

Sun StorageTek™ 5220 NAS

Just the Facts

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Sun StorageTek™ 5220 NAS Appliance

Positioning

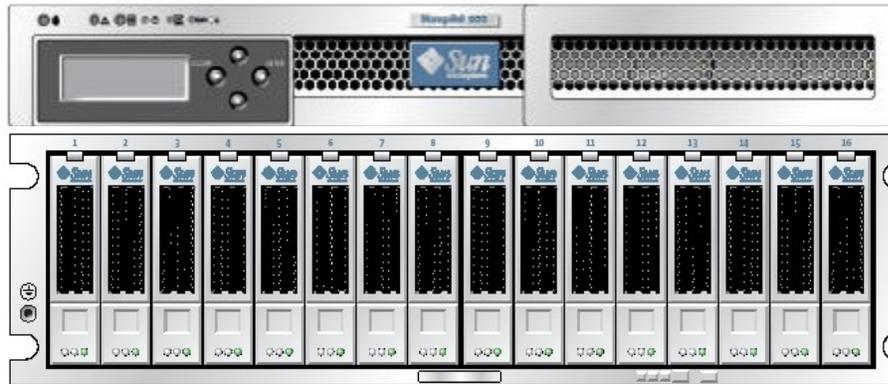


Illustration 1: Sun StorageTek 5220 NAS Appliance with the 5220 RAID Controller Unit..

Introduction

The Sun StorageTek 5000 NAS Family of Products are as follows:

- Platforms:
 - Sun StorageTek 5220 NAS Appliance
 - Sun StorageTek 5320 NAS Appliance
 - Sun StorageTek 5320 NAS Cluster Appliance
 - Sun StorageTek 5320 NAS Gateway System
 - Sun StorageTek 5320 NAS Cluster Gateway System
- Software:
 - Sun StorageTek 5000 NAS OS
 - Sun StorageTek File Replicator
 - Sun StorageTek Compliance Archiving Software

The Sun StorageTek 5000 NAS OS and optional software with 4.20 and above versions support all of the Sun StorageTek 5220/5320 Platforms listed above as well as the following platforms:

- Sun StorEdge 5210 NAS Appliance
- Sun StorEdge 5310 NAS Appliance
- Sun StorEdge 5310 NAS Cluster Appliance
- Sun StorEdge 5310 NAS Gateway System
- Sun StorEdge 5310 NAS Cluster Gateway System

Conventions used in this document are as follows:

- Sun StorageTek 5220 NAS. Refers to the StorageTek 5220 NAS Appliance platform listed above.

All hardware features described are specific to the Sun StorageTek 5220 NAS Appliance. All software features described can be applied to complete family of Sun StorageTek 5000 NAS Family of products.

Sun StorageTek 5220 NAS Appliances are delivered with back-end storage that is captive to the Sun StorageTek 5220 NAS Appliance. All discussions of back-end storage features in terms of RAID Array structures, hardware, capacity calculations, etc. are specific to the Sun StorageTek 5220 NAS Appliance.

The Sun StorageTek 5220 NAS Appliance is based on a dedicated, storage-optimized Operating System and the RoHS Galaxy-1 hardware platform that is equipped with the AMD Opteron Model 252 CPU Architecture. It typically requires minutes to configure and less than three minutes to boot, and delivers high network performance with minimal maintenance.

The Sun StorageTek 5220 NAS Appliance consists of a single NAS Filer Head appliance configuration that uses the Sun StorageTek 5220 RAID controller unit and Sun StorageTek 5220 Expansion unit.

Featured is a 64-bit journaling file system, checkpoints(snapshots), RAID 5, battery-backed cache, hot-swappable drives and power supplies, global spares, and support for a UPS. The journaling file system aids in ensuring data integrity across unforeseen events such as power outages. Sun StorageTek File Checkpoint creates “checkpoints” (also known as snapshots) that provide static images of the file system, enabling rapid recovery of mistakenly deleted files and enabling access to a point in time copy of the filesystem for purposes of further processing by commercially available backup and restore applications¹.

The Sun StorageTek 5220 NAS Appliances space-saving design conserves precious IT real estate, requiring only 4U of rack space. With the addition of a Sun StorageTek 5220 RAID (RCU) with a single dual port RAID Controller in Simplex Mode, and up to two (2) Sun StorageTek 5220 enclosure units, total scalability is 24TB_R utilizing 500 GB S-ATA drives.

The Sun StorageTek 5220 NAS model includes:

- NAS Operating System with a user license for an unlimited number of users
- CIFS, NFS and FTP file protocol support
- iSCSI block level support for IP-SANs
- Sun StorageTek File Checkpoint (snapshot)
- Dual redundant power supplies
- Embedded quad 10/100/1000 BaseT Ethernet ports
- An optional dual-port optical (MMF) or copper Gigabit NIC support or a Single port Ultra320 SCSI HBA for tape connectivity
- Real-time AntiVirus scanning (requires companion AV server)
- Optional software features including Sun StorageTek File Replicator and Sun StorageTek Compliance Archiving Software.

1 See the What Works With What document for a list of certified commercially available Backup/Restore applications.

Sun StorageTek 5220 NAS Appliance

The Sun StorageTek 5220 NAS Appliance is an entry-level storage solution for small and medium-size mid-range environments and is ideally suited for departmental, distributed enterprises, and small- to medium-sized companies with a need to consolidate storage, improve availability, share information, and reduce management costs. Purpose-built for simple operation, the Sun StorageTek 5220 NAS Appliance is a versatile NAS solution for mixed NFS/CIFS/iSCSI environments.

Product Family Placement

The Sun StorageTek 5220 NAS Appliance replaces the StorEdge 5210 NAS Appliance. The Sun StorageTek 5220 NAS appliance offers higher network port count and higher capacity than the the StorEdge 5210.

The Sun StorageTek 5220 NAS Appliance offers quick installation, simplicity of configuration and ease of management that scales in capacity from 4 TB_R to 24 TB_R (S-ATA). The Sun StorageTek 5220 NAS Appliance provides customers with reliable and affordable file serving and file storage.

The following table illustrates the differences between Direct Access Storage, Storage Area Network(s) and Network Attached Storage. It recognizes the strengths and weaknesses of each storage paradigm however, highlighted are the major advantages associated with the Sun StorageTek 5000 NAS Family (annotated as NAS in the figure below).

<i>Criteria</i>	<i>DAS</i>	<i>SAN</i>	<i>NAS</i>
Storage Management	Marginal, accomplished "server by server" contributing to the "Islands of Data" IT problem.	Good to Excellent. Storage Management tools have matured in recent years.	Excellent. Built-In Logical Volume Management, DTQ/User/Group Quotas & Snapshotting with file system consistency provide abstract layer storage management not available in SAN or DAS environments.
Storage Sharing	None.	Storage is consolidated but not shared. But, fundamentally, same as DAS. Centrally managed "Islands of Data" Platform.	Hardware is shared and Data is shared, fundamentally an optimum functional solution.
Data Sharing	None, this is what causes "Islands of Data" problem.	None, this is what causes "Islands of Data" problem.	All data sharable. Resolves the "Islands of Data" dilemma.
IT Management	Difficult, causes IT Management problems such as extended outages and undue risk to production data	Good to Excellent. SAN Management tooling has vastly improved but still can interrupt data availability.	Excellent, NAS Logical Volume Manager, Mirroring and Snapshotting separates data from Server Infrastructure preserving data availability..
Backup/Restore	Difficult due to loss of data availability when backing up mission critical highly volatile filesystem(s). This is exacerbated by the "Islands of Data" architecture	Better, data is separated from production support systems, proximity to B/R tooling is enabled by FC SAN connectivity.	Excellent due to NAS Filer features that enables B/R Best Practices. Features such as Snapshotting (Checkpoints) and NDMP technology improve B/R reliability as well as overall B/R service times.

Table 1: Comparison of DAS, SAN and NAS as it relates to key IT Infrastructure problem elements.

Typical connectivity is extremely large since it is often implemented on a corporate public network

backbone infrastructure where shared data files used in collaborative applications and home directories which facilitate storage consolidation initiatives are prevalent across vertical and horizontal markets.

The Data Center Infrastructure and Network Attached Storage

The Sun StorageTek 5000 NAS Family also resolves many information technology problems that exist in the enterprise data center today. Currently, data center storage suffers from exponential growth and scalability requirements with budgets that are only growing 2% to 4% annually. Having said this, the key elements of lowering total cost of ownership by minimizing hidden labor and storage management costs, price/performance, lower cost scalability and the ability to resolve key problems in a data center infrastructure are extremely important to the typical chief technology officer and data center manager.

Application Characterization and Network Attached Storage

The Sun StorageTek 5000 NAS Family being a NAS solution is extremely flexible and can integrate into many applications that exist in a customer's infrastructure. Care though should be taken as to the ideal storage architecture for types of applications. Data characterization which includes file types, file sizing and network infrastructure should be examined closely while the decision is made to use a NAS solution for any type of application. In addition, there are ideal storage architectures that are suited to unique application requirements. These requirements include perceived user response time, application dependencies that require direct/SAN attached solutions as well as vendor based certifications. Here is a table that at a high level provides data points towards in particular OLTP (Online Transaction Processing) application placement with respect to direct attached storage, storage area networks and network attached storage.

<i>Criteria</i>	<i>DAS</i>	<i>SAN</i>	<i>NAS</i>
OLTP (Low Transaction Rate)	On board DAS, could work well, but IT management issues marginalize the implementation.	Excellent. Server and SAN I/O Throughput exceeds the I/O and Network requirement.	Excellent. Server and Network I/O throughput exceed the requirement for performance. Snapshotting enables application processes that enhance processing of data.
OLTP (Medium Transaction Rate)	Marginal. Other disadvantages as well as peak workloads may exceed ability to preserve performance	Excellent. Server and SAN I/O throughput exceeds the I/O and Network requirement.	Very good. Server workload and Network I/O will meet this requirement. Care should be taken that txn levels don't exceed the network's ability to transport data to/from the Filer's NAS Filesystem.
OLTP (High Transaction Rate)	Marginal, depending on disk based technology. FC implementation would work well, but IT Management issues marginalize data availability. High Txn environments exceed typical SCSI performance and are usually not recommended.	Excellent. Server and SAN I/O Throughput meets or exceeds the I/O and Network requirement.	Marginal. Network throughput and overhead impacts overall application performance as well as user perceived response times.

Table 2: Key Application Performance Data Points.

Sun StorageTek 5220 NAS Product Availability

The following are the dates associated with the release of the RoHS-compliant Sun StorageTek 5220 NAS product family.

Product Event	Sun StorageTek 5220 NAS
• Sun Product Introduction (Presto)	November 7th, 2006
• WEBDESK Orderability	November 7th, 2006
• Public Announcement	November 7th, 2006
• Revenue Release (RR)	November 17th, 2006
• General Availability (GA)	November 17th, 2006

Table 3: Product Availability Information.

Key Messages

With the introduction of the Sun StorageTek 5220 NAS Product Appliance, Sun continues to offer customers value, innovation and choice in the entry level NAS storage space.

Value

- **Simplified Management:** The Sun StorageTek 5000 NAS Product Family provides an intuitive installation wizard for easy setup and configuration, and advanced software features that simplify network storage management. This simplified management enables organizations to consolidate dedicated storage from multiple servers and to scale as capacity requirements grow. The browser-based user interface with remote web administration enables system management and monitoring from anywhere in the world.

“Survey highlights: Placing second in overall satisfaction, in our midrange NAS survey, Sun users also loved the product's ease of use, ease of deployment and the number of file systems and capacity. ...”
...SearchStorage

See the following URL:

http://searchstorage.techtarget.com/originalContent/0,289142,sid5_gci1102541,00.htm2541,00.htm

Quote: SearchStorage article stating customer testimony regarding Sun StorEdge 5000 Ease of Use and Capability just behind Network Appliance but ahead of EMC and HP. (Note: While this survey was based on the StorEdge 5000 product line the StorageTek NAS OS preserves the heritage and benefits of the StorEdge 5000 line to allow this statement to be equally applicable to the StorageTek 5000 product line)

- **Investment protection:** The Sun StorageTek 5000 NAS Product Family incorporates state-of-the-art components that allow a seamless integration into any existing network infrastructure. It enables organizations to consolidate storage, reducing unused pools of expensive storage, and to scale as capacity requirements grow. Combined with simplified management, maximized system availability, and no additional user license fees required, the Sun StorageTek 5000 NAS Product Family provides an effective investment protection for current and future growth requirements.
- **World-class Services :** Sun's world-class service organization will provide the same high level of service and support for your Sun StorageTek 5000 NAS Appliance as it provides for a multi-million dollar Sun storage solution implementation. Internal automated diagnostics and remote notification capabilities, combined with a design that simplifies the serviceability of your Sun StorageTek 5000 NAS Appliance.
- **Sun's "One-Stop Shop":** Buy your Sun StorageTek 5000 NAS Appliance, software, service, consulting and training from Sun's "One-Stop Shop." Sun makes it easy – we understand secure enterprise network storage computing. Sun has what you need and Sun is here to help you.

Innovation

Advanced Technology: The Sun StorageTek 5220 NAS Appliance combines software and hardware technology in an easy-to-manage entry level NAS storage appliance. The Sun StorageTek NAS operating system is optimized for file serving and file storage and uses a 64-bit journaling file system specifically designed to ensure data integrity. The StorageTek File Checkpoint and StorageTek File Replicator are important applications that provide an additional level of data protection. The hardware design is based on the server-class AMD Opteron Galaxy-1 platform that provides excellent performance.

▪ **Compact Design:** The system architecture of the StorageTek 5220 NAS Appliance offers four built-in 10/100/1000 BaseT Ethernet ports, a single dual port embedded 2Gb Fibre Channel HBA, and support for one expansion card, either a optional dual port copper or optical Gigabit ports or a single Ultra-320 SCSI HBA, all within a compact 1U form factor design.

Robustness: The journaling filesystem helps to ensure data integrity across unforeseen events such as power outages. Checkpoints provide static images of the filesystem enabling rapid recovery of mistakenly deleted files or objects, and facilitating backup of the system. Combined with hardware RAID, battery-backed RAID cache, hot swappable drives, global spares, redundant hot-swappable power supplies and optional UPS backup, the Sun StorageTek 5220 NAS provides exceptional robustness.

▪ **Scalability:** The Sun StorageTek 5220 NAS standard S-ATA configuration can support the connection of a single Sun StorageTek 5220 RAID Enclosure and up two(2) Sun StorageTek 5220 enclosures for a total raw capacity of over 24 TB_R. Note, that storage can be inserted into the RAID CU and Disk Enclosures in 8 Disk increments. The initial deployment of the 8 drive increment must be installed with a Hot Spare.

5220 Storage	5220 RAID CU RAID Configuration	RAID CU Capacity 8 HDD per/Tray	5220 Enclosure RAID Configuration	5220 Enclosure Capacity 16 HDD per/tray	5220 Half Enclosure Capacity 8 HDD per/Tray	5220 Capacity RAID CU With Single Enclosure	5220 Capacity Maximum Full Capacity
500.0 GB _R 465.3 GB _F S-ATA	6+1 1 Hot Spare	4.000 _R 2.79 _F	6+1, 7+1 1 Hot Spare	8.000 _R 6.048 _F	4.000 _R 2.79 _F	16.000 _R 12.096 _F	24.000 _R 18.144 _F

Table 4: Sun StorageTek 5220 Simplex NAS Appliance Capacity(s).

Note: The 6+1 and 7+1 RAID Groups that use 500 GB S-ATA disk drives exceed the NAS OS and RAID Controller limitations of a two(2) TB LUN size. Because of this, these RAID groups are divided evenly into multiple LUNs.

Multiple Architectural Choices: Sun offers choices in system configuration, capacity and network connectivity to help tailor the StorageTek 5220 NAS systems to the customer's environment.

▪ Target Markets

The Sun StorageTek 5220 NAS Appliance Family is ideally suited for departments, distributed enterprises, and small- to medium-sized companies with UNIX and/or Windows network environments

and running any application with file-level storage requirement. Following are some of the applications that are supported:

- E-mail Servers: The Sun StorageTek 5000 NAS Appliance Family provides cross-platform file sharing and support for e-mail applications such as SendMail and Lotus Notes. Microsoft E-mail such as Exchange are supported via iSCSI.
- Storage Consolidation: The cross-platform file sharing support built into Sun StorageTek 5000 NAS Appliance Family aids in reducing the need for organizations to dedicate large storage resources to any single server.
- Engineering, CAD: The Sun StorageTek 5000 NAS Appliance Family provides cross-platform file sharing support for engineering applications such as CAD and computer software R&D.
- Imaging and Graphics: Huge graphic files demand maximum performance that can only be achieved with a filer that is optimized for storage services. The Sun StorageTek 5000 NAS Cluster system can be best utilized for this purpose.

Some applications impose extremely high and sustained transaction-per-second loads, require very

Features/Application	Imaging	Home Dir/ File Sharing	CAD/ CAM	VoIP/ Video	Web Server Consolidati on Storage	DW/DM
Checkpoints	✓	✓	✓	✓	✓	✓
File Replicator	✓			✓	✓	✓
Filer Cluster	✓	✓	✓	✓	✓	✓
Compliance Archiving Software	✓	✓				
Heterogeneous Access	✓	✓	✓			
Dynamic Volume Expansion	✓	✓	✓	✓	✓	✓
Quotas Support		✓	✓			
Autohome Shares		✓	✓			
Anti-Virus	✓	✓	✓	✓	✓	✓
iSCSI		✓			✓	

Table 5: Sun StorageTek 5000 NAS Appliance Family Feature/Functionality and Applications Table.

high QoS (low latency and low latency fluctuation) and have very high availability requirements necessitating fault-tolerance and/or failover capabilities. Examples of such applications are credit card transaction processing and airline ticketing. The Sun StorageTek 5000 NAS Product Family would not be well-suited to these environments. Other Sun products such as the StorageTek 6000 series and the StorageTek 9900 series are specifically designed to meet the requirements of these applications.

The table below lists applications with particular vertical markets. The checkmark(✓) does not necessarily indicate that the application is specific for that industry, but that a company within that industry could have a need for the listed application. For example, Home Directory/File Sharing is not a Telco application, but a company in the Telco industry could use the Sun StorageTek 5000 NAS Product Family to provide Home Directory/File Sharing capabilities to its employees.

The Sun StorageTek 5000 NAS OS provides advanced software features that facilitate the deployment in the recommended applications. The enclosed table lists the main software features

Application/Industries	Telco	Education	Mfg.	Gov't	Financial	Health Care	Retail	Business Services
Imaging (Document, Medical, GIS)	✓	✓	✓	✓	✓	✓	✓	✓
Home Directory/File Sharing	✓	✓	✓	✓	✓	✓	✓	✓
CAD/CAM			✓					
VoIP/Video	✓							
Web Server Consolidation Storage	✓	✓	✓	✓	✓	✓	✓	✓
DW/DM	✓	✓	✓	✓	✓	✓	✓	✓
E-mail (SendMail, Notes)	*	*	*	*	*	*	*	*
Microsoft Exchange	✓	✓	✓	✓	✓	✓	✓	✓
OLTP	X	X	X	X	X	X	X	X
Mandatory/Advisory Compliance	✓		✓	✓	✓	✓	✓	✓

Legend:
 ✓ = Recommended for StorageTek 5220 NAS.
 X = Not recommended with StorageTek 5220. Other Sun products should be used.
 * = Non notable installations on this application

Table 6: Sun StorageTek NAS Applications and Industries Table.

that apply for the specific applications, along with the benefits that these features provide in those application environments.

Sun StorageTek 5000 NAS File Checkpoint Software: Enables the creation of point-in-time images of a Sun StorageTek 5000 NAS filesystem taken at the volume level. Creation speeds are almost instantaneous, without disrupting normal operation, and consume minimal storage space. While the active file volume can be modified with read/write operations, a virtual volume produced at the time of checkpoint creation remains available in a static, read-only state.

- Provide a facility for self recovery of lost and/or accidentally deleted objects
- Provide for business continuance without requiring massive expenditures for completely redundant or mirrored systems
- Increase backup window, easing the burden on administrators to complete backup operations between production cycles, and obviates the need to undergo length-time and operator-intensive tasks such as restores from tape
- Facilitates migration to / from new applications

Sun StorageTek File Replicator Software: An optional StorageTek 5000 NAS Product Family feature that provides near Real-Time block and transaction level IP-based remote replication of data. Individual StorageTek 5000 NAS logical volumes can be mirrored from any system to any other system.

- Provides for business continuance, even in the face of catastrophic loss of the primary (source) system
- Fast reversion from source to target, providing maximum data availability and protection
- Network (Ethernet) based mirroring means lower cost, and provides the ability to exploit technology familiar to users and without requiring expensive gateways

Sun StorageTek Compliance Archiving Software: An optional Sun StorageTek 5000 NAS Product Family feature, the Sun StorageTek Compliance Archiving System couples any product of

the StorageTek 5000 NAS Appliance Family with the Compliance Archiving Software to provide compliance-enabling features for authenticity, integrity, ready access, and security. The compliance archiving software was designed from the ground up in consultation with information management compliance and enterprise content management industry experts to help address the most stringent requirements for electronic storage media retention and protection. For more in depth information, please consult the StorageTek Compliance Archiving Software “Just The Facts”.

Heterogeneous Access : Enables file-level access over an IP-based Ethernet network for NFS, CIFS, and FTP file access protocols.

- Enables robust and safe file sharing in heterogeneous UNIX, Windows, and Linux environments

Dynamic Volume Expansion: Provides the capability to add storage to a filesystem without downtime, maintaining data availability.

- Downtime due to capacity limitations eliminated
- Can be effected during normal business operations

Quotas Support: Allows for the restriction of disk space or number of files written to logical volumes. This limit can be determined for a user or group (user or group quota) or for a directory (directory tree quota).

- Support for User, Group, Default and Directory Tree Quotas.
- Enables administrators to quickly allocate space to departments or individuals
- Enables administrators to partition large, individual volumes from a capacity standpoint, providing for volume-like control of space allocations but without requiring them to administer multiple actual volumes
- Simple backup policies (e.g., volume-based full, differential, incremental backups) can be retained across the entire volume, even if capacity is being managed locally

Autohome Shares: Automatically creates temporary SMB/CIFS shares when a user logs on to the system and removes the shares when the user logs off.

- Facilitates IT Administrator’s management tasks by eliminating the need to create and manage shares manually for potentially thousands of users.

iSCSI: Support is provided for Solaris Version 10 as well as Microsoft Software Initiator V2.01.

- Fully functional and tested with Solaris 10 instances on Workstations and Servers.
- Tested at the Microsoft Hardware Compatibility Qualification Lab successfully with Microsoft Software Initiator V2.01. MS/Exchange 2003 and MS/SQL specifically supported.
- Note, that Cluster Failover, Checkpoints, and Linux iSCSI initiator support will be released in the near future.

Anti-Virus:

- StorageTek 5000 NAS OS provides standard Anti-Virus RPC API for Anti-Virus(AV) capability.
- Symantec Network Attached Storage Edition initially supported.

- CA eTrust AntiVirus engine supported

- Provides Real-Time File scanning on File Open, Close or Combination.
- Scheduled Filesystem AV scan also supported.

Sun Software Support

- VERITAS NetBackup v5.x, 6.x with NDMP Support.
- Enterprise Backup Software v7.2
- StarOffice v7

Third Party Application Support

- Oracle (Database)
- Adobe Acrobat Suite
- Microsoft Office
- BakBone Netvault with NDMP Support.
- Legato Networker with NDMP Support.
- Tivoli Storage Manager(TSM) with NDMP Support.

Relevant Standards Supported

The following standards are supported on the Sun StorageTek 5000 NAS:

- Java™ technology
- Intelligent Platform Management Interface (IPMI)
- IEEE 802.3 - Ethernet (10Mb/s)
- IEEE 802.3U - Ethernet (100Mb/s)
- IEEE 802.3ad – Link aggregation/Port Aggregation Protocol
- IEEE 802.3ab - Ethernet (1000Mb/s, Twisted Pair) Relevant standards supported
- IEEE 802.3z – Ethernet (1000Mb/s, Fiber) with multimode fiber NIC
- SNMP versions 1 and 2
- NDMP versions 2 and 3
- NFS v2 and v3
- IEEE 3720, and IEEE 3721 – iSCSI and iSCSI Naming and Discovery.

Features and Benefits

Features	Benefits
Flash-resident OS	<ul style="list-style-type: none"> OS resides on flash disk, which is more reliable than a traditional magnetic disk
External Hardware RAID	<ul style="list-style-type: none"> For the StorageTek 5220 NAS Appliance: External S-ATA hardware RAID-5, single RAID controller, with battery-backed cache
Availability	
Redundant Server Power Supplies	<ul style="list-style-type: none"> Reduces system outages in the event of StorageTek NAS power supply failure
Redundant Cooling Fans	<ul style="list-style-type: none"> Reduces system outages in the event of cooling fan failure
Redundant Disk Subsystem Power Supplies (each Expansion Module)	<ul style="list-style-type: none"> Reduces system outages in the event of Expansion Unit power supply failure
NIC Failover	<ul style="list-style-type: none"> Provides for a redundant path to the same IP address on the server through a different switch and using a cooperative (with the host) Failover topology
Port Aggregation	<ul style="list-style-type: none"> Enables the use of the same IP address across multiple NIC ports from a single switch, increasing bandwidth and providing some degree of fault tolerance
Serviceability	
Warranty	3 years. 1 st year next business day on-site; 2 nd and 3 rd years return to Sun.
Multiple components are hot-swappable: <ul style="list-style-type: none"> Server head power supplies Disk subsystem power supplies Disk subsystem I/O modules Disk Drives 	<ul style="list-style-type: none"> Ensures that the maximum level of data availability is provided by eliminating downtime when failed components need to be replaced or when proactive maintenance is performed
Dual-boot OS	<ul style="list-style-type: none"> Enables the user to quickly and easily backtrack to a prior version of the OS should problems manifest during or subsequent to an OS upgrade operation
Tool-less Access	<ul style="list-style-type: none"> Facilitates maintenance by eliminating the need for tools when servicing the system (most components)
Indicator LEDs	<ul style="list-style-type: none"> Enables operations personnel to easily identify problematic components and prevents mistakes in servicing
Diagnostics	
E-mail Diagnostics	<ul style="list-style-type: none"> Enables Sun's support representatives or customers to quickly get a clear and comprehensive report describing system configuration and health

Memory Tracking Facilities	<ul style="list-style-type: none"> • mbuf tracking for network issues • malloc tracking
Onboard Packet Capture	<ul style="list-style-type: none"> • Enables Sun's support representatives to create packet capture sequences describing particular protocol errors, thereby empowering the Tech Support team to diagnose customer situations more quickly
Automated Diagnostic Gathering	<ul style="list-style-type: none"> • Gathers and saves diagnostics in the event of system problem
Monitoring	
Disk Subsystem Monitoring via SCSI Enclosure Services (SES)	<ul style="list-style-type: none"> • Standards-based disk subsystem monitoring for enclosure, controller, power supply, fan and disk health.
UPS Monitoring	<ul style="list-style-type: none"> • RAID controller cache switched to write-thru mode if living off of battery (UPS) power, helping to ensure data integrity. • Graceful shutdown effected if battery charge drops below acceptable range • System does not revert to write-back mode until on AC power and battery sufficiently charged
IPMI Support	<ul style="list-style-type: none"> • Enables the system to monitor its own server components (power supplies, fans – including the dedicated processor fan and temperature) and inform the user should any problems be discovered, thereby preventing downtime due to catastrophic failure
Notification	
LCD Posting	<ul style="list-style-type: none"> • Provides a local reference enabling an administrator to get a picture of overall system health when viewing the unit in its immediate presence
Syslog (Local)	<ul style="list-style-type: none"> • Enables the user to exploit a standard and familiar facility for providing log-based information
Remote Syslog	<ul style="list-style-type: none"> • Enables the administrator to log StorageTek 5000 NAS OS events on a remote system (usually in concert/context with events from other systems) using a standard and familiar facility
SNMP Support	<ul style="list-style-type: none"> • Provides for simple integration of StorageTek NAS into an environment where systems are monitored centrally using familiar, industry-standard tools (Sun NetManager, Computer Associates Unicenter, IBM Tivoli, HP OpenView)
SMTP E-mail	<ul style="list-style-type: none"> • Provides a simple, effective and ubiquitous mechanism for critical system event notification
File system	
Dynamic Volume Expansion	<ul style="list-style-type: none"> • Volume expansion can be effected during normal business operations • Downtime due to capacity limitations eliminated

64-bit Filesystem	<ul style="list-style-type: none"> • File system scales to 16TB volume sizes – larger volume size support eases administrator’s management tasks by reducing the number of objects that they must manage • Up to 512 file systems • 2TB LUN (RAID group) capacity
Journaling Filesystem (JFS)	<ul style="list-style-type: none"> • Journaling – a two-phase commit operation – helps to ensure filesystem integrity across unforeseen events like power outages. In the two phase commit process, the first phase of journaling happens on NVRAM on the RAID controller. The second phase commits the data to disk thus ensuring data integrity. (See ‘On-disk Journaling’) • Enhances data availability by obviating the need for lengthy filesystem check operations subsequent to power outages or other unplanned events • Aids with data integrity by journaling both metadata and user data (for synchronous writes), ensuring that the client and StorageTek NAS Appliance have a consistent perspective of the on-disk data
On-disk Journaling	<ul style="list-style-type: none"> • The StorageTek 5000 NAS products journal to disk – as opposed to journaling to an in-head NVRAM card. The lack of data on the head unit precludes any possibility of a data integrity issue due to head unit failure or malfunction.
Directory Tree Quotas	<ul style="list-style-type: none"> • Enables administrators to allocate space quickly to departments or individuals • Enables administrators to partition large, individual volumes from a capacity standpoint, providing for volume-like control of space allocations but without requiring them to administer multiple actual volumes • Simple backup policies (e.g., volume-based full, differential, incremental backups) can be retained across the entire volume, even if capacity is being managed locally

Sun StorageTek Checkpoint	
Implementation	<ul style="list-style-type: none"> • Provides for business continuance without requiring massive expenditures for completely redundant or mirrored systems • Point-in-time image of filesystem increases backup window, easing the burden on administrators to complete backup operations between production cycles • Creation speeds are sub-second, almost instantaneous, providing administrators a very useful, powerful tool which obviates the need to undergo lengthy and operator-intensive tasks such as restores from tape • Sophisticated technology retains only those filesystem blocks that actually change, e.g., a change to a 16k portion of a 3GB file would create a checkpoint of size 16k, enabling administrators to exploit the capability without drastically increasing space requirements • Facilitates migration to / from new applications • Checkpoints use a “copy-on-write” technology which is the technique of duplicating disk blocks only as they are modified. • Checkpoints provide a facility for self recovery of lost and/or accidentally deleted objects
File Checkpoint Scheduling	<ul style="list-style-type: none"> • Provides for automatic creation of checkpoints based upon a user-defined schedule • Provides for user-defined retention criteria and automatic deletion of checkpoints at specified intervals
Local Directory Checkpoint Access (LDCA)	<ul style="list-style-type: none"> • Enables users to self-recover (i.e., without administrator assistance) prior versions of key files in the event they are accidentally deleted • Obviates administrator involvement, restore from tape drives etc. in the recovery process
Fast File Checkpoint Restore	<ul style="list-style-type: none"> • Provides for a metadata-effected restore of a checkpointed file • Facilitates recovery of accidentally-deleted data – even by a user • Does not necessitate recovery of an entire volume (as does some competitor implementations)
Data Protection Facilities	
Backup	<ul style="list-style-type: none"> • Local, Remote or 3-Way backup utilizing NDMP with supported third party NDMP-enabled backup products.

Sun StorageTek™ 5000 File Replicator: Block-level Mirroring (option)

- Provides for business continuance, even in the face of catastrophic loss of the primary (source) system
- All writes communicated in time order from source to target, guaranteeing a consistent view of the state of user data at the remote site, any point in time. (Note that asynchronous mirroring does not guarantee that the state of the local and remote sites is identical or changes simultaneous, only that each site is consistent to allow for target file system promotion at any time and updates in the same sequential order.)
- When promoted to source (or master), the remote system always provides access to every in-order transaction it received from the original source (master), thereby providing the optimal architecture for data preservation in an asynchronous mirroring model
- Preserves write ordering, ensuring that files remain consistent on the mirror target, and ensuring that up-to-the-second updates are available should mirror promotion occur
- Individual Sun StorageTek™ 5000 NAS volumes can be mirrored from any system to any other Sun StorageTek™ 5000 NAS family system or StorEdge 5000 NAS family system, providing the user with flexible and cost-effective options for assuring data availability
- Fast reversion from source to target, providing maximum data availability and protection
- Network (Ethernet) based mirroring means lower cost, and provides the ability to exploit technology familiar to users and without requiring expensive gateways.

Anti-Virus

- Real-Time Anti-Virus(AV) Support to include file scanning on File Open, File Close or combination.
- Full filesystem scan is available and schedulable via disk map to a filesystem share to the accompanying AV Server(s).
- Companion AV Server(s) are required to accomplish the Real-Time AV scan and full filesystem scan.
- AV Servers can be pooled to a maximum of 4 servers to minimize latency.
- AV Real-Time scan is implemented by a standard API using RPC.

Feature Functionality

IP Aliasing

- Enabler for active/active NIC's
- End user can set up a single port with multiple IP addresses, facilitating network management and topology layout

iSCSI

- Support is provided for the Solaris 10 iSCSI software initiator.
- Support is provided for the Microsoft Software Initiator V2.01.
- Tested at the Microsoft Hardware Compatibility Qualification Lab successfully with Microsoft Software Initiator V2.01.



Multi-byte Character Support	<ul style="list-style-type: none"> Unicode supported, facilitating deployment of Sun StorageTek™ 5000 NAS throughout the world.
DHCP	<ul style="list-style-type: none"> Facilitates installation in environments where DHCP is active, enabling the system to acquire an IP address (which is posted on the LCD) dynamically, which the user can then access to setup the system. Note: In cluster configurations is very important to have absolute control of the IP address of each port, therefore DHCP is not supported in cluster configurations.
Installation Wizard	<ul style="list-style-type: none"> Facilitates installation by automatically detecting first-time access and leading the user through an intuitive, 10-15 minute set of dialogs, after which the StorageTek NAS system will be largely ready to use
LCD Keypad	<ul style="list-style-type: none"> Simplifies installation by communicating success or failure, and acquired IP address if successful Provides the ability to effect a 'soft' shutdown from the front panel Provides the ability to set an IP address should DHCP fail Posting area for communication of system problems (e.g., disk failures, fan failures, power supply failures etc.)
Multiple Administration Interfaces <ul style="list-style-type: none"> Web GUI Telnet 	<ul style="list-style-type: none"> Provides the user with a choice of a user interface, enabling them to select and use the interface with which they feel the most comfortable
SSH Support	<ul style="list-style-type: none"> Provides for secure, remote menu access to Sun StorageTek™ 5000 NAS administrative facilities
Native Administration Tool Support	<ul style="list-style-type: none"> Facilitates administration thorough the provision of support for tools with which the administrator is already familiar, e.g., Windows Explorer can be used to set directory/file permissions
Comprehensive Quota Support <ul style="list-style-type: none"> User Quotas Group Quotas Default Quotas Directory Tree Quotas 	<ul style="list-style-type: none"> Enables the administrator to simply and easily prevent rogue applications or users from consuming too much disk space. Default quotas provide for a simple mechanism to set a global limit for all users and/or groups without setting each user/group individually
Cross-Protocol Support	<ul style="list-style-type: none"> Simplifies the administrator's storage management tasks by providing for access in heterogeneous environments, enabling administrators to create and manage storage without artificially partitioning it between Unix and Windows clients Facilitates file sharing between groups and users in the enterprise
User/Group Mapping	<ul style="list-style-type: none"> Facilitates administration in heterogeneous environments by enabling the administrator to map Unix users/groups to Windows users/groups, either through automatic means or manually

Cross-Protocol File Locking	<ul style="list-style-type: none"> Enables robust and safe file sharing in heterogeneous environments. Cross-protocol file locking is limited to blocking NFS writes to a file when a SMB/CIFS client has the file open. The converse is not implemented, in part because the often stateless nature of NFS access makes it difficult to determine when a file is being modified via NFS.
Cross-Protocol Security Mapping	<ul style="list-style-type: none"> Guarantees security by providing for consistent security policies for objects created through one filesystem protocol (e.g., Unix) and then accessed through another (e.g., Windows)
Permission Synthesis	<ul style="list-style-type: none"> Facilitates securing of data by synthesizing permissions during access of objects via non-creating protocols – for example, Windows permissions are synthesized if an object created under Unix is accessed through Windows
NTP Support	<ul style="list-style-type: none"> Enables the administrator to utilize industry-standard means of synchronizing StorageTek NAS time with network time (the clocks of all other servers on the network)
FTP	<ul style="list-style-type: none"> Provides a very fast, familiar and industry-standard tool for uploading and downloading files to StorageTek 5000 NAS system
Autohome -Home Directory/Automount Support	<ul style="list-style-type: none"> Temporary SMB/CIFS shares that are automatically created when a user logs on to the system and removed when the user logs off IT Administrator's do not have to create and manage shares manually for potentially thousands of users Supports standard UNIX automount feature relieving IT Administrator of constant management of NFS Mounts.

Enabling Technology

Technology Overview

The Sun StorageTek 5220 NAS Appliance utilizes the following technologies:

- Flash Disk Module for Operating System
- 1U chassis dual redundant power supplies and fans
- AMD Opteron Single Core, Single Processor Motherboard
- CSM2-Simplex Storage utilizing S-ATA disk storage technology.
- NAS Operating System Software

Flash Disk Module for Operating System

The Sun StorageTek NAS Operating System resides on a 256MB solid-state Flash Disk Module that connects directly to the internal IDE port. The main features the Flash Disk Module are:

- Solid-State (no moving parts)
- High Shock and Vibration Limits
- Rugged and compact
- 512 Byte Sector and ECC Defect Management Compatible to IDE Hard Disk Drives Storage

1U Chassis

The 1U chassis is a standard 19" rack-mountable with dual redundant and hot-swappable 550 watt power supplies and redundant fans. The chassis' front contains multiple LEDs indicators. Refer to the Server Architecture section for a detailed diagram of all the components on the front of the chassis.

Motherboard Board Information

The Sun StorageTek 5220 NAS Appliance is based on the AMD® Opteron™ 2.2 Ghz Single Core DP Technology. The main features of the motherboard are listed below.

- Support for a Single Core Dual Processor Motherboard where one AMD® Opteron™ processor is supported with 1MB of L2 Cache utilizing the 1000 MHz HyperTransport Fabric Protocol Technology.
- Support for 2 GB of registered DDR 400MHz Memory.
- Support for one (1) low profile Dual Port FC HBAs
- Integrated two dual-Port (4 total ports) 10/100/1000 BaseT Ethernet Ports.
-
- One (1) available PCI-X slots for one optional dual-port copper or optical Gigabit NIC or one Ultra-320 SCSI HBA for tape backup.

Storage

The StorageTek 5220 NAS Appliance uses the 5220 RAID controller and 5220 Disk Enclosures based on the CSM2 (Common Storage Module 2) and supports Serial-ATA storage (500GB drive). Both the RAID controller unit and expansion unit are in Simplex configuration, with only one RAID controller and one expansion storage module.

Software/Operating System

The Sun StorageTek 5000 NAS Operating System has been designed for the sole purpose of high-performing file serving and file storage. It utilizes the following technologies:

- 64-bit Journaling File system.
- File Sharing for NFS and CIFS clients
- iSCSI support
- Anti-Virus support
- Active Directory Services
- Sun StorageTek File Checkpoint
- Sun StorageTek File Replicator (optional)
- High Availability Bonds (NIC Failover/Port Aggregation)

64-bit Journaling File system

The Sun StorageTek 5000 NAS OS filesystem is a 64-bit journaling filesystem that guarantees filesystem integrity across unforeseen events, such as power outages, enhancing data availability by obviating the need for lengthy filesystem check operations subsequent to power outages or other unplanned events. The OS supports up to 512 file systems with file systems scaling up to 16TB in volume size, simplifying an IT administrator's management tasks since larger volume sizes reduces the number of objects they must manage.

Journaling ensures filesystem consistency and fast recovery in the unlikely event of a system crash. The OS maintains a log or journal of the block level activity that has taken place on disk as directed in the two phase commit process.

The two phase commit process is similar to a typical data base environment. When a client executes a transaction, the first phase of the commit process, a write, either synchronous or asynchronous, as determined by the transaction, initiates an entry in the Sun StorageTek™ 5000 NAS memory; the meta-data and content (data-data). In the event of a synchronous write, both the meta-data and the content are subsequently written to disk and the transaction is journaled. Conversely, in a asynchronous write, the content and meta-data are written to memory with only the meta-data being journaled allowing for greater performance and lower latency as experienced by the client and/or transaction. However, due to the architecture of asynchronous writes in both NFS and SMB the client and Sun StorageTek™ 5000 systems will have a consistent perspective of data on disk.

The second phase, the commit, as dictated by the client, “flushes” the content left in memory, as with a asynchronous write, to disk and subsequently a notification is sent to the client from the Sun StorageTek™ 5000 NAS system of the content being written to disk. At this time, content is also flushed from the client's cache thus “completing” the transaction.

In the unlikely event of an abnormal shutdown of the Sun StorageTek™ 5000 NAS system, any lost data can be recreated because any updates to the metadata in directories and bitmaps are written to the journal. This alleviates the need for fsck's.

With this journaling methodology filers can recover from an abnormal shutdown in a few minutes as opposed to requiring a costly, time-consuming consistency check. The journaling filesystem not only returns the data to the pre-crash configuration but also recovers unsaved data and stores it in the location it would have been stored had there not been an unexpected interruption.

Drawbacks encountered due to costly NVRAM topologies are non-existent by journaling to industry standard hard drive technologies. Since the data is on disk, there is no dependency on batteries to maintain journal information, for it is on fault-tolerant RAID drives.

In the event that the filesystem needs to be expanded, an available LUN can be assimilated by an existing volume via a simple operation. This feature provides for the dynamic expandability through the addition of unallocated extension segments while the Sun StorageTek™ 5000 NAS system is online and accepting data I/O. As such, this feature allows an administrator the flexibility to allocate storage on an as needed basis. Because of the dynamic scalability of a filesystem (volume), what was once a time consuming task requiring system downtime can be accomplished without the traditional negatives associated with such a task. Network storage made simple.

File Sharing for UNIX (NFS) and Windows (CIFS)

The Sun StorageTek 5000 NAS system delivers secure file services for CIFS and NFS clients. The integration of these two security models presents a challenge due to the many differences between these protocols. Windows file servers use access control lists, or ACL's, to specify access rights for defined lists of users and groups. NFS servers use traditional UNIX permissions - user/group/world - that specify a limited set of permissions. The Sun StorageTek 5000 NAS system provides an integrated security model in which Windows ACL's and UNIX permissions are simultaneously maintained for filesystem objects, and which preserves the semantics and features of the native security models.

With filesystem support for both CIFS and NFS security, the Sun StorageTek 5000 NAS OS provides an integrated model for file sharing between Windows and UNIX systems. This model includes support for NFS permissions, Windows ACL's, Windows Domain integration, and cross-platform services like credential mapping. The Sun StorageTek™ 5000 NAS OS also supports network name resolution via Network Information Services (NIS, NIS+), the Berkeley Domain Name System (DNS) and Microsoft Windows Internet Naming Service (WINS). The following are notable aspects of the design:

- The key to the Sun StorageTek 5000 NAS OS support for cross-platform file sharing is credential mapping. Credential mapping enables users with both NFS and CIFS user accounts to seamlessly exercise their ownership and access rights from either client platform via an association (or mapping) between the two accounts. This association can be created automatically, or it can be established manually in environments where the Windows and UNIX account names do not match. Credential mapping facilitates file sharing between the platforms by mapping each NFS user or group to a CIFS user or group and vice versa. This allows users to assign access rights to a user or group from either platform using that platform's native toolset.
- Files created via NFS are classified as UNIX files and files created via CIFS are classified as Windows files. Windows files typically have security descriptors associated with them while UNIX files do not. Editing or copying a UNIX file (a UNIX-created file) using a CIFS client

will add a security descriptor to it, and cause it to be reclassified as a Windows file. Removing the security descriptor from a Windows file (possible only when configured by the administrator to allow this) will cause the file to be reclassified as a UNIX file. For native file service requests (NFS to UNIX files and CIFS to Windows files) the security model honors the native CIFS or NFS access conventions. For non-native requests, a heuristic model is employed to synthesize permissions of the native (or creating) protocol. The guiding principle for Sun StorageTek 5000 NAS OS cross-platform file access is that a user will not be granted greater access via a non-native protocol than would have been granted via the native protocol.

- As with Windows systems, each StorageTek 5000 NAS system will establish membership in a Windows Domain. When a user connects to a StorageTek 5000 NAS system, the user is authenticated by a Domain Controller (DC) using pass-through security. Domain membership and pass-through authentication allow the StorageTek 5000 NAS system to take advantage of Windows availability and scalability features, such as Active Directory(AD), Primary (PDC) and Backup (BDC) Domain Controllers and inter-Domain trust relationships. An access token, obtained from the Domain Controller, is used to identify the user and contains the user's ID and the ID of each group of which the user is a member. The access token is used to represent the user when an attempt is made to access secured objects, such as files and directories.
- Windows files and directories are secured via security descriptors (SD). Each SD contains the ID of the object owner, the ID of the owning group and an access control list (ACL). The ACL is a list of access control entries (ACE), each of which grants or denies specific access rights to a specific user or group.
- The CIFS security model implemented on the Sun StorageTek 5000 NAS OS is the standard Windows security model. Each request to access an object contains a set of desired access rights. These desired access rights are checked against the access control information defined in the object's security descriptor to determine whether access should be granted or denied.
- The Sun StorageTek 5000 NAS OS provides support for several Windows built-in local groups. These groups are the standard Windows solution for assignment of system wide privileges for common administration tasks. A well-known example is the backup/restore privilege granted to the Backup Operators group. These groups can contain users from either the local domain or trusted domains. The Domain Admins group of the domain which the Sun StorageTek 5000 NAS system is a member of is automatically given membership in the local group Administrators. This behavior is expected from Windows Domain member servers, and therefore improves compatibility.
- The Sun StorageTek 5000 NAS OS automatically creates administrative CIFS shares for each volume. This provides access to all files and directories for Domain Administrators without the need to create shares at the root level. Again, this behavior is expected from Windows Domain member servers and improves compatibility with Windows and Windows-aware applications.
- The Sun StorageTek 5000 NAS OS provides file access from Windows systems via CIFS/SMB with support for either share level security or Windows Domain security. When used in a domain environment, Sun StorageTek 5000 NAS system users are authenticated with a Domain Controller using pass-through authentication. In the workgroup security mode, access is authenticated locally on the Sun StorageTek 5000 NAS system using a share password. ACL's are not used in workgroup mode, resulting in what we would designate as a "UNIX file". Workgroup security is weak in comparison to Windows Domain Security, and is generally not recommended.
- File Locking. The Sun StorageTek 5000 NAS OS employs an integrated file locking

mechanism that supports the following file locking schemes:

- Windows (CIFS) whole-file locks
- Windows (CIFS) byte-range locks
- Windows (CIFS) Opportunistic locks (optional file locks acquired at file open time, “breakable” by CIFS file access)
- UNIX (NFS) byte-range locks (advisory locks, via lockd and statd)

In addition to supporting single-protocol file locking, the Sun StorageTek 5000 NAS OS also protects user data with the support of an integrated cross-platform file locking mechanism. This functionality prevents NFS clients from writing to files that are open via the CIFS protocol.

File locking caveats:

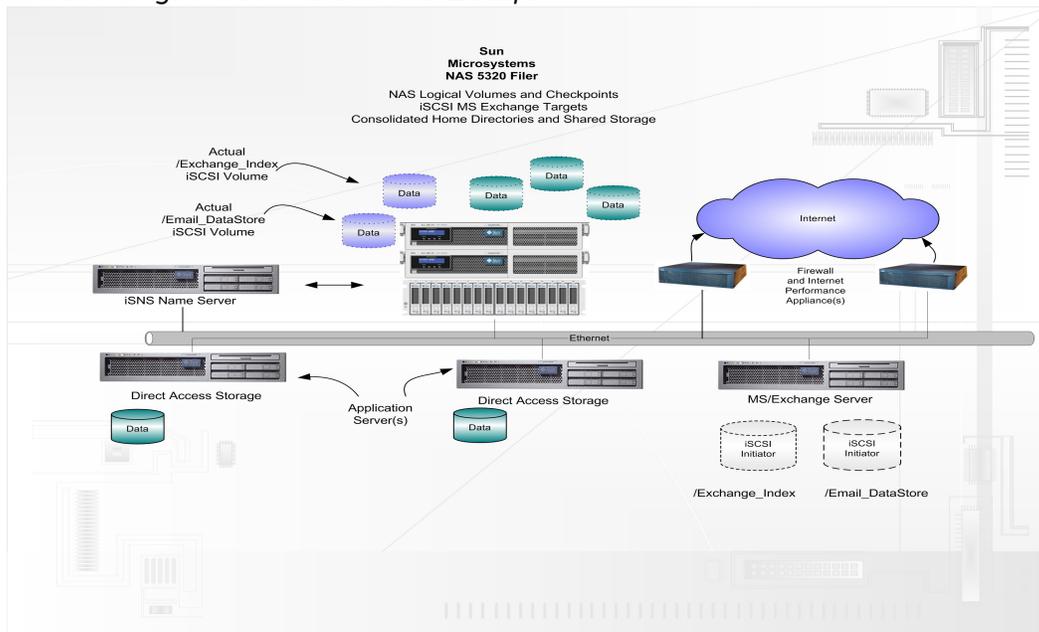
- Level II Opportunistic Locks (oplocks) are not supported.
- Cross-protocol file locking is limited to blocking NFS writes to a file when a SMB/CIFS client has the file open. The converse is not implemented, in part because the often stateless nature of NFS access makes it difficult to determine when a file is being modified via NFS.

ISCSI support

The Sun StorageTek 5000 NAS family of products act as a iSCSI target(s) for the Solaris 10 as well as the Microsoft iSCSI Software Initiator V2.0. The capability was tested thoroughly during qualification as well as at the Microsoft Hardware Compatibility and Qualification Lab and it passed all tests for Microsoft application compatibility.

- Support for the Internet System Naming Service (iSNS) which allows for a DNS like service for iSCSI targets and initiators on a network infrastructure.
- The CHAP security protocol is utilized to secure transmission of iSCSI target information from the StorageTek NAS Filer and the iSNS Server.

Typical Sun StorageTek 5000 NAS iSCSI Example.



- Conforming to best practices, iSCSI Ids associated with iSCSI initiated LUNs are first allocated on the iSCSI client which in turn are communicated to the iSNS Server. These Ids are then used to allocate Logical iSCSI devices on the Sun StorageTek 5000 system by the NAS Storage Administrator, which when communicated to the iSNS Server by the Sun StorageTek 5000 NAS, are associated with the iSCSI Client.

Anti-Virus Support

This feature allows the Sun StorageTek 5000 NAS Product Family to be configured as a client of an antivirus scan engine running on a Windows platform. The Sun StorageTek 5000 NAS OS supports the Symantec Anti-Virus Scan Engine NAS Edition.

Anti-Virus Support Overview

The NAS AVA supports real-time virus scanning. Depending on the policy chosen, a file is a candidate to be scanned when it is opened and/or when it is closed. The NAS AVA determines if files need scanning, but off-loads the scanning process to servers running anti virus software, known as Scan Engines.

When a Scan Engine receives a file it scans it. If the file is not infected with a virus then the Scan Engine returns a notice indicating that to the appliance, if the file is infected the next step depends on the policy set on the Scan Engine:

- It can remove viruses from the file, known as repairing the file, and return it to the appliance along with a notice indicating the scan status. The original file is replaced with the repaired file.
- It can return a scan status to the appliance telling it to deny access to the file, known as placing the file in quarantine.

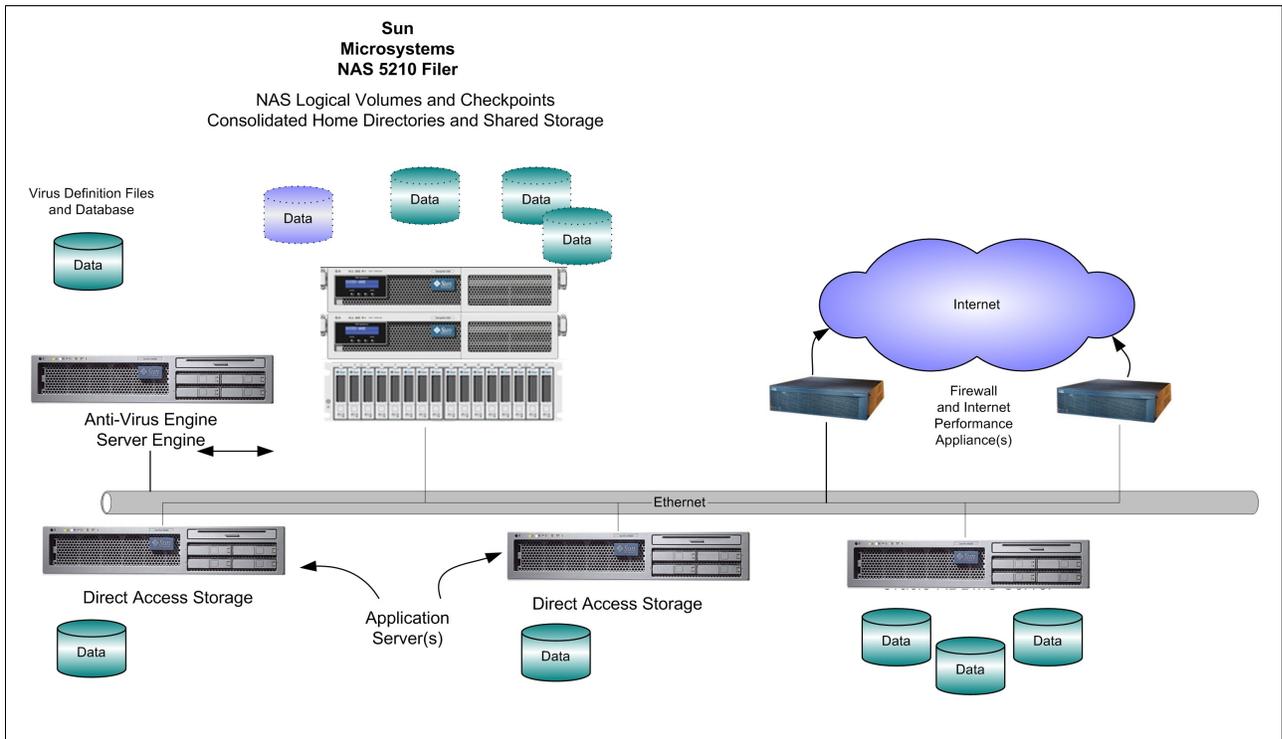
If a file has been quarantined then special procedures must be followed to recover or delete the file. In all other cases the file is tagged by the NAS AVA with the scan status: this is known as a scanstamp. The scanstamp remains current so long as the virus definitions on the Scan Engines are not updated. The next time an operation is requested on the file that makes it a candidate to be virus scanned the NAS AVA checks to see if the file's scanstamp is current or expired and that the file has not been modified or renamed since it was last scanned, if these conditions are met the operation is allowed to proceed without scanning the file; if not, then the file must be scanned before allowing the operation.

Virus Scanning:

NAS Client File Operation	Anti-Virus Scan [Y/N]
MS Windows® READ/WRITE	Yes
UNIX READ/WRITE	No
UNIX originated File during MS Windows® READ/WRITE	Yes
UNIX and MS Windows® originated File(s) full filesystem scan	Yes

Table 7: Sun StorageTek 5000 NAS Anti-Virus Scan Policy*.

*Note: Works identically to most NAS Vendor Anti-Virus Capabilities.



On-Demand Scan Real-time Scan - The On-Demand scan searches the entire filesystem when requested, checking files of selected types and or modification dates. This is typically performed at scheduled intervals. This approach does not require any specialized support from the NAS server because the filesystems can be scanned using mapped shares. On-Demand scan is simple, but has the disadvantages that files recently updated might not be scanned before use, and the full system scans can take a long time to complete on large systems.

Real-time scan method scans files “on-the-fly” as they are accessed. This is done after files are created or modified or before files are read or executed. This approach allows efficient mechanisms to implement the stronger virus protection strategies where all files are scanned with the latest virus definitions before being used on Windows clients. The only disadvantage of the Real-time scan method is that it requires the NAS system to support some method to initiate virus scans on specific files.

Possible Real-time Scanning Policies

Three virus scanning policies are available. The policies are as follows:

Scan-All-Access - Files are candidates to be scanned when they are opened and when they are closed, after being modified. This option offers the most thorough virus protection, only allowing access to data that has been scanned with the latest virus definitions. If a file has a current scanstamp and has not been modified since it was last scanned it will not be scanned when it is opened.

Scan-After-Modify - Files are candidates to be scanned when they are closed, after being

modified. This option offers a compromise between performance and thoroughness of virus protection, enabling fast read access but virus protection only as current as the time of file modification. The danger is that a file infected with a then unknown virus could be closed, scanned and marked as not infected. The next time the file is opened it will not be scanned, even if virus definitions have been updated, and the virus could be activated. For this reason, it is recommended that the Scan-After-Modify policy is supplemented with scheduled On-Demand full system scans.

Scan-Suspend - Anti virus scanning is suspended. Anti virus protection is not in effect when this option is selected. Access is still denied to files that have previously been quarantined.

Adding Scan Engines

The details of at least one Scan Engine must be entered. Up to four scan engines are supported per Sun StorageTek 5x20 NAS Appliance and scan requests are round-robin load-balanced between them. The only tunable is *Max Conn* which is how many outstanding scan requests we should allow against a Scan Engine before we stop sending new requests. *Max Conn* is usually set to two by default but can be much larger. The maximum setting is a function of the Scan Engine's anti virus software.

Excluding Files from Scans

By default all files on a Sun StorageTek 5x20 NAS Appliance accessed via the CIFS protocol are candidates for virus scanning. To modify this behavior the administrator can configure an exclude list of:

- File types by file extension. There is also an include list for files types.
- Files being accessed by named individual CIFS clients
- Windows NT and Windows Active Directory Groups of CIFS clients
- Named CIFS shares

For a detailed description of using Anti-Virus with the Sun StorageTek 5000 NAS Family see the following document on SUNWIN: Anti-Virus Protection for the Sun StorageTek 5000 NAS Family, Token: 471219

Active Directory Services

Active Directory is the Windows directory service that provides access to domain information such as users, groups and shared resources. Active Directory clients access this information on the network using the Lightweight Directory Access Protocol (LDAP). The AD relies on the Internet Domain Name System (DNS) to provide name resolution services. DNS is the industry standard service used throughout the Internet to resolve hostnames to Internet Protocol (IP) addresses. The DNS provided with AD supports the ability for clients to dynamically update their entries in the DNS database; this is known as dynamic DNS. Sun StorageTek 5000 NAS OS supports LDAP version 3, which is defined in RFC2251. Further information is also available on the Microsoft web site.

To support Windows environments, Sun StorageTek 5000 NAS OS provides the ability to publish shares in AD and update DNS records using dynamic DNS. AD clients can then access Sun StorageTek NAS OS shares by looking in the Active Directory. Shares appear in AD as folder objects that point directly to the appropriate shares on Sun StorageTek 5000 NAS OS. Share can be placed in any container in which a share folder object can be created. One of the properties of a share folder object is its UNC name. The Universal Naming Convention (UNC) name specifies both the server on which the share exists (i.e. server.sun.com) and the name of the share, i.e.

\\sun.com\sharename. AD provides the ability to control access to share objects within the directory service, in addition to any access controls placed on the Sun StorageTek 5000 NAS OS directory being shared.

Sun StorageTek 5000 NAS OS supports Kerberos version 5 authentication for secure AD and dynamic DNS updates. Kerberos uses secret-key cryptography to provide a network authentication protocol for client/server applications. Each secure AD or dynamic DNS update is performed within the context of an AD user. Sun StorageTek 5000 NAS OS communicates with a Key Distribution Center (KDC), which normally resides on a domain controller, to authenticate the user prior to performing an update²

The AD domain is equivalent to concatenating the NT domain name and the DNS domain name. For example, if the NT domain is SALES and the DNS domain name is sun.com, the AD domain would be sales.sun.com.

The username and password provide the user credentials used to authenticate AD updates. The user must be a valid Window user, defined in AD, that has the administrative rights required to perform secure AD updates, i.e. a Domain Administrator.

The User Container field specifies the container in which the username resides; for example, the administrator user resides in the users folder. The field format is in LDAP distinguished name notation, without the domain. Thus, for the administrator user, the container would be specified as: cn=users

If the user definition resides in an organizational unit folder (for example, user_folder) then the container would be specified as: ou=user_folder

If the user resides in a sub-container folder of a parent folder, then the container would be specified as: ou=sub_folder,ou=parent_folder. Note the reverse order definition.

Sun StorageTek 5000 NAS OS provides support for dynamic DNS, which can be used to automatically update the IP address and hostname of a Sun StorageTek 5000 NAS OS server. In an AD environment, it is important that the DNS information is correct since AD clients will use DNS to locate the Sun StorageTek 5000 NAS OS when they access shared resources.

Sun StorageTek 5000 NAS OS updates DNS when it boots up or when DNS settings are saved. Dynamic DNS must also be enabled in DNS. Sun StorageTek 5000 NAS OS can update a DNS using the secure or non-secure mechanisms. It will first attempt to update DNS using the non-secure method. If this fails, it will try the secure method. In order for Sun StorageTek 5000 NAS OS to update a DNS zone securely, the zone has to be an AD integrated zone, meaning the zone is stored in AD. Sun StorageTek 5000 NAS OS will use Kerberos to authenticate an AD user before DNS can be updated securely.

Sun StorageTek File Replicator

Leveraging the Sun StorageTek 5000 NAS OS's advanced journaling filesystem, the Sun StorageTek File Replicator can be used to create a copy of a volume on a remote StorageTek NAS system or remote StorageTek NAS system. This is performed using the Safe Asynchronous Mirroring (SAM) architecture which ensures file system consistency at both source and target. The

2 If the administrator user is used to update AD or DNS and the update fails then the DES encryption keys required for Kerberos may have to be regenerated by changing the administrator user password. administrator user and the previous password can be reused.

following are important aspects of the Sun StorageTek File Replicator architecture:

Source/Target Interconnection

A Sun StorageTek File Replicator implementation consists of a target and source file volume, along with the interconnecting TCP/IP network that is responsible for propagating the data between them. The target Sun StorageTek 5000 NAS system can be located virtually any distance from the source. The target Sun StorageTek 5000 NAS system can be on the same campus as the source, or on the other side of the world, as long as the interconnecting network has sufficient bandwidth to carry the data across. There are three options:

- **One-to-One Mirroring:** This is the most straightforward and popular approach to mirroring. There are one Master system and one Target system in this configuration and is described above.
- **Many-to-One Mirroring:**
In Many-to-One mirroring, several Master systems are mirrored to a single Mirror target. Many-to-One mirroring is frequently used by customers for Disaster Recovery purposes, to collect exact duplicates of multiple systems at multiple remote locations at a single, central site, where recovery scenarios can be centrally managed.
- **Bi-directional Mirroring:**
Bi-directional Mirroring refers to the ability for systems at sister locations to mirror to each other. For instance, a system in Los Angeles may be configured to mirror its volumes to a sister system in Houston, which in turn and simultaneously mirrors its volumes to the Los Angeles system. In the event either site experiences a problem, the data is readily available at the sister site.

Block-level Mirroring

With Sun StorageTek File Replicator, data replication is performed at the block level. All checkpoints, symbolic links, and other data structures existing on the target will be identical to those of the source volume. In fact, once the source and target have been synchronized, the target will be an exact, block-level image of the active disk. Sun StorageTek File Replicator's block-level implementation dramatically reduces the required bandwidth on the interconnecting network by transmitting only those data blocks that have changed. For example, if only a single 4 KB block of a one hundred megabyte (MB) file is updated, only that 4 KB block is transferred, not the entire 100 MB file.

Safe Asynchronous Mirroring (SAM)

In order to ensure data protection without compromising source Sun StorageTek 5000 NAS system performance or introducing checkpoint latency, Sun StorageTek File Replicator was designed with Safe Asynchronous Mirroring technology, a unique asynchronous replicating scheme that utilizes database technology to ensure file system integrity. On both ends of the mirror, there are dedicated mirror logs that log changes to both source and target file systems. Updates to a target Sun StorageTek 5000 NAS system are comprised of a series of write transactions, each containing a number of data block updates. The figure on the right shows the mirror logs and the transactions propagating between Sun StorageTek File Replicator source and target. Each transaction is sent from source to target in an ordered fashion and entered into the target mirror log. Each of these write transactions contain a number of key file system updates such as inode delete and update.

Data Integrity

Extensive effort has gone into ensuring that the target's data does not lag that of the source, thereby maintaining a high state of synchronization. Due to the asynchronous architecture of File

Replicator, the target may lag the source volume by an amount of time depending on the source Sun StorageTek 5000 NAS System's load and the speed of the network connection. Sun StorageTek File Replicator mirrors on a block level to ensure high performance, but does not commit data to the target volume on transactional boundaries. This guarantees the integrity of the file system on the target and also preserves write ordering.

Error Handling

The SAM architecture also aides in handling broken network connections between the source and target. If the interconnecting link is temporarily broken, the mirror log on the source continues to record file system block changes, serving as a buffer for un-sent data. When the link is reestablished, the logged data can then be propagated to the target Sun StorageTek 5000 NAS System. This ensures that temporary link-down scenarios can be gracefully handled and that the target data is brought in sync with the source in a timely fashion.

Deployment of Target StorageTek NAS System

Sun StorageTek File Replicator replicates data at the volume level. Both of the mirrored Sun StorageTek 5000 systems need not be identical and can have other normal, active volumes. This provides the IT manager the flexibility to decide which volume to mirror, and to utilize both filers for other file serving purposes.

Management

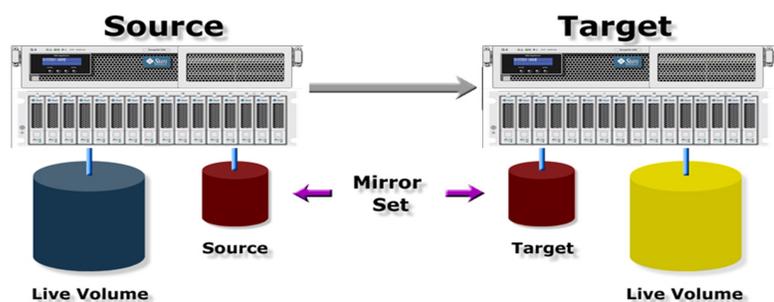
The source Sun StorageTek 5000 NAS System acts as the focal point for StorageTek File Replicator management. Configurations are performed on the source Sun StorageTek 5000 NAS System, which in turn affects the configurations changes on the target StorageTek NAS System. Sun StorageTek 5000 NAS OS's Java-based graphical user interface (GUI) provides an intuitive and easy-to-use browser-based interface for Sun StorageTek File Replicator management. Management can be performed on any browser-equipped workstation that can access the target Sun StorageTek 5000 NAS System's network. This fits with philosophy behind the Sun StorageTek 5000 NAS Product Family , simplifying data management by eliminating the need to install additional software on management workstations.

StorageTek File Replicator Applications

Sun StorageTek File Replicator can be used to help address many data management challenges facing IT professionals today:

Disaster Recovery:

Without a reliance on slow tape media, Sun StorageTek File Replicator eliminates the need for lengthy tape restores. Sun StorageTek File Replicator enhances recovery time in case of a complete loss of data, as businesses can now access mission-critical data from an online backup on a mirror Sun StorageTek 5000 NAS System. With StorageTek File Replicator properly configured, the target, or mirror, is assured to be an accurate, near real-time representation of the offline source Sun StorageTek 5000 NAS System. The target file volume can be brought online quickly to ensure uninterrupted operations.



Backup:

A Sun StorageTek File Replicator target volume may be dedicated for backing up source volumes. Without affecting production operations, replicated data can be backed up on the target. File Replicator enhances operations by moving backup I/O to the remote volume. This shadow processing capability reduces CPU load on the production Sun StorageTek 5000 NAS System, streamlining operations.

Storage Management - RAID

Armed with a 5220 RAID Controller in Simplex mode, the Sun StorageTek 5000 NAS Appliance Family offers the high availability attributes associated with RAID 5.

Sun StorageTek 5000 NAS File Checkpoints

Sun StorageTek 5000 NAS File Checkpoints is a point in time image (or “checkpoint”) of a filesystem taken at the volume level that resides on a NAS device. While the active filesystem(s), can be modified with read / write (R/W) operations, the “copy” or logical image can only be read and is not modifiable. It is a virtual and static read-only point-in-time “copy” of the active filesystem. A “copy” or “copies” co-exist with existing, live, filesystem(s). One should not consider a point in time image as a true “back-up” of the active filesystem. Its virtual existence is directly relational to the live physical filesystem’s existence.

While the functionality of using Sun StorageTek 5000 NAS File Checkpoint is diverse and vast, the process of implementing and managing checkpoints is simple. When a checkpoint is requested by an authorized user or is automatically “taken”, the time required and performance overhead are negligible to both the network infrastructure and the live, active filesystem.

Access to checkpoints is provided via multiple protocols: NFS and CIFS clients. There can be up to sixteen (16) checkpoints maintained at any one time per filesystem (volume) on a NAS device.

Sun StorageTek 5000 NAS File Checkpoint Applications

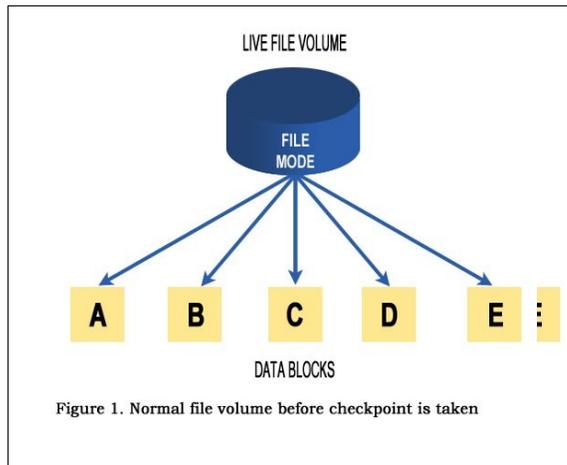
- **Rapid File Recovery:** When files are modified, deleted, checkpoints can be used to quickly access a recent image of the file.
- **Online backup of files:** With its checkpoint feature, Sun StorageTek 5000 NAS OS allows the flexibility to backup large file systems without worrying about data being changed during the backup process. This exclusive feature ensures that such file systems will always be backed up in a consistent state.
- **Database backups:** By checkpointing database files on a Sun StorageTek 5000 NAS System, it is not necessary to take a database offline during the time it takes to back it up. Instead, the database can be paused momentarily, then a checkpoint taken. The checkpoint will contain an image of the database files at a given point in time, which in turn can be backed up at the user’s convenience.

Sun StorageTek File Checkpoint Benefits

- **Reduced Recovery Time:** point in time images dramatically reduce the time it takes to recover lost or damaged files and filesystems. Recovering files from tape is no longer the only option. Point-in-time images of the active filesystem (volume) are accessed in a read-only state and accessed via CIFS share or NFS mount point assuming proper access rights.
- **User Satisfaction:** In the event of lost, corrupted, or damaged files, system administrators are no longer faced with the complex task and lengthy process of

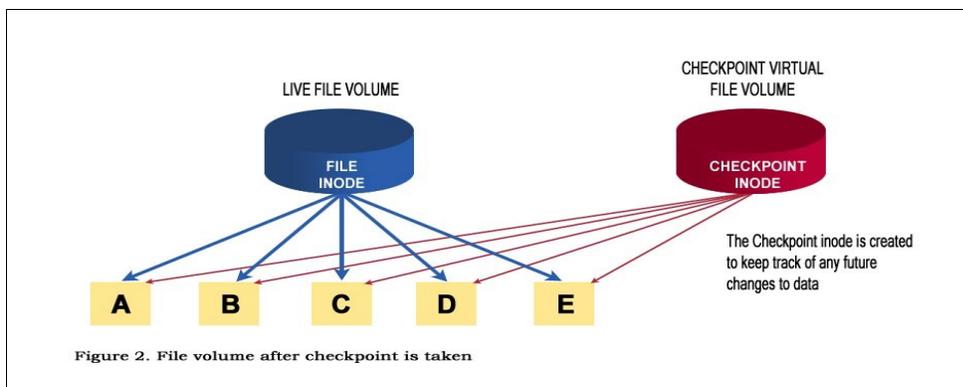
recovering to a “clean” version of the file in question. In a Windows environment, accessed through CIFS share, the file can be “dragged” and dropped” from the checkpoint folder into the proper volume. From a NFS mount point, the file in question can be copied from the checkpoint directory to the proper location.

- **Reduced Cost (TCO):** Lower TCO is achieved, in the event of recovering lost files, in time savings of the administrators doing the recovery. The time usually spent in searching archived files on tape, the “normal” wear-and-tear of tapes and tape devices, and having to do multiple recoveries in the event the wrong file being recovered allows for time better spent doing more meaningful tasks.



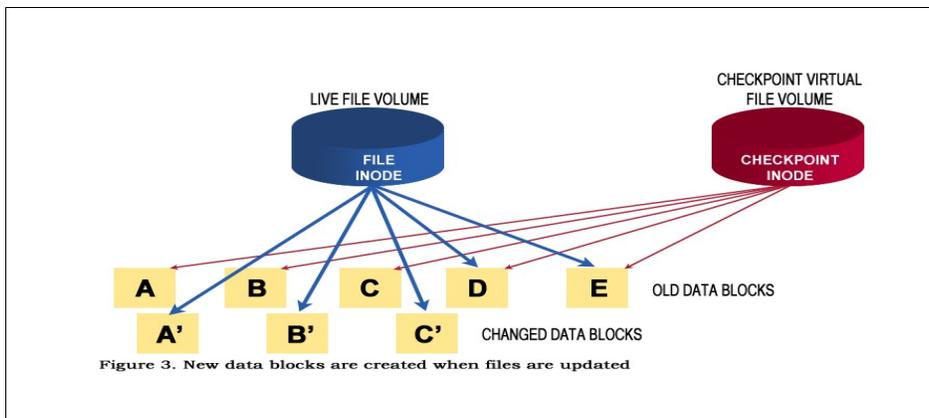
Sun StorageTek 5000 NAS File Checkpoint Explained

The Sun StorageTek 5000 NAS OS file system has i-nodes, which are data structures within the file system holding specific file related information, including the addresses of data blocks. As shown a live file volume has i-nodes that describe the



addresses of the blocks that compose any given file volume. This addressing is achieved by using pointers to reference the data blocks that are stored elsewhere on disk.

The Sun StorageTek 5000NAS OS creates a checkpoint by maintaining all pointers to disk blocks currently in use at the time of the checkpoint. As illustrated when the checkpoint is taken, a new i-node is created to maintain existing pointers to data blocks. Any changes made to files after a checkpoint has been established will



result in updates to the current set of pointers. This shows the state of the volume after data blocks are updated. This process is similar to when changes are made to non-checkpointed volumes, which also update pointers to point to the new disk blocks.

Because of this adherence to standard volume update processes, performance degradation with checkpoints is limited. The overhead experienced was a zero change in file system size, and 5% performance degradation in terms of iops on a standard benchmark applied to checkpointed volume. It is important to note that the benchmark imposed a very high proportion of write operations against the file system, therefore degradation is actually quite minimal. Actual effects on performance will vary depending on a number of factors including file system size, number of files, number of delete operations, depth of directories, average file size, and outstanding number of checkpoints.

High Availability Bonds: (NIC Failover / Port Aggregation):

The following describes the High Availability (HA) bond features available on the Sun StorageTek 5000 NAS OS. In addition, it may also be used to configure a network interface card (NIC) failover.

Network interface bonding is a method of grouping multiple physical NIC's together to form a single logical NIC. Sun StorageTek 5000 NAS systems support bonding for two distinct environments; load sharing and redundancy.

Load sharing bonds are referred to as port aggregation (PA) bonds, or Fast EtherChannel. Redundancy bonds are known as high availability (HA) bonds. There can be a maximum of 4 bonds per Sun StorageTek 5000 NAS System head.

Port Aggregation Bonds

Port aggregation bonds are used for two different purposes. First, PA bonds can increase the effective network connection bandwidth and secondly, to provide one form of NIC fault tolerance in which the system can tolerate a NIC failure and still provide a path to the network. If a NIC fails, the connection will continue to operate on the remaining operational NIC's.

When establishing a bond, there are considerations to keep in mind. All NIC's in a PA bond must be connected to the same switch and both ends of the network connection must support this form of bonding. In other words, when a Fast Ether-Channel NIC is connected to a switch the switch must support Fast EtherChannel technology. Additionally all of the member NIC's must participate in the sending and receiving of packets with each end, the switch and the NIC being responsible for performing load-balancing across the switch's configured ports. The NIC selection algorithm uses the destination IP address as part of the port selection criteria to ensure that all packets to the same host are sent via the same NIC. This will minimize out-of-order packets which can have a detrimental effect on network performance.

High Availability Bonds

High Availability (HA) bonds provide fault tolerance through **NIC failover**. This is an active-passive configuration in which one NIC within the bond is active and handling network traffic while the remaining NIC's are passive backup devices. In the event that the active NIC fails, the system will automatically switch over to one of the backup NIC's in the bond. In this configuration no support is required from the switch and there is no single switch restriction. The member NIC's of an HA bond may be of disparate types and may be connected to different switches or hubs -- avoiding a single point of failure at the switch or hub.

The table below provides a comparison of the features of port aggregation (PA) and high availability (HA) bonds.

Functionality	HA	PA
Load sharing	No	Yes
Bandwidth scalability	No	Yes
Switch support required (i.e. Fast Ether-Channel protocol)	No (any hub/switch)	Yes

Table 8: Bond feature comparison; at GA, one single-port MMF NIC and two on-board 10/100/1000 Ethernet ports provide all supported connectivity.

High Availability (HA) Bond

From an operational point of view, an HA bond works exactly like a single stand-alone NIC. Administration is performed on the master NIC within the bond but with the additional features that each type of bond provides. A bond can have up to 4 IP aliases as in a single stand-alone NIC. User administration tasks, such as changing an IP address, adding a netmask, and deleting aliases, etc., are done through the (master) bond itself and not on the slave NIC's.

Operation

When a bond NIC is configured the main NIC becomes the active NIC of the bond. All packets directed to the bond are sent and received through the active NIC. Once a HA bond is up and running, the link status of the active NIC is periodically monitored. If the link status is down then the NIC is considered failed and a backup NIC with a "good" link status is selected and configured to be the active NIC of the bond.

The time it takes for a NIC failover process to complete is minimal. Fail over time is usually less than a few seconds and is dependent on the type of NIC's that are being used in the bond. For link media that supports speed negotiation such as the 'emc' and 'fxp' NIC, the driver takes a little longer to complete its initialization. Transmission latency introduced to the HA bond software is minimal since no complex decision needs to be made at transmission time. There is no additional latency on packet reception since incoming packets do not go through the bond software.

Recovery

A NIC recovery is performed thus switching the active NIC back to the main NIC. This usually is done to restore network traffic back to the main NIC which might be a higher bandwidth link (1000T) than the backup NIC (100T). The Telnet and WEB GUI are enhanced to support NIC recovery operations.

StorageTek Compliance Archiving Software

The Sun StorageTek Compliance Archiving System provides the back-end archive for applications (such as those from Sun Independent Software Vendors (ISVs) in the enterprise content management (ECM) space), with the applications providing the interface with the end user. From the end-user perspective, and for the majority of the use cases, the user will interact with their content creation/management applications for email, scanned paper documents, electronic office documents, images, etc., and it's the ECM application that manages the deposit/retrieval of files into the appropriate location on the NAS appliance. When an office document, employee benefits web

page or email (for example) is required to be preserved as a “record” of an event for regulatory or business compliance requirements, it is preserved on the StorageTek Compliance Archiving System as a read-only file (write once read many (WORM)) with an associated retention period, during which the WORM protection will be enforced. Since the archive system uses magnetic disk media, this provides easy and fast accessibility should the customer need to retrieve the information again.

The system supports a mix of WORM protected files and regular read-write files, meaning a customer can start with a small area of the system dedicated for its compliance requirements, and grow as needed, while the rest of the system can be used as 'regular' storage.

Some customers have their own “home grown” applications and these can also send/retrieve files to/from the Sun StorageTek Compliance Archiving System. Most user and ISV applications will run unmodified on the system if they support standard file system interfaces. However, the compliance software adds a small application programming interface (API) for using its retention and “WORM” capabilities. For applications that collect and enforce retention periods for records (documents/files or groups of documents/files that record an activity), they can take advantage of retention period enforcement and “WORM” protection at the storage layer, essentially gaining a second layer of protection over that provided by the application alone.

For customers governed by the Securities and Exchange Commission (SEC)'s 240.17a-4 regulation (i.e. The dealer/broker community in Financial Services), added protection at the storage media layer is mandatory. Kahn Consulting, Inc. was retained to evaluate Sun Microsystems' StorageTek Compliance Archiving System in the context of relevant requirements of the Securities and Exchange Commission's (SEC) Regulation 17 CFR § 240.17a-4 (17a-4). It is Kahn Consulting, Inc.'s opinion that Sun StorageTek Compliance Archiving System complies with both the letter and the spirit of the relevant requirements of SEC Rule 17a-4. See <http://sundoc.central> token number 430962 for this white paper evaluation, or visit <http://www.sun.com/nas>.

Key Features of the Compliance Archiving Software

Note that some of the software features typically available in the 5000 series NAS appliances have been disabled to provide additional protection for the Sun StorageTek Compliance Archiving System.

Compliance Archiving Software

Feature	Specifications and/or benefit
Per-File retention period	A file's retention-period specifies how long the file must be preserved on non-rewritable, non-erasable disk. Retention periods may be extended (for legal hold situations or change in fiduciary responsibilities), but not decreased. A new retention-period may be assigned to a file whose previous retention period has expired. The Advisory retention mode of operation allows for “audited delete” which provides for a documented, audited removal of a file prior to meeting its initial retention period. This is required by some European Union privacy rules.

Feature	Specifications and/or benefit
Per-file WORM protection	Protection by non-rewritable, non-erasable disk storage for the duration of the assigned retention period. On “mandatory enforcement” volumes, WORM files cannot be modified, extended, or renamed, regardless of the identity or privileges of the user or client attempting the operation. In addition, the critical metadata attributes of WORM files cannot be changed. On “advisory enforcement” volumes, a trusted administrator can shorten retention times and remove files. Actions are captured in the audit log. NAS Gateway system configurations only support compliance with advisory enforcement.
Compliance Volumes	When the Compliance Archiving Software is licensed on the StorageTek NAS Appliance, administrators can create compliance-enabled volumes. It is possible to have multiple volumes on a single StorageTek NAS Appliance, only some of which are compliance-enabled. Sun recommends against enabling compliance on volumes that will be used by applications (and users) that are not aware of the different data retention semantics enforced by the compliance module. When each volume is created, the administrator can choose to enable compliance with “mandatory” or “advisory” enforcement. Mandatory enforcement is the most stringent form, with features designed to meet strict regulations including the U.S. Securities and Exchange Commission (SEC) Rule 240 17a-4. Advisory enforcement is less stringent and allows a trusted administrator to do certain activities, including reducing the retention time of a file or removing WORM-protected files.
Option for non-WORM file archive	You get the flexibility to set up areas (volumes) where you can store information you are not yet ready to WORM protect.
Secure clock	A secure clock helps prevent changes to the externally visible system clock from affecting the retention periods of WORM files
Audit system	An audit system captures and preserves retention-related actions, including operations that create or delete WORM files and operations that set or extend retention periods or delete WORM files
Empty folder rename	An empty folder on a compliance-enabled volume can be renamed. This is beneficial to Windows clients where “New Folder” directories require new names in order to be meaningful.
Data Mirroring(recommended - optional software)	The ability to remotely mirror files to another Sun StorageTek NAS Appliance running the Sun StorageTek Compliance Archiving Software provides for a duplicate copy of all WORM files(and indexes to those files) on non-erasable, non-rewritable media and helps support business continuity and disaster recovery initiatives.
Administrative security controls	Administrative functions cannot be used to circumvent the guarantees made by WORM files and retention-periods.

Feature	Specifications and/or benefit
Advanced access controls	Only authorized users can gain access to your archived eRecords. Mechanisms to enforce this include: Windows Access Control Lists (ACLs) and Access Tokens; UNIX credentials and permissions; credential mapping, approve lists, trusted host lists, netgroups; cross-platform file locking; and cross-platform authentication.
Lightweight Directory Access Protocol (LDAP) and Windows active directory	Enables integrated authorization and authentication services between the application and the Sun StorageTek Compliance Archiving System.
Supports a variety of name services: Active Directory Service (ADS), Windows Internet Naming Service (WINS), Domain Name System (DNS), Network Information Service (NIS) , Network Information Service Plus (NIS+), LDAP	Enhancements are supported to help provide identity and security among systems interoperating with the Sun StorageTek Compliance Archiving System.
Multi-client support	Content applications archiving to the system can run on UNIX/Linux or Windows clients, enabling you to choose the platform or platforms that work best for your infrastructure.
Trustworthiness:	<p>The system will be instrumental in proving that an electronic record is “trustworthy” in regulated industries in the event of an audit. For a record to pass muster and be considered trustworthy, the customer (using the underlying storage technology as proof points) will need to demonstrate that the record has:</p> <ol style="list-style-type: none"> 1. integrity (can demonstrate the eRecord has not been altered) 2. accuracy (contains information it was supposed to contain when created) 3. authenticity (source/origin can be reliably demonstrated – proof of who generated it and who controlled it over its life) 4. accessibility (can access the record in a timely manner) <p>The system is designed with this in mind.</p>

Important Legal Note

Never say that the software or system makes a customer compliant with regulations. Sun cannot take this position. We are engaging 3rd parties to evaluate the product against key regulations. All documents must say enables, or helps achieve compliance. It is Kahn Consulting, Inc.’s opinion that Sun StorageTek Compliance Archiving System complies with both the letter and the spirit of the relevant requirements of SEC Rule 17a-4. See <http://sundoc.central> token number 430962 for this white paper evaluation, or visit the link off http://www.sun.com/storage/solutions/content_compliance/

At no time position yourself or Sun as an expert of any of the myriad compliance regulations; point the customer to his/her legal team or a qualified 3rd party expert. If in doubt, contact your SMI legal representative.

Target Markets

Version one of the Sun StorageTek Compliance Archiving Software is designed to today's most stringent regulation around electronic storage media, the Securities and Exchange Commission (SEC)'s 240.17a-4. By building the Sun StorageTek Compliance Archiving System to such a high standard, Sun expects to be able to provide a solution to the Financial Services' broker dealer community, and – most importantly – the system will be of interest to industries that may not have these mandated requirements around data storage *per se*, but do have similar needs. To that regard, publicly traded US companies that must comply with the Sarbanes Oxley Act of 2002 are ideal candidates, as are those affected by their non-US equivalents (such as the EU's 8th Directive). Note that there are approximately 450 non-US companies on the US stock exchange, with a market cap of approximately \$5Million Euros (according the NYSE.com).

Generally, the target market focus will be provided with partner ISVs who provide the enterprise content management (ECM) applications, and are strong in key verticals. In order to provide the added assurances around retention and WORM protection at the storage layer, some integration work is required to hook into the small API for WORM and Retention. Note that applications (ISV or home grown) will likely operate unmodified if the customer does not need the retention and WORM assurances enforced by the Sun StorageTek Compliance Archiving Software. This is because the Sun StorageTek NAS Appliance presents a standard file system interface to the application, with the exception of the API for Retention and WORM. See the next section or the WWWW Guide for the current list of applications that have been qualified.

Target customers will also include customers who currently are using optical media for their long term archiving and data protection, and would like to get the performance and capacity advantages or WORM-protected spinning disk.

Compliance Applications

Refer to the Sun StorageTek 5220 WWWW for details on applications that integrate with Sun StorageTek Compliance Archiving Software.

System Architecture

Overview

The Sun StorageTek 5220 NAS System consists of a 1U NAS head with a 3U RAID controller unit and expansion units which can be mounted in industry-standard 19-inch equipment racks. The NAS head includes rail kits, but the expansion unit requires the purchase of rail kits.

Sun StorageTek 5220 NAS System Head

The Sun StorageTek 5220 NAS System Head is 1.73 in. (4.38 cm) high, 17.52 in. (44.5 cm) wide and 25.2 in. (64 cm) deep. The airflow direction is from front to back; I/O ports are located on both the front and rear panels. Informational LEDs are located on the front panel. Access to the two power connections is at the rear of the chassis.

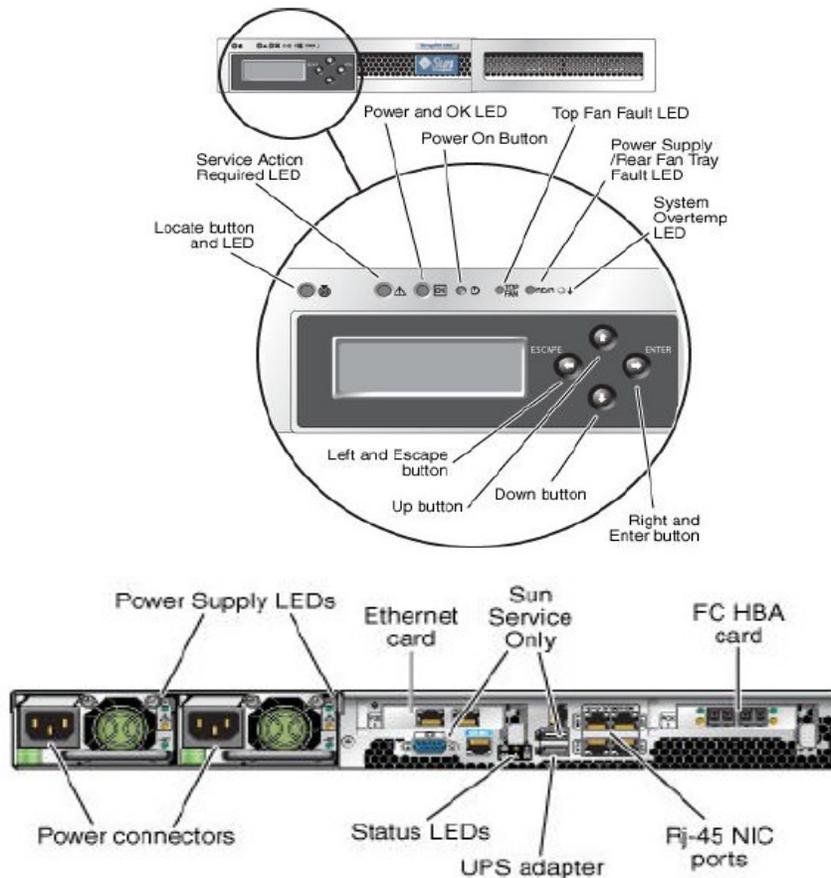


Illustration 2: Sun StorageTek 5220 NAS System Head Front and Back.

Sun StorageTek 5220 Expansion Units

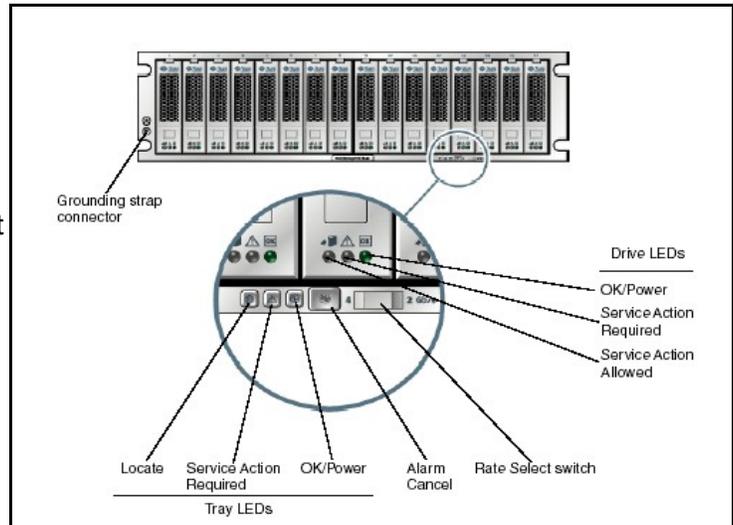
Overview

The Sun StorageTek 5220 Enclosures are a high-performance, enterprise-class, full 4 gigabit per second (Gb/s) Fibre Channel connectivity solution that combines outstanding performance with the highest reliability, availability, flexibility and manageability. The Sun StorageTek 5220 Enclosures consist of two primary components, a RAID Controller Tray and an Expansion Tray .

Sun StorageTek 5220 RAID CU Tray

The Sun StorageTek 5220 RAID CU houses a single intelligent FC RAID array controller that provides a single 4 Gb/s host connection and supports 16 S-ATA drives. Up to a maximum of 2 16-SATA drive StorageTek Expansion units can be supported for a total raw capacity of 24TB.

The Sun StorageTek 5220 RAID CU has a single Ethernet port for remote management from anywhere on the network through Sun StorageTek Configuration Service software.



All primary components of the Sun StorageTek 5220 RAID CU, except for the RAID Array controller, are hot-swappable, field-replaceable units (FRU's) to help prevent servicing downtime and to help minimize the time to repair a failure. Each FRU, including the FC RAID controller, fans, power supplies and disk drives can be easily accessed and removed or replaced .

Sun StorageTek 5220 RAID Controller Unit

The card benefits from over a decade of design knowledge and firmware development focused entirely on open systems and high-speed, disk-based performance.

The Sun StorageTek 5220 RAID controller cost effectively combines high-speed, industry-standard components with robust firmware to deliver enterprise-class functionality and exceptional performance value.

The Sun StorageTek 5220 RAID controller card has two, 2 Gb/s FC host I/O ports, supporting direct host or SAN attachments, and two, 2 Gb/s FC drive interfaces. A integrated FC hub connects the drive-side FC interface chips in the controller. Note, that the Sun StorageTek 5220 RAID CU is configured in Simplex mode. This means that a 2nd RAID CU is not present and thus there is no Cache mirroring of data during I/O transactions between the NAS Filer Head resident NAS OS and the RAID Groups.

The Sun StorageTek 5220 RAID CU controller card's I/O system core provides built-in hardware XOR for high-speed RAID parity calculations, enabling this compute-intensive task of to be handled efficiently and effortlessly.

The Sun StorageTek 5220 RAID CU controller card is equally adept at both I/O per second (IOPS) and throughput (MB/s). Its 800 MB/s bus (64 bit, 100 MHz) between the core processor and I/O chips has both the “width” to handle large-block I/O (sustaining up to 400 MB/s on 512k sequential disk reads) and the “speed” to process large amounts of small-block I/O (sustaining 25,000 IOPS on 4k random disk reads).

The Sun StorageTek 5220 RAID CU controller card and cache algorithms are designed to provide 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 decade.

The use of large cache in storage has long been driven by the unique requirements of mainframe environments. Open systems servers, however, are seldom able to make good use of large 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 5220 RAID and disk enclosure was designed from the outset for open system I/O requirements – recognizing that disk performance is vastly more important than cache performance in these environments. Open systems 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.

Cache Usage

The Sun StorageTek 5220 RAID and disk enclosure dynamically utilizes cache for both read and write caching. This allows for more efficient use of available cache by adapting its utilization to match the I/O requests from attached hosts as the needs of the applications change during the computing day. This adaptability is one reason that the Sun StorageTek 5220 RAID CU can sustain higher levels of real-world performance than monolithic and modular systems with larger caches.

Write Policy

The Sun StorageTek 5220 RAID CU offers both write-back and write-through caching options to optimize performance or protection. The write policy determines whether I/O completion is signaled when data is transferred to the cache or when data is written to disk. With write-back caching, the write request is signaled complete as soon as the data is in cache, and actual writing to disk occurs at a later time. Write-through caching signals the completion of a write request when the data is safely stored on disk. Write-back caching creates significantly higher write performance for applications with a high locality of reference, and its inherent risk is eliminated as the Sun StorageTek 5220 RAID CU’s battery backup protects the cache at all times. Write performance with a write-through cache is approximately that of a non-cached system, but ensures the greatest data protection.

Write Cache

The Sun StorageTek 5220 RAID CU's cache algorithms are designed to provide the lowest latency I/O access possible when securing the user's data in storage system cache. And the Sun StorageTek 5220 RAID CU ensures that its cache is ready to receive the next write request from the host by efficiently writing cached data to disk in a manner that minimizes disk I/O. By identifying high locality of write data in its cache, the Sun StorageTek 5220 RAID CU is able to group all data in a RAID stripe thus eliminating the need for disk read operations in the computation of parity in RAID 5. This ensures that disk utilization is minimized for a particular usage pattern, allowing maximum I/O throughput per spindle available.

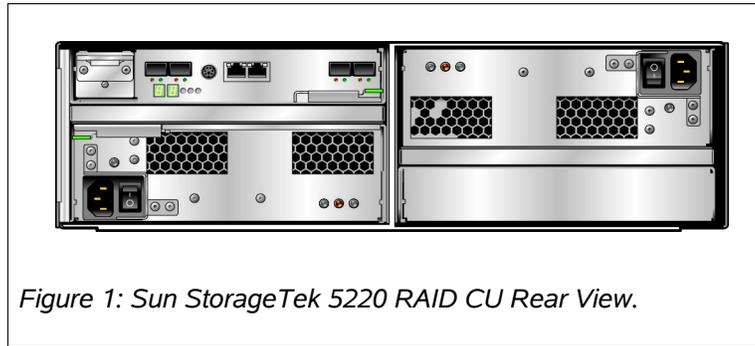


Figure 1: Sun StorageTek 5220 RAID CU Rear View.

Cache Flushing

To prevent data loss or corruption, the controller periodically writes unwritten data residing in its cache to disk (flushes the cache) based on one of two factors:

- A time-based flush writes cache data to disk after a user-defined period of time (in seconds). This value can range from immediate to infinite, with a value of 10 seconds or less recommended for optimal data protection.
- A threshold-based flush occurs when the amount of unwritten data in cache reaches a certain level, called a start percentage. The controller writes cache data to disk until the amount of data in cache drops to a stop percentage level. For example, the controller can start flushing the cache when the cache reaches 80 percent full, and stop flushing the cache when the cache reaches 20 percent full. The start and stop percentage levels are user-defined to maximize data protection and/or performance.

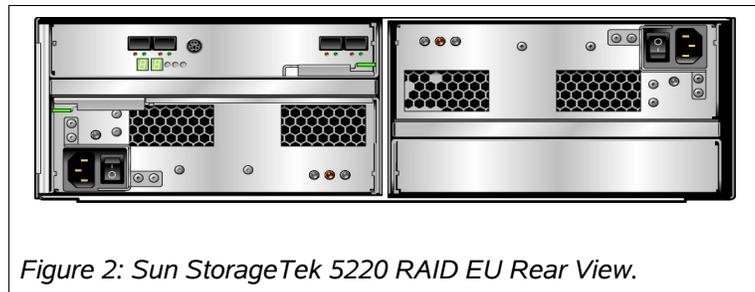


Figure 2: Sun StorageTek 5220 RAID EU Rear View.

Sun StorageTek 5220 RAID Expansion Unit

The Sun StorageTek 5220 EU is more than “just-a-bunch-of-disks” with features designed to optimize performance, availability and serviceability. Embedded “loop switch”, redundant, dual-active drive loops access the dual-ported S-ATA drives ensuring maximum performance and complete accessibility to all drives in the event of a loop or cable failure.

All the primary components in the Expansion unit are hot-swappable, with the exception of the FC I/O modules (IOM). This includes the S-ATA disk drives, cooling fans, and power supplies. The IOM deliver online information about component status, such as temperature, fan speed, or faults, to the storage management software and provide the ability to cascade multiple drive modules to a single array module.

The expansion tray supports up to 16 low-profile S-ATA disk drives in a 3U enclosure, enabling the Sun StorageTek 5220 EU storage system to maximize “spindle density” and capacity in a minimum

amount of space.

Switched Bunch of Disks (SBODS)

The switched expansion tray has an embedded “loop switch” which isolates each drive on a private loop with the environmental services module (ESM), enabling direct and detailed FC communication with each individual drive. The switched drive module provides the following key benefits.

Drive isolation enables improved diagnostics for less time in degraded mode

The switched drive module’s IOM-embedded “loop switch” creates what is essentially a private Fibre Channel arbitrated loop between an IOM and a drive. Drive isolation eliminates the risk of a single drive disrupting the loop and potentially causing other drives to fail on the loop (referred to as fault propagation). Drive isolation also enables diagnostics to be performed on an individual drive level, simplifying analysis of drive and loop problems. The longer it takes to identify and diagnose a problem drive, the longer the overall storage system performance is degraded. In loop-based drive enclosures, where multiple drives are operating on a given loop, it can be extremely difficult to identify which drive is faulty. The switched drive module’s drive isolation and direct communication with each individual drive, which allows for more detailed diagnostic information to be gathered, greatly simplifies analysis of drive and loop problems – enabling problem drives to be located and remedied faster.

Fewer nodes creates lower latency and linear scaling for more responsive applications

With loop-based enclosures, each drive is a node on the drive loop. Large loops create a longer and slower I/O path from a controller to a drive and back to the controller. The switched drive module adds only one node (the I/O Module) to each of its redundant drive loops, and its drives are just one point-to-point step away from the now shorter and quicker loop. Fewer nodes and faster communication significantly lowers the latency and provides linearly scalable performance for more responsive applications. Additionally, the switched drive module’s ability to acquire detailed diagnostic information enables more effective performance tuning. A loop-based drive enclosure adds 15 nodes to each redundant drive loop (one IOM and 14 drives). Large loops create a longer and slower I/O path from a controller to a drive and back to the controller. The switched drive module adds only one node (the IOM) to each of its redundant drive loops – a 93 percent reduction. And its drives are just one point-to-point step away from the now shorter and quicker loop. Fewer nodes and faster communication significantly lowers the latency and provides linearly scalable performance for more responsive applications.

Preventive maintenance

The switched drive module puts all drives through an insertion test (port test before insert, or PTBI) before they are added to the Fibre Channel loop. The intent is to identify faulty drives before they can disrupt the loop. PTBI causes a drive being added to the loop to be LIP’d and then looped back to itself. The switched drive module monitors the drive for 5 seconds, and if the loop remains up, the drive is LIP’d again and allowed to join the loop.

Reliability, Availability and Serviceability (RAS)

Reliability

- Flash-resident Operating System enhances reliability
- System monitoring and diagnostic of Sun StorageTek 5000 Family (power supplies, fans – including the dedicated processor fan and temperature) and Sun StorageTek 5220 EU components. Informs the user should any problems be discovered, aiding in the reduction of

- downtime due to catastrophic failure
- ECC on data cache
- Error checking and correction on disk drives
- Spare cylinders and skip sectors on disk drives

Availability

- Dual hot-swappable redundant load-sharing/load-balancing auto-sensing 110V AC/240V AC power supplies with individual power cords
- Redundant cooling fans
- NIC Failover provides for a redundant path to the same IP address on the server through a different switch and using a cooperative (with the host) failover topology
- NIC Port Aggregation enables the use of the same IP address across multiple NIC ports from a single switch, increasing bandwidth and providing some degree of fault tolerance
- Journaling Filesystem guarantees filesystem integrity across unforeseen events such as power outages enhancing data availability by obviating the need for lengthy filesystem check operations subsequent to power outages or other unplanned events
- Sun StorageTek File Checkpoint “checkpoints” (also known as Snapshots), provide static images of the filesystem enabling rapid recovery of mistakenly deleted files or objects, and facilitating backup to tape
- Dynamic Volume Expansion provides the capability to add storage to a filesystem without system downtime, maintaining data availability
- UPS management port ensures the graceful shutdown of the StorageTek 5220 NAS in the event of an extended power outage.
- Sun StorageTek 5000 File Replicator is an optional software application that allows mirroring, through a TCP/IP network, of logical volumes from one Sun StorageTek NAS Appliance to another Sun StorageTek NAS Appliance anywhere in the world. It provides for business continuance (data availability) in the event of a catastrophic loss of the primary (source) system. When this occurs, the target may be promoted to source (master) and it takes over all the requests to the failed system.

Serviceability

- Tool-less access facilitates maintenance by eliminating the need for tools when servicing the system (most components)
- Hot-swappable dual redundant hot-swappable power supplies easily accessible from the rear of the system
- Dual-boot OS enables the user to quickly and easily backtrack to a prior version of the OS should problems manifest during or subsequent to an OS upgrade operation
- Embedded system diagnostics tools enable Sun support representatives to quickly get a clear and comprehensive report describing the configuration and health of the system. It also enables support representatives to create packet capture sequences describing particular protocol errors, thereby empowering them to more quickly diagnose and service customer situations
- Fault indicator LEDs are present on the front and rear of the system to easily identify problematic components and prevent mistakes in servicing. A fault indicator LED stays on following a fault even if the system has been powered off (but is still connected to the power source)

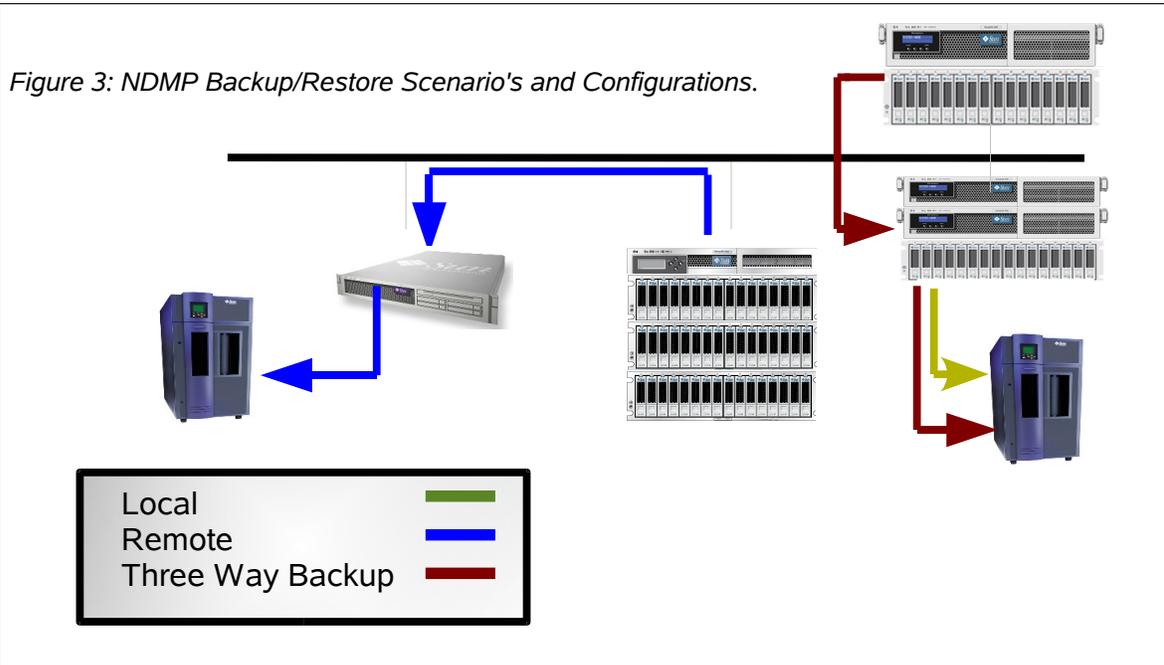
Tape Backup and Restore

One of the primary goals of enterprise storage management is to back up and restore information in a timely, secure, and cost effective manner over enterprise wide operating systems.

Companies need high-performance backup and the ability to back up data to local media devices. While the data itself may be distributed throughout the enterprise, its cataloging and control must be centralized. The emergence of network-attached storage and dedicated file servers makes storage management more challenging.

Network Data Management Protocol (NDMP) recognizes that these issues must be addressed. NDMP is an opportunity to provide truly enterprise-wide heterogeneous storage management solutions - permitting platforms to be driven at a departmental level and backup at the enterprise level.

The Sun StorageTek 5220 NAS Appliance is supported in certain direct attach, 3-way, and "remote" back up configurations utilizing NDMP. Please see the Sun StorageTek 5220 NAS Appliance WWW (SunWIN/Partner Document Library) for details regarding supported configurations, NDMP tiering, etc.



Server Management

Management of the Sun StorageTek 5220 NAS Appliance is eased by the browser-based user interface with remote web administration for system monitoring from anywhere in the world. The following are protocols and tools that are used to provide system monitoring and management for the Sun StorageTek 5220 NAS Appliance.

IPMI

The OS utilizes Intel’s environmental protocol, IPMI (Intelligent Platform Management Interface), to manage and report hardware component statistics. It enables the system to monitor its own server components (power supplies, fans – including the dedicated processor fan and temperature) and inform the user should any problems be discovered, thereby preventing downtime due to catastrophic failure.

System Monitoring

Environmental statistics, such as fan speeds, chassis temperatures, power, and voltage statuses are easily viewed through a JAVA based GUI (Graphical User Interface). This offers the NAS administrator a clear, pictorial view of the integrity of the Sun StorageTek 5220 NAS Appliance. From this color, graphical depiction of the environmental statuses, appropriate actions can be taken to correct approaching problems or feel confident in how the machine is running and functioning.

SMTP

Using SMTP, an administrator can establish E-mail notification through a SMTP server. This information can contain either SMTP (Simple Mail Transfer Protocol) server name, as well as designate e-mail notification recipients. In the event of a system error, Sun StorageTek 5220 NAS Appliance OS will send a detailed e-mail message to recipients via the SMTP server based off of a

“Notification Level”. Effectively, the administrator will be notified if/when the Sun StorageTek 5220 NAS System encounters situations that have been predefined thus providing quicker and timelier attention to those situations. This “Notification Level”, which is a system wide setting, is determined when the recipient is added. One of three levels can be chosen:

Voltage Regulator	Status	Current Value
+1.2V	◆	1.2
+5V	◆	5.25
+3.3	◆	3.48
Standby	◆	5.01
-5V	◆	-5.07
-1.2V	◆	-1.24

Illustration 3: Voltage Regulator Status panel

▪ **Disk subsystem monitoring via SCSI Enclosure Services (SES):**

Standards-based disk subsystem monitoring for enclosure, controller, power supply, fan and disk health.

- **Errors Only:** The server will notify recipients when the system detects errors but not warnings.
- **Errors and Warnings:** The server will notify recipients of all errors and warnings.
- **None:** Effectively disables the e-mail notification option. Sun StorageTek 5000 Appliance NAS OS will not send any notifications. If “NONE” is chosen as the option, the system should be configured for diagnostic e-mails at minimum to ensure that proper notification is not missed.

Recipient e-mail addresses are displayed in the **List** box. Once an error has been detected, Sun StorageTek 5220 NAS Appliance OS logs it in the system log file and sends an e-mail notifications and warnings to the listed recipients as designated.

SNMP

Simple Network Management Protocol is an industry standard to monitor and manage diverse network devices. Supporting SNMP allows the administrator to establish “if/then” rules through SNMP compliant tools allowing faster resolution to adverse scenarios.

One simply enables SNMP by selecting the “Enable SNMP” checkbox in the SNMP administration window. Other attributes are:

- **Server SNMP Community:** SNMP community to which the Sun Storage NAS belongs
- **Contact Info:** Name of the person who is responsible for this Sun StorageTek NAS System.
- **System Location:** The network location which can be logical or physical
- **Destination IP Address:** The TCP/IP address for the server you wish to designate as an SNMP trap destination in the event of system errors
- **Port #:** Port to which Sun StorageTek 5000 NAS OS will send traps
- **Version:** SNMP protocol version (1 or 2)
- **Community:** Community string for the trap destination

Telnet

A Telnet session offers two distinct realms of functionality. The first is an administrative, “green screen” window into the Sun StorageTek 5000 NAS OS. From this interface an administrator, security permitting, has the ability to manage all operating functions of the NAS device. As with the GUI, the administrator can alter operational characteristics, configuration parameters, or access

controls in a menu driven format.

Secondly, Telnet access allows an administrator, via a secure format, to access a CLI (Command Line Interface). From the CLI, the administrator may issue UNIX style commands furthering operational alterations to the Sun StorageTek 5000 NAS OS. Standard MAN and HELP functions detail commands furthering the ease-of-use message.

LCD Keypad

The Sun StorageTek 5220 NAS System offers an LCD interface on the front of the unit. The LCD provides a local reference point enabling an administrator to get a "picture" of the overall system health. From the LCD, an administrator has the ability to dynamically set network accesses by setting the GATEWAY, IP address, SUBNET, and NETMASK. The Administrator can also perform system shutdowns and restarts from this panel. Utilizing the "Left/Right" and "Up/Down" arrows, and the "Select" "Exit" buttons, navigating the panel options is made as simple as possible for a NAS administrator.

Syslog/Remote Syslog

Further expanding an administrator's ability to track system activity, a log may be generated and stored locally. Or, the Network System Logger, SYSLOGD, may be enabled. In either instance, storing logs locally or remotely, the administrator can capture a combination of eight (8) different types of messages: emergency, alert, critical, error, warning, notice, info, and/or debug.

If the administrator requires granularity when enabling SYSLOGD, a Facility Value can be identified. Following is a list of Facility Values that the administrator can choose from:

- **Kern:** Messages generated by the kernel
- **User:** Messages generated by random user processes
- **Mail:** The mail system
- **Daemon:** System or network daemons
- **Auth:** Authorization systems such as "LOGIN"
- **Syslog:** Messages generated internally by SYSLOGD
- **LPR:** Line printer spooling system
- **News:** Reserved for USENET network news system
- **Uucp:** Reserved for UUCP system
- **Local0 – Local7:** Reserved for local use

Sun StorageTek NAS Differences

Backend Features	ST5220	ST5320
Maximum Number of Controller Trays	1	2
Number of RAID Controllers per Controller Tray	1 (Simplex)	2 (Duplex)
Server to tray connections	1	2 or 4
Mirrored cache support	No	Yes
RAID controller NVSRAM version	N399X-616843-903	N399X-616843-504
RAID controller Firmware version	06.16.81.10	06.16.81.10
Maximum Number of Expansion Trays per Controller Tray	2	6
Number of ESM Modules per Expansion Tray	1	2
Number of Power Supplies per Tray	2	2
Number of Drives per Tray	16	16
Maximum Number of Drives	48	112 (per Controller)
FC Drive Support	No	300GB, 10K
SATA Drives Supported	250/500, 7.2K	500GB, 7.2K
Maximum SATA Drive Capacity per Controller	24 TB	56 TB (per Controller)

Hardware Feature	SE5210	ST5220	ST5320
Server Platform	Sun Fire V65	SunFire X4100	SunFire X4200
Processor	3.06GHz Intel Xeon	2.2GHz Single core AMD Opteron	2.6GHz Single core AMD Opteron
Memory	4GB (4x 1GB DIMM)	2GB (2x 1GB DIMM) DDR1 400MHz	4GB (4x 1GB DIMM) DDR1 400Mhz
Frontend	10/100/1000 Ethernet	GigE Base: 4 ports (built in) 6 ports Max.	GigE Base: 4 ports (built in) 10 ports Max.
Backend	Ultra-320 SCSI	2GB FC Base (2 ports only)	2GB FC Base 2 ports, Max 4 ports
Drive Technology	Ultra-320 SCSI	SATA	FC/SATA
Internal drives	6	Not supported	Not supported
RAID Controller	Dual PCI	Single (in array)	Dual (in array)
Cluster Support	No	No	Yes
Optional Tape Backup	SCSI	FC or SCSI	FC or SCSI
Information Display	LCD Module	LCD Module	LCD Module
Boot	IDE flash disk (internal)	256MB Compact Flash Module	256MB Compact Flash Module
Power	Redundant Power Supply	Redundant Power Supply	Redundant Power Supply

Sun StorageTek 5220 NAS Specifications

Processors

Processor	AMD® Opteron™ 2.2GHz, Model 252 Single Core Single Processor
Cache	1 MB Level 2 Cache

Memory

2 GB registered DDR1/400 RAM Memory

Standard/Integrated Interfaces

Network	- Four 10/100/1000BaseT Ethernet ports - Optional dual port NIC (optical or copper), when the optional SCSI HBA is not installed.
SCSI	Optional: One Ultra320SCSI multimode (SE/LVD), when the optional NIC is not installed.
USB	Two (bottom for UPS connection, top for factory service)
Expansion bus	Two PCI-X 64bit/100MHz (One available for expansion)
Fibre Channel	One dual-port 2Gb/s FC PCI HBA's

Mass Storage

External Disk S-ATA	Sun StorageTek 5220 RAID Simplex Controller Unit and Expansion Units; EU supports 16 x 500 GB S-ATA HDDs • See Table 4 on Page 10 for Scalability Metrics. • Note: FC HDDs are NOT supported on the Sun StorageTek 5220 NAS Appliance.
RAID Level Support	RAID 5

Power Supply

Equipped with two power supplies. Second one is for redundancy	
Maximum DC output	550W

Environment

AC Power	90-264 V, 47-63 Hz
Operating temperature/humidity (single, non-rack system)	5°C to 35 °C (41 °F to 95 °F), 10% to 90% relative humidity, noncondensing, 27 °C max wet bulb
Nonoperating temperature/humidity (single, non-rack system)	-40 °C to 65 °C (-40 °F to 149 °F), up to 93% relative humidity, noncondensing, 38 °C max wet bulb
Altitude (operating) (single, nonrack system)	Up to 3048 m, maximum ambient temperature is derated by 1 degree C per 300 m above 900 m
Altitude (nonoperating) (single, non-rack system)	Up to 12000 m

Regulations

Meets or exceeds the following requirements:	
Safety	IEC 60950, UL/CSA 60950, EN 60950, CB Report with all national differences
RFI/EMI	Class A, FCC CFR47 Part 15, ICES-003, EN55022, EN300 386 v1.3.2
Immunity	EN55024, EN300 386 v1.3.2
Certifications	
- Safety	cULus, CE, GOST R, S-Mark (CCC exempt as "Storage" product)
- EMC	Class A, FCC, VCCI, C-Tick, MIC, BSMI, GOST, (CCC exempt as "Storage" product).

Dimensions and Weight

Chassis <ul style="list-style-type: none"> • Height • Width • Depth • Weight 	Sun StorageTek 5220 NAS System Head 1.72in. (43.8 mm) 17.52 in. (445 mm) 25.2in. (640 mm) 41.1 lb. (18.6kg)
Enclosure	Supported in SunRack 900 and 1000 cabinets. <u>Third-party</u> , 4 post, 19in, ANSI/EIA 310-D-1992 or IEC 60927 compliant cabinets that have 24"-36" mounting depth, 33mm front clearance (front rails to door), 800mm rear clearance (front rails to rear door) and M6, 10-32 or square hole mounting. Please note that not all 3rd party racks meet these parameters and are not compatible with these slide rail kits. Also, some third-party rack vendors do not support a completely filled rack with this type of server, due to the amount of power required.

Software/Operating System

Feature	Specifications
Operating System	Storage-optimized Operating System
File System	<ul style="list-style-type: none"> • 64-bit Journaling File system • Up to 16TB per file system; up to 512 file systems • Sun StorageTek File Checkpoint "checkpoints" • Online extensible/expandable capacity • NTFS streams support • Quotas: default, user, group and directory tree • Unicode
File Access Protocols	CIFS/SMB, NetBIOS, NFS v2 and v3, FTP
Block Access Protocols	ISCSI Target
Directory and Name Services	AD (LDAP, Kerberos v5), NT 4.0 Multiple Master Domains (MMD), DNS, WINS, NIS, NIS+, Local files
Network Services	<ul style="list-style-type: none"> • DHCP • NTP • RDATE • Network Status Monitor
Access Control	<ul style="list-style-type: none"> • NT4.0 Access Control Lists and Access Tokens • UNIX credentials and permissions • Credential mapping • Directory tree quotas • User and Group Quotas • Sun StorageTek File Checkpoint "checkpoints" • SMB/CIFS Shares • UNIX exports • Approve lists, trusted host lists, netgroups • Cross-platform file locking (limitations) • Cross-platform authentication

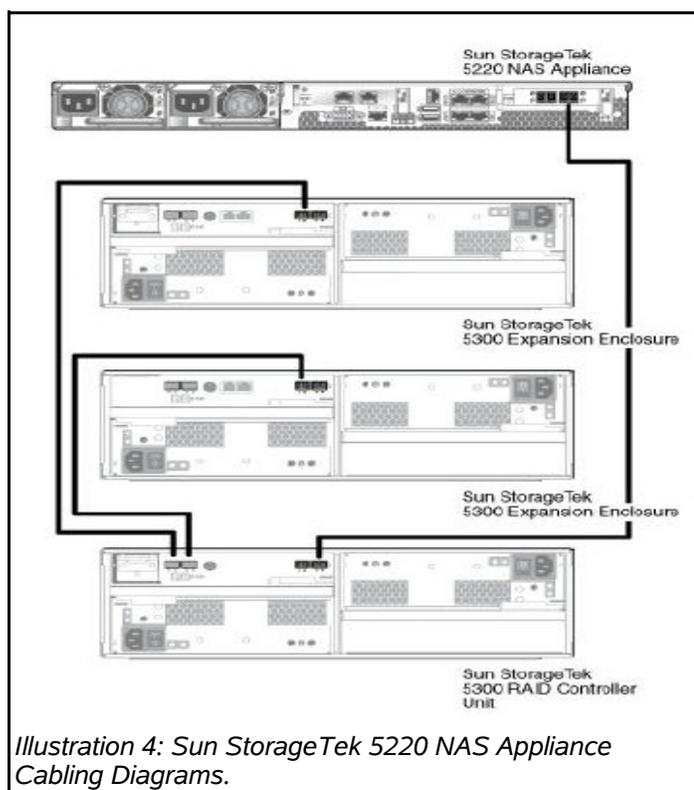
Feature	Specifications
Supported clients See the StorageTek 5220 WWW for most current support information – SunWIN # 477566	A client is any computer on the network that requests file services from the Sun StorageTek 5220 NAS Appliance. In general, if a client implementation follows the NFS version 2 or 3 protocol or the CIFS specifications, it is supported with the Sun StorageTek 5220 NAS Appliance.
Remote Management	<ul style="list-style-type: none"> • SNMP • Remote Syslog
System Administration	<ul style="list-style-type: none"> • Web (HTTP/Java based) GUI • Telnet • Rlogin • Rsh • SSH • Console Command Line Interface (CLI)
Mail Services	SMTP
System Monitoring	<ul style="list-style-type: none"> • Disk subsystem via SCSI Enclosure Services (SES) • Fans, power supplies, temperature, voltages via IPMI protocol • UPS • Network monitor
Tape Backup	<ul style="list-style-type: none"> • NDMP v2 and v3 • Backup with full Unicode • “Remote backup” and direct attach/3-way configurations supported w/NDMP
Setup and Configuration	Web-based GUI

StorageTek 5220 RAID Expansion Unit & 5220 Expansion Unit Specifications

Feature	Specification	
	Sun StorageTek 5220 RAID CU	Sun StorageTek 5220 EU F & S
Physical Planning		
Dimensions	5.21 inches high (13.2 cm) 17.6 inches wide (44.5 cm) 22.1 inches deep (56.1 cm)	5.1 in (12.9 cm) 17.6 in (44.7 cm) 22.1 in (56.1 cm)
Maximum Weight	82 lb (37.2Kg)	81 lb (36.7Kg)
Environmental (operating)		
Temperature	5° to 40° C (41° to 104° F)	
Relative Humidity	10% to 90% noncondensing	
Altitude	100 ft (30.5 M) below sea level to 9,840 feet (3,000 meters)	
Shock	5.0 g, 11 ms half sinewave	
Vibration	0.20 G, 5 to 500 Hz sinusoidal	
Heat Output	994 BTU/hr (CU), 963 BTU/hr (EU)	
Environmental (nonoperating)		
Temperature (Storage)	-10° to 50° C (-14° to 120° F)	

Feature	Specification
Temperature (Transit)	-40° to 60° C (-40° to 140° F)
Humidity (Storage)	10% - 90%, Max Dew Point is 26° C (79° F), 10% per hour Gradient
Humidity (Transit)	5% - 95%, Max Dew Point is 26° C (79° F), 10% per hour Gradient
Altitude	100 ft (30.5 M) below sea level to 40,000 feet (12,000 meters)
Shock	30 G, 11 msec half sine wave in the side/side & up/down directions 5 G, 11 msec half sine wave in the front/back direction
Vibration	1.0 G, 5 to 500 Hz sinusoidal
Power Requirements	
AC Power (RAID CU)	Voltage Range: 90-264 VAC; Frequency: 47-63 Hz 4.2 A Max. @ 115 VAC; 2.1 A Max. @ 230 VAC
AC Power (EU)	Voltage Range: 90-264 VAC; Frequency: 47-63 Hz 4.1 A Max. @ 115 VAC; 2.0 A Max. @ 230 VAC
Standards Compliance	
Safety and Emissions	IEC 60950, EN 60950, UL 60950, UL 1950, FCC Part 15 (47CRF15B), CISPR 22 (EN55022 — RF Radiated and Conducted Emissions), IEC 61000-3-2, IEC 61000-3-3
Immunity	CISPR 24 (EN55024), IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11

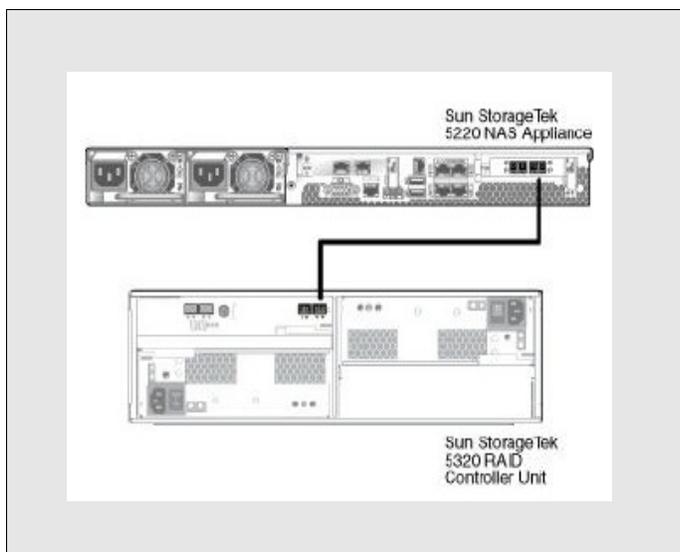
Cabling Diagrams



Sun StorageTek 5220 RAID EU's are configured with a “top-down/bottom-up” cabling scheme. This ensures data access to surviving drive modules even in the unlikely event that a full drive module is unavailable.

All StorageTek 5220 RAID CU's optical SFP and I/O Modules copper interconnect connections are designed with port bypass technology. Port bypass technology maintains fibre loop integrity when new Fibre Channel connections are made – or if existing ones are removed – by automatically opening and closing ports as needed. This means full drive modules can be added or removed without interrupting access to data. Client Operating System Support

A client is any computer on the network that requests file services from the Sun StorageTek 5000 NAS System. In general, if a client implementation follows the NFS version 2 or 3 protocol or the CIFS specifications, it is supported with the Sun StorageTek 5000 NAS Appliance.



Expansion

The Sun StorageTek 5220 NAS Appliance supports the following expansion feature:

- S-ATA - Up to 1 Sun StorageTek 5220 RAID Controller Units with up to 2 Sun StorageTek 5220 EUs.

Please consult the “What Works With What” (SunWIN/Partner Document Library #472566) for the most current information on support.

Peripherals Support Matrix

<i>Category</i>	<i>Description</i>
Cables	<p>Used for connecting the StorageTek 5220 RAID CU to the Sun StorageTek 5220 NAS Appliance. All cables are FC. The StorageTek 5220 NAS Appliance ships with 2 5m LC to LC connector FC cables. If longer cables are required, order the following part numbers:</p> <ul style="list-style-type: none"> • X9732A: 2M LC to LC FC Optical Cable • X9734A: 15M LC to LC FC Optical Cable • X9736A: 25M LC to LC FC Optical Cable • X9738A: 50M LC to LC FC Optical Cable

Category	Description
Rack	<p>Supported in SunRack 900 and 1000 cabinets.</p> <p><u>Third-party</u>, 4 post, 19in, ANSI/EIA 310-D-1992 or IEC 60927 compliant cabinets that have 24"-36" mounting depth, 33mm front clearance (front rails to door), 800mm rear clearance (front rails to rear door) and M6, 10-32 or square hole mounting.</p> <p>Please note that not all 3rd party racks meet these parameters and are not compatible with these slide rail kits. Also, some third-party rack vendors do not support a completely filled rack with this type of server, due to the amount of power required.</p>
Rackmount Kit	<p>StorageTek 5220 NAS System Head: Included with ST5220 NAS server</p> <p>StorageTek 5220 RAID Controller Unit: XTACSM2-RK-3RU-19U</p> <p>StorageTek 5220 Expansion Unit: XTACSM2-RK-3RU-19U</p>
Power cords	Power cord appropriate for installation requirements to be ordered as an x-option.

Ordering information

Ordering Notes

Follow the order-flow diagram below to properly configure the StorageTek 5220 appliance

- All Sun StorageTek 5000 NAS systems ship with documentation on CD. There is no hardcopy documentation with the exception of the “Quick Start Guide” and the “Safety and Compliance Guide”.
- The StorageTek 5220 NAS appliance supports one 5220 RAID Controller Unit and up to two 5220 expansion units.
- The Sun StorageTek 5000 NAS products ship with dual power supplies standard. Appropriate power cords must be ordered.
- The Sun StorageTek 5220 NAS head ship with rail kits. The Sun StorageTek 5220 RAID and Disk expansion units do not ship with rail kits, those are to be ordered separately:
 - XTACSM2-RK-3RU-19U for the Sun StorageTek 5220 RAID Controller Unit and StorageTek 5220 Expansion Unit
- Sun StorageTek File Replicator Software is available for StorageTek 5220 NAS. At least two Sun StorageTek 5220 NAS Systems are require to implement data replication, and each server must have its own File Replicator license. See the Q&A section for more detail.
- Compliance Archiving Software license is available, One lincese per StorageTek 5220 appliance is required.

Sun StorageTek 5220 NAS Ordering Flow Chart

Each step represents a line item on a Sales Order

Step 1 – required

Base NAS server



Order Qty 1:

XTB5220HR10A1-Z - ST5220 NAS,1 FC HBA,RR

Step 2 – required

Storage

The 5220 supports one RAID controller and up to two expansion units.



Maximum one (1) RAID controller unit is supported.

XTB5220HR11A1SB20Z -ST5220-RAID,2.0TB-S,8x250-RR
XTB5220HR11A1SB40Z -ST5220-RAID,4.0TB-S,16x250-RR
XTB5220HR11A1SC40Z -ST5220-RAID,4.0TB-S,8x500-RR
XTB5220HR11A1SC80Z -ST5220-RAID,8.0TB-S,16x500-RR

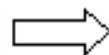
Maximum of 2 expansion units per RAID controller unit.

XTB5220HR01A0SB20Z -ST5220-EU,2.0TB-S,8x250-RR
XTB5220HR01A0SB40Z -ST5220-EU,4.0TB-S,16x250-RR
XTB5220HR01A0SC40Z -ST5220-EU,4.0TB-S,8x500-RR
XTB5220HR01A0SC80Z -ST5220-EU,8.0TB-S,16x500-RR

Step 3 – Optional

Rackmounting Kits

The RAID CU and expansion units require a rackmounting kit. The StorageTek 5220 NAS Server ships with a rackmounting kit.



Order qty 1 for each 5220 RAID CU and Disk EU:

XTACSM2-RK-3RU-19U - Sun CSM200 - 3U Rack Kit, X

Step 4 – Required

Power Cords

Order 2 power cords for each ST5220 NAS server and 2 for each 5220 RAID CU or Expansion Unit. Following are two cable options (refer to your country requirements for the specific power cable part number):



Order:

X311L - NORTH AMERICAN/ASIA PWR CRD KT
X320A - No. Amer./Asia 220V Pwr Cord Kit

Step 5 – Optional

Additional Network or SCSI port
The 5220 has one available PCI slot for expansion, and only one of the following three options can be installed.



Order Qty 1:
XTA5000-NF2-1G-Z -2-port MMF (Optical) Gigabit NIC
XTA5000-NC2-1G-Z -2-port 10/100/1000 NIC
SGXPCH1SCSILM320-Z - PCI Single Ultra320 SCSI HBA

Step 6 – Optional

Data Services



Compliance Archiving Software.
Order Qty 1
SEC3C-LCO-W929 - ST5200 Compliance Archiving SW Lic

File Replicator Software
Order Qty 1:
SFR39-LCO-W929 – ST5200 File Replicator SW License
SFR39-LCO-WD29 – ST5200 File Replicator SW License-Eval

Sun StorageTek 5000 NAS Part Numbers

<i>Description</i>	<i>Order Number</i>
Sun StorageTek 5220 Network Attached Storage Appliance: Rack Ready, 2.20GHz CPU, 2GB Memory, 4*10/100/1000 Ethernet Ports, 1*2-port 2Gb/s FC HBA, 2*2m fiber optic cables, 4*6m RJ45-RJ45 cables, 2 AC Power Supplies; (Standard Configuration); RoHS-5 compliant	XTB5220HR10A1-Z ^(1, 4)
Sun StorageTek 5220 RAID Controller Unit, Simplex, Rack-Ready, 2.0TB, 8 * 250GB 7.2Krpm SATA Drives, 1 * 1GB-cache FC RAID Controllers, 2 * redundant power supplies, 2 * redundant cooling fans, 1 * copper FC ports for expansion units, (Standard Configuration); RoHS-5 compliant	XTB5220HR11A1SB20Z ^(2,3,5)
Sun StorageTek 5220 RAID Controller Unit, Simplex, Rack-Ready, 4.0TB, 16 * 250GB 7.2Krpm SATA Drives, 1 * 1GB-cache FC RAID Controllers, 2 * redundant power supplies, 2 * redundant cooling fans, 1 * copper FC ports for expansion units, (Standard Configuration); RoHS-5 compliant	XTB5220HR11A1SB40Z ^(2,3)
Sun StorageTek 5220 RAID Controller Unit, Simplex, Rack-Ready, 4.0TB, 8 * 500GB 7.2Krpm SATA Drives, 1 * 1GB-cache FC RAID Controllers, 2 * redundant power supplies, 2 * redundant cooling fans, 1 * copper FC ports for expansion units, (Standard Configuration); RoHS-5 compliant	XTB5220HR11A1SC40Z ^(2,3,5)
Sun StorageTek 5220 RAID Controller Unit, Simplex, Rack-Ready, 8.0TB, 16 * 500GB 7.2Krpm SATA Drives, 1 * 1GB-cache FC RAID Controllers, 2 * redundant power supplies, 2 * redundant cooling fans, 1 * copper FC ports for expansion units, (Standard Configuration); RoHS-5 compliant	XTB5220HR11A1SC80Z ^(2,3)
Sun StorageTek 5220 Expansion Unit, Simplex: Rack-Ready, 2.0TB, 8 * 250GB 7.2Krpm SATA drives, 1*FC I/O Modules, 2 redundant power supplies, 2 redundant cooling fans, 1* copper FC ports (for expansion trays), 1*2m copper cables; (Standard configuration); RoHS-5 compliant	XTB5220HR01A0SB20Z ^(3, 5)
Sun StorageTek 5220 Expansion Unit, Simplex: Rack-Ready, 4.0TB, 16 * 250GB 7.2Krpm SATA drives, 1*FC I/O Modules, 2 redundant power supplies, 2 redundant cooling fans, 1* copper FC ports (for expansion trays), 1*2m copper cables; (Standard configuration); RoHS-5 compliant	XTB5220HR01A0SB40Z ⁽⁵⁾
Sun StorageTek 5220 Expansion Unit, Simplex: Rack-Ready, 4.0TB, 8 * 500GB 7.2Krpm SATA drives, 1*FC I/O Modules, 2 redundant power supplies, 2 redundant cooling fans, 1* copper FC ports (for expansion trays), 1*2m copper cables; (Standard configuration); RoHS-5 compliant	XTB5220HR01A0SC40Z ^(3,5)
Sun StorageTek 5220 Expansion Unit, Simplex: Rack-Ready, 8.0TB, 16 * 500GB 7.2Krpm SATA drives, 1*FC I/O Modules, 2 redundant power supplies, 2 redundant cooling fans, 1* copper FC ports (for expansion trays), 1*2m copper cables; (Standard configuration); RoHS-5 compliant	XTB5220HR01A0SC80Z ⁽⁵⁾
Sun StorageTek 5000 NAS SATADrives, to upgrade existing 5000 RAID CU or Expansion Unit, 2.0TB, 8x250GB 7.2Krpm SATA HDD; X option; RoHS-6 compliant	XTB5000S8-250G7KZ ⁽⁵⁾
Sun StorageTek 5000 NAS SATADrives, to upgrade existing 5000 RAID CU or Expansion Unit, 2.0TB, 8x500GB 7.2Krpm SATA HDD; X option; RoHS-6 compliant	XTB5000S8-500G7K-Z ⁽⁵⁾

Footnotes:

1. ST5220 NAS server supports one 5220 RAID controller unit.
2. ST5220 RAID controller unit supports up to 2 expansion units, for a total of 48 drives.
3. For rack-mounting kit, order qty:1 XTACSM2-RK-3RU-19U per 5220 RAID controller or expansion unit.
4. Rack-mounting kit is included with the ST5220 NAS servers. Does not require to be ordered separately. A rack-mounting kit must be purchased for the ST5220 RAID controller unit and Expansion unit.
5. To upgrade an existing 8-drive RAID or expansion unit, purchase available 8-drive packs.

Sun StorageTek 5220 NAS Options

<i>Description</i>	<i>Order Number</i>
Dual-port Gigabit MMF (Optical) Network Interface Card, for ST5000 NAS; 2*2M LC-LC optical cables,, RoHS-5 compliant	XTA5000-NF2-1G-Z ⁽¹⁾
Dual-port Gigabit Copper 10/100/1000 Network Interface Card, for ST5000 NAS; 2*6m RJ45-RJ45 cables, RoHS-5 compliant	XTA5000-NC2-1G-Z ⁽¹⁾
Xoption, Sun StorEdge PCI Single Channel, Ultra320 SCSI Host Adapter, Low Profile, includes standard and low profile brackets RoHS6 compliant	SGXPCI1SCSILM320-Z ^(1,2)
Sun StorageTek Compliance Archiving Software License for ST5200 NAS Appliance.	SEC3C-LCO-W929 ⁽³⁾
Sun StorageTek File Replicator Software License for ST5200 NAS Appliance.	SFR39-LCO-W929 ⁽⁴⁾
Sun StorageTek File Replicator Software EVALUATION License for ST5200 NAS Appliance.	SFR39-LCO-WD29 ⁽⁴⁾

Footnotes:

1. Only one additional expansion card can be installed in the ST5220 NAS appliance. Select from either a dual-port NIC (XTA5000-NF2-1G-Z or XTA5000-NC2-1G-Z), or the SCSI HBA (SGXPCI1SCSILM320-Z) for tape backup.
2. ST5220 supports NDMP tape backup either through the available standard Fibre Channel port or through the optional single-port SCSI HBA.
3. StorageTek Compliance Archiving SW license requires qty:1 for ST5220 NAS
4. StorageTek File Replicator SW license requires qty:1 for ST5220 NAS. 90-day Evaluation license available.

Warranty, Service and Support

Warranty

The Sun StorageTek 5220 NAS Appliance comes with a three year warranty. Year one provides next business day on-site support and year two and three Return to Sun.

Sun Spectrum Instant Upgrades

Warranty coverage can be upgraded to standard Silver, Gold, 7x24 Gold or Platinum coverage utilizing Sun Spectrum Instant Upgrades. Sun Spectrum Instant Upgrades allow you to obtain the coverage that best supports your business environment through a variety of service levels including phone and on-site response times, escalation options, event monitoring, account management and skills assessments. Sun Spectrum Instant Upgrades also allow you to maintain consistent support levels in your IT environment with the ability to maintain all your Sun products at the same service level.

Enterprise Installation Service

Installation and configuration of the Sun StorageTek 5220 including installation planning, site audit, acceptance testing and system turnover. The scope of the installation is expected to get the StorageTek 520 NAS to a basic level of functionality including:

- Planning the Installation
- Installing the StorageTek 5220 NAS and ST5220 Storage Expansion Unit
- Powering on the System Locally
- Connecting the Grounding Cable
- Connecting the Power Cables
- Establishing a Serial Connection
- Establishing Initial Configuration for one LUN
- Setting and Verifying Default Configuration

Knowledge Services

EA-111 Sun Spectrum Education Account.

Help your customers stay ahead of constantly changing technologies by investing in their enterprise's most important asset – people. Thousands of students each year are trained by Sun and its authorized centers through Web-based courses and at training sites located in more than 60 countries. Sun Education's historical business manages a portfolio of IT curriculum focused on Sun technology sold and delivered to Sun external audiences in classroom, CD-ROM, and web formats.

Professional Services

Storage Migration Service - This service can help customers safely transfer data from one storage system to another storage system, without pulling their internal resources from other critical business tasks. Sun Services can offer multiple levels of consulting services to ensure a smooth data migration from the existing storage to the StorageTek 5220. Sun Services offers a wide range of data management and migration services to accommodate most customer environments and circumstances. Contact local Sun Services for further details and quotation for the specific customer environment.

External - <http://www.sun.com/service/storage/>

Internal -

<http://mymarketing.central.sun.com:81/NASApp/myMarketing/Portal/NonLeaf?FunctionalCatId=1656&CategoryId=2916>

Glossary

1U	One rack unit as defined by the Electronic Industries Alliances (EIA). A vertical measurement equal to 1.75 inches.
2U	Two rack units; a vertical measurement equal to 3.5 inches.
AC	Alternating Current.
Access Control	Limits user access to resources on a computer network, most commonly by requiring a user name and password. Usually a single logon is sufficient to authenticate, or verify, a user.
Access Rights	Permissions granted to user accounts to allow access to such system resources as filesystems, applications, and directories. For example, read-only access allows a user to open or list a file without being able to make changes to the file. Users who are granted access rights to a directory usually have the same access rights to all subdirectories.
AD	Short for Active Directory Service. AD is a Windows 2000 namespace that is integrated with the Domain Name System (DNS). AD stores domain information such as users, groups, and shared resources and makes that information available to Active Directory clients.
Alias IP Address	Multiple IP addresses assigned to a single port, in addition to the primary IP address. All IP aliases for a port must be on the same physical network and share the same netmask and broadcast address as the first or primary IP address.
Authentication	The process of validating that the user attempting to logon is truly the owner of the account.
Autohome Shares	Temporary SMB/CIFS shares that are created when a user logs on to the system and removed when the user logs off.
Block or Block Size	Also known as stripe unit size, block size is often used to describe the amount of data sent or received by the host per I/O operation. Also used to describe the size of an atomic read/write operation to/from a disk as well as the size of the data unit being "striped" across disks.
Boot Up	The process of starting a computer. Booting up involves checking all hardware components, initializing system components, and loading the operating system.
Browser	Software used for access to information on the World Wide Web. Microsoft Internet Explorer and Netscape Navigator are examples of browsers. See also Web Browser.
Cache	Cache is the DRAM based staging area used to provide higher performance to applications for reads and writes. During reads, the RAID controller tries to keep the latest and most often accessed data in the cache and also tries to pre-stage the cache with future data during sequential accesses. For writes, cache is used to provide delayed writes to the drives. This delays the parity calculations and drive writes during RAID 5 operations. More optimization and advanced staging algorithms thus provide better performance.
Checkpoint	A point-in-time image of a StorageTek NAS filesystem taken at the volume level. While the active file volume can be modified with read/write operations, a virtual volume produced at the time of checkpoint creation remains available in a static, read-only state.
CIFS	Stands for Common Internet File System. An enhanced version of the SMB file-sharing protocol that allows groups of users to work together and share documents over the Internet in the same way as in local area networks.
Density	Number of units in a given amount of space.
DHCP	Stands for Dynamic Host Configuration Protocol. DHCP provides a mechanism by which a computer can acquire an IP address automatically when it connects to the network. DHCP allows more flexible and efficient use of network resources than static IP addresses.
DNS	Short for Domain Name System. A network service that translates domain names into IP addresses. If you have multiple DNS servers on your network, and one DNS server can't resolve host names, it asks another one, and so on, until the IP address is found. See also Domain Name System.

Domain	A group of computers and devices on a network that are administered as a unit with common rules and procedures.
Domain Name	A name that identifies a domain. See also Domain. The domain name can be the company name, division name, facility name, department name, or other descriptive name.
Domain Name System	The network server that maintains the list of all host names in a domain. StorageTek NAS OS uses the name server to translate domain names to the corresponding IP address. See also DNS.
DTQ	Stands for Directory Tree Quota. A directory tree quota is a quota, or limit, to the space or the number of files that a directory tree (a directory and its subdirectories) can occupy.
Ecache	External cache. Memory cache external to the CPU chip, also referred to as L2 cache.
ECC	Error Correcting Code. A type of memory that corrects errors on the fly.
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.
Ethernet	A network communication system developed and standardized by DEC, Intel, and Xerox using baseband transmission, CSMA/CD access, logical bus topology, and coaxial cable. The successor IEEE 802.3 standard provides for integration into the OSI model and extends the physical layer and media with repeaters and implementations that operate on fiber optics, broadband, and unshielded twisted pair.
Ethernet 10/100/1000BaseT	The most widely used LAN access method defined by the IEEE 802.3 standard; uses standard RJ-45 connectors and telephone wire. 100BaseT is also referred to as Fast Ethernet. 1000BaseT is also referred to as Gigabit Ethernet.
Field Replaceable Unit	A component which can be removed and replaced during service in the field.
File Sharing	A feature that allows users of networked computers to make files available to other users.
File Volume	Filesystems created from partitions that have available space. If the file volume does not use up all the available space in a partition, the remaining space is automatically allocated into the next partition. See also Partition.
File Volume Extension	See Segment.
Filer	A Network Attached Storage device focused solely on file service and file storage
FRU	Field Replaceable Unit.
FTP	File Transfer Protocol. A client-server protocol which allows a user on one computer to transfer files to and from another computer over a TCP/IP network. Also the client program the user executes to transfer files. It is defined in STD 9, RFC 959.
General-purpose Server	A server designed to perform any type(s) of function(s). General-purpose servers typically require skilled IT professionals and system administrators to maintain them.
Gigabit Ethernet	An Ethernet standard that enables data transfer rates of up to 1 Gbps running over copper or optical fiber cable.
GUI	Stands for Graphical User Interface. A GUI uses graphical elements to present information to a computer user rather than the traditional text-only command line interface still found in telnet and similar implementations.
HBA	Host bus adapter.
Host ID	The unique identifier assigned to the host computer.
Hot-spare	A drive used by the RAID controller to replace a failed drive. Hot-spares are continuously powered up and spinning, but are not actually part of the array because they contain no data. This allows the array processor to have immediate access to a functioning drive for possible reconstruction of lost data when a disk fails.
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 automatically recognizes the component change and configures itself as necessary.
HTTP	Stands for Hyper-text Transmission Protocol. A protocol for exchanging HTML pages and forms.
I/O	Input/output. Transferring data between the CPU and any peripherals.

IP Address	A unique 32-bit value that identifies network hosts using TCP/IP. An IP address, or a block of addresses, is assigned upon application to organizations responsible for that function. No two network hosts can be assigned the same IP address. Each address consists of a network number, optional subnetwork number, and host number, written as four numbers separated by periods. Each number can be 0 to 255. See also <i>Address</i> and <i>URL</i> .
ISV	Independent software vendor.
Java	Java is a programming language developed by Sun Microsystems to be portable to any type of computing device. In practice, java allows web browsers to do much more than display information. Java scripts allow much more flexibility and functionality in web access and they run on virtually any type of computer.
Journaling File System	A fault-resilient filesystem in which data integrity is ensured because updates to directories and bitmaps are constantly written to a serial log on disk before the original disk log is updated. In the event of a system failure, a full journaling filesystem ensures that the data on the disk has been restored to its pre-crash configuration.
Kerberos Realm	A kerberos realm is a secured network requiring access through a key. (See also <i>KDC</i> .) Each system or user with a key can access any services or systems that the key opens. The user does not have to enter a user name and password each time he requests a controlled service.
L2 cache	See Ecache.
LAN	Stands for Local Area Network. A communications network that provides high-speed (over 1 Mbps) data transmission and is limited to a specific physical area (up to about six miles). The basic components of a LAN are: adapter boards installed in each computer to provide a cable connector, cabling, server hardware, and network management software.
LCD	Stands for Liquid Crystal Display. On the StorageTek NAS, the LCD is a two line display that shows basic information about system functions and, in conjunction with the control panel, allows you to perform certain system functions, like setting the IP address, directly on the unit, without access through the internet or intranet.
LED	Light emitting diode.
Login	Logging in is a security process designed to prevent access to system settings or other resources by those who should not have access. A login process usually requires a user name and password to verify, or authenticate, a user.
Master Domain Model	One of several types of domain models. In the Master Domain Model, an account domain is trusted by a resource domain.
Mirroring	Mirroring allows you to duplicate any or all of the file volumes of an active server onto a mirror server. In the event that the active server fails, the mirrored file volumes on the mirror server can be made available to network users within minutes.
MTBF	Mean Time Between Failures. The average time a component works without failure.
MTTR	Mean Time To Repair. The average time it takes to repair a component.
NetBIOS	NetBIOS is a protocol used for networking. NetBIOS was designed to support communications between symbolically named stations and the transfer of arbitrary data. NetBIOS manages the use of node names and transport layer connections for higher layer protocols such as SMB.
Network	A series of nodes such as terminals, computer systems, or other peripheral devices connected by a communications channel. See also LAN.
NIC	Stands for Network Interface Card. A NIC is an expansion card that provides access to a network.
NIS	Short for Network Information Service. Along with NFS, NIS provides a distributed database system to centralize (i.e., store one copy, on a single computer) common configuration files, such as the password file (<i>/etc/passwd</i>) and the hosts file (<i>/etc/hosts</i>).
NIS+	Short for Network Information Service Plus (NIS+). NIS+ was designed to replace NIS. NIS+ can provide limited support to NIS clients, but was mainly designed to address problems that NIS cannot address.

NTP	Stands for Network Time Protocol. NTP provides a mechanism for synchronizing the time among a number of computers connected to a network.
Packet	A piece of a message transmitted over a network. Contains the destination address in addition to the data. Once all packets arrive at the destination, they are recompiled into the original message.
Partition	Sections on a LUN. Each partition can either have some space allocated to it, or can be empty. When a LUN is first created, all of the available space is located in the first partition, while the other partitions are empty. Each partition can have only one volume.
Port Bonding	Otherwise known as “channel bonding.” Port bonding allows you to scale network I/O by joining ports. This forms a single network channel of high bandwidth from two or more channels of lower bandwidth.
Protocol	A set of standards or rules that enable computers to connect to one another and exchange data. Using a protocol helps reduce the possibility of errors during data transmission.
Quota	A restriction on disk space or the number of files written to file volumes in the StorageTek NAS. This limit can be determined for a user or group (user or group quota) or for a directory (directory tree quota).
RAID	Redundant array of independent disks. A set of disk drives which appears as a single logical disk drive to the filesystem. Different RAID levels provide different capacity, performance, availability, and cost characteristics.
RAID 0	RAID level 0, or striping without parity or mirroring protection. Data is distributed evenly at the block level among disks for performance. No redundancy is provided, and the loss of a single disk causes the loss of data on all disks. Use this level for high-speed streaming of large file reads (for example, video) of non-critical data which is easily available elsewhere within the organization.
RAID 10	Also known in the industry as RAID 0+1. Implements block interleave data striping and mirroring. RAID 10 is not formally recognized by the RAID Advisory Board (RAB), but, it is an industry standard term. In RAID 10, data is striped across multiple disk drives, and then those drives are mirrored to another set of drives. The performance of RAID 10 is approximately the same as RAID 0 for sequential I/Os. RAID 10 provides an enhanced feature for disk mirroring that stripes data and copies the data across all the drives of the array. The first stripe is the data stripe; the second stripe is the mirror (copy) of the first data stripe, but it is shifted over one drive. Because the data is mirrored, the capacity of the logical drive is 50 percent of the physical capacity of the hard disk drives in the array.
RAID 5	RAID level 5, or striping with distributed parity. Both data and parity are distributed evenly across all the disks in the array at the block level. No single disk can compromise the integrity of the data. RAID 5 balances the optimization of performance, reliability and cost. Use this level for most applications which do not require the special characteristics of the above RAID levels.
RAM	Random Access Memory.
RDATE	RDATE is a time synchronization method that simply asks another computer on the network what the correct time is and resets itself accordingly. RDATE is not particularly accurate, but is adequate for most networks.
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.
SCSI	Small Computer Systems Interface. Pronounced “scuzzy.” An ANSI standard for controlling peripheral devices by one or more host computers.
Segment	Segments are available space that can be “attached” to a volume when the volume reaches its assigned capacity. This increases the volume’s total capacity. The segment, after being attached, becomes part of the volume and cannot be removed. Otherwise known as volume extensions.

Server	A network host that makes network resources, such as software applications and databases on hard disk or CD-ROM, available to network users. The server provides the centralized, multi-user functionality of the network application, such as data management, information sharing, network administration, or security.
Server Name	Identifies a network server. Server names are used in addition to IP addresses. This allows a server to be advertised on a network with a recognizable name. For example, the first StorageTek NAS server on a network could be identified as cdts0, the second as cdts1, and the third as cdts2 or they could be identified as Fred, Barney, and Wilma.
Shutdown	The multi-user operating system resident on the StorageTek NAS server must be shut down in an orderly sequence prior to turning the power off. The shutdown sequence closes files and terminates running programs to prevent loss or corruption of data.
SMB	Stands for Server Message Block. A Microsoft-compatible network protocol for exchanging files. SMB is typically used by Windows for Workgroups, OS/2 Warp Connect, and DEC Pathworks. See also CIFS.
SMTP	SMTP (Simple Mail Transfer Protocol) is a TCP/IP protocol used in sending and receiving e-mail.
SNMP	Stands for Simple Network Management Protocol. SNMP is primarily used for network monitoring and notification of network errors and other events. In the StorageTek NAS, SNMP also provides notification services through e-mail messages.
TCP/IP	Stands for Transmission Control Protocol/Internet Protocol. A commonly used networking protocol that allows interconnection of different network operating systems.
Telnet	A terminal emulation program for TCP/IP networks. The Telnet program runs on your computer and connects your PC to the StorageTek NAS server on the network. You can then enter commands through the Telnet program and they run as if you were entering them directly on the server console.
Transfer Rate	The rate at which data is transferred, usually measured in megabytes per second (MB/sec.).
Ultra320 SCSI	A standard for SCSI data transfers. It allows a transfer rate of up to 320 Mbytes/sec over a 16-bit SCSI bus.
Unicode	Unicode is a standard for representing letters that allows the language of computer messages and commands to be displayed in a variety of languages without rewriting the underlying programs.
URL	Stands for Uniform Resource Locator. An address system used by servers and clients to request documents. See also IP Address.
User Credentials	The information containing the user, account data, and the user's group membership.
Volume	A volume is a virtual disk into which a filesystem, a DBMS, or an application can place data. A volume can be a single physical disk or a virtual disk mapped from one or more underlying extents. Applications that use volumes do not need to be aware of their underlying physical structure. Software handles the mapping of virtual partition addresses to physical addresses.
Web Browser	A web browser is a software application designed to search for and retrieve information from the Internet and the world-wide web.
WINS	Stands for Windows Internet Naming Service. A WINS server resolves NetBIOS names to IP addresses, allowing computers on a network to locate other NetBIOS devices more quickly and efficiently. WINS performs a similar function for Windows environments as DNS does for Unix environments.

Materials Abstract

Collateral	Description	Purpose	Distribution	SunWin Token #
References				
Sun StorageTek 5220 NAS, Just The Facts	Reference Guide (this document)	Training Sales Tool	SunWIN, Reseller Web	TBD
Sun StorageTek(TM) 5000 NAS - Sales Presentation, 04-23-2006	Sales/Training Presentation	Training Sales Tool	SunWIN, Reseller Web	473305
Sun StorageTek(TM) 5000 NAS - Technical Presentation, 04-23-2006	Technical Presentation	Training Sales Tool	SunWIN, Reseller Web	473307
Sun StorageTek(TM) NAS - Competitive Overview Presentation, 04-23-2006	Competitive Presentation	Training Sales Tool	SunWIN	473308
Sun StorageTek(TM) NAS - Application Solutions Presentation, 04-23-2006	Sales/Training Presentation	Training Sales Tool	SunWIN, Reseller Web	473309
Sun StorageTek 5220 NAS “What Works With What”	Compatibility/Support Guide	Training	SunWIN, Reseller Web	TBD
Sun StorageTek 5000 Beat Sheet	Competitive	Training Sales Tool	Sun WIN	432664
Guide to Selling the StorageTek 5000 family of NAS Appliances	Competitive	Training Sales Tool	SunWin Reseller Web	469405
Product Literature				
Sun StorageTek 5220 NAS Data Sheet	Data Sheet	Sales Tool	SunWIN, Reseller Web	TBD
Sun StorageTek 5000 File Replicator Data Sheet	Data Sheet	Sales Tool	SunWIN, Reseller Web	443728
Sun StorageTek 5000 Compliance Archiving Software Data Sheet	Data Sheet	Sales Tool	SunWIN, Reseller Web	425962
Sun StorageTek 5000 NAS OS Data Sheet	Data Sheet	Sales Tool	SunWIN, Reseller Web	460307
External Web Site				
Sun Storagetek 5220 NAS Web Site				

Collateral	Description	Purpose	Distribution	SunWin Token #
	http://www.sun.com/storagetek/nas/5220/index.xml			
Warranty terms, SunSpectrum, Installation, Software Support and Implementation information	http://www.sun.com/service/warrantiescontracts			
User Guides	http://www.sun.com/products-n-solutions/hardware/docs/Network_Storage_Solutions/nas/5220/index.html			
Internal Web Site				
Sun StorageTek 5220 NAS Internal Site	http://dmgsalescommunity.stortek.com/Sales/default.aspx , click on "Product & Solutions" and then select "NAS"			
Sun StorageTek NAS PTS Internal Site	http://pts-storage.west/products/SE5210/index.html			
Partner Web Site				
Sun StorageTek NAS Partner Site	http://mysun.sun.com/portal/dt and select the ShareSpace tab andn then select "NAS and Storage Software". Must register prior to this.			
Sun StorageTek NAS Sharespace	http://sharespace.sun.com/gm/folder-1.11.62027			

Q & A

- Q. Where have NAS devices been deployed most effectively -- in terms of best applications and size of IT environment or company?
 - **Answer:** NAS has been predominantly deployed in departmental or workgroup environments. Probably greater than 90% of NAS devices are in these environments. The size of company isn't the issue - it's the application or work environment that dictates what is deployed. Development (engineering CAD or programming) was one of the first big users of NAS. Now we're seeing departments in companies using NAS even if they have a central IT organization. Remote offices such as insurance agents have also been a success story for NAS.

- Q. What are NAS "heads" or "gateways"?

- **Answer:** Gateways are the NAS controller function (head) without the storage. All NAS resolves down to block storage and most use direct-attached storage (DAS). A NAS Gateway uses the storage in a SAN rather than direct-attached for the block I/O to be done.

- Q. Does the StorageTek 5000 NAS support DFS?

Answer: DFS (distributed file system) is a hierarchical file system that allows files to be stored across multiple servers and managed as a single group. The StorageTek 5000 NAS can serve as a DFS target. This means that DFS referrals can redirect clients to the StorageTek 5000 NAS, but the StorageTek 5000 NAS does not provide referrals and cannot be configured as a root replica.

- Q. What is "port aggregation"?

Answer: Port aggregation gives you the flexibility to scale your network I/O in port aggregation or to provide NIC port redundancy in high availability.

Port Aggregation is also known as "channel bonding" or "trunking." This type of bonding lets you scale network I/O by joining adjacent NIC ports. It forms a single network channel of high bandwidth from two or more channels of lower bandwidth. You must have a minimum of two available NIC ports for port bonding, and they must be of the same interface type (e.g., Fast Ethernet with Fast Ethernet).

High Availability port bonding provides NIC port redundancy or failover. More than one NIC port is bonded to a primary port as backup ports. If the primary port fails, the StorEdge switches over to the backup port that is first on the list of "high availability" bonded ports. If that port also fails, the port next on the list is used and so on.

- Q. Can more than one default gateway be set?

Answer: No. The default gateway is the gateway used when a TCP/IP client needs to send data to a network which it does not have a specific route to. After checking the destination network against the routing table and finding no match, the data is sent to the default gateway. There is no provision within TCP/IP to choose between default gateways.

Some operating systems allow the administrator to configure a second default gateway to be used in the case of failure of the primary default gateway. StorageTek 5000 NAS does not currently support this feature.

Q. How many Sun StorageTek 5220 RAID CUs and 5220 EU's may be attached to the Sun StorageTek 5220 NAS Appliance?

Answer: Only a single Sun StorageTek 5220 RAID CU may be attached to the Sun StorageTek 5220 NAS Appliance.

Q. Are other arrays supported with the StorageTek 5220 NAS Appliance?

Answer: Currently, only the Sun StorageTek 5220 RAID CU and Sun StorageTek 5220 EU are supported for attachment & capacity expansion on the Sun StorageTek 5220 NAS appliance.

Q. Are the Sun StorageTek 5220 RAID CU and Sun StorageTek 5220 EU F the same as the StorageTek 6140 and the CSM1200?

Answer: No. The Sun StorageTek 5220 Expansion Units are based on the same technology as the StorageTek 6140 and the CSM200 and have been optimized for connection to the StorageTek 5220 NAS Appliance. The firmware has been slightly changed and the Sun StorageTek 5220 RAID CU is configured in Simplex mode.

Q. Are rackmount kits included with the Sun StorageTek 5220 NAS Appliance and Sun StorageTek 5220 RAID CU and Sun StorageTek 5220 EU?

Answer: Rackmount kits are included with the StorageTek 5220 NAS. For the StorageTek 5220 RAID EU and StorageTek 5220 Disk EU.

Q. What configurations are the Sun StorageTek 5220 RAID CU and Sun StorageTek 5220 EU shipped in?

Answer: The Sun StorageTek 5220 RAID CU and 5220 EU are shipped in 16 drive configurations. EU's are configured as specified in Tabl4 on Page 10 of this document.

Q. Can the Sun StorageTek 5220 RAID CU and 5220 EU be attached to hosts other than the Sun StorageTek 5220 NAS Appliance?

Answer: No. Attaching the Sun StorageTek 5220 RAID CU and 5220 EU to hosts other than a Sun StorageTek 5220 NAS Appliance is not supported and may void the warranty.

Q. What is StorageTek File Replicator?

Answer: StorageTek File Replicator is an available software option that allows a StorageTek NAS Appliance volume to be replicated on another remote StorageTek NAS Appliance.

Q. Why do I need StorageTek File Replicator?

Answer: Anyone that needs to have an online copy of data available at all times can benefit from StorageTek File Replicator. It can be used to simplify the following data administration tasks:

*Disaster Recovery

*Backup

Q. How does StorageTek File Replicator work?

Answer: Any update (disk write) made on the source volume is automatically duplicated on the target volume on another StorageTek NAS Appliance using an interconnecting network that is responsible for propagating the data between the nodes. The target StorageTek NAS Appliance can be in the same room as the source, or on the other side of the world, as long as the interconnecting network has sufficient bandwidth to carry the data across.

Q. How does the data move from the source StorageTek NAS Appliance to the target StorageTek NAS Appliance?

Answer: All communications between the data source and target utilize the TCP/IP protocol, so the target may be located on any reachable subnet. There has to be a reliable and persistent interconnection to ensure that data is always moving.

Q. How would one use StorageTek File Replicator?

Answer: StorageTek File Replicator can be used to help address many data management challenges facing IT professionals today:

***Disaster Recovery**

Without a reliance on slow tape media, StorageTek File Replicator helps to relieve the need for lengthy tape restores. StorageTek File Replicator enhances recovery time in case of a complete loss of data, as businesses can now access mission-critical data from an online backup on a mirror filer. With StorageTek File Replicator properly configured, the target, or mirror, is assured to be an accurate, near real-time representation of the offline source filer. The StorageTek NAS Appliance target file volume can be brought online quickly to help enable uninterrupted operations.

***Backup**

A StorageTek File Replicator target volume may be dedicated for backing up source volumes. Without affecting production operations, replicated data can be backed up on the target: StorageTek File Replicator enhances operations by moving backup I/O to the remote volume. This shadow processing capability reduces CPU load on the production filer, streamlining operations.

Q. Does StorageTek File Replicator mirror entire files?

Answer: No. With StorageTek File Replicator, data replication is performed at the block level of files. This means that individual blocks that compose a file are sent over the network.

This block-level implementation dramatically reduces the required bandwidth on the interconnecting network by transmitting only the data blocks that have changed. For example, if only a single 4 KB block of a multi-megabyte (MB) file is updated, only that 4 KB block is transferred, not the entire file. As a result, StorageTek File Replicator efficiently utilizes StorageTek NAS Appliance resources and available network bandwidth

Q. Can StorageTek File Replicator software be used to replicate between Sun StorageTek 5210, 5310, 5220 and StorageTek 5320 NAS Appliances?

Answer: Yes. StorageTek File Replicator may be used to replicate data from a Sun StorageTek , 5210, 5220 or 5310 NAS Appliance to a Sun StorageTek 5320 NAS Appliance (or vice versa). Both NAS Appliances must be using the same level of operating system.

Q. When does the eval period begin with the StorageTek File Replicator evaluation licenses?

Answer: The 90-day evaluation period begins on the day the customer faxes their license card information to Sun's Licensing Center for their enablement key.

Q. May CIFS and NFS clients share the same file system at the same time?

Answer: Yes, you may access the same file system using both CIFS and NFS. It works as you would expect; files created by e.g. Windows users may be read or modified by Unix users, etc.

As with other multiprotocol NAS servers, there are some initial configuration questions that the administrator needs to answer to allow the system to relate access rights in one domain to user credentials in the other (is a Windows Admin the same as Unix 'root'? What [uid, gid] corresponds to \\ENG-DOMAIN\MERHAR?)

Also, there is no need to purchase additional license for heterogeneous environments. The StorageTek NAS Appliances come with both CIFS and NFS support as a standard feature.

Q. Does StorADE support the StorageTek 5000 NAS Appliances?

Answer: The StorageTek 5220 is a self-contained NAS Appliance, of which the Sun StorageTek™ RAID CU in Simplex Mode, is one component. All event logging for all subsystems in the NAS Appliance, including the storage, is maintained in a single system log. All external event notifications such as e-mail alerts and SNMP traps, are generated by the StorageTek 5220, including events it detects within its storage subsystem.

Please note that StorADE does support collection and integration of StorageTek 5000 NAS alerts and events. Customers not already using StorADE may choose to handle notifications directly, for example by directing e-mail alerts to their IT response team.

Q. Does the StorageTek 5000 NAS Appliance support HTTP WEB DAV?

Answer: This is asking for Distributed Authoring for web pages, a feature not currently supported. The web server embedded in the StorageTek 5000 NAS products is there for administration purposes only, and not exposed as a general purpose web server.

Q. Is StorageTek 5000 NAS a good fit in an "Exchange" environment?

Answer: Yes, but only using the iSCSI feature now available in NAS OS 4.11.. In order to support MS Exchange, or SQL, one needs block level access.

Q. Is Symantec the only Anti-Virus Vendor that is certified?

Answer: No. CA eTrust AntiVirus engine is now supported.

Q. Does the StorageTek 5000 NAS clean all files stored on the NAS Storage ?

Answer: The StorageTek 5000 NAS utilizes Symantec Anti-Virus for Network Attached Storage . The NAS OS detects whether a file needs to be scanned and automatically invokes the external AV Server, which must be purchased separately by the customer, to scan and if necessary clean the file. Note, that only CIFS/SMB (MS/Windows) originated files are supported with this release of the AV capability.

Q. Does the StorageTek5220 support Compliance?

Answer: With this release of the NAS OS, the ST5220 supports both Mandatory as well as Advisory Compliance Enforcement. Although the ST5220 supports Mandatory Compliance Enforcement, it is recommended that the StorageTek 5320 NAS Appliance be used in strict compliance environments.

Q. What do we support with the StorageTek 5000 NAS iSCSI target?

Answer: The StorageTek 5000 NAS have passed the Microsoft WHQL (Windows Hardware Qualification Lab) testing standards and now provide iSCSI target support for the Microsoft Software iSCSI initiator V2.0. Note, that Cluster Failover, Linux and Solaris iSCSI initiator support will be released in the near future.

Q. What is Advisory Compliance Enforcement -vs- Mandatory Compliance Enforcement?

Answer: Advisory enforcement is a less stringent capability of the StorageTek Compliance Archiving Software compliance environment for business governance. It allows the customer to shorten as well as lengthen retention periods, remove WORM files and directories as well as advisory compliance volumes and restore WORM files from a Checkpoint(snapshot).

Q. What is CIFS Authenticated IPC ?

Answer: This allows the customer to operate at a higher level of security with the StorageTek 5000 NAS. IPC capability allows the exchange of data between the StorageTek 5000 NAS and other key servers in the customer's infrastructure such as the Primary Domain Controller, Active Directory Server and the Anti-Virus Server. Previous to this release, the StorageTek 5000 NAS exchanged data as an anonymous server which forced the customer to operate at a lower security level. With this release, the StorageTek 5000 NAS can authenticate with these servers prior to exchanging data with them. This gives the customer the flexibility to operate at a higher level of security.

Q. What are the software licensing requirements for iSCSI and Anti-Virus ?

Answer: There are no additional licenses or costs required for the StorageTek 5000 NAS to enable iSCSI or Anti-Virus. This continues our strategy of bundling feature and functionality into our NAS solution while keeping the customer's cost well below the competition.

Q. What is the external AV Server?

Answer: The external AV server is a Windows-based platform that runs the Symantec Anti-Virus Engine.

Q. What is Acopia ?

Answer: The S StorageTek 5000 NAS is now certified with the Acopia ARX product application. Certification with the 53210C and Gateway products are ongoing and no significant issues are

expected. Acopia is a third party application that allows storage managers to non-disruptively add capacity, consolidate servers, and migrate file data across systems without affecting user access to data or requiring client reconfiguration. In addition, Acopia's Global Presentation Namespace allows for an enterprise-wide unified view of file storage resources.

Q. In the Compliance Audit feature can an "audited delete" be accomplished ? This feature is required in some countries for privacy reasons where a WORM-protected file must be removed immediately from storage.

Answer: Yes, but only on "advisory enforcement" volumes. To accomplish a deletion the retention period is reduced so that it expires and the file can be removed. Mandatory enforcement does not offer this capability since it is designed for the most stringent environments where early removal of files could break business or regulatory rules.