  - Solaris 9 (2540 Only)
- Windows
  - Windows Server 2003 SP1,
  - Windows Server 2008
- Linux
  - Red Hat Enterprise Linux:
    - v4.0 (2.6 kernel) AS, WS, ES
    - 5.0
  - SUSE Enterprise Linux:
    - V9.0 (2.6 kernel)
    - V10.0 (2.6 kernel)
- VM Ware
  - ESX 3.0.1, 3.0.2 (2540 only)
  - ESX 3.5 (2540 and 2510 only)

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System Architecture

Overview

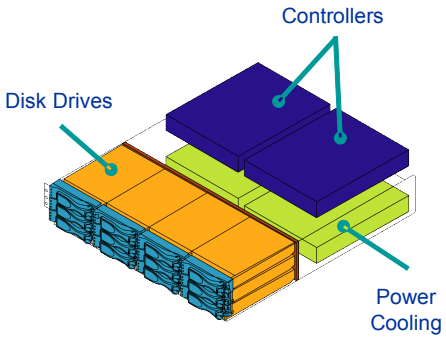
The Sun StorageTek 2500 Arrays integrate industry-standard components with the Sun legacy of best-of-breed technology at a cost-effective price point. The Sun StorageTek 2500 Arrays consist of two primary components, the controller tray and expansion trays (optional). Custom configurations can be built to address specific performance or capacity requirements. Each of the primary components is fault tolerant with automatic I/O path failover and redundant hot-swappable components to help ensure the highest availability.

Sun StorageTek 2500 Controller Tray

The Sun StorageTek 2500 array series' controller trays house duplex (active/active), intelligent iSCSI (2510), SAS (2530) or FC (2540) RAID Controllers (simplex versions are available). Redundant RAID controllers, combined with OS-dependent failover drivers, provide automated I/O path protection and help ensure continuous data access. In the event of a component failure anywhere in the data path between server and disk drives, I/O is re-routed down the surviving path for uninterrupted access to the data and application availability.

The Sun Storage 2500 array controller trays have two Ethernet ports, one per controller, for remote management from anywhere on the network through the Sun StorageTek Common Array Manager Software. All primary components of the Sun StorageTek 2500 controller tray are hot-swappable, customer replaceable units (CRUs) to help prevent servicing downtime and to help minimize the time to repair a failure. Each CRU, including the RAID controller, fans, power supplies and disk drives can be easily accessed and removed or replaced.

Figure 2. Sun StorageTek 2500 Array Controller Tray



Sun StorageTek 2510 Controller Tray (iSCSI)

Sun StorageTek 2510 array supports direct host connection or ethernet switched configurations. With 2 or 4 iSCSI host ports (2 per controller), the Sun StorageTek 2510 array can provide 2 direct attached servers with redundant connections. Multiple hosts can be connected via an IP SAN switch.

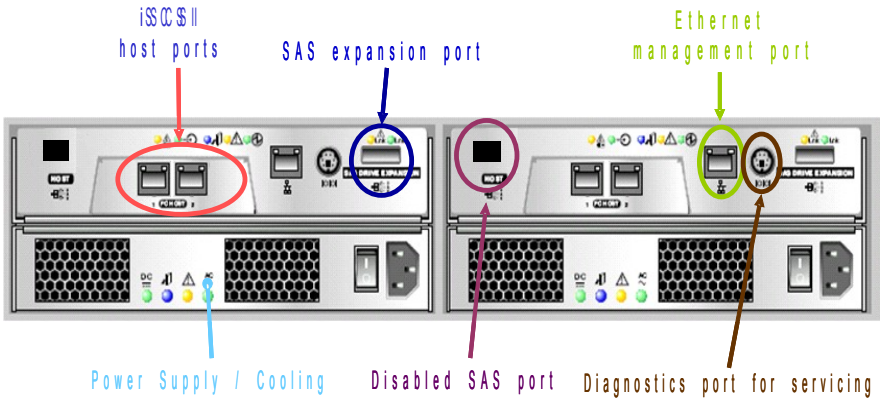


Figure 3. Sun StorageTek 2510 Array Controller Tray

Sun StorageTek 2530 Controller Tray (SAS)

Sun StorageTek 2530 array supports direct host connections (point-to-point). With up to six 3Gb/s SAS host ports (three per controller), the Sun StorageTek 2530 array can provide three servers with redundant connections – enabling capacity-efficient storage consolidation without the need of a storage network. Clustering further supports storage availability by allowing servers, typically two, to share access to data on a single storage system and allows an application to keep running on a second (failover) server in the event that the primary server fails .

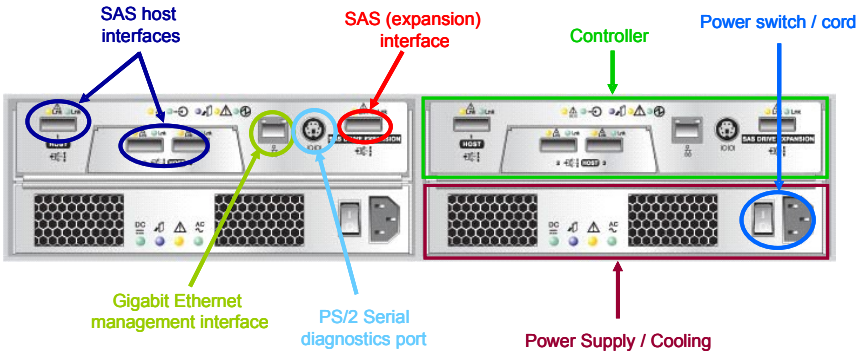


Figure 4. Sun StorageTek 2530 Array Controller Tray

Sun StorageTek 2540 Controller Tray (FC)

With four auto-negotiating 4Gb/s FC host ports per system, the Sun StorageTek 2540 array supports direct attachment of multiple hosts or connectivity to a storage area network. This makes it a great system for environments that want to initially deploy the Sun StorageTek 2540 array as a DAS system, and then seamlessly transition to a SAN when ready. Additionally, the Sun StorageTek 2540 array is a great fit for existing SANs as it can easily integrate into 1, 2 and 4Gb/s infrastructures

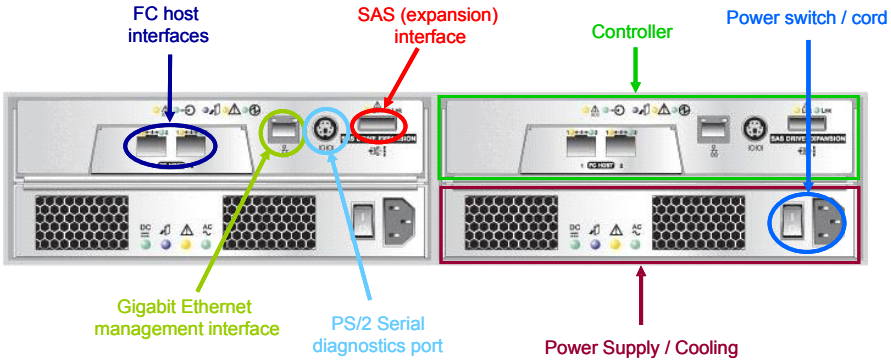


Figure 5. Sun StorageTek 2540 Controller Tray

Architecture

The Sun StorageTek 2500 controllers have a 1GB/s bus between the core processor and I/O chips. This 64 bit, 133 MHz PCI-X bus has the “width” to handle large-block I/O, and the “speed’ to process small-block I/O to satisfy high-performance requirements for high transaction applications. These controllers have a single memory that is partitioned between processor and data cache memory. The I/O system core integrates the XOR engine and processor. While the processor focuses on data movement control, the high-speed XOR engine generates RAID parity.

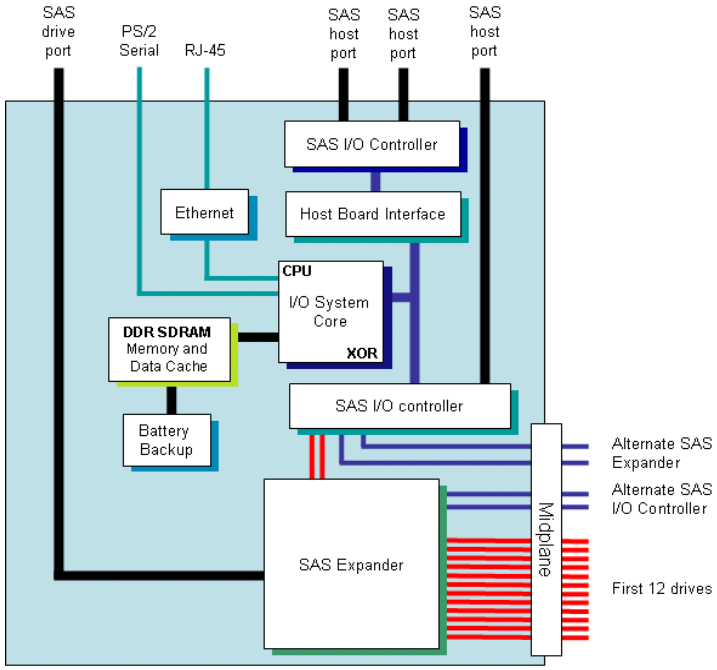


Figure 6. Sun StorageTek 2530 Controller Architecture

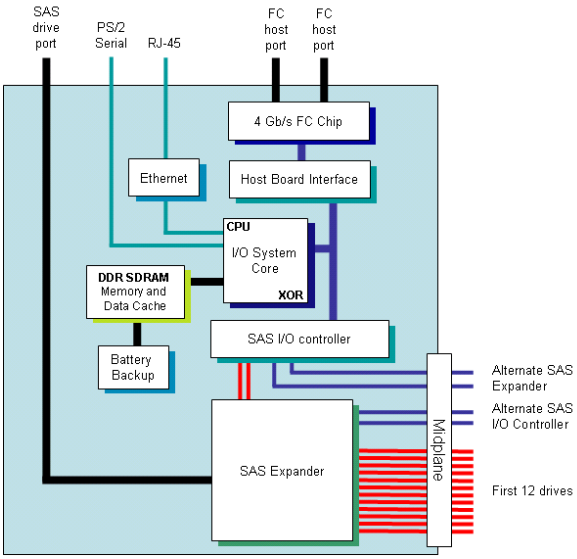


Figure 7. Sun StorageTek 2540 Controller Architecture

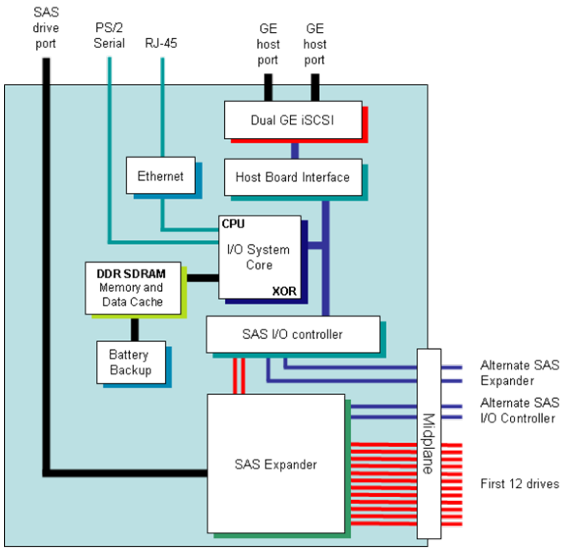


Figure 8. Sun StorageTek 2510 Controller Architecture

Performance

IOPS Comparison

	Drive Type	ST2510* (iSCSI)	ST2530 (SAS)	ST2540 (FC)
Burst I/O rate – cache reads	N/A	63,300 IOPs	103,000 IOPS	104,000 IOPS
Sustained I/O rate – disk reads	SAS	21,400 IOPs	19,900 IOPS	21,800 IOPS
	SATA	4,900 IOPS	4,800 IOPS	5,300 IOPS
Sustained I/O rate – disk writes	SAS	4,600 IOPS	4,300 IOPS	4,700 IOPS
	SATA	1,000 IOPS	1,000 IOPS	1,100 IOPS
Drive Qty for Benchmark Test		48	48	48

Throughput Comparison

	Drive Type	ST2510* (iSCSI)	ST2530 (SAS)	ST2540 (FC)
Burst throughput – cache reads (512k)	N/A	470 MB/sec	1,500 MB/sec	1,600 MB/sec
Sustained throughput – disk read (512k)	SAS	400 MB/sec	920 MB/sec	940 MB/sec
	SATA	410 MB/sec	860 MB/sec	860 MB/sec
Sustained throughput – disk write (512k) CMD	SAS	320 MB/sec	800 MB/sec	760 MB/sec
	SATA	330 MB/sec	700 MB/sec	650 MB/sec
Drive Qty for Benchmark Test		48	48	48

Notes:

1. *SAS and SATA drives were benchmarked with dual controllers*
2. Performance results achieved under ideal circumstances in a benchmark test environment. Actual customer results will vary based on configuration and infrastructure components.
3. The number of drives used does not reflect an optimized test config. The number of drives required could be lower/higher.
4. ST2510 performance results achieved with the QLogic 4060 iSCSI HBA
5. 73GB 15KRPM SAS drives and 750GB 7200RPM SATA drives
6. Code thread FW v7.35
7. 512 MB Controllers

Cache

Cache Design

The Sun StorageTek 2500 Arrays' RAID and cache algorithms are designed to provide the best possible performance without the need for extremely large cache. This is accomplished with a cache management design that has been developed and perfected over the past 17 years. The use of large cache in storage has long been driven by the unique requirements of mainframe environments. Open system servers, however, are seldom able to make good use of large scale storage cache. Their applications, which typically involve high-levels of random I/O activity, are increasingly unlikely to experience disk subsystem *cache hits.* In fact, large cache *monolithic* systems can substantially increase the cost of the storage without providing any significant performance benefit. The Sun StorageTek 2500 Arrays are designed from the outset for open system I/O requirements – recognizing the disk performance is vastly more important than cache performance in these environments. Open system servers feature their own large well-managed, on-board caches and gain more benefit from an efficient storage controller design that maximizes disk performance than from additional cache.

Sun StorageTek 2500 Arrays Expansion Tray

Housing ESMs, cooling fans, power supplies and drives, the Sun StorageTek 2500 Arrays 3Gb/s SAS Expansion Tray, also known as the Sun StorageTek 2501 Expansion Array, is a 2U, 19" rack-mountable drive enclosure for expansion. With "Star" point-to-point topology and dual ported SAS drives, the Sun StorageTek 2501 expansion tray is more than just-a-bunch-of-disks. Combined, these two features support accessibility to all drives and maintain data protection.

Like the Sun StorageTek 2500 Arrays, the Sun StorageTek 2501 expansion tray houses redundant and hot-swappable components. This includes disk drives, cooling and power supplies, and I/O modules. The I/O modules deliver online environmental information about the tray status such as temperature, fan speed, faults to the management software and provide the ability to expand up to a total of three Sun StorageTek 2501 expansion trays behind a single Sun StorageTek 2500 array to accommodate a total of 48 disk drives.

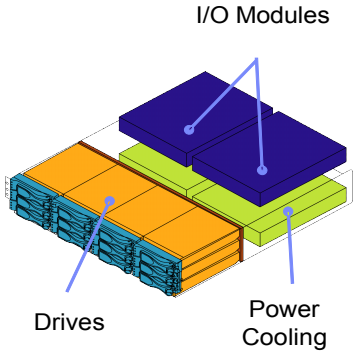


Figure 9. Sun StorageTek 2501 Expansion Tray

"Star" Topology (Point-to-Point)

Point-to-point architecture allows the I/O module (or controller) to achieve direct contact with each drive in a tray. This feature allows the controller to "talk" directly to a specific drive with each drive getting full bandwidth. This architecture enables the locating of problem drives more quickly then parallel loop topology where communication travels through each node – ensuring minimum arbitration overhead.

The older SCSI technology leveraged a loop topology. With parallel SCSI loop architecture, if an I/O module needs to make contact with a drive, communication would had to go through the other drives in the loop. This is a much slower communication process and can have negative effects across the entire system.

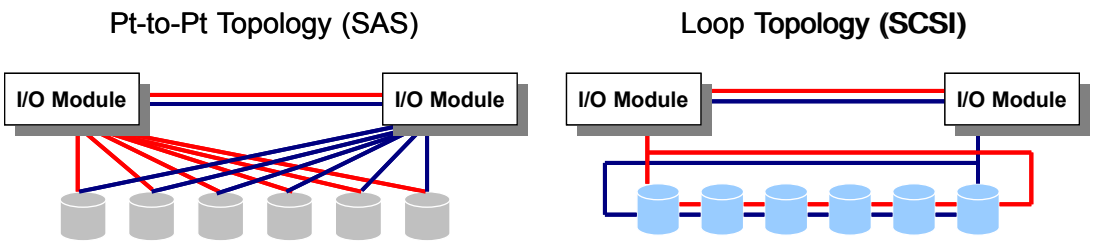


Figure 10. SAS point-to-point topology vs. SCSI loop topology

Configuration

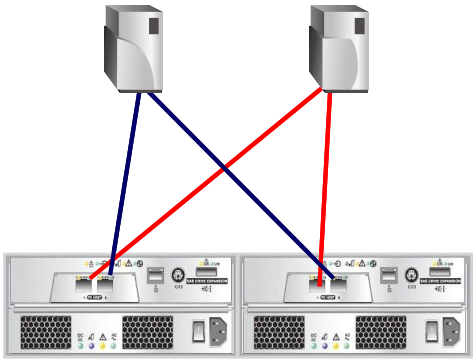
A key selling feature of the Sun StorageTek 2500 Arrays are “start small, grow big” scalability. Scalability in the storage domain allows IT managers to respond to their constantly changing storage environment. By starting small, with the flexibility to dynamically grow, the Sun StorageTek 2500 Series storage systems allow users to make additional investments in their infrastructure only when their data growth necessitates it. Designed with replaceable components and key-enabled software features, organizations can easily increase capacity and storage capabilities if, and when, they need to.

For the most up to date documentation on configuration, firmware, installation, and upgrades, please visit the Sun Documentation Repository: http://docs.sun.com/app/docs/coll/st2500arrays

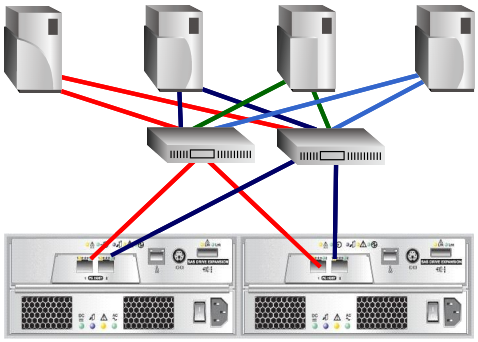
Cabling

Sun StorageTek 2510 Array

The Sun StorageTek 2510 controller tray provides up to 4 1Gb/s iSCSI host interface connections. The Sun StorageTek 2510 controller tray can provide two servers with redundant direct attach connections or multiple hosts via an IP SAN fabric.



Highly Available Direct Host Connections



Highly Available IP SAN Configuration

Sun StorageTek 2530 Array

The Sun StorageTek 2530 controller tray provides up to six 3Gb/s SAS host interface connections. The Sun StorageTek 2530 controller tray can provide three servers with redundant connections – enabling capacity-efficient storage consolidation without the need of a storage network. If redundancy is not necessary in an end-user environment, up to six servers can be connected to a single array for a consolidated shared storage strategy.

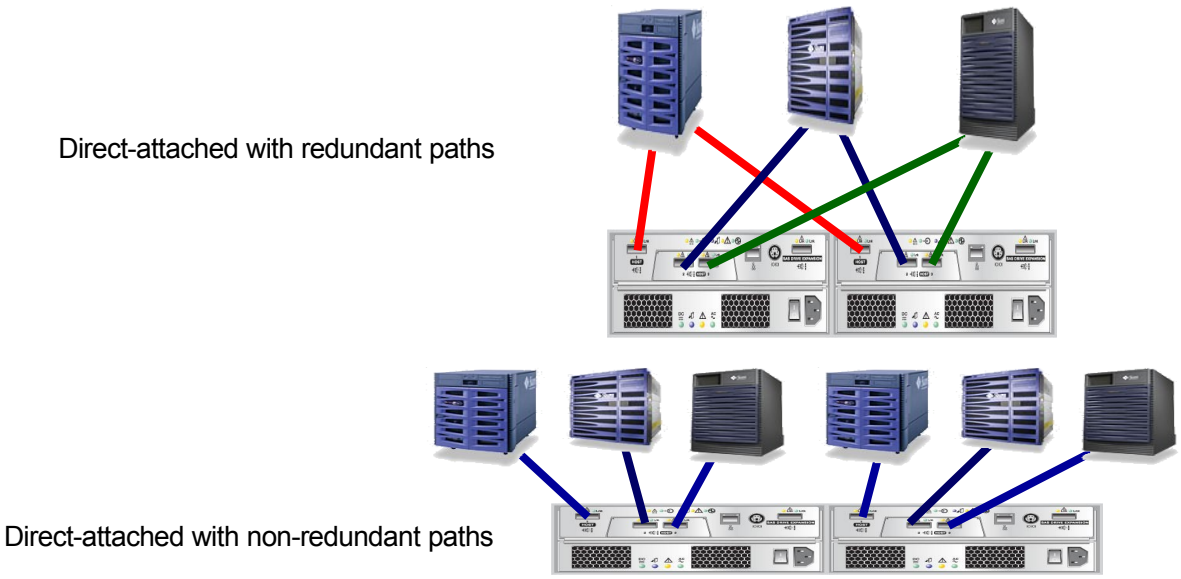


Figure 11. Sun StorageTek 2530 Cabling Configurations

Each interface can achieve a theoretical burst bandwidth up to 1200MB/s with the SAS “wide” ports. This enables the Sun StorageTek 2530 array to deliver a theoretical maximum of 7200MB/s of host-side burst bandwidth.

Sun StorageTek 2540 Array

The Sun StorageTek 2540 controller tray provide up to four auto-negotiating 4Gb/s FC host interface ports in a dual controller configuration. With four auto-negotiating 4Gb/s FC host ports per system, the ST2540 supports direct attachment of multiple hosts or connectivity to a storage area network. This makes it a great system for environments that want to initially deploy the ST2540 as a DAS system, and then seamlessly transition to a SAN when ready. Additionally, the ST2540 is a great fit for existing SANs as it can easily integrate into 1, 2 and 4Gb/s infrastructures.

With each interface delivering a theoretical maximum bandwidth of 400MB/s, the Sun StorageTek 2540 array can theoretically achieve up to 1600MB/s of host side bandwidth.

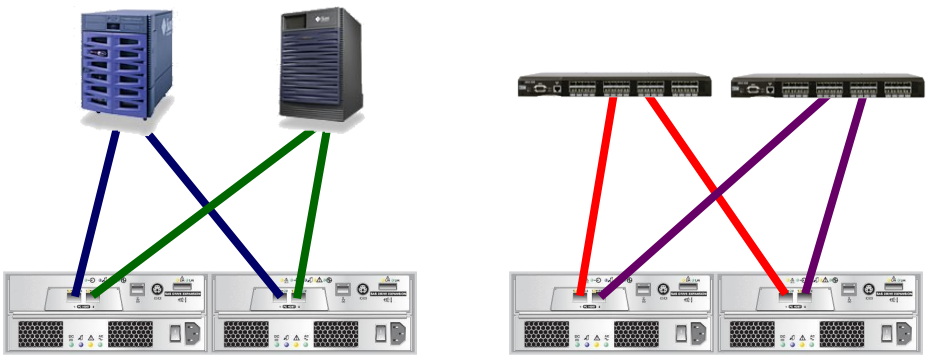


Figure 12. Sun StorageTek 2540 Cabling Configurations

Expansion Cabling

The Sun StorageTek 2501 expansion trays have redundant, dual-active drive loops running to the dual-ported SAS disk drives. The I/O modules each have two 3Gb/s SAS drive expansion ports. Each 3Gb/s drive loop comes *in* through one port on the I/O module and *out* through the other when additional Sun StorageTek 2501 expansion trays are attached.

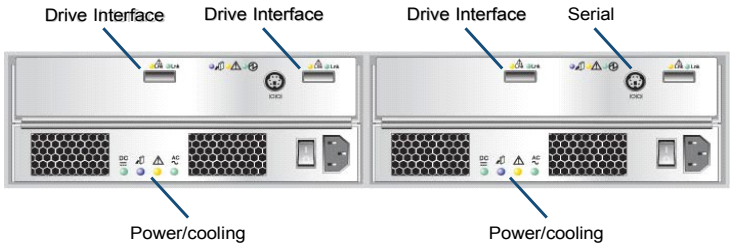


Figure 13. Sun StorageTek 2501 Expansion Tray – Rear View

One loop pair illustrated below outlines the cabling required to ensure a multi-path highly available storage configuration. This ensures accessibility to all the drives in the instance that an I/O Module is taken offline or in the unlikely event that a full tray becomes unavailable. When daisy-chaining an I/O Module, the “Out” connector of one I/O Module must be cabled to the “In” connector of the next tray’s I/O Module.

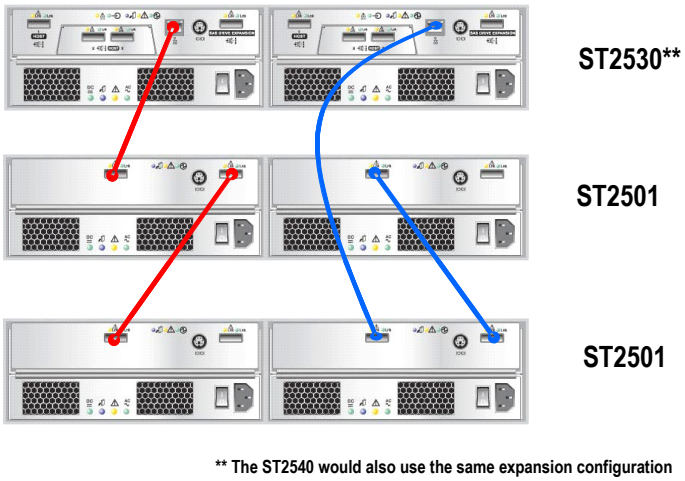


Figure 14. Sun StorageTek 2500 Array Expansion

Configuration Flexibility

With the Sun StorageTek Common Array Manager software, a single Sun StorageTek 2530 or 2540 array can concurrently support multiple RAID levels (0,1,3,5,1+0, 6 P+Q), mixing drive technologies*, capacities and rotational speeds (with 15K RPM SAS drives and 7.2K SATA drives), multiple and various virtual disk sizes, and one or more volumes per virtual disk. Additionally, each volume supports individualized configuration settings, including controller power ownership, segment size, modification priority, and all cache policies. And, all options can be configured and re-configured ensuring data is always accessible.

This industry-leading flexibility enables the Sun StorageTek Common Array Manager software to best match application data availability, performance or capacity requirements. This is especially important in consolidated

environments where multiple servers, each with varying and potentially drastically differing performance demands, are sharing a single storage system. With every environment is different and has its own distinct performance, data availability and capacity usage requirements, it is possible to outline some best practices guidelines centered on drive types and RAID levels.

RAID Levels

The selection of the RAID level is equally critical for each application to meet the required data availability, performance and capacity requirements. And, like drive types and configurations settings, the Sun StorageTek Common Array Storage Manager software supports intermixing RAID configurations to provide maximum flexibility and utilization. RAID 5 is generally considered the best balance of cost, performance and availability. The following table outlines the trade-offs of the various supported RAID configurations.

RAID Level –	0	1 & 1+0	3	5	6 (P+Q)
Description	Data is striped across multiple drives	Data is mirrored to another drive	Data is distributed across multiple drives. Parity info is written to one disk in the group	Drives operate independently with data & parity blocks distributed across all drives in the group.	Drives operate independently with data & parity blocks distributed across all drives in the group with an additional parity drive. (Sun's RAID 6 implementation is hardware based increasing performance.)
Min # of Drives	1	2	3	3	5
Max # of Drives	48	48 (24+24)	30 (29+1)	30 (29+1)	30 (28+2)
Usable capacity (as a % of raw capacity)	100%	50%	66.67% to 96.7%	66.67% to 96.7%	60.0% to 93.3%
Application	IOPs & MB/s	IOPs	MB/s	IOPs & MB/s	IOPs & MB/s
Advantages	Performance – due to parallel operation of the access. All storage can be utilized – no disk drive overhead	Performance – due to multiple requests can be fulfilled simultaneously.	High performance for large, sequentially accessed files. Parity utilizes a small portion of raw capacity.	Reads, small IOPs, many concurrent IOPs and random I/Os. Parity uses a small portion of raw capacity.	Reads, small IOPs, many concurrent IOPs and random I/Os. Parity uses a small portion of raw capacity.
Disadvantages	No redundancy – one drive fails, data is lost.	Double the drive cost.	Degraded performance with 8-9 I/O threads, random IOPs & smaller more numerous IOPs.	Demanding writes.	Demanding writes. Performance implications of dual parity calculations.

Management Software

The Sun StorageTek Common Array Manager software is the primary interface for configuring and managing the Sun StorageTek 2500 Arrays. The management software consists of a suite of tools that are installed on an external management host. The management host can run on a variety of management platforms, including Solaris, Windows, and Linux. The management software enables the user to manage the Sun StorageTek 2500 Arrays from any system with a Web browser that is on the same network as the management host. The supported browsers are:

- Netscape Navigator 7.0
- Microsoft Internet Explorer 5.0
- Mozilla 1.2.1

For the latest browsers supported, see the *Sun StorageTek 2510, Sun StorageTek 2530 or 2540 Array Release Notes.*

The Sun StorageTek Common Array Manager software provisions and maintains the storage for data hosts:

- *Common arrays* are collections of volumes that share a profile defining the common configuration of the volumes. Storage profiles define the characteristics of a common array. The user can choose one from the set of pre-configured profiles or create a new one
- *Volumes* are divisions of a common array, consisting of virtual disks, representing the storage space that is used by the data hosts in the environment,
- *Virtual disks*, also called RAID sets, are collections of locations in the memory of more than one physical disk. The storage array visualizes a virtual disk as if it were and actual virtual disk.
- *Host groups* are a collection of hosts that share access to the same volumes
- *Snapshots* are copies of the data in a volume at a specific moment. Snapshot offer a highly available alternative to backups as the array can remain online to create the snapshot. Snapshots also take considerably less space then the original data.
- *Volume Copy* creates a complete physical copy – or clone – of a volume within an array. These unique copies can be assigned to any host and used for application testing and development, information analysis or data mining .

Please visit the below link for the latest version of Common Array Manager (CAM):

http://www.sun.com/download/index.jsp?cat=Systems%20Administration&tab=3&subcat=Storage%20Management

Volumes

The Sun StorageTek 25000 arrays' physical disks are managed as a pool of storage space for creating volumes. A volume is a logical unit on a storage array and is created by slicing a virtual disk into a stripe with a defined capacity. Volumes are storage "containers" in which applications, databases and file systems can place data. Volumes are created from the virtual disks, based on the characteristics of the common array associated with the virtual disks. Based on a user's specifications, the array can automatically allocate a virtual disk the can satisfy the volume configuration requirements.

With the Sun StorageTek Common Array Manager software, each virtual disks supports up to 32 volumes with a maximum of 256 volumes. During or after standard creation, a host or host group read and write privileges to the volume Each host, including any host that is a member of the host group, must be assigned one or more initiators before the host or host group can be mapped to the volume. There are several different types of volumes:

- *Standard volume* - A logical structure created on an array for data storage. When a volume is create, it is initially a standard volume. Standard volumes are the typical volumes that users access from data hosts.

- *Snapshot volume* - A point-in-time image of a standard volume. The management software creates snapshot volumes when the snapshot feature is utilized. The standard volume on which a snapshot is based is also known as the base or primary volume.
- *Reserve volume* - Is automatically created when a snapshot is created. The reserve volume stores information about the data that has changed since the volume snapshot was created. When a snapshot is deleted, the management software also deletes its associated reserve volume.

A volume can be created on a virtual disk as long as the RAID level, the number of disks, and the disk type of the virtual disk matches the storage profile associated with the volume's pool The virtual disk must also have enough capacity for the volume. The user chooses the method of determining which virtual disk is used to create the volume. The following options are available:

- *Automatic* - Sun StorageTek Common Array Manager software automatically searches for and selects a virtual disk that matches the necessary criteria. If none are available, it creates a new virtual disk if enough space is available.
- *Create volume on an existing virtual disk* – The administrator manually selects the virtual disk on which to create the volume from a list of all available virtual disks. It is important to ensure that the number of disks selected have enough capacity for the volume.
- *Create a new virtual disk* – The administrator create a new virtual disk on which to create the volume. It is important to ensure that the number of disks selected have enough capacity for the volume.

A volume can be added to an existing storage domain, including the default storage domain, or a new one can be created by mapping the volume to a host or host group. A storage domain is a logical entity used to partition storage that allows a host or host group to have read and write access to the volume. The default storage domains contains all hosts and host groups without explicit mappings and enables them to share access to all volumes that are not explicitly mapped.

Storage Profiles

A storage profile is a set of attributes that can be applied to a common array to allocate storage instead of having to set each attribute individually. The array has a predefined set of storage profile which the administrator can choose from to suit their specific application requirements. The Sun StorageTek 2500 Arrays have a default storage array profile that is suitable for many storage applications. The default pool uses default profile. If none of these profiles are suitable, a new storage profile can be created. Each storage profile has the following settings:

Parameter	Value or Variable Type	Description
Name	Up to 32 characters	Unique identifier for the storage profile
RAID Level	0, 1, 3, 5, 10, 6 P+Q	Configured across all disks within a virtual disk
Segment Size	8KB, 16KB, 32KB, 64KB, 128KB, 256KB, 512KB	Segment size is the portion of a disk allocated to a virtual disk stripe
Read-ahead	Enabled or disabled	Read-ahead mode of the array. Cache read-ahead enables the controller to copy additional data block into cache while the controller reads and copies host requested data blocks from disk into cache
Disk type	SAS or SATA	Disk type
Number of disks	Up to 30 drives(RAID 3, 5, 6 P+Q) Up to 48 drives (RAID 0, 10)	The number of disk drives to be grouped together in a virtual disk. For example, a common array is created with a profile that has the number of disks parameter set to a number. All virtual disks that are part of a common array must have the same number of disks. If the number of disks parameter is set to the *Variable* value, the administrator is prompted for the number of disks when storage is added to the pool.

Virtual Disks

A virtual disk is a set of drives that the controller logically groups together to provide one of more volumes to an application host. Each virtual disk has an assigned RAID level and typically all the drives in a virtual disk are the same capacity. Virtual disks can be created using drives of different capacities, however, the usable capacities of the drives in that virtual disk are adjusted down to the disk drive of the lowest capacity.

The drives that make up a virtual disk can be selected manually or automatically and can reside in a single drive module or across a multiple drive modules. When using the automatic configuration option, virtual disks are configured to balance the load across as many drive channels and drive modules as possible. This helps ensure maximum protection and optimum performance.

While multiple RAID levels be can be intermixed in a single Sun StorageTek 2500 systeme array, each virtual disk has a single, assigned RAID level and can compromise up to 30 drives (48 drives in the case of RAID 0 and 10). The RAID level can be dynamically migrated through the Sun StorageTek Common Array Manager software. The software also provides the ability to dynamically add additional drives, up to two at a time, to existing virtual disks. Existing volumes are then re-striped across all drives in the newly expanded virtual disk. And, like RAID level migration, this occurs while the virtual disks and its volumes remain online and accessible for I/O.

Virtual disks are created and removed indirectly through the process of creating or deleting volumes or snapshots. RAID systems provide storage by making the data on many small disks readily available to file servers, hosts or the network as a single array. RAID utilizes two more disk drives in combination for fault tolerance and performance. One of the factors in data throughput and availability is how the data is stored within the array, that is, the array's RAID level. In the Sun StorageTek 2500 Arrays, disk drives within a tray are

grouped together into RAID sets, also called virtual disks, according to the RAID levels.

The Sun StorageTek 2500 Arrays support the following RAID levels:

- RAID – 0: Stripes data across multiple disks without redundancy. This improves performance, but does not deliver fault tolerance.
- RAID – 1&10: Mirrors a disk so that all data is copied to a separate disk drive.
- RAID – 3: Stripes data at the byte level across multiple disks while writing the stripe parity to a parity disk drive. Provides high throughput for a single streamed file. Checks parity on reads.
- RAID – 5: Stripes data at the byte level and provides stripe error correction (parity checking) information. For this level, the minimum of drives is three. RAID – 5 results in excellent performance and good fault tolerance. Parity checking specifies that when the RAID controller writes data to disks, it also writes redundant data, called parity bits. If a disk fails, the parity information enables the RAID controller to re-create the lost information as it is requested. Since the parity information is spread across multiple disks, only a percentage of the disks are used for parity information which improves the efficiency of available storage space.
- RAID – 6: Stripes data at the byte level and provides stripe error correction (parity checking) information. For this level, the minimum of drives is five. RAID – 6 results in excellent performance and good fault tolerance. Parity checking specifies that when the RAID controller writes data to disks, it also writes redundant data, called parity bits to two disks. RAID 6 uses two parity values with each data stripe: a conventional RAID 5 XOR parity element (P) plus a second parity element (Q). If a disk fails, the parity information enables the RAID controller to re-create the lost information as it is requested. Since the parity information is spread across multiple disks, only a percentage of the disks are used for parity information which improves the efficiency of available storage space.

Storage Pools

A storage environment can be divided into storage pools. Each pool is associated to a profile that allows the storage pool to meet specific I/O requirements. Each array has a default pool that uses the default profile. The default pool satisfies most common storage requirements. The array also provides a set of storage profiles that satisfy certain I/O requirements which are optimal for the type of application to which they refer. If none of the factory profiles are suitable for an application's requirements, a custom storage profile can be created. When a new storage pool is created, a storage profile is assigned to it. Removing a storage pool destroys all data stored in the pool and removes all volumes that are members of the pool. The data can be restored from backup after new storage pools are added, but it is far easier to avoid the difficult in the first place.

Remote CLI Client

The Sun StorageTek 2500 Arrays can also be configured and managed using the remote command line interface (CLI) client. The CLI provides the same control and monitoring capability as the Web browser and it is also scriptable for running frequently performed tasks. The remote CLI client is available for the Solaris OS, Windows and several other operating systems. See the *Sun StorageTek 2510, 2530 and 2540 Array Release Notes* for details on the supported operating system platforms.

Configuration Metadata

The Sun StorageTek 2500 Arrays' controllers store configuration metadata in a private 512MB region on every configured disk drive. This private metadata contains drive state and status information, volume state and status information, and controller and subsystem information. It also stores the drives worldwide name (WWN) of its virtual disk, the volumes it contains and the definitions for these volumes. Also, one drive in each virtual disk (with a minimum of three in each array) stores the controller and subsystem-level information.

Storing metadata in the non-volatile private metadata space provides the highest availability and enables easier re-configurations and migrations. As system configuration data resides on every configured drive, controllers and/or multiple drives can be removed or swapped without losing the array's configuration. Drives can be relocated within the array to improve channel utilization and protection or even migrated as a complete virtual disk into another storage system. And, in both instances, all configuration metadata and user data remains intact on the drives.

Online Administration

The Sun StorageTek 2500 Arrays enable nearly all storage manager tasks to be performed while the storage remains online with complete read/write data access. This allows storage administrators to make configuration changes, conduct maintenance or expand capacity without disrupting I/O to its attached hosts. Online capabilities include:

- *Dynamic Capacity Expansion (DCE)* – DCE enables the capacity and number of drives to be increased for a given virtual disk. Up to two drives at a time can be added to existing virtual disks. The existing volumes are then re-striped across the full set of drives now compromising the virtual disk.
- *Dynamic Volume Expansion (DVE)* – DVE allows the capacity if an existing volume to be expanded using the free capacity on an existing virtual disk. Note: DVE is only supported on certain operating systems.
- *Dynamic RAID Level Migration (DRM)* – Changes the RAID level of virtual disk Note: The virtual disk must have enough capacity and the appropriate number of drives to support the new RAID level.
- *Dynamic Segment Size Migration (DSS)* – A default segment size is set during volume creation based on the virtual disk RAID level and the volume usage specified. The two parameters should optimize the segment size appropriately for the environment. If, when monitoring the storage system, it reflects less then optimal performance, the segment size of a given volume can be changed.
- *Dynamic defragmentation* – This feature rearranges volumes and consolidates free capacity within a virtual disk resulting in optimized access patterns for existing and newly created volumes.
- *Virtual disk/ volume configuration* – HotScale technology enables new drive modules to be added to the Sun StorageTek 2500 Arrays, virtual disks to be configured, and volumes to be created without disrupting access to existing data. One a newly created volume is defined, Sun StorageTek Common Array Manager software's immediate LUN availability and *hot add* features enable it to be instantly mapped and accessed by a host(s).
- *Performance Monitoring* – The Sun StorageTek Common Array Manager software for the Sun StorageTek 2500 Arrays enable the array performance to be monitored in real-time to assist in performance tuning decisions.
- *Non-disruptive controller firmware upgrades* – Controller firmware can be upgraded with no interruption to data access. The new firmware is transferred to the first controllers, its flash memory is updated, and the controller is rebooted. The firmware is then passed from the first controller to the second and the process is repeated. With a multi-path driver installed, access to storage array volumes is maintained throughout the process. The exception for this is firmware v7.35 upgrade which requires an offline upgrade.

Performance Tracking Utility

The Sun StorageTek Common Array Manager software provides quick performance health statistics, which allows fine running of attributes to reach the optimal configuration for precise application needs. Since performance degradation is often a precursor to component or system downtime, performance tracking enables predictive, preemptive maintenance. The Performance Monitor data table tracks the following parameters by device (Sun StorageTek 2500 Arrays' controllers, volumes and storage system totals).

Performance Metric	Definition
Total IOPS	The total number of I/Os handled by the component per second
Run Average Total IOPS	The average total number of I/Os handled by the component over the entire performance sampling period.
Peak Total IOPs	Highest total IOPs over polling period
Read Percentage	The percentage of read operations handled by the component between two sampling periods (T1, T2)
Write Percentage	The percentage of write operations handled by the component between two sampling periods (T1, T2)
Cache Read Hit Percentage	The percentage of cache read hit operations handled by the component between two sampling periods (T1, T2)
Total Data Transferred (KB/s)	Total data transferred by component (read/writes)
KB/s Read	Total data read in KB per second
Run Average KB/s Read	The average total data read in KB per second by the component over the entire performance sampling period
Peak KB/s Read	Highest KB/s read over polling period
KB/s Written	Total data written in KB per second
Run Average KB/s Written	The average total data written in KB per second by the component over the entire performance sampling period
Peak KB/s Written	Highest KB/s written over a polling period
Average Read Size (Bytes)	The average read size for a component for a single sampling period
Average Write Size (Bytes)	The average read size for a component for a single sampling period

Global Hot Spares

The Sun StorageTek 2500 Arrays supports an unlimied quantity of hot spare drives, and each can be a spare for any disk in the array. A hot-spare is a drive containing no data that acts as standby in the storage array in case a drive fails in a RAID-1, RAID-3, RAID-5, or RAID-6 volume. The hot spare adds another level of redundancy to the storage array. Generally, the drive assigned as a hot spare should have a capacity that is equal to or greater than the capacity of the largest drive on the storage array. If a hot spare is available when a drive fails, the hot spare is automatically substituted for the failed without user intervention. Upon physical replacement of the failed drive, the data from the hot spare is copied back to the replacement drive and the hot spare returns to its role as the hot spare drive . This is called copyback. An administrator also has the option to have the hot spare become a permanent member of a volume group, eliminating the copy-back process. The replacement drive, in this case, would then be in an unassigned state until configured.

If a hot spare drive is not available, a failed disk drive can still be replaced while the storage array is operating. If the drive is part of a RAID-1, RAID-3, or RAID-5 volume group, the controller uses redundancy data to automatically reconstruct the data onto the replacement drive. This is called reconstruction.

Multipathing

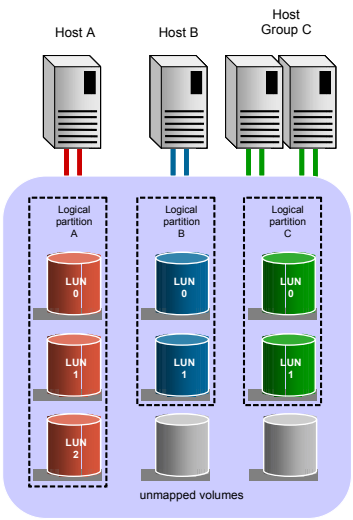
With multipathing, also called multipath failover, an array or network can detect when an adapter has failed and automatically switches access to an alternate adapter. Multipathing enables high availability configuration because it helps to ensure that the data path remains active. Multipathing also helps increase performance to multi-controller disk arrays by spreading I/O between multiple path into the array. With the array, common arrays use multipathing by default. To complete the data path, data hosts also need the ability to multi-path, Therefore, all data hosts need on of the following software products:

- Sun StorageTek Traffic Manager software
- MPxIO, part of the Sun StorageTek SAN Foundation software and integrated into the Solaris 10 OS
- Veritas Volume Manager with Dynamic Multipathing (DMP) (2540 only)
- Linux RDAC Drives
- Other multipathing drivers (see SAN 4.4.X WWWW matrix)

Storage Domains

The Sun StorageTek Common Array Manager software's Storage Domain feature enables a single Sun StorageTek 2510, 2530 or 2540 array to be logically partitioned and function up to 32 virtual arrays. A storage domain is a logical entity consisting of one or more storage system volumes that are accessed by a single host or shared among host that are part of a host group. A storage domain is created when the administrator defines a single host or a collection of hosts, called a host group, and then defines a volume-to-LUN mapping. This mapping defines what host or host group have access to a particular volume in the array. Host and host groups can only access data through assigned volume-to-LUN mappings. Storage Domain access is maintained at the controller level for complete data integrity in multi-host, multi-OS environments.

Storage Domains create valuable flexibility for the storage administrator as any available volume can be mapped to any attached server. So while the individual server see a virtual array that consists of only their LUNs/volumes, the volumes can be intermixed throughout the array within one or more virtual disks. Storage Domains combined with the The Sun StorageTek Common Array Manager software's configuration capabilities enables users to choose from a range of volumes with different characteristics to meet a server's exact needs for a given LUN. Each volume can have a unique configuration settings and reside on a different types with different RAID levels. Two (2) Storage Domains are included with the product. Upgrade licenses (8and 32) for additional domains are available as optimal premium features. This flexibility enables a range of hosts with different capacity, performance, or data protection demands to effectively share a single Sun StorageTek 2500 Arrays.



Heterogeneous Hosts

The heterogeneous hosts feature allows the firmware on each controller in the array to tailor its behavior (such as LUN reporting and error conditions) to the needs of the host operating system. This provides each individual host the view of the storage system that it would experience if it had exclusive access to the array.

In a heterogeneous environment, the user must set each host type to the appropriate operating system during host port definition. The host type can be completely different operating systems, such as the Solaris OS and Windows, or variants of the same operating system, e.g. clustered and not-clustered. Each storage host port can be configured for multiple host types enabling complete flexibility for heterogeneous consolidation. Heterogeneous host settings are only available when the Storage Domain feature is enabled.

Sun StorageTek Data Snapshot Software – Optional

Sun StorageTek Data Snapshot software provides an additional level of data protection and the means to improve the utilization of production data. It enables non-production servers to access an up-to-date copy of production data for a variety of applications – including backup, application testing or data mining, while the production data remains online and user-accessible.

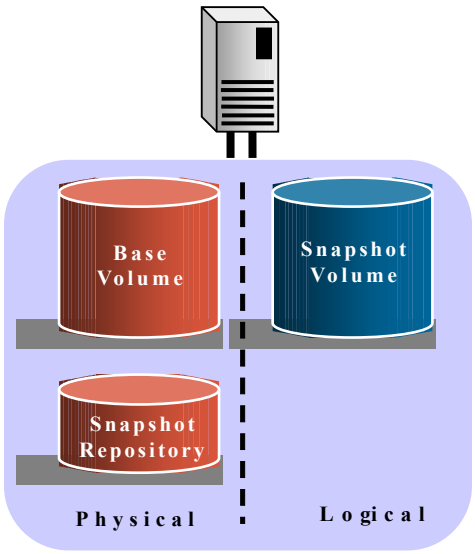
A snapshot volume is a point-in-time image of a volume. It is the logical equivalent of a complete physical copy, but is created much more quickly and requires less disk space. Snapshot volumes appear and function as standard storage volumes. They are host-addressable and can be read, written to or copied.

Volume snapshot uses an innovative copy-on-write technology to maintain the logical snapshot volume while minimizing disk utilization. When the snapshot is “taken,” the controller suspends I/O to the base volume for a few seconds while it creates a physical volume – called the repository volume – to store snapshot metadata and copy-on-write data. When a data block on the base volume is modified, a copy-on-write occurs, copying the contents of blocks that are to be modified into the repository volume for safekeeping. This repository volume combined with the original base volume creates the logical snapshot volume.

Since the only data blocks that are physically stored in the repository volume are those that have changed since the time of the snapshot, the snapshot technology uses less disk space than a full physical copy. The repository volume is typically 20 percent of the base volume, but will vary depending on the amount of changes to the data. The longer a snapshot is active, the larger the repository is needed. Volume snapshot provides notification when the repository volume nears a user-specified threshold (a percentage of its full capacity). And at any time, The Sun StorageTek Common Array Manager software’s DVE feature can be used to dynamically expand the repository volume.

For optimal performance when using the Sun StorageTek Data Snapshot software:

- Locate repository volumes on separate disks from production LUNs to isolate repository writes and minimize the copy-on-write penalty
- Try to schedule read I/Os the snapshot volume at off-peak times when I/O activity on the source LUN is lower



Key Features and Benefits

- **Up to eight snapshots per volume**
  - Better protection — Support for multiple copies of data volumes allows frequent and regular snapshots to be used to protect against data loss from an operational problem.
  - Protects data by providing up to four readily available online copies that reduces restore time.
- **Rapid availability**
  - Snapshot creation within seconds — Sun StorageTek Data Snapshot software can create a snapshot volume in seconds, which avoids the lengthy time required to do a full disk-to-disk copy or tape backup and then restore. Fast creation of snapshots means less waiting to use them.
  - Improves employee productivity by having an immediate copy. No more waiting for large volumes of data to copy, snapshot is nearly instantaneous.
- **Read and write support for snapshots**
  - Support all application needs — read and write access to snapshots means that virtually any type of testing or analysis can be applied to using snapshots without jeopardizing primary production data. While the snapshot version of data can be modified by a secondary application, the primary data volume continues to be used and modified by the original application server.
  - Provides more rapid application development by immediately creating a test environment and capitalizing on the ability to write to the snapshot image.
- **Space saving design**
  - Maintain multiple copies with minimal extra disk expense — the copy-on-write design allows multiple versions of data to be protected with minimal disk space consumption. As a result, Sun StorageTek Data Snapshot software may require only 5 to 100 percent of additional capacity for four snapshots instead of the 400 percent (for four copies) of additional capacity that would be required with full volume copies.

Sun StorageTek Data Volume Copy Software — Optional

Sun StorageTek Data Volume Copy software provides administrators with another tool to effectively manage information growth and maximize the utilization of Sun StorageTek 2500 arrays. It creates a complete physical copy, or a clone, of a volume within a storage system. The clone volume is a uniqueentity that can be assigned to any host and used by applications requiring a point-in-time (PiT) copy of production data — such as backup, application testing or development, information analysis, or data

mining — without affecting the performance of the production volume.

The software is configured and accessed via easy-to-use wizards or command line interface. It supports up to eight concurrent copies within a single storage system. Sun StorageTek Data Mirror software is a background operation with five user-defined priority settings, enabling administrators to minimize either copy time or the overall I/O impact to the storage system. And as the software is controller-based, it requires no host interaction or CPU cycles, minimizing the impact to applications and the storage infrastructure.

Sun StorageTek Data Volume Copy software can be used in conjunction with Sun StorageTek Data Snapshot software — which creates a PIT image of a volume while maintaining read and write access — enabling a complete PIT clone to be created without interrupting the I/O activity of the production volume. Additionally, Sun StorageTek Data Volume Copy software can be used to redistribute data — moving volumes from older, slower disk drives to newer, faster, or higher capacity drives — to optimize application performance and/or capacity utilization.

Features, Functions and Benefits

Feature	Function	Benefit
Leverages Sun enterprise-class engineering and development.	▪ Sun's legacy in enterprise storage systems was the intellectual ground work for the Sun StorageTek 2500 Arrays development	○ Best-of-breed technology and reliability
Simple and affordable	▪ As the Sun StorageTek 2500 Arrays were developed for the entry-level user perspective, only features and tools were fashioned to benefit their specific data requirements	○ The Sun StorageTek 2500 Arrays were specifically made for the entry-level market as an out-of-the-box storage solution that is all-inclusive with a minimal investment of time or capital.
1Gb/s iSCSI (2510) 3Gb/s SAS (2530) or 4Gb/s FC (2540) host interface options	▪ 1Gb/s iSCSI technology provides up to 100MB/s throughput per channel ▪ 3Gb/s SAS technology provides up to 1200MB/s burst throughput per channel ▪ 4Gb/s FC technology provides up to 400MB/s throughput per channel	○ Interface options to meet the throughput demands of your specific application's requirements
Auto-negotiating 4GB/s FC	▪ Ability to auto-negotiate FC link speeds allowing for seamless integration into an existing 1Gb/s or 2 Gb/s environment	○ Provides investment protection when the SAN inevitably becomes 4Gb/s
Application-oriented management interface	▪ Simplifies storage provisioning	○ Quickly and predictably provision storage to precise application demands
Sun StorageTek Common Array Manager	▪ Enables a common management interface across the Sun StorageTek 2500 and 6000 families ▪ Manage multiple arrays or other storage systems from the same common browser-based console	○ Simplifies storage management ○ Saves time. Removes the time that would be necessary to go from one management interface to another ○ Helps ensure maximum utilization of storage capacity and complete control over growing environments
Online storage management, redundant, hot-swappable components and automated path failover	▪ Data protection assurances in place	○ Provides trusted access to data and availability at all times supporting workforce productivity and customer satisfaction
SAS and SATA drive intermix	▪ SAS and SATA drives can be housed in the same array, but volume groups can contain only one drive type	○ A user can best suit their applications' storage needs from highly available to near-line storage in a single storage system.

Feature	Function	Benefit
		○ Simplifies purchasing and storage deployment with near-line applications utilizing inexpensive SATA drives and highly-utilized applications deploying SAS drives.
Solution of choice for clustered topologies	▪ Microsoft's support of external RAID clustering, positions the Sun StorageTek 2500 Arrays as the entry-level choice for clustered topologies.	○ Clustering allows for multiple servers, typically two, to share access to data stored on a single storage system. Clustering also allows a user's application to keep running on a secondary server should the primary server fail.
Enhanced data protection software	▪ Sun StorageTek Data Snapshot software enables customers to create real-time copies of critical volumes, which can be used to eliminate the backup window and quickly recover data ▪ Sun StorageTek Volume Copy enable customers to create complete copies, or clones, of a volume, which can be used as back-up or for non-production testing	○ Maximum application recovery and data protection
Storage Domains	▪ Virtual arrays – segment storage capacity by host and applications	○ Lower total cost of ownership through storage consolidation in heterogeneous host environments
"Start small, grow big" scalability	▪ Modular design supports up to 48 drives with online capacity expansion ▪	○ Lower initial investment ○ Enables additional purchases only if and when the organization data growth necessitates it
Configuration "metadata" is stored on every configured drives in the array	▪ Centralized configuration administration from anywhere	○ Data-intact drive portability supports changing requirements with redundant protection of critical configuration metadata ○ Loss of a management station does not cause loss of any configuration data
Common Storage Tray	▪ Enables all storage arrays in the Sun StorageTek 2500 family to share common storage ▪ When upgrading from one ST2500 array to another ST2500 array, the same storage tray can be used in the new system without moving the data	○ Investment protection, cost savings, flexibility and data-in-place migration
Dynamic reconfiguration functionality	▪ Volume expansion, RAID migration, capacity expansion, segment size migration, volume and virtual disk reconfiguration, and controller	○ Around-the-clock availability ○ The flexibility to make on-the-fly changes without

Feature	Function	Benefit
	firmware upgrades	interrupting I/O
Performance data gathering	▪ Helps track and optimize specific applications' performance	○ Minimize downtime through predictive and preemptive maintenance and automated diagnostics for proactive health monitoring
Supports RAID 0, 1, 3, 5, 1+0, 6 (P+Q)	▪ Ability to cost-effectively match performance and availability to the application	○ Achieve optimal performance by gauging the appropriate RAID level with the application
Online configuration – reconfiguration capabilities	▪ Reconfigure the arrays' attributes on-the-fly	○ Dynamically tune volume attributes to meet changing requirements
Peak KB/s Written		Highest KB/s written over a polling period
Average Read Size (Bytes)		The average read size for a component for a single sampling period
Average Write Size (Bytes)		The average read size for a component for a single sampling period

Best Practices for the Sun StorageTek 2500 Arrays

Planning and Acquisition

If possible, it is best a proper understanding of the applications and the expectations of them before investing in storage resources in order to ensure a satisfactory outcome. Properly understanding the applications are not always possible, however, either because of severe budgetary limitations or other factors such as management mandates for storage consolidation and/or the pre-assignment of re-deployed hardware that “will just have to do the job”. In the latter case, planning may not help much when there are only a few options available. The former situation, however, does allow business and technical trade-offs to be considered that can provide better results when the available resources are selected on the basis of what is needed for the application.

Best Practices Require that the Application(s) be Well Understood

Two typical classification methods are based on the access patterns for the data.

- Transaction processing is the interactive online communication with record-oriented data.
    - Sample applications may be order entry or an airline reservations system
    - Transaction processing characteristically employs short records or blocks asynchronously and randomly accessed.
    - Performance is measured in terms of I/O operations per second, or IOPs
- Data streaming reflects the continuous intake, processing our output of data
    - Sample applications may be satellite data collection or media serving
    - Data streaming more classically uses very large data blocks that are sequentially accessed
    - Performance is measured in terms of MB/s
- Some applications require a combination of the two patterns above. The Sun StorageTek 2500 Arrays are well-suited for both transactional and streaming data patterns as long as the array is configured to best address the performance characteristics of each.

Performance enhancement of intelligent RAID-based arrays, like the StorageTek 2500 arrays, is best achieved by leveraging parallel and overlapped operations which overall appear to exceed the basic I/O operating specifications of the actual hardware. This is typically possible by taking advantage of dual controllers each with large flexible cache buffers, numerous drive spindles across which the data is stripped, and dynamically manager I/O queues that utilize access optimization algorithms.

How Many Drives are Required?

The design of the StorageTek 2500 arrays provide the user with a scalable array that can be predictably configured for most applications. The reason for this is that in addition to its explicit objective of maximum availability, the RAID architecture provides exceptional parallelism and extensive overlap of I/O operations in addition to the use of intrinsically fast components. The StorageTek 2500 arrays also provide low access time to data. A transaction processing application designed around a relational database normally requires several random accesses for modest amounts of data with each access. Overall performance of this application is said to be IOPs bound, because input/output overhead is a function of transaction rate, but could possibly be enhanced through performance optimization techniques reviewed in this document.

While numerous factors come into play, the most common is the more disk drive spindles that data can be spread across, the faster access time to a particular record. For planning purposes, if the number of IOPs the target uses is known, it is possible to estimate the future IOPs required based on business growth.

Try to plan a storage solution around a key application. Remember that the notion of buying the largest drive size because it provides more capacity, might be an incorrect assumption. If the application demands a maximum level of performance, select the higher spindle count with lower capacity. It is also important to note that when Data Snapshot is utilized, the incremental drive requirement for this function should be taken into consideration separately.

Other applications such as data acquisition for signal processing are bandwidth-oriented. There are few accesses except for very large blocks of data, primarily in sequential order. IOPs are not as significant as the continuous streaming of large volumes of data, referred to as bandwidth or throughput oriented. Performance requirements, in this case, are measures in terms of MB/s.

Which RAID Level is Best for the Application?

RAID levels for one or all of the volume groups affects cost, performance and data recovery times.

RAID – 0: uses the least amount of storage requiring no capacity for redundancy or parity protection.

- Is the least expensive solution as no additional hardware for data protection or recovery is needed. This does not take into account the cost of recovery from data loss.
- RAID 0 is a high performance solution as there is no overhead to manage redundancy that does not exist.
- RAID 0 is rarely selected as the level of choice for business-critical data

RAID – 1 (and 1+0): requires twice the capacity of the actual data and is therefore the most expensive.

- Using two complete copies of a volume, data recover is not only ensured, but data access operates very quickly as the controller has the choice of accessing data from either set of drives.
- Recovery from data or hardware loss is relatively quick as the failed set can be rapidly recovered from the surviving set at data without requiring mathematical algorithms.

RAID – 3, 5, or 6: has some capacity compromise among the above RAID levels mentioned above since a parity drive is required for each volume group between 5 and 29 drives.

- Failed devices or data errors can be recovered through mathematical analysis of the surviving data.
- Low parity ratios (e.g. 4+1) results in lower cost savings but good recovery times. Higher parity rations (e.g. 15+1) are less costly then lower ratio solutions, but will require a lengthier error recovery time.

RAID groups within the same array do not have to use the same RAID level in the Sun StorageTek 2500 Arrays and do not require the same spindle counts, parity rations or block sizes. It is also important to note that IOPs for most applications is skewed much more heavily toward reads then writes, Applications typically exhibit more of a write bias, such as greater than 20-25 percent write operations, may be better suited to RAID 1 or 1+0.

The process of rationalizing the business decision of which RAID level and parity level to choose for the various logical storage volumes should be well thought out and based on the requirements and based on the requirements of the application and organization. The advantage of the Sun StorageTek 2500 Arrays' management software is its flexibility. Changing RAID levels, drives counts, parity ratios, volume group size, etc. can be dynamically performed from one value to another without interrupting normal application processing or database access – a clear advantage over alternative designs.

How Many Disk Drives Should be in a Volume Group?

For transaction processing or IOP heavy applications, the guidelines below will be helpful:

1. Pick a RAID level reasonable for the expected activity
    a. For this example, start with a moderate RAID 5
2. Pick a drive type and capacity
    a. (146GB 15K rpm SAS drives)
3. Pick a parity drive ratio
    a. (5 data drives + 1 parity drive is a good ratio)
4. Quick check
    a. Database requirement = 700GB, including planned growth
    b. 5 times 146GB drives = 730GB = ~ 700GB
    c. Plus 1 parity drive totals 6 drives, which equals half of a drive rack
    d. This volume group should be capable of sustaining at least 1500 random IOPs (reads)

Another guideline to keep in mind for Volume Groups is that the number of data spindles in the data volume group should be able to accommodate the maximum size of a data stripe. In other words, the maximum size of the data stripe should be equal to or greater than the segment size multiplied by the number of data disk spindles reserved for that volume group.

RAID Topology

Most applications require several to numerous data segments. The segment can be either a small volume or, if the volume is significantly large based on the mathematical rules provided in the above section, each and every portion of a volume group distributed among the different spindles can also be referred to as a segment. When segments for the same application require access concurrently during normal operation, some performance benefit can be achieved if those segments are allocated to spindles in as many different drive enclosures as possible. This is sometimes referred to as vertical striping, as contrasted with segments striped to or from spindles within the same drive enclosure. This simple explanation for this is that stripping benefits from overlapped I/O, but cannot benefit when there are conflicts for the same resource. Therefore, reduce all obvious points of conflicts for the same resource.

Controller Cache Parameters

Better I/O efficiency is achieved if the I/O block size for the controller cache is equal to the stripe size of the I/O record. IOPs applications typically have smaller block sizes than bandwidth data. If this is the case, try to select the block size as a simple multiple or factor of the stripe size.

Server Hardware – Bus Bandwidth and HBAs

An important limiting factor in I/O performance is the I/O capability of the server hosting the application. The aggregate bandwidth of the server to the array is measured in MB/s and consists of the total capability of the buses to which the array is connected.

Multiple HBAs on this bus share a single source of I/O bandwidth and each HBA can have multiple FC ports or SAS ports which typically operate at 1Gb/s, 2Gb/s, 4Gb/s or 3Gb/s, respectively. Therefore the ability to drive a storage array can be throttled by either the server bus or the HBAs.

When a server is configured, or whenever I/O performance is analyzed, it is important to understand how much

server bandwidth is available and which devices share that bandwidth. If the aggregate maximum bandwidth of the HBAs exceed that of the server, then the server can become a throughput bottleneck. If the aggregate throughput is lower, however, it might be possible to increase the throughput of an application by adding additional HBAs to the server or replacing lower performance HBA with faster ones, or reassigning the fastest HBAs to the applications that can take advantage of their higher performance.

For the most up-to-date list of supported HBAs, refer to What Works With What (WWWW) or the Sun Interop tool. Contact the Sun Product Manager for additional information.

Reliability, Availability and Serviceability (RAS)

Reliability

Reliability features of the Sun StorageTek™ 2500 arrays include the following:

- No Single point of failure
- Passive midplane (except for FRU-ID EEPROM)
- Automatic sector reallocation on RAID controller
- I2C for components management & fault detection
- Path Fail Over (PFO) Protection – coverage for I/O Module pulls, hardware or firmware failure
- Path Fail Back Protection – PFB – after a PFO the ability to add a new I/O module back into the tray
- Global Hot Spare drives (unlimited)
- Link redundancy chip and 8- to 10-bit encoding on FC-AL loops
- ECC on data cache
- Cooling Fan Module proactively adjusts fan speed based on temperature monitoring
- Temperature sensors located closer to heat spots to provide accurate temperature measurements
- RAID Set / Disk Scrubbing
- RAID redundant data verification prior to rebuild
- I/O Data Gathering

Availability

Availability features of the Sun StorageTek 2500 Arrays include the following:

- Dual-active RAID controllers with Cache Mirroring
- Dual-active drive channels
- Dual hot-swappable redundant 515W power supplies and fan modules with individual power cord
- All CRUs are hot swappable
- Write Through / Write Back with mirroring
- Global hot spare with automatic drive failure detection and rebuild
- 7 day battery back-up for 1 GB cache, per controller
- Fast “On the fly” background Volume (RAID Set) Initialization
- Dynamic reconfiguration: virtual disk strip size, RAID migration, volume create/delete, Defragmentation, Online controller firmware upgrade, expansion trays addition
- Persistent group reservation (supporting industry-standard SCSI-3 persistent reserve commands)

Serviceability

Serviceability features of the Sun StorageTek 2500 Arrays include the following:

- Low CRU count — the drives, RAID controllers with integrated back-up battery or I/O Modules, cooling fan modules and power supplies — can be hot-swapped with no tools required
- Support CRU – Customer Replaceable Units can be hot-swapped and replaced by the customer without service intervention.
- Failed FRU ID

- Host-based phone home capability
- Auto Disk recognition
- Advanced run time diagnostics
- Background Media Scan
- Quick snap locking mechanisms for easy insertion/extraction of disks and other CRUs
- Collect and store support bundle on critical alert
- In a critical event, the monitor saves support bundle to the local hard drive of the client system. The information will stored for at least 72 hours.
- Expanded diagnostic data capture - Capture enough info on the first error event to correct error 90% of the time

Specifications

Sun StorageTek™ 2540, 2530, or 2510 Array - One Fully Populated Controller Tray

Feature	Specification
Physical Planning	
Dimensions	3.39 inches high (86.1mm) 17.66 inches wide (448.6mm) 21.26 inches deep (59.55 cm)
Shipping Dimensions	31.25 x 23.38 x 9.75 inches
Maximum Shipping Weight	88 pounds (40 kilograms)
Environmental (operating)	
Temperature	10º to 40º C (50º to 104º F) without battery 10º to 35º C (50º to 95º F) with battery
Relative Humidity	20% to 80% non-condensing
Operating Altitude	68.3 kPa (3200 m), 40°C, 4 hr dwell* **Commencing upon product reaching temperature stability*
Operating Shock	5.5g's, 11 ms, half-sine, 10 shocks per direction, all 6 directions
Operating Vibration	All three axes: 0.25 g's, 5 to 500 Hz, swept-sine, 5 sweep cycles, 1 octave per minute
Heat Output	460 Watts (1571 BTU/Hr)
Environmental (non-operating)	
Temperature (Storage)	-10º to 50º C (-14º to 122º F) without battery -10º to 45º C (-14º to 113º F) with battery three month maximum
Temperature (Transit)	-40º to 60º C (-40º to 140º F) without battery -20º to 60º C (-4º to 140º F) with battery one week maximum
Humidity (Storage)	10% - 90%, Max Dew Point is 26º C (79º F), 10% per hour Gradient
Humidity (Transit)	5% - 95%, Max Dew Point is 26º C (79º F), 10% per hour Gradient
Altitude	18.8 kPa (12200m m), 0C, 4 hr dwell.* **Commencing upon product reaching temperature stability*
Shock	20 G, 8.0 msec square wave in each direction along x,y and z axis
Shock	33 g's, 11 msec, half-sine 3 shocks per direction, all 6 directions

Feature	Specification
Vibration	All three axes: 1.2 g's, 5 to 500 Hz, swept-sine, 5 sweep cycles, 1 octave per minute
Power Requirements	
AC Power (CU)	3.96 A Max Operating @ 115 VAC (90 – 264 VAC Range), 47/63 Hz 2.06 A Max Operating @ 240 VAC (90– 264 VAC Range), 47/63 Hz
DC Power	17 A Max Operating (-42 to -60 VDC)
Standards Compliance	
NEBS Support	GR-63 CORE Requirements GR-1089 CORE Requirements Support AC and -48V DC power supply capability
Safety and Emissions	EN55022 Report FCC (> 1 GHz), part 15, VCCI Class A, AS/NZS 3548, EN 61000-3-2, EN 61000-3-3, EN55024, EN300 386 (for Radiated Immunity only), RoHS, WEEE
Immunity	CISPR 24 (EN55024), IEC 61000-4-2
Sound (All measurements at 25 deg. C normal room temp and fan speed)	
ES 2-10-02 Standard Level 2	0.5 bels margin
Sound Power (normal operation)	5.5 bels
Sound Pressure (normal operation)	60 dBA

System Requirements

Supported Operating Systems

- Solaris 9 (2540 only) and 10 SPARC Operating Environments
- Solaris 10 x86 Operating Environments
- Windows Server 2003 SP1, 2008
- Linux
    - Red Hat Enterprise Linux:
        - v4.0 (2.6 kernel) AS, WS, ES
        - 5.0
    - SUSE Enterprise Linux:
        - V9.0 (2.6 kernel)
        - V10.0 (2.6 kernel)
- VM Ware
    - ESX 3.0.1 and higher (2540 only)
    - ESX 3.5 (2540 and 2510 only)

The Sun StorageTek Interop Tool

The Sun StorageTek 2500 Arrays are fully supported with major host operating systems and multi-path drivers. For details, please refer to the Sun StorageTek Interop Tool at:
https://interop.central.sun.com/interop/interop

Partners can request access to the tool here (must be have a partner login id):
http://partner.sun.com/tools/interop-access.html

The Sun StorageTek 2510 iSCSI Array is supported with any ethernet enabled device running in a supported O/S environment. As such, is not maintained in the interop tool referenced above.

Supported Sun Software

- Sun StorageTek Storage Domain (8 or 32)
- Sun StorageTek Data Snapshot software for the Sun StorageTek 2500 Arrays
- Sun StorageTek Volume Copy software for the Sun StorageTek 2500 Arrays
- Sun Cluster 3.0 and greater
- Sun Logical Volume Manage

Third Party Software

- Veritas Windows - VxVM SF 4.3
- Veritas RHEL 3.X – VxFS SF 4.0 (32 bit Only)

- Veritas RHEL 3.X – VxVM SF 4.0 (32 bit Only)
- Veritas RHEL 4.X – VxFS SF 4.1
- Veritas RHEL 4.X – VxVM SF 4.1
- Veritas Netbackup
- Veritas Cluster support
- Veritas Storage Foundation 5.0
- Enterprise Backup Software (EBS)
- Microsoft Cluster Server (MSCS) 2003 & 2008

For detailed support information, please refer to the latest support matrix at URL:

https://interop.central.sun.com/interop/interop

System Configuration and Management

Common Array Manager / Sun StorageTek Configuration Service Software

Common Array Manager for the Sun StorageTek 2500 Arrays, StorageTek Configuration Service software provides a powerful, yet easy to use, Java-based GUI for administering the Sun StorageTek 2500 Arrays. Common Array Manager software enables online administration, a consistent interface across all operating systems, and the ability to monitor and manage one or all Sun StorageTek 2500 Arrays from any location on the network.

Centralized Administration

Common Array Manager software enables all Sun StorageTek 2500 and 6140 Arrays to be managed from a single interface at one or more locations on the network. Its browser user interface (BUI) provides a comprehensive view of all storage systems in the management domain. From the BUI, new arrays s can be manually or automatically detected and added. Each storage system is managed through a Storage Window. The console is specific to an individual array; however multiple Storage Windows may be launched from the Array Summary Window to simultaneously manage multiple storage systems.

Array Summary Window

The Array Summary Window is browser based GUI used to configure and maintain the Sun StorageTek 2500 Arrays. The Array Summary Window allows auto discovery and manual registration of the different Sun StorageTek 2500 and 6140 arrays. In additional, it displays detailed information for the array like: Name, Health, Type, Firmware version, total capacity, available capacity and network address.

Storage Window

The Storage window displays the application-oriented storage profiles, logical components (volumes and Virtual Disk, Pools, Data Services like Snapshot), physical components (initiators, host groups, hosts, trays and drives) for each Sun StorageTek 2500 array. All storage management operations for a selected storage system or for selected components within a storage system are launched from the appropriate Storage Window menu.

Sun Storage Automated Diagnostic Environment

The Storage Automated Diagnostic Environment component of the StorageTek 2500 Common Array Manager offers proactive health checking, intelligent diagnosis, fault isolation event notification and fault management reporting for the Sun StorageTek 2500 Arrays from a single management console. This software helps improve recoverability and increase infrastructure uptime, thus contributing to overall improved application service levels. More specifically, it provides the following functionality:

- Collects health, configuration, and other non-customer-related data
- Evaluates statistical error reports
- Notifies designated parties about events, when action is required
- Step-by-step instructions to add expansion trays to the StorageTek 2500 arrays
- Monitors host message files for errors in order to obtain status information about the Sun StorageTek 2500 Arrays

- Makes decisions on actionable service issues
- Troubleshooting/fault isolation of the Sun StorageTek 2500arrays
- Provides mechanisms for service personnel to remotely access the system to gather additional data, perform maintenance, perform upgrades, and invoke diagnostics
- Guides service personnel through CRU isolation, replacement, and validation
- Device revision checking for firmware of the Sun StorageTek 2500 Arrays

Management Host System Requirement:

The external management host where the management software resides has the following system requirements:

- Platform: SPARC or x64 server
- Operating System: Solaris 10 SPARC or x64 Operating Environments, Linux, Windows
- Disk Space: 500 Mbytes
  - Includes 300 Mbytes in the /opt directory, 200 Mbytes in the /var directory)
- Minimum Array Memory (2 arrays, 2 users): 512 MB
- Recommended Array Memory: 1 GB
- Client Memory: 256 KB
-

Supported Browsers:

- Netscape Navigator 7.0
- Microsoft Internet Explorer 5.0
- Mozilla 1.2.1

Ordering Information

Ordering information and part numbers for the Sun StorageTek 2500 Arrays are provided in this section.

Shipping Configuration Details

Sun StorageTek 2540 FC Array controller trays include the following:

- Single or Dual FC RAID controller cards per tray with 512-MB cache per controller or 1 GB mirrored cache per controller
- One (1) pair left and right end caps (plastic bezels)
- Two (2) or Four (4) 4 Gbps FC shortwave SFP's for host connections (2 per FC controller module)
- Two (2) 6-meter RJ45 -RJ45 Ethernet cables (one per controller module)
- One (1) RJ45-DIN9 cable
- One (1) RJ45-DB9 adapter
- One (1) null modem adapter
- Sun StorageTek 2500 Array Poster Install Guide
- Sun StorageTek Common Array Manager Software CD, including firmware updates
- Sun StorageTek Common Array Manager Software Installation Guide (on the software CD)
- Common Array Manager sscs CLI Quick Reference Card
- Sun StorageTek 2500 Series Array Hardware Installation Guide (Hardcopy)
- Accessing Documentation guide

Sun StorageTek 2530 SAS Array controller trays include the following:

- Single or Dual SAS RAID controller cards per tray with 512-MB cache per controller or 1 GB mirrored cache per controller
- One (1) pair left and right end caps (plastic bezels)
- Two (2) 6-meter RJ45 -RJ45 Ethernet cables (one per controller module)
- One (1) RJ45-DIN9 cable
- One (1) RJ45-DB9 adapter
- One (1) null modem adapter
- Sun StorageTek 2500 Array Poster Install Guide
- Sun StorageTek Common Array Manager Software CD, including firmware updates

- Sun StorageTek Common Array Manager Software Installation Guide (on the software CD)
- Common Array Manager sscs CLI Quick Reference Card
- Sun StorageTek 2500 Series Array Hardware Installation Guide (Hardcopy)
- Accessing Documentation guide

Sun StorageTek 2510 iSCSI Array controller trays include the following:

- Single or Dual iSCSI RAID controller cards per tray with 512-MB cache per controller or 1 GB mirrored cache per controller
- One (1) pair left and right end caps (plastic bezels)
- Two (2) 6-meter RJ45 -RJ45 Ethernet cables (one per controller module)
- One (1) RJ45-DIN9 cable
- One (1) RJ45-DB9 adapter
- One (1) null modem adapter
- Sun StorageTek 2500 Array Poster Install Guide
- Sun StorageTek Common Array Manager Software CD, including firmware updates
- Sun StorageTek Common Array Manager Software Installation Guide (on the software CD)
- Common Array Manager sscs CLI Quick Reference Card
- Sun StorageTek 2500 Series Array Hardware Installation Guide (Hardcopy)
- Accessing Documentation guide

- Sun StorageTek 201 SAS Expansion Array trays include the following:
  - Single or Dual SAS I/O modules per tray
  - One (1) or Two (2) 1 meter copper SAS interconnect cables (1 cable per SAS I/O module)
  - One pair left and right end caps (plastic bezels)
  - Accessing Documentation Guide

Each Sun StorageTek 2500 Array (and expansion array) requires a minimum of 5 drives per tray, maximum of 12 drives per tray. Drive options include:

- SAS 3Gbps hard disk drive: 73 GB 15K rpm; 876 GB per tray (EOL 12/1/2008)
- SAS 3Gbps hard disk drive: 146 GB 15K rpm; 1752 GB per tray
- SAS 3Gbps hard disk drive: 300GB 15K rpm; 3600 GB per tray
- SAS 3Gbps hard disk drive: 450GB 15K rpm; 5400 GB per tray

•SAS 3Gbps hard disk drive: 600GB 15K rpm; 7200 GB per tray

•SAS 3Gbps hard disk drive: 400GB 10K rpm; 4800 GB per tray

•SATA-II 3Gbps hard disk drive: 500 GB 7.2K rpm; 6000GB per tray

•SATA-II 3Gbps hard disk drive: 750 GB 7.2K rpm; 9000 GB per tray

•SATA-II 3Gbps hard disk drive: 1 TB 7.2K rpm; 12 TB per tray

- Available as rack-ready configurations (* Note: Rack rail kits must be ordered separately.)
- A country kit with the appropriate separately orderable geo-specific power cords is added by the WebDesk Configuration Tool depending on the destination of the shipment.

Optional data services and premium features:

Sun StorageTek Domain Licenses:

•Sun StorageTek Storage Domain — 4 storage domain RTU license

•Sun StorageTek Storage Domain — upgrade to 16 total storage domains RTU license

•Sun StorageTek Storage Domain — upgrade to 32 total storage domains RTU license

Sun StorageTek Local Copy Option License:

•Sun StorageTek Volume Copy

•Sun StorageTek Enhanced Data Snapshot software (DSE)- 8/volume group,128/array

Marketing Part Numbering Scheme

The basic ST2500 system configurations can be determined from the components of each part number. Here is an example part number with each component explained along with its associated variables.

Example part number = XTA2540R01A2F3600

X = X-option (parts without the leading 'X' are a part of the ATO model)

T = Sun StorageTek family product designator

A = Revision level A= 512 MB Cache Controllers, Initial Release

B= 1GB Cache Controllers, Initial Release (December 2008)

2540 = Product class/Model number:

2540 = FC RAID Array
2530 = SAS RAID Array
2510= iSCSI RAID Array
2501 = SAS Expansion Array

R = Physical configuration: R = rack-ready (X-Option "PTO" w/shipping box)

01 = RAID controller support (*): 01 = Supports addition of RAID controller (ST2540, ST2530 and ST2510 arrays)

A = Power supply: A = AC, D = DC

2 = Number of controller boards per controller array: 1 = 1 RAID Controller, 2 = 2 RAID controllers

F = Hard disk drive types:

SAS Drives:

D = 73 GB/15K rpm, 3 Gbps, SAS HDD (EOL)
E = 146GB/15Krpm, 3 Gbps, SAS HDD (EOL)
F = 300GB/15Krpm, 3 Gbps, SAS HDD
S = 450GB/15Krpm, 3 Gbps, SAS HDD (EOL)
Q= 400GB/10Krpm, 3Gbps, SAS HDD (EOL)
R= 600GB/15Krpm, 3Gbps, SAS HDD

SATA II Drives:

A= 500GB/7.2Krpm, SATA II
L= 750GB/7.2Krpm, SATA II (EOL)
N= 1TB/7.2Krpm, SATA II
T= 2TB/7.2Krpm, SATA II

3600 = Raw unformatted capacity in GB (3600 GB = 12 x 300GB drives)

* Note: The ST2501 SAS Expansion Array does NOT support the addition of a RAID controller.

Configuration Matrix / Marketing Part Numbers

Ordering Details and Marketing Part Numbers

For technical validation and quality assurance, orders for the Sun StorageTek 2500 Arrays **must be placed** through the WebDesk Configurator for rack-ready trays (field installed in rack/cabinet).

There are three URL's for WebDesk, depending on the geography:

- AMER = http://webdesk.central
- APAC = http://webdesk.singapore
- EMEA = http://webdesk.holland

WebDesk Configurator - General Flow (12 steps)

WebDesk users will need to have obtained the following information before creating a ST2500 Series configuration and placing a WebDesk quote:

WebDesk UI - Base Array Type (required fields)

Step 1. Base Array Marketing Part:

If known, the user can select a five (5) or twelve (12) drive pre-defined "fixed" standalone ST2500 X-option system Base Array Marketing Part (assoc. marketing part numbers are listed after the General Flow section of this document). If not known, from the following user inputs WebDesk will automatically derive the appropriate marketing part by default. If custom configuration is desired, start with the ATO base part number (follow the flow with -ATO).

The base ATO part number contains “-CHASSIS-Z” for each of the 2540, 2530, 2510, and 2501.

Step 2. Number of Disk Drives:

Available configuration options are five (5) or twelve (12).

* Notes:

a) Up to six (6) additional X-option disk drives can be ordered in conjunction with five (5) drive Base Array Marketing Part configuration orders.

b) Separate orders for X-option disk drives only must be added to WebDesk quotes manually.

c) There are no technical issues with mixing SAS drive capacities within the same tray (e.g., 73GB with 300GB).

d) If SATA and SAS are mixed in the same tray, they must be configured in different LUN's

e) Drives ordered a x-options do not come installed from the factory.

Step 2-ATO. Number of Disk Drives:

Base chassis require a minimum of five (5) drives and allow up to twelve (12) drives.

Notes:

a) If multiple drive types are desired, please order the x-option drives.
    i. X-option drives will need to be installed by the customer

Step 3. Disk Drive Type:

Available SAS HDD options are 73GB, 146GB, 300GB, 450GB , 600 15Krpm HDD's, and 400 GB 10Krpm HDD's; SATA HDD options are 500GB, 750GB, 1TB, 2TB SATA II 7.2Krpm HDD's;

Step 3-ATO. Disk Drive Type:

Available SAS HDD options are 73GB, 146GB, 300GB, 450GB , 60015Krpm HDD's, and 400 GB 10Krpm HDD's; SATA HDD options are 500GB, 750GB, 1TB , 2 TB SATA II 7.2Krpm HDD's;

Note: System automatically adds drive filler panels for any empty drive slots.

Step 4. Number of RAID Controllers:

Available options are 1 or 2 controllers (or I/O Modules with the 2501 Expansion Trays)

Step 4-ATO. Number of RAID Controllers:

Same as Step 4.

Step 5. Power:

AC or DC Power can be selected.

Step 5-ATO. Power:

AC or DC Power can be selected for all each Sun StorageTek 2500 Array.

a) System automatically orders a second power supply.

Step 6. Device Racking:

Available option is Rack-Ready. (Rack rail kits must be ordered separately.) User can also add a Sun Rack 900 or 1000 to the configuration.

Step 6-ATO. Device Racking:

Same as Step 6.

WebDesk UI - Add Expansion Array Selection Button (optional step to add ST2501 Arrays)

If an expansion array is required and Steps 1-5 have been completed, the user may select the "Add Expansion Array" selection button and use another configuration UI to add up to three (3) additional ST2501 arrays per ST2540, ST2530, or ST2510 RAID array to the configuration.

From this UI the user will select either the Expansion Array Base Marketing Part or the Disk Drive Type and Number of Disk Drives to derive the Base Marketing Part.

Important Note: The ST2501 SAS Expansion Array is NOT supported as a standalone JBOD array and is only configurable as an expansion array. The ST2501 array connects to the ST2540, ST2530 and ST2510 RAID arrays and provides additional storage capacity. Maximum of three ST2501's can be connected to each RAID array providing expansion up to a total of 48 drives per system.

Step 7. Power Cord Type:

User may select from appropriate localized AC power cord options. (The configuration tool will automatically configure the correct quantity of selected power cords based on the number of ST2500 arrays configured (i.e., 2 power cords per array). Note: Power cords are separately orderable line items. DC power cords are automatically added, with DC power supply selection.

WebDesk UI - Racking Options (required field)

Step 8. Rack Mount Kit:

Available option is ST2500 2U Universal Rack Rail Kit.

WebDesk UI - Non-Clustered Host Connections (required field)

Step 9. Number of Connections Configured:

Select "Connections" button to launch pop up configuration window for HBA's and cables. User selects qty 1 or 2 hosts (i.e., Customer Owned Servers or Workstations) along with required HBA's and Fibre Channel or SAS cable lengths from the pull down menus, if required.

WebDesk UI - Software (optional premium features)

Step 10. Data Snapshot License:

Sun StorageTek Data Snapshot software enables customers to create real-time copies of critical volumes, which can be used to eliminate the backup window and rapidly recover data.

Step 11. Storage Domain License:
Sun StorageTek Storage Domains software segments storage capacity by host and applications and enable storage consolidation in multi-platform environments. Each Sun StorageTek 2500 Array controller tray comes standard with 2 storage domains pre-installed. Optional storage domain RTU licenses covering up to sixteen (16) domains are available.

WebDesk UI - Services (optional)

Step 12. SunSpectrum Instant Upgrade (SIU):

These and other service offerings are covered in a subsequent section of this document.

Worldwide Configuration Guide

The pre-defined "fixed" standalone ST2500 system base array and option marketing part numbers and general WebDesk configuration details are included in the Worldwide Configuration Guide at http://mysales.central/public/configGuide/

Once inside the Configuration Guide:

- 1) Select "Workgroup Storage"
  2) Select one of the following associated links
    - Sun StorageTek 2500 Family Options
    - Sun StorEdge 2500 Series Arrays Fixed Configuration Ordering Flow Chart

*Please visit Webdesk for the most current ordering flow structure.

Sun StorageTek 2500 Series Arrays – Marketing Part Numbers

Marketing Part Number (*EOL)	Description
Sun StorageTek 2540 FC Array	
XTA2540R01A1D365*	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 365GB (5* 73GB 15Krpm SAS drives), 1 * 512MB cache FC HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans, and 2 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A1D876*	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 876GB, 12 * 73GB 15Krpm SAS drives, 1 * 512MB cache FC HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans, 2 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A2D365*	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 365GB, 5* 73GB 15Krpm SAS drives, 2 * 512MB cache FC HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans, 4 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A2D876*	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 876GB, 12 * 73GB 15Krpm SAS drives, 2 * 512MB cache FC HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans, 4 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A1E730*	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 730GB, 5* 146GB 15Krpm SAS drives, 1 * 512MB cache FC HW RAID controller, 2 *redundant AC power supplies, 2 * redundant cooling fans, 2 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A1E1752*	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 1752GB, 12* 146GB 15Krpm SAS drives, 1 * 512MB cache FC HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans, 2 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 *storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A2E730*	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 730GB, 5* 146GB 15Krpm SAS drives, 2 * 512MB cache FC HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans, 4 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 *storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A2E1752*	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 1752GB, 12* 1 46GB 15Krpm SAS drives, 2 * 512MB cache FC HW RAID controllers, 2 *redundant AC power supplies, 2 * redundant cooling fans, 4 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 *storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A1F1500	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 1500GB, 5* 300GB 15Krpm SAS drives, 1 * 512MB cache FC HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans, 2 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A1F3600	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 3600GB, 12 * 300GB 15Krpm SAS drives, 1 * 512MB cache FC HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans, 2 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A2F1500	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 1500GB, 5* 300GB 15Krpm SAS drives, 2 * 512MB cache FC HW RAID controllers, 2 *redundant AC power supplies, 2 * redundant cooling fans, 4 * shortwave SFPs;

Marketing Part Number (*EOL)	Description
Sun StorageTek 2540 FC Array	
	Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A2F3600	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 3600GB, 12 * 300GB 15Krpm SAS drives, 2 * 512MB cache FC HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans, 4 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A1A2500	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 2500GB, 5* 500GB 7.2Krpm SATA-II drives, 1 * 512MB cache FC HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans, and 2 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A1A6000	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 6000GB, 12* 500GB 7.2Krpm SATA-II drives, 1 * 512MB cache FC HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans, and 2 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A2A2500	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 2500GB, 5* 500GB 7.2Krpm SATA-II drives, 2 * 512MB cache FC HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans, and 4 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A2A6000	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 6000GB, 12* 500GB 7.2Krpm SATA-II drives, 2 * 512MB cache FC HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans, and 4 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01D2E1752*	Sun StorageTek(TM) 2540 FC Array, Rack- Ready Controller Tray, 1752GB, 12 * 146GB 15Krpm SAS drives, 2 * 512MB cache FC HW RAID controllers, 2 * redundant DC power supplies, 2 * redundant cooling fans, 4 * shortwave SFPs and 2 * DC power cables; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A1N5000	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 5TB, 5* 1TB 7.2Krpm SATA-II drives, 1 * 512MB cache FC HW RAID controller, 2 * redundant AC powersupplies, 2 * redundant cooling fans, and 2 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A2N12000	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 12TB, 12* 1TB 7.2Krpm SATA-II drives, 2 * 512MB cache FC HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans, and 4 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A1Q2000*	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 2TB, 5* 400GB 10Krpm SAS, 1 * 512MB cache FC HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans, and 2 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5

Marketing Part Number (*EOL)	Description
Sun StorageTek 2540 FC Array	
XTA2540R01A2Q4800*	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 4.8TB, 12* 400GB 10Krpm SAS, 2 * 512MB cache FC HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans, and 4 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTB2540R01A2N12000	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 12TB, 12* 1TB 7.2Krpm SATA-II drives, 2 * 1GB cache FC HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans, and 4 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTB2540R01A2S5400*	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 5400 GB, 12 * 450 GB 15Krpm SAS drives, 2 * 1GB cache FC HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans, 4 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A1R3000	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 3TB, 5 * 600GB 15Krpm SAS drives, 1 *512 MB cache FC HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans, and 2 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01A2R3000	Sun StorageTek(TM) 2540 FC Array, Rack-Ready Controller Tray, 3000GB, 5* 600GB 15Krpm SAS drives, 2 * 512MB cache FC HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans, 4 * shortwave SFPs; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01D2E730*	Sun StorageTek(TM) 2540 FC Array, Rack- Ready Controller Tray, 730GB, 5* 146GB 15Krpm SAS drives, 2 * 512MB cache FC HW RAID controllers, 2 * redundant DC power supplies, 2 * redundant cooling fans, 4 * shortwave SFPs and 2 * DC power cables; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01D2F1500	Sun StorageTek(TM) 2540 FC Array, Rack- Ready Controller Tray, 1500GB, 5 * 300GB 15Krpm SAS drives, 2 * 512MB cache FC HW RAID controllers, 2 * redundant DC power supplies, 2 * redundant cooling fans, 4 * shortwave SFPs and 2 * DC power cables; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2540R01D2F3600	Sun StorageTek(TM) 2540 FC Array, Rack- Ready Controller Tray, 3600GB, 12 * 300GB 15Krpm SAS drives, 2 * 512MB cache FC HW RAID controllers, 2 * redundant DC power supplies, 2 * redundant cooling fans, 4 * shortwave SFPs and 2 * DC power cables; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
Sun StorageTek 2530 SAS Array	
XTA2530R01A1D365*	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 365GB, 5 * 73GB 15Krpm SAS drives, 1 * 512MB cache SAS HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A1D876*	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 876GB, 12 * 73GB 15Krpm SAS drives, 1 * 512MB cache SAS HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun

Marketing Part Number (*EOL)	Description
Sun StorageTek 2540 FC Array	
	StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A2D365*	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 365GB, 5 * 73GB 15Krpm SAS drives, 2 * 512MB cache SAS HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A2D876*	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 876GB, 12 * 73GB 15Krpm SAS drives, 2 * 512MB cache SAS HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A1E730*	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 730GB, 5 * 146GB 15Krpm SAS drives, 1 * 512MB cache SAS HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A1E1752*	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 1752GB, 12 * 146GB 15Krpm SAS drives, 1 * 512MB cache SAS HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A2E730*	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 730GB, 5 * 146GB 15Krpm SAS drives, 2 * 512MB cache SAS HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A2E1752*	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 1752GB, 12 * 146GB 15Krpm SAS drives, 2 * 512MB cache SAS HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A1F1500	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 1500GB, 5* 300GB 15Krpm SAS drives, 1 * 512MB cache SAS HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A1F3600	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 3600GB, 12 * 300GB 15Krpm SAS drives, 1 * 512MB cache SAS HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A2F1500	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 1500GB, 5* 300GB 15Krpm SAS drives, 2 * 512MB cache SAS HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A2F3600	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 3600GB, 12 * 300GB 15Krpm SAS drives, 2 * 512MB cache SAS HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5

Marketing Part Number (*EOL)	Description
Sun StorageTek 2540 FC Array	
XTA2530R01A1A2500	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 2500GB, 5 * 500GB 7.2Krpm SATA-II drives, 1 * 512MB cache SAS HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A1A6000	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 6000GB, 12 * 500GB 7.2Krpm SATA-II drives, 1 * 512MB cache SAS HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A2A2500	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 2500GB, 5 * 500GB 7.2Krpm SATA-II drives, 2 * 512MB cache SAS HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A2A6000	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 6000GB, 12 * 500GB 7.2Krpm SATA-II drives, 2 * 512MB cache SAS HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A1N5000	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 5TB, 5 * 1TB 7.2Krpm SATA-II drives, 1 * 512MB cache SAS HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A2N12000	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 12TB, 12 * 1TB 7.2Krpm SATA-II drives, 2 * 512MB cache SAS HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A1Q2000*	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 2TB, 5 * 400GB 10Krpm SAS, 1 * 512MB cache SAS HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A2Q4800*	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 4.8TB, 12 * 400GB 10Krpm SAS, 2 * 512MB cache SAS HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTB2530R01A2N12000	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 12TB, 12 * 1TB 7.2Krpm SATA-II drives, 2 * 1GB cache SAS HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5

Marketing Part Number (*EOL)	Description
Sun StorageTek 2540 FC Array	
XTB2530R01A2S5400*	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 5400 GB, 12 * 450GB 15Krpm SAS drives, 2 * 1GB cache SAS HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2530R01A2R3000	Sun StorageTek(TM) 2530 SAS Array, Rack-Ready Controller Tray, 3TB, 5 * 600GB15Krpm SAS drives, 2 * 512 MB cache SAS HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
Sun StorageTek 2510 iSCSI Array	
XTA2510R01A1E730*	Sun StorageTek(TM) 2510 iSCSI Array, Rack-Ready Controller Tray, 730GB, 5 * 146GB 15Krpm SAS drives, 1 * 512MB cache iSCSI HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans, Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2510R01A2E1752*	Sun StorageTek(TM) 2510 iSCSI Array, Rack-Ready Controller Tray, 1752GB, 12*146GB 15Krpm SAS drives, 2 * 512MB cache iSCSI HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2510R01A1F1500	Sun StorageTek(TM) 2510 iSCSI Array, Rack-Ready Controller Tray, 1500GB, 5 * 300GB 15Krpm SAS drives, 1 * 512MB cache iSCSI HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2510R01A2F3600	Sun StorageTek(TM) 2510 iSCSI Array, Rack-Ready Controller Tray, 3600GB, 12* 300GB 15Krpm SAS drives, 2 * 512MB cache iSCSI HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans, Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2510R01A1A2500	Sun StorageTek(TM) 2510 iSCSI Array, Rack-Ready Controller Tray, 2500GB, 5 * 500GB 7.2Krpm SATA drives, 1 * 512MB cache iSCSI HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans, Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2510R01A2A6000	Sun StorageTek(TM) 2510 iSCSI Array, Rack-Ready Controller Tray, 6000GB, 12 * 500GB 7.2Krpm SATA drives, 2 * 512MB cache iSCSI HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans, Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2510R01A1L3750*	Sun StorageTek(TM) 2510 iSCSI Array, Rack-Ready Controller Tray, 3750GB, 5 * 750GB 7.2Krpm SATA drives, 1 * 512MB cache iSCSI HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans, Includes Sun

Marketing Part Number (*EOL)	Description
Sun StorageTek 2540 FC Array	
	StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2510R01A2L9000*	Sun StorageTek(TM) 2510 iSCSI Array, Rack-Ready Controller Tray, 9000GB, 12*750GB 7.2Krpm SATA drives, 2 * 512MB cache iSCSI HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans, Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2510R01A1N5000	Sun StorageTek(TM) 2510 iSCSI Array, Rack-Ready Controller Tray, 5TB, 5 * 1TB 7.2Krpm SATA-II drives, 1 * 512MB cache iSCSI HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2510R01A2N12000	Sun StorageTek(TM) 2510 iSCSI Array, Rack-Ready Controller Tray, 12TB, 12 * 1TB 7.2Krpm SATA-II drives, 2 * 512MB cache iSCSI HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2510R01A1Q2000*	Sun StorageTek(TM) 2510 iSCSI Array, Rack-Ready Controller Tray, 2TB, 5 * 400GB 10Krpm SAS, 1 * 512MB cache iSCSI HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2510R01A2Q4800*	Sun StorageTek(TM) 2510 iSCSI Array, Rack-Ready Controller Tray, 4.8TB, 12 * 400GB 10Krpm SAS, 2 * 512MB cache iSCSI HW RAID controllers, 2 * redundant AC power supplies, 2 * redundant cooling fans; Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2510R01A2S5400*	Sun StorageTek(TM) 2510 iSCSI Array, Rack-Ready Controller Tray, 5400GB, 12* 450GB 15Krpm SAS drives, 2 * 512 MB cache iSCSI HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans, Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2510R01A1R3000	Sun StorageTek(TM) 2510 iSCSI Array, Rack-Ready Controller Tray, 3000GB, 5 * 600GB 15Krpm SAS drives, 1 * 512 MB cache iSCSI HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans, Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
XTA2510R01A2R3000	Sun StorageTek(TM) 2510 iSCSI Array, Rack-Ready Controller Tray, 3000GB, 5 * 600GB 15Krpm SAS drives, 2 * 512 MB cache iSCSI HW RAID controller, 2 * redundant AC power supplies, 2 * redundant cooling fans, Includes Sun StorageTek(TM) Common Array Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5
Sun StorageTek 2501 SAS Expansion Array	
XTA2501R01A1D365*	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 365GB, 5 * 73GB 15Krpm SAS drives, 1 SAS I/O Module, 2 * redundant AC

Marketing Part Number (*EOL)	Description
Sun StorageTek 2540 FC Array	
	power supplies and 2 * redundant cooling fans; Includes 1 * 1m SAS host cable; RoHS-5
XTA2501R01A1D876*	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 876GB, 12 * 73GB 15Krpm SAS drives, 1 SAS I/O Module, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 1 * 1m SAS host cable; RoHS-5
XTA2501R01A1E730*	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 730GB, 5 * 146GB 15Krpm SAS drives, 1 SAS I/O Module, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 1 * 1m SAS host cable; RoHS-5
XTA2501R01A1E1752*	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 1752GB, 12 * 146GB 15Krpm SAS drives, 1 SAS I/O Module, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 1 * 1m SAS host cable; RoHS-5
XTA2501R01A1F1500	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 1500GB, 5 * 300GB 15Krpm SAS drives, 1 SAS I/O Module, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 1 * 1m SAS host cable; RoHS-5
XTA2501R01A1F3600	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 3600GB, 12 * 300GB 15Krpm SAS drives, 1 SAS I/O Module, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 1 * 1m SAS host cable; RoHS-5
XTA2501R01A2D365*	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 365GB, 5 * 73GB 15Krpm SAS drives, 2 SAS I/O Modules, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 2 * 1m SAS host cables; RoHS-5
XTA2501R01A2D876*	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 876GB, 12 * 73GB 15Krpm SAS drives, 2 SAS I/O Modules, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 2 * 1m SAS host cables; RoHS-5
XTA2501R01A2E730*	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 730GB, 5 * 146GB 15Krpm SAS drives, 2 SAS I/O Modules, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 2 * 1m SAS host cables; RoHS-5
XTA2501R01A2E1752*	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 1752GB, 12 * 146GB 15Krpm SAS drives, 2 SAS I/O Modules, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 2 * 1m SAS host cables; RoHS-5
XTA2501R01A2F1500	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 1500GB, 5 * 300GB 15Krpm SAS drives, 2 SAS I/O Modules, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 2 * 1m SAS host cables; RoHS-5
XTA2501R01A2F3600	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 3600GB, 12 * 300GB 15Krpm SAS drives, 2 I/O Modules, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 2 * 1m SAS host cables; RoHS-5
XTA2501R01A1A2500	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 2500GB, 5 * 500GB 7.2Krpm SATA-II drives, 1 * SAS I/O module, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 1 * .5m SAS host cable; RoHS-5
XTA2501R01A1A6000	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray,

Marketing Part Number (*EOL)	Description
Sun StorageTek 2540 FC Array	
	6000GB, 12 * 500GB 7.2Krpm SATA-II drives, 1 * SAS I/O module, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 1 * .5m SAS host cable; RoHS-5
XTA2501R01A2A2500	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 2500GB, 5 * 500GB 7.2Krpm SATA-II drives, 2 * SAS I/O modules, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 2 * .5m SAS host cables; RoHS-5
XTA2501R01A2A6000	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 6000GB, 12 * 500GB 7.2Krpm SATA-II drives, 2 * SAS I/O modules, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 2 * .5m SAS host cables; RoHS-5
XTA2501R01D2E1752*	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 1752GB, 12 * 146GB 15Krpm SAS drives, 2 * SAS I/O modules, 2 * redundant DC power supplies, 2 * redundant cooling fans and 2 * DC power cables; Includes 2 * .5m SAS host cables; RoHS-5
XTA2501R01D2E730*	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 730GB, 5 * 146GB 15Krpm SAS drives, 2 * SAS I/O modules, 2 * redundant DC power supplies, 2 * redundant cooling fans and 2 * DC power cables; Includes two .5m SAS host cables; RoHS-5
XTA2501R01D2F1500	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 1500GB, 5 * 300GB 15Krpm SAS drives, 2 * SAS I/O modules, 2 * redundant DC power supplies, 2 * redundant cooling fans and 2 * DC power cables; Includes 2 * .5m SAS host cables; RoHS-5
XTA2501R01D2F3600	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 3600GB, 12 * 300GB 15Krpm SAS drives, 2 * SAS I/O modules, 2 * redundant DC power supplies, 2 * redundant cooling fans and 2 * DC power cables; Includes 2 * .5m SAS host cables; RoHS-5
XTA2501R01A1Q2000*	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 2TB, 5 * 400GB 10Krpm SAS, 1 * SAS I/O module, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 1 * .5m SAS host cable; RoHS-5
XTA2501R01A2Q4800*	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 4.8TB, 12 * 400GB 10Krpm SAS, 2 * SAS I/O modules, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 2 * .5m SAS host cables; RoHS-5
XTA2501R01A1N5000	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 5TB, 5 * 1TB 7.2Krpm SATA-II drives, 1 * SAS I/O module, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 1 * .5m SAS host cable; RoHS-5
XTA2501R01A2N12000	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray , 12TB, 12 * 1TB 7.2Krpm SATA-II drives, 2 * SAS I/O modules, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 2 * .5m SAS host cables; RoHS-5
XTA2501R01A2S5400*	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 5400GB, 12 * 450 GB 15Krpm SAS, 2 * SAS I/O module, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 2 * 1m SAS host cable;RoHS-5

Marketing Part Number (*EOL)	Description	
Sun StorageTek 2540 FC Array		
XTA2501R01A1R3000	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 3000GB, 5 * 600 GB 15Krpm SAS, 1 * SAS I/O module, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 1 * 1m SAS host cable; RoHS-5	
XTA2501R01A2R3000	Sun StorageTek(TM) 2501 SAS Expansion Array, Rack-Ready Expansion Tray, 3000GB, 5 * 600 GB 15Krpm SAS, 2 * SAS I/O module, 2 * redundant AC power supplies and 2 * redundant cooling fans; Includes 2 * 1m SAS host cable; RoHS-5	
ATO Marketing Part Numbers		
TA2540-CHASSIS-Z	Sun StorageTek(TM) 2540 FC , Rack-Ready Controller Tray, Chassis and Midplane; Mandatory options- Controllers, HDD's, and Power Supplies; RoHS-5	**ATO Base Part**
TA2530-CHASSIS-Z	Sun StorageTek(TM) 2530 SAS , Rack-Ready Controller Tray, Chassis and Midplane; Mandatory Options- Controllers, HDD's, and Power Supplies; RoHS-5	
TA2510-CHASSIS-Z	Sun StorageTek(TM) 2510 iSCSI , Rack-Ready Controller Tray, Chassis and Midplane; Mandatory Options- Controllers, HDD's, and Power Supplies; RoHS-5	
TA2501-CHASSIS-Z	Sun StorageTek(TM) 2501 SAS Expansion Array , Rack-Ready Controller Tray, Chassis and Midplane; Mandatory options- Controllers, HDD's, and Power Supplies; RoHS-5	
TA-2540-1CTRL512MZ	Sun StorageTek(TM) 2540 FC Single RAID Controller; 512MB cache and battery, 2 * shortwave SFPs, 2 * FC Host Ports, includes controller blank; Includes Sun StorageTek(TM) Common Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5	**ATO Controller Options**
TA-2540-2CTRL1GB-Z	Sun StorageTek(TM) 2540 FC Dual RAID Controller; 512MB cache and battery, 2 * shortwave SFPs, 2 * FC Host Ports, per each controller; Includes Sun StorageTek(TM) Common Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5	
TA-2540-1CTRL1GB-Z	Sun StorageTek(TM) 2540 FC Single RAID Controller; 1GB cache and battery, 2 * shortwave SFPs, 2 * FC Host Ports, includes controller blank; Includes Sun StorageTek(TM) Common Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5	
TA-2540-2CTRL2GB-Z	Sun StorageTek(TM) 2540 FC Dual RAID Controller; 1GB cache and battery, per each controller, 2 * shortwave SFPs, 2 * FC Host Ports, per each controller; Includes Sun StorageTek(TM) Common Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5	
TA-2530-1CTRL512MZ	Sun StorageTek(TM) 2530 SAS Single RAID Controller; 512MB cache and battery, 3 * SAS Host Ports, includes controller blank; Includes Sun StorageTek(TM) Common Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5	
TA-2530-2CTRL1GB-Z	Sun StorageTek(TM) 2530 SAS Dual RAID Controllers; 512MB cache and battery, 3 * SAS Host Ports, per each controller; Includes Sun StorageTek(TM) Common Manager	

Marketing Part Number (*EOL)	Description	
Sun StorageTek 2540 FC Array		
	software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5	
TA-2530-1CTRL1GB-Z	Sun StorageTek(TM) 2530 SAS Single RAID Controller; 1GB cache and battery, 3 * SAS Host Ports, includes controller blank; Includes Sun StorageTek(TM) Common Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5	
TA-2530-2CTRL2GB-Z	Sun StorageTek(TM) 2530 SAS Dual RAID Controllers; 1GB cache and battery, per each controller, 3 * SAS Host Ports, per each controller; Includes Sun StorageTek(TM) Common Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5	
TA-2510-1CTRL512MZ	Sun StorageTek(TM) 2510 iSCSI Single RAID Controller, 512MB cache and battery, includes controller blank; Includes Sun StorageTek(TM) Common Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5	
TA-2510-2CTRL1GB-Z	Sun StorageTek(TM) 2510 iSCSI Dual RAID Controllers, 512MB cache and battery, per each controller; Includes Sun StorageTek(TM) Common Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5	
TA-2510-1CTRL1GB-Z	Sun StorageTek(TM) 2510 iSCSI Single RAID Controller, 1GB cache and battery, includes controller blank, 2* iSCSI Host Ports; Includes Sun StorageTek(TM) Common Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5	
TA-2510-2CTRL2GB-Z	Sun StorageTek(TM) 2510 iSCSI Dual RAID Controllers, 1GB cache and battery, per each controller, 2 * iSCSI Host Ports, per each controller; Includes Sun StorageTek(TM) Common Manager software and 2 * storage domains using Sun StorageTek(TM) Storage Domains software; RoHS-5	
TA-2501-1-IOM-Z	Sun StorageTek(TM) 2501 SAS Single I/O Module, includes IOM blank and one 0.5M SAS host cable; RoHS-5	
TA-2501-2-IOM-Z	Sun StorageTek(TM) 2501 SAS Dual I/O Modules, two 0.5M SAS host cables; RoHS-5	
TA-2500-2UACKIT-Z	Sun StorageTek(TM) 2500 2U AC Power Supply and Fan Module; RoHS-5	**ATO Power Supply Options**
TA-2500-2UDC-KIT-Z	Sun StorageTek(TM) 2500 2U DC Power Supply and Fan Module; RoHS-5	
TA-SS1NG-73G15K-Z*	1 * 73GB 15Krpm SAS 3.5" x 1" disk drive in Sun StorageTek(TM) 2500 carrier; (RoHS-6)	**Disk Drive Options**
TA-SS1NG-146G15K-Z*	1 * 146GB 15Krpm SAS 3.5" x 1" disk drive in Sun StorageTek(TM) 2500 carrier; (RoHS-6)	
TA-SS1NG-300G15K-Z	1 * 300GB 15Krpm SAS 3.5" x 1" disk drive in Sun StorageTek(TM) 2500 carrier; (RoHS-6)	

Marketing Part Number (*EOL)	Description
Sun StorageTek 2540 FC Array	
TA-SS1NG-450G15K-Z*	1 * 450GB 15Krpm SAS 3.5" x 1" disk drive in Sun StorageTek(TM) 2500 carrier; (RoHS-6)
TA-SS1NG-600G15K-Z	1 * 600GB 15Krpm SAS 3.5" x 1" disk drive in Sun StorageTek(TM) 2500 carrier; (RoHS-6)
TA-SS1NG-400G10K-Z*	1 * 400GB 10Krpm SAS 3.5" x 1" disk drive in Sun StorageTek(TM) 2500 carrier; (RoHS-6)
TA-ST1NG-500G7K-Z	1 * 500GB 7.2Krpm SATA-II 3.5" x 1" disk drive in Sun StorageTek(TM) 2500 carrier; RoHS-6
TA-ST1NG-750G7K-Z*	1 * 750GB 7.2Krpm SATA-II 3.5" x 1" disk drive in Sun StorageTek(TM) 2500 carrier; RoHS-6
TA-ST1NG-1T7K-Z	1 * 1TB 7.2Krpm SATA-II 3.5" x 1" disk drive in Sun StorageTek(TM) 2500 carrier; RoHS-6
Data Services – optional for the Sun StorageTek RAID Arrays (*EOL)	
XTA25X0-DSS-ARY*	Sun StorageTek(TM) Data Snapshot software, unlimited capacity RTU license for Sun StorageTek(TM) 25X0 Array
XTA25X0-DSE-ARY*	Sun StorageTek Enhanced Data Snapshot software, unlimited capacity RTU license for Sun StorageTek 25X0 array, up to 8 snapshots per volume.
XTA25X0-DVC-ARY*	Sun StorageTek Volume Copy software RTU license for Sun StorageTek 25X0 Array.
XTA25X0-DOM4-ARY*	Sun StorageTek(TM) Storage Domains software, 4 Domain RTU license for Sun StorageTek(TM) 25X0 Array; (License supports up to 4 Storage Domains on an ST25X0 Array)
XTA25X0-DOM8-ARY*	Sun StorageTek(TM) Storage Domains software, 8 Domain RTU license for Sun StorageTek(TM) 25X0 Array; (License supports up to 8 Storage Domains on an ST25X0 Array)
XTA25X0-DOM16-ARY*	Sun StorageTek(TM) Storage Domains software, 16 Domain RTU license for Sun StorageTek(TM) 25X0 Array; (License supports up to 16 Storage Domains on an ST25X0 Array)
XTA25X0-DOM32-ARY	Sun StorageTek(TM) Storage Domains software, 32 Domain RTU license for Sun StorageTek(TM) 25X0 Array; (License supports up to 32 Storage Domains on an ST25X0 Array)
XTCTIER0-BASE4	Recommended base quantity 4 Domain right-to-use (RTU) license key for all Sun StorageTek 25xx Arrays.
XTCTIER0-CPY	Local copy services (snapshot & volume copy) for Sun StorageTek 25xx arrays. The key enables 8 snapshots per volume (128 total), and 255 total volume copies.
XTC-TIER0-UG16	12 Domain right-to-use (RTU) upgrade license key for Sun StorageTek 25xx Arrays. Use to upgrade customer from 4 to 16 domains.

·Options

Part Number (*EOL)	Description	Category
XTA-SS1NG-73G15K*	1 * 73GB 15Krpm SAS 3.5" x 1" disk drive in Sun StorageTek(TM) 2500 carrier; RoHS-6	Hard Disk Drives
XTA-SS1NG-146G15K *	1 * 146GB 15Krpm SAS 3.5" x 1" disk drive in Sun StorageTek(TM) 2500 carrier; RoHS-6	
XTA-SS1NG-300G15K	1 * 300GB 15Krpm SAS 3.5" x 1" disk drive in Sun StorageTek(TM) 2500 carrier; (RoHS-6)	
XTA-SS1NG-450G15K*	1 * 450GB 15Krpm SAS 3.5" x 1" disk drive in Sun StorageTek(TM) 2500 carrier; (RoHS-6)	
XTA-SS1NG-600G15K	1 * 600GB 15Krpm SAS 3.5" x 1" disk drive in Sun StorageTek(TM) 2500 carrier; (RoHS-6)	
XTA-ST1NG-500G7K	1 * 500GB 7.2Krpm SATA-II 3.5" x 1" disk drive in Sun StorageTek(TM) 2500 carrier; RoHS-6	
XTA-ST1NG-750G7K*	1 * 750GB 7.2Krpm SATA-II 3.5" x 1" disk drive in Sun StorageTek(TM) 2500 carrier; RoHS-6	
XTA-ST1NG-1T7K	1 * 1TB 7.2Krpm SATA-II 3.5" x 1" disk drive in Sun StorageTek(TM) 2500 carrier; RoHS-6	
XTA-SS1NG-400G10K*	1 * 400GB 10Krpm SAS 3.5" x 1" disk drive in Sun StorageTek(TM) 2500 carrier; (RoHS-6)	
SG-XPCI2FC-QF4	PCI-X 4Gb FC Dual Port HBA	Host Bus Adaptors (Fibre Channel & SAS)
SG-XPCI1FC-QF4	PCI-X 4Gb FC Single Port HBA	
SG-XPCI2FC-QF2-Z	PCI Dual FC 2Gb HBA w/SFS	
SG-XPCI2FC-QF2	PCI Dual FC 2Gb HBA w/SFS	
SG-XPCI1FC-QF2	PCI Single FC 2Gb HBA w/SFS	
SG-XPCIE2FC-QF4	4Gb FC Dual Port HBA	
SG-XPCIE1FC-QF4	4Gb FC Single Port HBA	
SG-XPCI2FC-EM4-Z	PCI-X 4Gb Dual Port FC HBA	
SG-XPCI1FC-EM4-Z	PCI-X 4GB Single Port HBA	
SG-XPCI2FC-EM2	Emulex 2Gb Dual Port FC HBA	
SG-XPCI1FC-EM2	Emulex 2Gb Single Port FC HBA	
SG-XPCIE2FC-EM4	PCI-E 4Gb FC Dual Port HBA	
SG-XPCIE1FC-EM4	PCI-E 4Gb FC Single Port HBA	
SG-XPCIE8SAS-E-Z	PCIe SAS 8p Host Bus Adapter	
SG-XPCI8SAS-E-Z	PCI-X 8p SAS Host Bus Adapter	
X9730A-Z	0.8m LC to LC FC optical cable, RoHS-5 compliant.	LC – LC Fibre Channel cables
X9732A-Z	2M LC to LC FC optical cable, RoHS-5 compliant	
X9733A-Z	5M LC to LC FC optical cable, RoHS-5 compliant	
X9734A-Z	15M LC to LC FC optical cable, RoHS-5 Compliant.	
X9736A-Z	25M LC to LC FC optical cable, RoHS-5 Compliant.	
X9738A-Z	50M LC to LC FC optical cable, RoHS-5 Compliant.	
X9740A-Z	100M LC to LC FC optical cable, RoHS-5 compliant	

Part Number (*EOL)	Description	Category
X9722A-Z	2M LC to SC FC optical cable, RoHS-5 compliant.	LC – SC Fibre Channel cables
X9723A-Z	5M LC to SC FC optical cable, RoHS-5 compliant.	
X9724A-Z	15M LC to SC FC optical cable, RoHS-5 compliant	
X9735A-Z	25M SC to LC FC optical cable. RoHS-5 compliant.	
X9737A-Z	50M SC to LC FC optical cable, RoHS-5 compliant.	
XTA25X0-0.5M-SAS-Z*	Sun StorageTek 0.5m, mini, shielded, SAS cable; For connection between array and host; RoHS-6	SAS Cables
XTA25X0-1.0M-SAS-Z*	Sun StorageTek 1.0m, mini, shielded, SAS cable; For connection between array and host; RoHS-6	
XTA25X0-2.0M-SAS-Z*	Sun StorageTek 2.0m, mini, shielded, SAS cable; For connection between array and host; RoHS-6	
XTA25X0-3.0M-SAS-Z*	Sun StorageTek 3.0m, mini, shielded, SAS cable; For connection between array and host; RoHS-6	
XTA25X0-6.0M-SAS-Z*	Sun StorageTek 6.0m, mini, shielded, SAS cable; For connection between array and host; RoHS-6	
XTA-0.5M-SAS	Sun StorageTek 0.5m, mini, shielded, SAS cable; For connection between array and host; RoHS-6	
XTA-1.0M-SAS	Sun StorageTek 1.0m, mini, shielded, SAS cable; For connection between array and host; RoHS-6	
XTA-2.0M-SAS	Sun StorageTek 2.0m, mini, shielded, SAS cable; For connection between array and host; RoHS-6	
XTA-3.0M-SAS	Sun StorageTek 3.0m, mini, shielded, SAS cable; For connection between array and host; RoHS-6	
XTA-6.0M-SAS	Sun StorageTek 6.0m, mini, shielded, SAS cable; For connection between array and host; RoHS-6	
XTA-2540-CTRL-512M	Sun StorageTek(TM) 2540 FC RAID Controller; 512MB cache and battery; RoHS-5	Controller cards
XTA-2530-CTRL-512M	Sun StorageTek(TM) 2530 SAS RAID Controller; 512MB cache and battery; RoHS-5	
XTA-2510-CTRL-512M	Sun StorageTek(TM) 2510 iSCSI RAID Controller; 512MB cache and battery; RoHS-5	
XTA-2540-CTRL-1GB	Sun StorageTek(TM) 2540 FC RAID Controller; 1GB cache and battery; RoHS-5	
XTA-2530-CTRL-1GB	Sun StorageTek(TM) 2530 SAS RAID Controller; 1GB cache and battery; RoHS-5	
XTA-2510-CTRL-1GB	Sun StorageTek(TM) 2510 iSCSI RAID Controller; 1GB cache and battery; RoHS-5	
XTA-2501-IOM	RoHS-5, Sun StorageTek CSM200, I/O moduleSun StorageTek(TM) 2501 SAS I/O Module; RoHS-5	SAS I/O modules
XTA-2500-1GBMEM	RoHS-5, Sun StorageTek CSM200, I/O moduleSun StorageTek(TM) 2501 SAS I/O Module; RoHS-5	Cache DIMM
XTA-2500-2URK-19U	Sun StorEdge(TM) 2500 2U universal rack, sliding rail kit; RoHS-5	Rack rail kit
XTA-25X0-CTRL-BATT	Sun StorageTek(TM) 25X0 Array Controller Battery; RoHS-5	Controller Battery
XTA-2500-2UAC-KIT	Sun StorageTek(TM) 2500 2U AC PWR Supply and Fan Module; RoHS-5	AC Power Supply/Fan

Part Number (*EOL)	Description	Category
		Conversion Kits
XTA-2500-2UDC-KIT	Sun StorageTek(TM) 2500 2U DC Power Supply and Fan Module and 1 * DC power cable; RoHS-5	DC Power Supply/Fan Conversion Kit
CABLE10187033-Z	Sun StorageTek CAB Assy,CAT5E,8FT,24AWG,SHLD, RoHS-5	Ethernet Cables
CABLE10187034-Z	Sun StorageTek CAB Assy,CAT5E,35FT,24AWG,SHLD, RoHS-5	
CABLE10187035-Z	Sun StorageTek CAB Assy,CAT5E,50IN,24AWG,SHLD, RoHS-5	
CABLE10187038-Z	Sun StorageTek CAB ASSY,CAT5E,100FT,24AWG,SHLD, RoHS-5	
CABLE10187037-Z	Sun StorageTek CAB ASSY,CAT5E,55FT,24AWG,SHLD, RoHS-5	

Part Number	Description
EIS-2501TRAY-E	Installation of Sun StorageTek 2501 Expansion tray into a new or existing Sun StorageTek 2530 or 2540 array during local business. 1 part number per tray.
EIS-2501TRAY-E-AH	Installation of Sun StorageTek 2501 Expansion tray in a new or existing Sun StorageTek 2530 or 2540 array after local business. 1 part number per tray.
EIS-2540ARRAY-E	Installation of Sun StorageTek 2540 Array during local business. Additional expansion tray must use EIS-2501TRAY-E (1 per tray)
EIS-2540ARRAY-E-AH	Installation of Sun StorageTek 2540 Array after local business. Additional expansion tray must use EIS-2501TRAY-E (1 per tray)
EIS-2530ARRAY-E	Installation of Sun StorageTek 2530 Array during local business. Additional expansion tray must use EIS-2501TRAY-E (1 per tray)
EIS-2530ARRAY-E-AH	Installation of Sun StorageTek 2530 Array after local business. Additional expansion tray must use EIS-2501TRAY-E (1 per tray)

Frequently Asked Questions

This section summarizes some of the most frequently asked questions about the Sun StorageTek 2500 array. Additional details can be found throughout this JTF document. For detailed notes visit the online documentation pages.

Please visit the documentation page for the 2500 for complete Release Notes, Installation Guides, and the Upgrade Utility Guide: http://docs.sun.com/app/docs/coll/st2500arrays

Please visit the Common Array Manager (CAM) documentation pages here: http://docs.sun.com/app/docs/prod/stor.arrmgr#hic

Question 1. What is the ST2500?

A. The ST2500 is Sun's newest member of the Modular family of storage arrays, designed to compliment Sun's industry leading line of servers. It is based on a new low cost SAS disk subsystem providing consolidated RAID to FC and SAS host interfaces.

- Simple server oriented management using CAM
- Small footprint (2U/12 drives)
- World-record price/performance and the first storage benchmarks with SAS
- Reliable data protection < $10K

Extends Sun's leading Modular array line down to an entry price point.

Question 2.What is SAS?

A. SAS stands for Serial Attach SCSI, a new generation storage protocol designed to deliver optimal performance and reliability at lower costs. Unlike traditional SCSI devices which use a shared bus, parallel architecture, SAS is based on a point-to-point architecture similar to FC in the way devices can scale in terms of # of drives and nodes while supporting a dedicated 3Gb/s link (has a roadmap to support up to 12Gb/s over time).

Question 3. What Sun products use SAS?

A. All new Sun x64 and Sparc servers integrate SAS for internal storage connectivity. With the ST2500 and associated SAS HBAs, customers can now support a full end to end SAS stack from the server to the storage for better performance and reliability at lower costs.

Question 4. Which target markets and applications does the ST2500 sell into?

A. The ST2500 sells into 3 target markets: 1) Workgroup customers who are struggling to keep pace with application data growth; 2) Enterprise customers who are looking for tier 2 storage; and 3) NEP/Telco customers who are looking for storage for their emerging Telco build-out. Supported applications include: file/print, email, web/video, distributed database, D2D2T.

Question 5. What is the typical customer profile interested in the ST2500?

A. Customers looking for:

Simple, reliable, cost effective storage
Migration from DAS to SAN, shared DAS, or as adjunct to an existing SAN
Rack space utilization requirements that need to be met
Pay as you grow scalability

Refreshing their current workgroup solution/install base

Ruggedized environments requiring NEBs certification

Question 6. What SAS HBA and ST2500 products are currently available?

A. SAS HBAs:

- SG-XPCI8SAS-E-Z (PCI-X)
- SG-XPCIE8SAS-E-Z (PCI-E)

ST2500 arrays (36 configurations; 12 configurations for each array)

- ST2540 FC array (RR/GA Date May 4, 2007)
- ST2530 SAS array (RR: June 8, 2007, GA: June 22, 2007
- ST2501 SAS Expansion Array (RR/GA Date May 4, 2007)

Question 7. What configurations are offered for the ST2500?

A. Many configurations are available, from single to dual RAID, disk expansion trays, and disk drive types including 73GB15K, 146GB15K, and 300GB15Krpm. SATA drives will be supported through a firmware update in Q1FY08.

Question 8. Do you have to pay extra for Management?

A. No, Sun StorageTek Common Array Manager (CAM) is included free of charge with the purchase of the ST2500 Arrays.

Question 9. Does ST2500 involve complex serviceability?

A. No, ST2500 is customer installed and also follows a CRU model to reduce complexity and increases ease of serviceability.

Question 10. Does ST2500 support "off platform" environments (e.g. non Solaris)?

A. Yes, heterogeneous support is included (Linux, Windows, and VMWare).

Question 11. **What Integrated Data Services are available with the StorageTek 2500 Series Arrays?**

A. The Sun StorageTek 2500 Series Array offers the following optional data services:

- Sun StorageTek Storage Domains software: logically divides a single array into multiple arrays by defining which host or host group can access each volume in the array. This enables a range of hosts - with different capacity, performance, or data protection demands - to

effectively share a single array. ST2500 Series Arrays include, free of charge, an RTU license for 2 storage domains (RTU licenses for up to 4, 8, or 16 storage domain are offered as orderable options). Note: Domain licenses are "absolute" and not incremental (e.g., the 4 domain license is not a prerequisite purchase to an 8 domain license).

- Sun StorageTek Data Snapshot software: enables customers to create real-time copies of their critical volumes, which can be used to eliminate the backup window and rapidly recover data. (Supports up to 4 Copy-On-Write snaps per volume, 128 per array. Up to 512 copies per system.)

Question 12. How many servers can be connected to the ST2500?

A. With the ST2540, many servers can be supported through a existing or new SAN. With the ST2530, up to 6 servers can be supported through a shared DAS configuration. With the ST2510, many servers can be supported through a existing or new ethernet.

Question 13. What does the "Try and Buy" Program entail for the ST2500?

A. Customers can basically "try out" either an ST2510, ST2530 or ST2540 product "free-of-charge" for 60 days. In the event they decide to keep them, Sun will simply charge them for the unit. In the event they decide to forgo the unit, Sun will take back the unit at no cost to the customer.

Question 14. What level of support is available for the 2500 series arrays?

A. Sun offers 1, 2 and 3 year service level upgrades to all medal levels: silver, gold and platinum. Sun also makes it easier and more affordable for our customer to acquire higher levels of support at point of sale, by bundling the storage hardware and support into Sun System Packs.

Question 15. Does Sun support remote diagnostics and automated services requests on the 2500?

A. Yes. All Sun 2500 customer are entitled to receive Sun's Common Array Manager as a feature of the product, free of charge. With CAM, 2500 series customers get a unified array management and remote monitoring capability that extends across Sun's modular disk line of products.

Question 16. Are other services available for 2500 customers?

A. Sun offers an extensive range of services from installation, implementation and data migration to highly sophisticated IT transformational projects like Data Center services, which provide a full complement of services to manage infrastructure change without disruption. All services are delivered by Sun-badged personnel committed to the highest standards of excellence.

Question 17. Do the rack-ready StorageTek 2500 configurations come with rack mount rail kits?

A. No. Rack-ready configurations of the Sun StorageTek 2500 arrays do NOT come with any rack mount rail kits. Customers need to order the following to meet their rail kit requirements:

- XTA-2500-2URK-19U: Sun StorEdge(TM) 2500 2U universal rack, sliding rail kit; RoHS-5

Question 18. What are the availability dates of the ST2530 SAS Array?

A. Revenue Release Date: June 8, 2007

General Availability Date: June 22, 2007

Question 19. Where can I find more comprehensive information regarding the ST2540 FC Array, ST2530 SAS Array and ST2501 SAS Expansion Array; associated US list pricing information, market value proposition, features/functions/benefits and associated Sun Service offerings?

A. For this information and more, please refer to the following Sun Product Introductions:

Title: Announcing Sun StorageTek(TM) 2540 FC Array and 2501 SAS Expansion Array with Integrated Services

Announcement Date: April 03, 2007

Sun Product Intro#: Q3FY2007-272I

Title: Announcing Sun StorageTek(TM) 2530 SAS Array with Integrated Services and Sun Spectrum Support

Announcement Date: May 22, 2007

Sun Product Intro#: Q4FY2007-99I

Question 20. What are the operating systems, hosts, adapters, switches and FC cables supported by the ST2500 Series Arrays?

A. The Sun StorageTek 2500 Series Arrays are compatible with a wide variety of operating systems, hosts, adapters, switches and FC cables. For the latest compatibility information, please refer to the following:

Sun StorageTek Interop Tool posted at:

https://extranet.stortek.com/interop/interop?cmd=report

ST2500 Series release notes posted at:

http://docs.sun.com/app/docs/prod/storedge#hic

Question 21. Will SAS Host Bus Adapters (HBA's) and SAS host interconnect cables be available to support the connectivity of the ST2530 SAS Array to Sun's servers?

A. Yes. On April 3, 2007 Sun Microsystems, Inc. announced the availability of the Sun StorageTek (TM) PCIe SAS Host Bus Adapter, 8 port, RoHS 6 compliant HBA(SG-XPCIE8SAS-E-Z) and Sun StorageTek (TM) PCI-X SAS Host Bus Adapter, 8 port, RoHS 6 compliant HBA (SG-XPCI8SAS-E-Z). The associated Sun Product Introductions are cited below.

A variety of SAS host interconnect cable lengths are being made available with this announcement (see the ordering section of this document for details).

SAS HBA Product Announcements:

Title: Announcing Sun StorageTek™ PCIe SAS HBA, 8 port, RoHS 6 compliant

Announcement Date : April 03, 2007

Sun Product Intro#: Q3FY2007-268I

Title: Announcing Sun StorageTek™ PCI-X SAS HBA, 8 port, RoHS 6 compliant

Announcement Date : April 03, 2007

Question 22. Where can I find more detailed technical information on the Sun StorageTek 2500 Series Arrays?

A. User's guides, field guides and more are posted externally at:

http://www.sun.com/storagetek/disk_systems/workgroup/

http://www.sun.com/products-n-solutions/hardware/docs/Network_Storage_Solutions/Workgroup/

http://docs.sun.com/app/docs/prod/storedge#hic

Question 23. Will the ST2530 operating system (OS) support include S10 X64, SPARC in a multi-path mode at revenue release (RR)?

A. No. Initial OS support will include S10 X64, SPARC in a single path mode only. Multi-path support will be available approximately 60-90 days after RR through a patch release. The following multi-path support will be available at RR:

Windows 2K3 w/ multi-path support

Linux (RHEL 3.0/4.0, SESL 8.0/9.0) w/ multi-path support

Note: More detailed information regarding the ST2530 Array and multi-path support will be published in a subsequent product announcement and in this JTF document.

Question 24. Are the ST2500 Series Arrays and all X-option part numbers supported by the ST2500 Series compliant with the European Union(EU)parliament and China "Restriction of Hazardous Substances" (RoHS) directives?

A. Yes. Note: The ST2500 Series will be taking the Lead in solder exemption to the RoHS directive. As a result, "RoHS-5" is indicated in all ST2500 Series related product descriptions.

Question 25. What management software should I order for the Sun StorageTek 2500 Series Array?

A. This is not necessary. The Sun StorageTek Common Array Manager (CAM) is the standard management software for the Sun StorageTek 2500 Series Arrays. With features like Storage Profiles and a built-in performance utility, this software simplifies administration and enables comprehensive management of multiple arrays (e.g., ST2540, ST2530, ST6140 and ST6540). In addition, CAM is included with the array at no additional licensing or maintenance costs.

Question 26. What is the difference between a CRU and a FRU?

A. Field Replaceable Units (FRUs) are typically replaced by Sun authorized and trained personnel. A Customer Replaceable Unit (CRU) has been designed to be easily replaced by the customer and designated as customer replaceable. FRUs and CRUs are easily identified in the Sun System Handbook available to customers with a Sun Service Plan.

Question 27. How will customers receive replacement CRU's in the event of a failure?

A. Customers will open a service call with Sun. A Sun technician will confirm the CRU failure and schedule shipment of a replacement CRU with a prepaid return label to the customer. Customer will remove the failed CRU and return it to Sun in the box the new unit was shipped in utilizing the prepaid return label.

Question 28. How will customers know how to replace the CRU?

A. Instructions for removal and replacement are available via the Service Advisor which is accessible through StorageTek Common Array Manager. For easy reference, hard copy removal and replacement instructions will also be provided as part of the CRU shipment.

Question 29. What CRU's are available with the 2500 Series Arrays?

A. Customer Replaceable Units (CRU's)are available for chassis/midplanes, controllers, I/O modules, batteries, power/cooling units and disk drives.

Question 30. What is SAS technology?

A. SAS is defined as Serial attached SCSI. It is the industry's storage protocol technology successor to parallel SCSI. SCSI is in its 7th generation with the U320 SCSI and has reached its final iteration. SAS provides customers the following benefits:

*Better performance: 3 Gb/s SAS "x4 wide" ports provide a cumulative bandwidth of 12 Gb/s

*Full duplexing: Allows for data to be received and transmitted at the same time

*Scalable: Freedom from 15 drive maximum per SCSI channel

Question 31. What does the term SAS "Wide" Ports refer to?

A. The SAS lane is 3 Gb/s. The path to the disk drives is a single lane. "x4 wide" creates 4 lanes in a single connector. Moreover, Lanes 2, 3and 4 are use are "overflow" when concurrent I/Os overload the previous channel.

Question 32. What are the ST2500 Series Array high availability features?

A.

-Redundant, hot-swappable components

-Controllers, drives, cables, power/cooling

-Automated I/O path failover

-Online administration, expansion, configuration

-Global hot spares

-Battery-backed cache with cache mirroring

Question 33. Can the ST2540 FC Array be converted to a ST2530 SAS Array by swapping host interface cards?

A. No. This conversion is NOT supported.

Question 34. What is the purpose of offering ST2501 SAS Expansion units that include both 1 SAS I/O module and 2 SAS I/O modules?

A. The ST2501 configurations with single SAS I/O module have been made available to support connections with single controller versions of the ST2540, ST2530 and ST2510 RAID arrays, while the dual SAS I/O ST2501 configurations support the dual controller versions of the ST2540, ST2530 and ST2510 RAID arrays.

Question 35. What is the cache policy of the ST2540, ST2530 and ST2510 with dual RAID controllers?

A. The default setting for better performance, is write back. However, the user can toggle back between write through and write back cache policies.

Question 36. Can I access the terminal interface point to point (From a PC to the array)?

A. Yes, you can directly connect to an ST2500 array and access the terminal interface through a serial cable.

Question 37. What is Auto Service Request (ASR) and how does it relate to remote Monitoring?

A. Auto Service Request (ASR) uses fault telemetry 24/7 to automatically initiate a service request and begin the problem resolution process as soon as a problem occurs. Automatic Service request requires a one way connection via the internet and a valid warranty or support contract.

Note: Requires StorageTek Common Array manager to enable the connection.

Question 38. I have a customer who wishes to upgrade to a redundant controller, what needs to be ordered?

A. A controller card (of the same type already in the array) should be ordered. To make any expansion trays also redundant and to receive the benefit of the second controller, a second IOM module should be ordered for any expansion tray managed by the base array.

Question 39. Will product shipped prior to 1/29/2008 with the 1 year Next Business Day service warrant receive the 3 year parts only warranty effective on 1/29?

A. No. If a product shipped prior to 1/29, the entitlement database would show a 1 year NBD warranty associated with the serial number of the system in question. If the product shipped after 1/29, the entitlement database would show a 3 yr Return to Sun warranty associated with that serial number.

Question 40. Are installation services available for this product?

A. This product is customer installable, but optional installation services are available in the Ordering section of this announcement. These part numbers begin with "EIS-"

Question 41. Do I need to upgrade the firmware on my previously purchased ST2500 Array prior to adding x-option SATA-II disk drives to create an

intermix of SAS and SATA drives or prior to converting my SAS drive based array to a SATA drive based array?

A. Arrays running with controller firmware 06.17.52.10 or earlier will need to be updated to the current firmware in order to support the addition of SATA-II drives. The associated StorageTek Common Array manager (CAM) v5.1.3 (and eventually CAM v6.0) patch for ST2500 SATA Support can be obtained through the standard Sun patch support process. Be sure to follow the patch instructions in the associated README file.

Question 42. It is clear the mixing of SAS and SATA drives in the same ST2500 tray is supported. How about the mixing of drive types across trays in a multiple tray configuration? Are there any special technical considerations one should keep in mind when mixing these drive types?

A. Mixing SAS and SATA drives in the same tray and across trays is indeed supported. Mixing SAS and SATA drives in the same volume group is NOT supported.

Question 43. What version of StorageTek CAM supports the new SATA ST2500 offerings being made available with this announcement?

A. CAM v5.1.3 and v6.0.0 with the patch or v6.0.1 or later.

Question 44. Where can I find the documentation that covers the steps to perform the firmware upgrade that will enable SATA support on the ST2500 Arrays?

A. This documentation can be found in the ST2500 Release Notes located at the following URL: http://docs.sun.com/app/docs/coll/2500

Question 45.What languages does the StorageTek 2500 Series Array software and documentation support?

A. English, French, Japanese and Simplified Chinese are the languages currently supported. Strategy for further localization is reviewed on a periodic basis.

Question 46. In regards to the Sun StorageTek 2510 iSCSI Array, statements have been made suggesting no limitation to cable length. Is this realistic?

A. Distance is limited by tolerance to network latency. With increased cable lengths network latency will degrade.

Question 47. Will product shipped prior to 1/29/2008 with the 1 year Next Business Day service warrant receive the 3 year parts only warranty effective on 1/29?

A. No. If a product shipped prior to 1/29, the entitlement database would show a 1 year NBD warranty associated with the serial number of the system in question. If the product shipped after 1/29, the entitlement database would show a 3 yr Return to Sun warranty associated with that serial number.

Question 48.What are the baseline firmware and CAM versions required for support of 48 drives?

A. Please follow the procedures in the release notes to ensure the proper firmware levels and CAM releases are installed prior to downloading the CAM 6.0.1 patch.

CAM Release Notes can be found at:

http://docs.sun.com/source/820-3997-10/index.html

2500 Release Notes can be found at:

http://docs.sun.com/source/820-3511-10/index.html

Question 49.Is SAS multipathing on Solaris available?

A. Yes. Please locate the appropriate drivers in the Download Product-Specific Patches section at:

http://sunsolve.sun.com/show.do?target=patchpage

STMS support for the mpt driver is available in the latest Sol 10 mpt
driver patch :

Patch Id: 125081-xx
Summary: SunOS 5.10: mpt driver patch
Date: Jan/04/2008
Solaris Release: 10
Relevant Architecture: sparc

Patch Id: 125082-xx
Summary: SunOS 5.10_x86: mpt driver patch
Date: Jan/04/2008
Solaris Release: 10_x86
Relevant Architecture: i386

Question 50.Are any additional parts needed to add the third expansion tray?

A.To conform with the 48 drive supported cabling, please order the 1m SAS cable, XTA25X0-1.0M-SAS-Z.

Question 51.Where can I find the SMI-S providers for the 2500 arrays?

A. The providers can be found at:
http://www.lsi.com/storage_home/products_home/external_raid/management_software/smis_provider/index.html

Question 51.How do I upgrade to firmware version 7.35.xx.xx (also named "Exmoor")?

A. Please follow the Upgrade Utility Guide, here:
http://docs.sun.com/app/docs/coll/st2500arrays

Question 52.Does the upgrade to firmware version 7.35.xx.xx (also named "Exmoor") require an offline upgrade?

A. Yes. The firmware update requires the array to be brought offline.

Question 53. What version of CAM is required for firmware version 7.35.xx.xx (also named "Exmoor")?

A. CAM 6.2 (or later) is required to support the new firmware version 7.35.xx.xx

Question 54. Is there a way to determine if an array ships with firmware version 7.35.xx.xx (also named "Exmoor")?

A. Yes. For 2500 array systems coming in from Sun manufacturing, the traceability of this change can be identified via date code within the system level serial number in manufacturing. The date code is 0825 (year 08, week

25) and all 2500 array systems manufactured on and after that date have the "Exmoor" firmware. The date code can be found as part of the chassis Serial Number in the form "YYWWXXXXXX" where YY=year and WW=week.

Question 55.Are the domain licenses fixed or incremental?

A. No. The number of domains stated in the license is the TOTAL number of domains supported -- and is priced accordingly. For example a customer who purchases four domains and wishes to add two more must purchase the eight domain license (not another four domain license).

Another example: A customer using the two included domain licenses who wants to upgrade to six domains must buy an eight domain license. A four domain license will NOT add four new domains to the two already in place.

Optional – Sun Services

The Sun StorageTek 2500 array models have optional enhanced services package, which allows customers to rapidly implement complex data storage environments. This extended service package helps ensure the use of sound storage installation and configuration practices, thereby allowing Sun to put the support infrastructure in place that is required to maintain the most demanding enterprise and data center environments.

Recommended services available for the Sun StorageTek 2500 Arrays are shown in the table below.

Installation Service	Part Number
Installation of Sun StorageTek 2540 Array during local business. Additional expansion tray must use EIS-2501TRAY-E (1 per tray)	EIS-2540ARRAY-E
Installation of Sun StorageTek 2540 Array after local business. Additional expansion tray must use EIS-2501TRAY-E (1 per tray)	EIS-2540ARRAY-E-AH
Installation of Sun StorageTek 2530 Array during local business. Additional expansion tray must use EIS-2501TRAY-E (1 per tray)	EIS-2530ARRAY-E
Installation of Sun StorageTek 2530 Array after local business. Additional expansion tray must use EIS-2501TRAY-E (1 per tray)	EIS-2530ARRAY-E-AH
Installation of SunStorageTek 2510 Array during local business. Additional expansion tray must use EIS-2501TRAY-E (1 per tray)	EIS-2510ARRAY-E
Installation of SunStorageTek 2510 Array after local business. Additional expansion tray must use EIS-2501TRAY-E (1 per tray)	EIS-2510ARRAY-E-AH
Installation of Sun StorageTek 2501 Expansion tray into a new or existing Sun StorageTek 2530 or 2540 array during local business. 1 part number per tray.	EIS-2501TRAY-E
Installation of Sun StorageTek 2501 Expansion tray in a new or existing Sun StorageTek 2530 or 2540 array after local business. 1 part number per tray.	EIS-2501TRAY-E-AH
FOR IDO PARTNER PURCHASE ONLY - Installation of Sun StorageTek 2530 Array during local business. Additional expansion tray must use EIS-2501TRAY-E (1 per tray)	P-EIS-2540ARRAY-E

Installation Service	Part Number
FOR IDO PARTNER PURCHASE ONLY - Installation of Sun StorageTek 2540 Array during local business. Additional expansion tray must use EIS-2501TRAY-E (1 per tray)	P-EIS-2530ARRAY-E
FOR IDO PARTNER PURCHASE ONLY - Installation of SunStorageTek 2510 Array.	P-EIS-2510ARRAY-E
FOR IDO PARTNER PURCHASE ONLY - Installation of Sun StorageTek 2501 Expansion tray into a new or existing Sun StorageTek 2530 or 2540 array during local business. 1 part number per tray.	P-EIS-2501TRAY-E

Warranty

The following table indicates warranty details for the Sun StorageTek 2500 Arrays:

Repair Support Duration	Software Support Duration	Phone Coverage		Hardware Coverage		
		Hours of Coverage	Call-Back Response Time	Hours of Coverage	Response Time	Delivery Method
3 year	90 days	8 a.m.-8 p.m. Mon-Fri	Customer-defined priority	N/A	• Parts Exchange	Parts shipped based on priority

For the latest warranty information for the Sun StorageTek 2500 storage system, refer to:
http://www.sun.com/service/support/warranty/features.html

SunSpectrum^{SM} Instant Upgrades (Warranty Upgrades)

The SunSpectrum^{SM} program is a service offering that allows customers to choose the level of service best suited to their needs. The SunSpectrum program provides a simple pricing structure in which a single fee covers support for an entire system, including related hardware and peripherals, the Storage environment firmware, and telephone support.

SunSpectrum program support contracts are available both during and after the warranty program. Customers can choose to uplift the service and support agreement to meet their business needs by purchasing a SunSpectrum contract. The four levels of SunSpectrum support contracts range from SunSpectrum Bronze^{SM} level to SunSpectrum Platinum level.

Benefits

A SunSpectrum Support as part of the overall solutions ensures a consistent business relationship which will deliver services for managing reliability, availability, and predictability of Sun technology.

Transitioning from a warranty and break/fix environment to a SunSpectrum support environment provides reduction in total cost of support for Sun products. Customers who make this move can realize benefits in the form of a lower total cost of support, improved system availability and improved system administrator productivity.

Customer can dictate the appropriate Sun's response time and have their service requests receive priority at the Sun Solution Center, through their choice of support. The flexibility to choose a level of service that matches the criticality of each product, coupled with Sun's support engineers' proven expertise and responsiveness, and consistent service quality, deliver and assured level of service to meet business requirements..

One-price coverage

With a SunSpectrum Service Plan you get all the essential services you need for one price, per product, per year.

For information specific to the Sun StorageTek 2500 Arrays, refer to: http://www.sun.com/service/support/products/storage/

The following part numbers can be used to upgrade system warranty to the given level of SunSpectrum[SM] service for each specified product:

Customers should check with their local Sun Services representative for program and feature availability in their areas.

2540 IWU Part Numbers	2530 IWU Part Numbers	2510 IWU Part Numbers	List Price
IWU-ST2540NW-1P	IWU-ST2530NW-1P	IWU-ST2510NW-1P	$1,476.00
IWU-ST2540NW-2P	IWU-ST2530NW-2P	IWU-ST2510NW-2P	$2,832.00
IWU-ST2540NW-3P	IWU-ST2530NW-3P	IWU-ST2510NW-3P	$4,068.00
IWU-ST2540NW-24-1G	IWU-ST2530NW-24-1G	IWU-ST2510NW-24-1G	$1,116.00
IWU-ST2540NW-24-2G	IWU-ST2530NW-24-2G	IWU-ST2510NW-24-2G	$2,136.00
IWU-ST2540NW-24-3G	IWU-ST2530NW-24-3G	IWU-ST2510NW-24-3G	$3,096.00
IWU-ST2540NW-1G	IWU-ST2530NW-1G	IWU-ST2510NW-1G	$828.00
IWU-ST2540NW-2G	IWU-ST2530NW-2G	IWU-ST2510NW-2G	$1,584.00
IWU-ST2540NW-3G	IWU-ST2530NW-3G	IWU-ST2510NW-3G	$2,268.00
IWU-ST2540NW-1S	IWU-ST2530NW-1S	IWU-ST2510NW-1S	$540.00
IWU-ST2540NW-2S	IWU-ST2530NW-2S	IWU-ST2510NW-2S	$1,032.00
IWU-ST2540NW-3S	IWU-ST2530NW-3S	IWU-ST2510NW-3S	$1,476.00
IWU-ST2540NW-1B	IWU-ST2530NW-1B	IWU-ST2510NW-1B	$384.00
IWU-ST2540NW-2B	IWU-ST2530NW-2B	IWU-ST2510NW-2B	$744.00
IWU-ST2540NW-3B	IWU-ST2530NW-3B	IWU-ST2510NW-3B	$1,044.00

2501 IWU Part Numbers	List Price
IWU-ST2501NW-1P	$744.00
IWU-ST2501NW-2P	$1,440.00
IWU-ST2501NW-3P	$2,052.00
IWU-ST2501NW-24-1G	$552.00
IWU-ST2501NW-24-2G	$1,056.00
IWU-ST2501NW-24-3G	$1,512.00
IWU-ST2501NW-1G	$420.00
IWU-ST2501NW-2G	$816.00
IWU-ST2501NW-3G	$1,152.00
IWU-ST2501NW-1S	$264.00
IWU-ST2501NW-2S	$504.00
IWU-ST2501NW-3S	$720.00
IWU-ST2501NW-1B	$192.00
IWU-ST2501NW-2B	$360.00
IWU-ST2501NW-3B	$540.00

Education

For further information on courses visit Sun Ed Web site at http://www.sun.com/service/suned, or to order, call: 1-800-422-8020.

Professional Services

See the professional Services catalog at https://icexchange.central.sun.com/ for other Services and the latest updates on the Services mentioned below.

Consulting Services

Sun Client Services can offer multiple levels of consulting services to ensure a smooth data migration from other Sun StorageTek series of arrays to the Sun StorageTek 2500 array. SunPS offers a wide range of data management and migration services to accommodate most customer environments and circumstances. Contact local Sun Client Services for further details and quotation for the specific customer environment.

Sun also offers a wide variety of consultative services that will help the customer architect their Sun StorageTek 2500 array into existing storage infrastructures. These services are generally custom-priced engagements that can assist with the design and implementation of larger storage architectures. These services can also assist with analysis of total cost of ownership (TCO), storage migration, comprehensive review of backup and recovery procedures, data replication design and implementation, and security issues.

Host-Based Data Migration Service

Sun's Host Based Data Migration (HBDM) Service makes relocation or consolidation of data simple and non-disruptive to your business. Whether you are refreshing your Sun servers and disk hardware or adopting Sun systems for the first time, the HBDM service is easy to implement, flexible, and transparent to applications that require access to the data. Our data migration capabilities are vendor-neutral and application-agnostic. We can move data in both mainframe and open systems environments. And we can

move your data locally (SAN or direct attach) or globally (via TCP/IP). Whatever your data migration needs, Sun Storage Services provides expert project planning and delivery, so end users no longer have to risk data loss or corruption, or incur expensive downtime in order to move their data.

Backup and Recovery Service

The Sun StorageTek Backup and Recovery Consulting Custom Service includes an analysis of Customer's current backup and recovery environment, with recommendations on how to improve performance, backup window, hardware and software upgrades and migrations, or how to implement a backup strategy, or how to completely out source Customer's data backup needs. This is a custom engagement that must be tailored to Customer's requirements to determine scope and price.

Business Continuity and Disaster Recovery Services

The Sun StorageTek Business Impact Analysis (BIA) service will help Customer gather the necessary business information, and identify the associated operational and financial impacts, in the event of a business disruption. Findings are analyzed and documented in a business impact analysis report that includes recommendations and suggested solutions. This is a 1-2 week fixed price engagement limited to one customer location and 3 business units at that location.

A custom version of this service is also available

Storage Assessment Services Suite

(formerly Business Value Assessments or BVA)

The Assessment suite comprises three incremental Services. The customer starts with the fundamental offer and can purchase the additional services as needed.

Sun StorageTek Storage Management Productivity Discovery Base Service: will assess the current state of Customer's storage environment and results in a written report that will document any potential areas for increased efficiency or improvement. This is a fixed fee engagement and limited to 1 site, up to 5 hosts, up to 2 disk subsystems,1 backup master server, 1 Automated Cartridge System Library Software (ACSLS) server (if applicable), 2 SAN switches, 1 database, and 6 customer staff interviews.

A CUSTOM version of this service is available when the Base Service does not fit the scope of Customer's requirements.

Storage Management Architecture Review: is a technical deep dive into the storage, process, and management of Customer's storage infrastructure. The output of the review is a report of specific actionable steps Customer can take to improve the reliability, utilization, and performance of Customer's storage subsystems, focused on disc, tape, and the networking SAN infrastructure. This is a custom engagement that must be tailored to Customer's requirements to determine scope and price.

Sun StorageTek Storage Management Optimization Service: focuses on mitigating issues, and improving the over all performance of, Customer’s storage infrastructure. This Service is designed to help Customer implement the recommendations documented in the Sun StorageTek Storage Management Architectural Review Service (WW-PS-BVAO2-CUSTOM). This is a custom engagement that must be tailored to Customer's requirements to determine scope and price.

A Disk Implementation Service is not available for the 2500 modular arrays. Implementation of large or heterogeneous deployments may be supported as standalone PS engagements.

Glossary

Use the Glossary table for terms and definitions. Glossary terms should be in alphabetical order. Note that all acronym descriptions start with the full spelling of the acronym, followed by a period, and then followed by the regular description of the term.

Term	Definition
Array	Storage system consisting of trays and controller units. Storage system consisting of a minimum of one controller unit. Also includes one or more slots to house disks drives.
Array hot-spare	Disk that serves as a hot-spare within an array. A reserve disk that can be made available to all virtual disks within an array.
Bandwidth	A measure of the capacity of a communication channel, usually specified in MB/second.
Block or block size	Amount of data sent or received by the host per I/O operation. Atomic read/write operation to/from a disk. Size of data unit that is striped across disks.
Cache	A high-speed memory or storage device that reduces the effective time required to read data from or write data to a lower speed memory device (disk drives). Read cache holds data in anticipation that it will be requested by the client. Write cache holds day written by a client until it can be safely stored to disk.
Cache hit	Read or write request for data that is already in cache. Therefore, a request can be serviced without needing to go to disk.
CLI	Command Line Interface
Controller tray	A tray with one or more installed controller units.
Controller unit	The intelligence card that manages RAID functions and failover characteristics for an array or tray, or group of trays.
Copy-On-Write (COW)	The process that Sun StorageTek Data Snapshot software uses to preserve point-in-time data when new data is written to disk. With each write, the system preserves the old data in snapshot reserve space, so that it can re-create the volume as it existed at the time of the snapshot.
DAS	Direct attach storage. Storage directly attached to servers or hosts (as opposed to SAN storage where storage is attached to a network of storage devices).
Data path	The path traveled by data packet — between the host processor and the disk.
Defragmentation	A process that reorganizes files on a disk to consolidate non-contiguous space on a volume group. This user can create non-contiguous space by deleting volumes or by not using all the free capacity during volume creation.
Disk	Physical entity that stores data (as compared to a virtual disk, which is a logical grouping of disks or storage extents).
Disk Slot	Slots on trays that house physical disks.
Drive depopulation	Drive depopulation allows additional spindles to be added to drive trays that are not fully populated with 14 drives.
ECC	Error correction code. Extra bits added to words, or double words, that correct all single-bit errors, and detect all double-bit errors. A superior technology to parity, which detects, but does not correct, single-bit errors, and cannot detect double-bit errors.

Term	Definition
Fabric	A group of interconnections between ports that includes a fabric element. A collection of switches and the connections between them.
FC-AL	Fibre Channel arbitrated loop, a loop topology used with Fibre Channel.
Fiber	A wire or optical strand. Spelled *fibre* in the context of Fibre Channel.
Fibre Channel	A set of standards for a serial I/O bus capable of transferring data between two ports up to 100 MB per second. Fibre Channel supports point-to-point, arbitrated loop, and switched topologies. Fibre Channel can be implemented with either optical fiber (note spelling) or copper.
Fiber-optic cable	Jacketed cable made from thin strands of glass, through which pulses of light transmit data. Used for high-speed transmission over medium to long distances.
F_Port	On a Fibre Channel switch, a port that supports an N_port.
HBA	Host bus adapter. A card that connects a peripheral device to the computer system's I/O bus.
host	represents a data host and is comprised of 0 or more initiators. A host has a name that is unique to the storage array on which it lives (the uniqueness is enforced by the storage array firmware).
host group	is a collection of host objects on a particular storage array. Host groups have names that are unique to the storage array on which they live (the uniqueness is enforced by the storage array firmware).
Host ports	DSP ports attached to hosts or host-facing SAN ports. Any DSP port is capable of being either a host port or a storage port.
Hot-swappable	A hot-swappable component can be installed or removed by simply pulling the component out and putting the new one in. The system either automatically recognizes the component change and configures itself as necessary or requires user interaction to configure the system. However, in neither case is a reboot required. All hot-swappable components are hot-pluggable, but not all hot-pluggable components are hot-swappable.
Hot-spare	Disk used by a controller unit to replace a failed disk.
In-band	Using the data path between a host(s) and a storage device to transport system management traffic.
Initiator	is a port on a fiber channel card of a data host. The initiator has a world-wide name (WWN) that is globally unique and a name. Note that because the array allows the use of duplicate names for initiators, the management software can allow duplicate names to be used on the same storage array.
In-band	Using the data path between a host(s) and a storage device to transport system management traffic.
Initiator	is a port on a fiber channel card of a data host. The initiator has a world-wide name (WWN) that is globally unique and a name. Note that because the array allows the use of duplicate names for initiators, the management software can allow duplicate names to be used on the same storage array.
I/O	Input/output.
I/O rate	A measure of a device's capacity to transfer data to and from another device within a given time period, typically as I/O operations per second.
IOPS	Input/output operations per second. A measure of I/O performance, this is commonly used to quote random I/O performance.
IP	Internet protocol. A set of protocols developed by the United States Department of Defense to communicate between dissimilar computers across networks.

Term	Definition
LED	Light emitting diode.
LUN	Logical Unit as defined by SNIA. Defines a volume as it is mapped to particular host(s) or initiator(s). Distinguished from a volume in a sense that the same volume can represent a different LUN to different host(s) or initiator(s).
LUN mapping	Assigning volume permissions (read-only, read/write, or none) to a host or initiator.
LUN masking	A technique that prevents all but certain initiators from gaining access to a volume.
Management path	The out-of-band path that connects components of the system to the storage service processor.
Mapping	is an association between a storage volume and either a host or a host group that has a Logical Unit Number (LUN). All mappings are implicitly read/write mappings between the volume and all initiators contained inside the host or host group.
Mirrored cache	Redundant copies of data residing in cache — the (write) data residing in cache that has not yet been written to the hard disks is duplicated for failover operation.
Mirroring (RAID)	Redundant storage of data, achieved by duplicating files (so there is always a primary file and a copy of the primary file) onto separate disks.
MTBF	Mean time between failures. A measure of reliability, this is the average expected time between failures of equipment, usually measured in operating hours.
MTBDL	Mean time between data loss. In a RAID system, this is the average expected time between two rapid disk failures that would cause irreparable data loss.
MTTR	Mean time to repair. A measure of availability, this is the average time the system is out of commission to complete a repair process.
Multipathing	Providing two or more physical paths to a given target or device.
Non-disruptive	Does not prevent system or data access at any time during operation. Data path access is not sacrificed, and the host does not see any I/O failure (unless dual points of failure). Availability of management services not included.
N_Port	A Fibre Channel port in a point-to-point or fabric topology.
NL_Port	A port attached to a node for use in all three topologies (point-to-point, arbitrated loop, or fabric).
NVRAM cache	A non-volatile (battery-backed) random access memory area used as an intermediate store for data between a host computer system and disk drives to achieve faster writes and, in some cases, faster reads.
OLTP	On-line transaction processing.
Optical fiber	Any filament of fiber, made of dielectric material, that guides light.
Out-of-band	Using a path other than the data path to transport system management information. Connecting to a management port using an IP network, for example.
Parity	Additional information stored along with the data that allows the controller to reconstruct lost data on RAID 3 or 5 LUNs if a single drive fails.
Partitions	See Storage Domains
Path failure	The loss of a data or management path.
Path failover and recovery	The process of automatically moving traffic to a different path when a path either fails, or is re-instated.
Point-in-time copy	A frozen copy of a volume's data, as created when taking a snapshot.
Port	An access point on a device for attaching a link.
Primary volume	Used in the context of snapshots, the primary volume is the live data set from which the snapshot copy is made.

Term	Definition
Profile	A set of attributes applied to a set of storage in a Common Array designed to help optimize that pool for a particular access pattern and/ or level of data protection. Profiles are associated with Common Arrays to define the attributes of the pool.
Protocol	A convention for data transmission that defines timing, control, format, and data representation.
RAID	Redundant array of independent disks. A set of disk drives that appear to be a single logical disk drive to an application such as a database or file system. Different RAID levels provide different capacity, performance, availability, and cost characteristics.
RAS	Reliability, availability, and serviceability. Reliability is a measure of the likelihood that problems will occur. A highly reliable system has few problems. Once a problem occurs, availability is the measure of how the system protects the user from being adversely affected by the problem. Serviceability is a measure of how easy it is to repair the problem.
Read-ahead	Sequential data read from disk into cache without having actually been requested by the application host, in anticipation that it will be requested by the host. When the request occurs, it can be serviced as a low latency cache hit, thus improving host application performance.
Reconstruction	The process of rebuilding lost data on a replacement disk after a disk failure.
Redundancy	Duplication for the purpose of achieving fault tolerance. Refers to duplication or addition of components, data, and functions within the array.
Repository Volume	A special volume created as a resource for a snapshot volume.
SAN	Storage area network. SAN architecture uses high-performance, high-capacity Fibre Channel switches to connect storage islands to servers. This approach provides physical connectivity, facilitating information sharing, or simplifying management across servers.
SAS	Serial Attached SCSI (SAS) – is a serial communication protocol designed for transfer of data to and from devices. The SAS standard defines a device-level enterprise storage interface incorporating SCSI command sets, serial point-to-point interconnections, dual-porting, increase addressability and the ability to scale small form factors.
SATA	Serial Advanced Technology Attachment (SATA) – evolution of PATA (parallel) drive technology. A serial link that uses a single cable to create a point-to-point connection between two devices. SAS and SATA intermix support in the Sun StorageTek 2500 Arrays*.
Snapshot Volumes	a point-in-time image of a standard volume. Only possible if the premium feature for snapshots is enabled.
SNMP	Simple network management protocol. A simple protocol designed to allow networked entities (for example, hosts, routers) to exchange monitoring information.
Storage domain	A logical domain with its own storage, and its own management environment. It is one or more mappings between a host or host group, and volumes. A Storage Domain may contain up to 256 volumes, each volume having a unique LUN id with a value between 0 and 255. Storage Domain is synonymous to the term “Partitioning”.
Storage pool	A collection of disks, virtual disks or storage extents, generally with common configuration, availability, and performance characteristics, that can be carved into volumes.
Storage Profile	is a collection of attributes that identifies the storage properties of a storage volume. The attributes will contain values that are applicable at the level of Storage Array, Vdisk, and Volume.
Storage Volume	volume on a particular Vdisk on a particular storage array

Term	Definition
Striping	Laying data out over a series of disks or virtual disks, allows multiple disk controllers to simultaneously access data, thus improving performance. Spreading or interleaving logical contiguous blocks of data across multiple independent disk spindles. Striping allows multiple disk controllers to simultaneously access data, improving performance.
Stripe size	Total amount of data in a disk stripe, that is, the block size multiplied by number of data disks in the stripe.
Stripe width	Total number of disks in a disk stripe.
Sun StorageTek Data Snapshot software	Dependent style point-in-time copies, using copy on write technology.
Sun StorageTek Common Array Manager software	Uses virtualization capabilities of the Sun StorageTek 6920 system to simplify storage management, using Common Arrays and application-oriented storage profiles.
Switch	The name of an implementation of the fabric topology. A fabric element that implements a fabric. The fabric element that allows each port of a switch to be connected to any other port on that switch. A collection of switches implement a fabric and provide the network through which any device can communicate with any other device.
Throughput	A measure of sequential I/O performance, quoted as megabytes per second (MB/sec.). See *IOPS and I/O rate.*
Topology	The components used to connect two or more ports together. Also, a specific way of connecting those components, as in point-to-point, fabric, or arbitrated loop.
Transfer rate	The rate at which data is transferred, usually measured in megabytes per second (MB/sec.).
Tray	An enclosure containing disks.
Tray depopulation	Trays delivered without the full compliment of disks installed. Allows additional disks to be added to trays that are not fully populated.
Virtual disk	Any abstraction or collection of disks that appears as a single disk to the device mounting it. is a volume group (a RAIDset) on a particular storage array comprised of similar disk types (either fiber channel or SATA).
Volume	A logical structure created on a Storage Array for data storage. Can be a single physical disk or a virtual disk mapped from one or more underlying extents. These are the typical volumes that users will access from data hosts.
Warm boot device	Bootable on all supported HBAs with storage booted before server booting.
XOR	exclusive OR. A binary mathematical operation performed on data to produce parity information. In RAID levels 3 and 5, parity is generated from the user data, stored, and used to regenerate lost data if a drive failure occurs.
Zone or zoning	Provided by fabric switches, a function that allows segmentation of node by physical port, name, or address.

Materials Abstract

All materials are available on SunWIN except where otherwise noted.

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
Product Literature				
– *Sun StorageTek 2500, Just the Facts (JTF)*	Reference Guide (this document)	Training Sales Tool	SunWIN, Reseller Web	SunWIN #500199
– *Sun StorageTek 2500, Customer Presentation*	Customer Presentation	Sales Tool	SunWIN, Reseller Web	SunWIN #500200
– *Sun StorageTek 2500 Technical Presentation*	Technical Presentation	Sales Tool	SunWIN, Reseller Web	SunWIN #500201
References				
– *Sun StorageTek 2500 Data Sheet*	Data Sheet	Sales Tool	SunWIN, Reseller Web, COMAC	SunWIN #499802
– *Sun StorageTek 2540 Data Sheet*	Data Sheet	Sales Tool	SunWIN, Reseller Web	SunWIN #524770
– *Sun StorageTek 2530 Data Sheet*	Data Sheet	Sales Tool	SunWIN, Reseller Web	SunWIN #524769
– *Sun StorageTek 2510 Data Sheet*	Data Sheet	Sales Tool	SunWIN, Reseller Web	SunWIN #524768
– *Sun StorageTek 2500 Beat Sheet*	Beat Sheet	Sales Tool	SunWIN, Reseller Web	SunWIN #499802
– *Sun StorageTek 2500 Cheat Sheet*	Product Snapshot	Sales Tool	SunWIN, Reseller Web	SunWIN #501256
– *Sun StorageTek 2500 Modular Portfolio Overview*	Modular Disk Overview	Sales Tool	SunWIN, Reseller Web	SunWIN #501776
– *Sun StorageTek 2500 Quick Reference Guide*	Product Overview	Sales Tool	SunWIN, Reseller Web	SunWIN #500018
– *Sun StorageTek 2500 SAS vs. SCSI technology brief*	Technology Brief	Sales Tool	SunWIN, Reseller Web	SunWIN #501777
External Web Sites				

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
– *Sun Web Site* – *Sun Network Storage Main Page*	http://www.sun.com http://www.sun.com/storage/			
– *Sun StorageTek 2500 Documentation*	http://docs.sun.com/app/docs/coll/st2500arrays			
– *Sun StorageTek 2500 Main Page*	www.sun.com/storagetek/disk_systems/workgroup/2500/			
– *Sun StorageTek 2500 Marketing URL*	www.sun.com/ST2500			
– *Sun StorageTek 2500 Partner Portal*	http://portal.sun.com/products/storage/2500.html			
– *Interop Tool Access Request*	http://partner.sun.com/tools/interop-access.html			
– *Sun Try and Buy Program*	http://www.sun.com/tryandbuy/index.jsp			
– *Sun Startup Essentials program*	http://www.sun.com/emrkt/startupessentials/products.jsp			
– *Sun SPA Rewards "Win-Win" program*	https://www.sunpartnerrewards.com/mipaxwar/pax/do/pageDisplay?programOid=29549374996876&templatePageOid=31177167601877			
– *Sun IBB Program*	www.sun.com/ibb			
Internal Web Sites – *Sun StorageTek 2500 MySales* – *Sun StorageTek 2500 OneStop (primary content loaction)*	 https://central.sun.net/http://mysales.central/public/storage/disk-storage32.html https://central.sun.net/redirect/https://onestop.sfbay.sun.com/storage/st2500/index.shtml?menu			
– *Interop Tool (includes servers)*	https://interop.central.sun.com/interop/interop?cmd=search_matrix			
– *Sun IBB Program*	https://central.sun.net/http://ibb.eng.sun.com/			
Further Assistance				
– *ST2500 Hotlines*	800-381-9958 (US) / 650-331-3283 (outside the US)			
– *ST2500 Support Alias*	lca-support@sun.com			

Additional Information