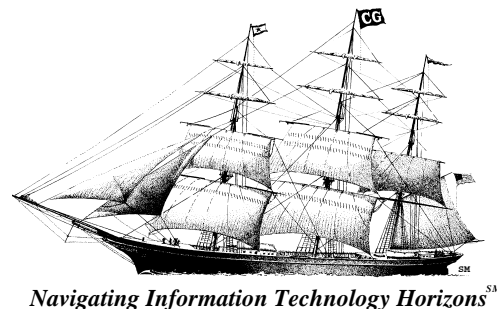


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Sun Pushes The Dimensions of Storage

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Management Summary

Managing what you've got is important; managing what you do with it is critical. Capacity, its management, and related costs are relatively easy to quantify for storage. However, **managing data to meet the needs of the enterprise matters most.** This task is seldom simple. The size of a company, or its revenue (and pocketbook), are not necessarily echoed by the size of its data structure and data management needs. The nature of the business, its evolutionary history, and the shape and extent of supplier and distribution channels influence more how data is used. Horizontally-organized enterprises have different needs than those which are vertically-integrated and often convoluted. While all shapes and sizes of enterprise need easy resource provisioning, protection, and data sharing, none need all these functionalities for all of their data, everywhere, all of the time. Not everything needs to be mirrored, or to be replicated to other locations. Many files do not have to be accessed by multiple users. Yet these methods bring real business value to the enterprise. File sharing, for instance, streamlines business processes. Many enterprises want storage products with a range of capabilities to match the resource with the requirement. Selling storage into today's data-glutted environments is different from the days of direct attach storage, when the array was sized to the server to which it was attached. The old categories of "enterprise," "mid-tier," and "entry level" have been useful for assessing markets, and are traditional for describing the size of an array, but do not always map well to where those arrays are sold.

In building out its storage portfolio with software, services and new mid-range hardware, Sun Microsystems offers enterprises a range of functionality. The new mid-range system has a service processor for call home and management functionality. The unit comes as direct-attached (the 3900) or enhanced with virtualization engines and higher LUN capacity (the 6900), targeted at storage consolidation. Sun's new software capabilities in storage resource management deliver essential functionality for a networked environment. The file systems give new capabilities: SAM-FS to evoke and manage an entire hierarchical storage environment, and QFS to optimize data access performance by file size, initially targeted at the very large files used by industries such as energy and biotechnology. New service offerings support these new capabilities. **Together, the products give Sun storage the ability to offer building blocks of different functional shapes as well as of different capacities.**

Sun defines this offering as the *Storage One* concept, to go along with last year's *Sun One* (infrastructure) and a new network concept called *NI* (more on *NI* on page 2). Because of its functional depth, *Storage One* is more than just a blob in the quadrant of a two-dimensional diagram. Sun offered the same kind of variability for its servers when it introduced the Uniboard, with a variable mix of memory and processors, at the end of 2001. *Storage One's* functional scalability, added to the concepts of *H1* (horizontal scalability) and *V1* (vertical scalability), gives Sun's vision of the network the third dimension it needs to lift it off the page and make Sun's enterprise product offerings more comprehensive and compelling. For more details, read on.

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The Sun Vision

Sun has built out its vision of the network as the computer by introducing the concept of *NI*, a higher-order operating system (modeled or evolved from Solaris) that would exist in addition to traditional network management. Traditional network management ensures that the network is entire, unimpeded, and secure by means of device recognition and monitoring, security, and traffic management. Sun sees *NI* as a process management super-cop to manage the applications' use of the network's resources. Within the Sun *NI* concept, storage can be considered as cache.¹ More significantly, it can be managed as cache, which will cast Sun's storage offerings as hierarchical storage².

The StorEdge Story

From the *T3* workgroup product up through the classic advanced functionality and manageability of the *9900*, Sun's storage products are targeted at the functional requirements of enterprise applications and users, not just at providing sufficiently granular units for acquisition. All hardware comes with "Floor Tile Ready" pre-testing to facilitate rapid deployment.

The New StorEdge 3900 and 6900

Sun's new storage products use its own *T3* array as a component and add an out-of-band storage service processor for monitoring, configuration and call-home. These products fill the space between the *9900* on the high end and the *T3* on the low end.

The new *3900* and *6900* systems support Sun and Veritas Clustering products. Both systems have internal, embedded Sun switches. Brocade switches are available, through professional services, for those enterprises requiring them for interoperability. Capacity on the new products runs from just over half a terabyte to over 10 TB (raw capacity). Customers can move their existing *T3*s into the new product enclosures, if they want to transfer the assets. The difference between the *3900* and *6900* products lies in their functionalities. The

3900, targeted at high performance computing and decision support system applications, is capable storage that can support all of Sun's file systems.

The *StorEdge 6900* is intended for storage consolidation, using virtualization and the ability to easily create and expand more logical units (LUNs), to allow high utilization and flexibility. Virtualization engines allow dynamic assignment of storage to different applications. Many kinds of enterprise environments can use this product, including Solaris, Linux and Windows NT.

Enhancements to existing StorEdge Products

StorEdge 9900

For the mission-critical data that needs full support, the *StorEdge 9900* now has *StorEdge Storage Resource Management (SRM)* integrated with Hitachi Data Systems' *HiCommand* storage management facility. In addition, Sun has new field service and sales agreements with HDS that extends the value of the OEM product.

The *9900* gives customers a greater choice of replication capabilities, now with *SAM-FS* as an option:

- Array-based snapshot and replication licensed from HDS (LUN-based replication invoked locally with no CPU performance impact)
- Host-based replication with Sun *StorEdge Network Data Replicator 3.01*, giving the maximum flexibility, including the ability to replicate a snapshot over IP
- File-system-based data replication with *SAM-FS*.

The customer can choose the approach that is most suitable for each situation.

Improvements to Sun's StorEdge T3

The existing *T3* array has bulked up its capabilities with Brocade switch support, SAN support for heterogeneous servers (*NT*, *AIX* and *HP-UX*), and with a new controller with a faster CPU, increased cache and error correcting. The *T3* features integrated failover and load balancing, and SAN fabric support for *Solaris* (support for other platforms will follow).

¹ Scott McNealy, Sun's CEO, suggested DAS, NAS and SAN be considered levels 4, 5 and 6 cache.

² Hierarchical storage permits less active files to be moved transparently and automatically to less expensive storage devices.

Software

Sun's storage management software products have been consolidated into four functionally-oriented suites. All are priced by storage capacity. Customers can choose one suite for some storage, and another suite for other storage, or they can choose multiple suites. Other third-party software continues to be supported on Sun's storage products.

Availability Suite

This collection is a new packaging of Sun's existing point-in-time (*Instant Image*) and remote mirroring (*Network Data Replicator*) products. It covers the basics of data replication, and will be enhanced with additional capabilities over time.

Utilization Suite – SAM-FS

SAM-FS is a meta-file system for hierarchical storage, in that it uses primary disk storage as cache and uses automated off-line storage as longer-term archive storage. It can do this because everything that is saved to disk is also copied³ to archive in a "tar" format which timestamps and preserves the original pathname, ownership and control. This copy method produces a consistent copy that can be a source for distance replication. Files are mounted to the file system, not to individual media devices, all of which are managed SAM-FS. Managing files at that level allows an almost unlimited number of files, an almost unlimited file size, and dynamic assignment of *inodes*, which speeds file system recovery. SAM-FS provides an opportunity to use of both small and large disk allocation units in disk arrays minimizes large file fragmentation while optimizing small file disk utilization. Separate volume management products are not needed. SAM-FS was developed on Solaris and is optimized on that platform, but can interact with other servers and provide them with storage services.

SAM-FS uses a lot of storage and robotics, requires a lot of policy generation, and is not primarily targeted at new or quickly evolving enterprises. But while no one knows what data will be created, many enterprises know how many files there will be, and how big they will be, how often they will be accessed and by whom, and how soon they will become obsolete.

³ The copy can be immediate, delayed, or overridden. Multiple copies may be made.

For these companies, and particularly for those for whom data generation and use is a core process, SAM-FS is a winning proposition.

Performance Suite – QFS

QFS is targeted at high performance computing involving very large files. It optimizes beyond the traditional limits of UNIX systems in the following ways:

- Minimization head movement on disk drives (by separation of meta-data from data and by block pre-allocation)
- Striping refinements
- The ability to do direct I/O instead of paged I/O
- The ability to do parallel updates or simultaneous reads and writes to the same file where appropriate (i.e., where an application controls corruption)

It shares many features, like dynamic file system extension, with SAM-FS, and the two can be used together. Again, this highly-tunable file system is not for everybody, but benefits mostly those with large files, definable file access characteristics, and, most importantly, a need for performance above and beyond the usual UNIX system parameters. QFS's optimization will be extended to work with smaller file size targets, as well.

Storage Resource Management Suite

SRM enables resource auto-discovery monitoring and reporting. By tracking consumption, SRM enables charge-back and enforcements of user quotas. Analysis of storage resource management data also facilitates data migration (storage consolidation). Modules include *Capacity Reporter*, *Database Reporter*, *File Reporter* and *Global Reporter*.

Storage Services

Sun has augmented its Assessment, Design and Deployment and Security Services for basic arrays with additional services including

- Data Services (replication, migration)
- Service Level Management
- Storage Resource Management,
- Business Continuance
- Hierarchical Storage Management
- Business Intelligence and
- Vertical Solutions

Conclusion

With N1, Sun has laid out its plan to realize its *The-Network-is-the-Computer* philosophy. Sun presents not just an expanded number of products and services, but also ways to tailor them for use in specific business environments. **Sun wants to be your storage infrastructure mentor and provisioner.** As a highly-branded vendor, Sun must have a comprehensive product line to offer compelling network-level solutions. Its enhanced multi-dimensional storage offering is a strong move in that direction.



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