# Low Cost, High Speed Backup

## The Sun Fire™ X4500 server and Veritas Netbackup software

Today, massive volumes of data must be retained online and managed effectively in order to be kept readily accessible and available. Traditional data storage technologies can be prohibitively expensive, and IT professionals are struggling to maintain corporate data while keeping within budgets. Sun offers the Sun Fire™ X4500 server with massive storage capacity and state-of-the-art server technology. The combination of Veritas Netbackup by Symantec software and Sun Fire X4500 servers provides high-performance, enterprise-class compute power and high density storage at a very low cost per gigabyte.

### Highlights

- Secure valuable enterprise data with a revolutionary high-performance, low-cost backup solution utilizing Sun Fire™ X4500 servers and the Veritas Netbackup software
- Reduce the amount of datacenter floor space consumed, save on disk storage costs, and cut power consumption at the same time
- Scale and protect data on networked servers and workstations across the enterprise
- Take advantage of Solaris™ ZFS for ease of administration, software RAID functionality, and massive capacity
- Utilize features of the powerful Solaris 10 Operating System for additional performance, stability, scalability, security, and data integrity
- Benefit from best practices devised by Sun engineers for solution deployment

### Veritas Netbackup by Symantec software running on Sun Fire™ X4500 servers

The high-performance solution consists of the Veritas Netbackup by Symantec software, a Sun Fire™ X4500 server and the Solaris™ 10 Operating System (OS). The Sun and Veritas Netbackup solution integrates state-of-the-art server and storage features, providing extremely high data throughput at a low cost per gigabyte.

Combining a high density data server with advanced file system and volume manager capabilities, the solution offers two to five times the density of traditional storage systems at half the cost, and significant space and power savings. Indeed, the Solaris 10 OS includes a leading-edge file system that provides a dramatic advance in data management with an innovative approach to data integrity. As a result, datacenter managers can cut the cost of disk storage in half, save 50 percent of datacenter floor space, and provide high-speed simultaneous backups for multiple users with the highest level of data protection.

### Solution components

Key components of the solution include:

- The Veritas Netbackup Master Server — A SPARC®, x64, or x86 host server running the Solaris 10 OS, and the Veritas Netbackup software version 6.5. The Veritas Netbackup Master server maintains control and scheduling over other Veritas Netbackup hosts in the configuration, as well as licensing information and backup schedules and definitions of other Veritas Netbackup clients and Netbackup Media Servers.
- The Veritas Netbackup Media Server — A Sun Fire X4500 server running the Solaris 10 OS and the Veritas Netbackup software. The Veritas Netbackup Media Server controls the resources used in storing data and utilizes Solaris ZFS to scale disk backup resources to petabytes on Sun Fire X4500 servers.
- An optional tape library system can be used for cloning, staging, or archiving data.

Clients can be UNIX®, Windows, Linux, or NetWare platforms running the Veritas Netbackup Client software. Client backup schedules are maintained on the Veritas Netbackup Master Server or manual backups can be performed as needed. Agents are available for integration with IBM, Microsoft, Oracle, SAP, and Sybase environments.

*Figure 1. The Sun Fire X4500 server provides massive storage in a small footprint.*

## Sun Fire™ X4500 servers

Combining the remarkable performance of a four-way x64 server with 24 TB of disk storage in a mere 4U of rack space, Sun Fire X4500 servers offer the highest storage density available in such a small footprint. Powered by fast, energy efficient, dual-core AMD Opteron® processors, the systems deliver optimal data throughput at half the cost of traditional solutions. Sun Fire X4500 servers run virtually any operating system including the Solaris 10 OS, Linux, and Windows environments. With enterprise server reliability, availability, and serviceability features, Sun Fire X4500 servers incorporate redundant, hot-swappable components for increased uptime. The servers also offer unprecedented data integrity and dramatically simplified administration with the Solaris 10 OS and Solaris ZFS.

## The Solaris™ 10 Operating System

The result of significant research and development investments, the Solaris 10 OS offers innovative performance, stability, and security features. Supported on more than 900 x86, x64, and SPARC platforms, the Solaris 10 OS continues to shatter performance records while boosting system uptime. An optimized TCP/IP stack facilitates high-performance networking and supports advanced network computing protocols.

New tools provide observability into systems even while running in production. Solaris Dynamic Tracing makes it possible to troubleshoot system problems in real time. Predictive Self Healing technology can help quickly identify and resolve hardware issues for greater stability and increased availability. With advanced security features such as Process and User Rights Management and a cryptographic framework, IT managers can institute powerful system protections and successfully enforce security policies.

## The Solaris ZFS file system

Key to the solution is the Solaris ZFS file system. With advanced data security and protection features, Solaris ZFS offers a dramatic advance in data management with an innovative approach to data integrity. One vital feature is the use of end-to-end 64-bit checksums on data to safeguard against silent data corruption. When the data is read, the checksum is verified to ensure that the data the application wrote is the data that is returned.

Another feature of Solaris ZFS redefines file systems as virtualized storage pools called *zpools*, making it easy to expand or contract file systems simply by adding or removing more disk drives. The pooled storage model eliminates the concept of storage volumes and issues of partitioning and provisioning, enabling the easy reallocation of resources and streamlining storage administration. With virtually unlimited capacity, file systems can draw as much or as little disk space from a zpool when needed. System administration is also simplified by removing the need for a volume manager. As a result, complicated storage management tasks are automated and consolidated, reducing administrative overhead and accomplishing tasks quickly with reduced errors and no system downtime.

## Veritas Netbackup by Symantec software

With disk-based data protection for any architecture or device, the Veritas Netbackup software provides end-to-end backup capabilities across heterogeneous platforms. A single console offers centralized, Web-based management of backup and recovery operations. Veritas Netbackup integrates data protection for environments such as the Solaris OS, UNIX, Windows, Linux, NetWare, and VMWare. Offering virtually unlimited scalability, the Sun and Veritas Netbackup solution provides backups for small departments to large enterprise datacenters.

## Best practices in solution deployment

Based on extensive experience, Sun engineers devised a set of best practices to facilitate the deployment and operation of the Sun and Veritas Netbackup solution.

### Networks

A dedicated network for backup traffic is recommended to minimize bandwidth consumption on the production LAN. The network interface on Sun Fire X4500 servers provides up to four physical Gigabit Ethernet connections to four separate subnets at the same time. The ports can also be combined for improved throughput to a single subnet. A 10 Gigabit Ethernet network interface card can be installed in the Sun Fire X4500 Peripheral Component Interconnect Extended (PCI-X) expansion slot for use with a 10 Gigabit Ethernet network for even greater bandwidth.

### Disks

Software RAID is used in Sun Fire X4500 servers to provide data protection in the event a drive failure occurs. Solaris ZFS includes RAID-Z and RAID-Z2, offering RAID-0, RAID-1, RAID 0+1, RAID-5, and RAID-6 capabilities. While the default factory configuration for Sun Fire X4500 servers is 46 data disks with zero hot spares, spare drives should be used to help ensure high levels of data protection.

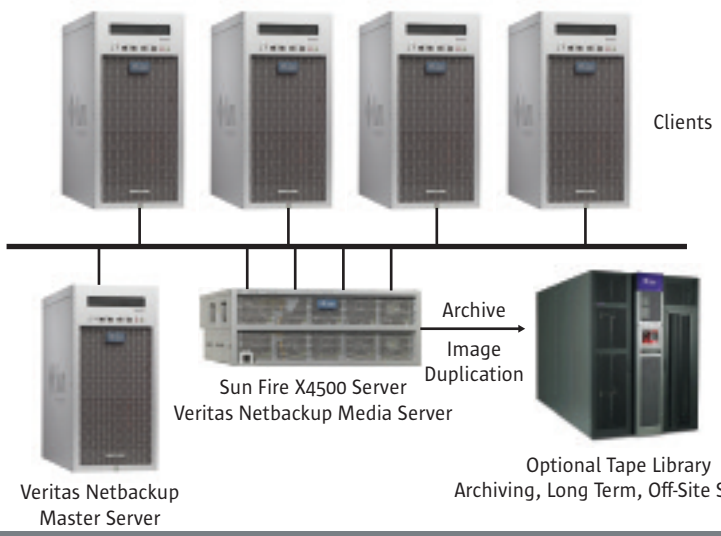


*Figure 2. An architectural view of the Veritas Netbackup disk backup solution running on a Sun Fire X4500 server.*

An optimal configuration balances speed, data protection, and disk capacity within the RAID sets on the server. For a best practices configuration that encompasses performance and reliability, Sun recommends configuring Sun Fire X4500 servers with eight RAID-Z1 or RAID-Z2 zpools of five disks each and six hot spares. In addition, the Sun Fire X4500 server ships with two mirrored operating system drives and Solaris ZFS preinstalled. Furthermore, to help ensure sufficient storage capacity, calendar-based schedules or capacity triggers can be configured in the Veritas Netbackup software.

### Tape Storage

Fibre Channel or SCSI connections are used to connect optional tape library systems if needed. While the Sun Fire X4500 server is used as the primary data cache, a tape library can provide longer term storage. Data can be moved to tape after certain file system utilization or time thresholds are reached. The tape library can be attached to a completely separate Netbackup Media Server or the Netbackup Master Server itself.

## Sizing and configuration recommendations

While no two businesses, environments, or even workloads are ever the same, it can be helpful to look at performance in a given environment to understand how the Veritas Netbackup software running on a Sun Fire X4500 server might apply. One key factor in maximizing performance is the configuration of Solaris ZFS zpools.

The tests were performed with three different zpool configurations:

- RAID-Z1 with zero hot spares, the factory default configuration
- A mirrored configuration of 23 disk pairs in a single zpool
- A configuration of eight zpools consisting of five disks each, for a total of 40 disks with six hot spares, the recommended best practices configuration

Each zpool configuration was tested using four Solaris ZFS file systems. The Veritas Netbackup software was configured to handle three backup streams per file system. Six clients ran a total of 12 streams over four file systems, with three streams per file system for optimal load balancing.

Each zpool configuration was tested four times, the first using just one Gigabit Ethernet port, the second using two ports, until all four Gigabit Ethernet ports were used. In order to increase the number of Gigabit Ethernet ports used in the backup testing, the number of clients used was increased for each testing iteration, forcing the usage of the Gigabit Ethernet ports to grow incrementally to meet demand. During the peak transfer period, the `zpool iostat` command was used to obtain ten samples at five-second intervals to determine the rate of data transfer to the disks. Figure 3 illustrates an average of the ten samples. Tests were also performed with a 10 Gigabit Ethernet network.

### Gigabit Ethernet test results

Test results show that the Sun Fire X4500 server running the Veritas Netbackup software and utilizing Solaris ZFS is capable of backing up data at speeds exceeding 350 MB/second over four separate Gigabit Ethernet ports. The most important factors to consider when configuring zpools are maintaining data protection and availability, and the total amount of disk space available.

### 10 Gigabit Ethernet test results

Using a Neterion Xframe II 10 Gigabit Ethernet network interconnect card in a Sun Fire X4500 server, Veritas Netbackup can move data over a 10 Gigabit Ethernet network between clients and the Sun Fire X4500 server. A 10 Gigabit Ethernet network offers high bandwidth I/O to the system and faster back up speeds. By utilizing the recommended best practices Solaris ZFS zpool configuration, it is possible to reach backup speeds over 500 MB per second. The Sun Fire X4500 server enables IT staff to attain faster backup speeds through use of 10 Gigabit Ethernet.

Because every environment is different, implementation factors such as the configuration and size of zpools, the number and speed of Gigabit Ethernet ports, and the RAID level used can affect solution performance. To find out how the Sun and Veritas Netbackup solution can help in a particular environment, contact a Sun sales representative to schedule an analysis.

## Summary

Sun understands that data is the lifeblood of the enterprise, and applies unique and innovative approaches to provide state-of-the-art server and storage solutions. The Sun and Veritas Netbackup solution combines massive data storage capacity and throughput with powerful AMD Opteron™ processors, enabling data storage and access in ways that are far superior to traditional storage in density, data throughput, speed, and cost. The addition of the innovative Solaris ZFS file system results in a revolutionary integrated data backup and storage solution.

With over two decades of industry experience, Sun demonstrates a proven record of flexible, scalable, innovative, and cost-effective solutions that incorporate the latest technologies and next generation processors. Sun continues to pursue a commitment to provide leading-edge, high-performance solutions that can be used by enterprises to handle explosive data growth and the management challenges that result.

Learn More

All solution components, including Veritas Netbackup software, are available directly from Sun. To learn more, visit sun.com or contact a Sun representative.

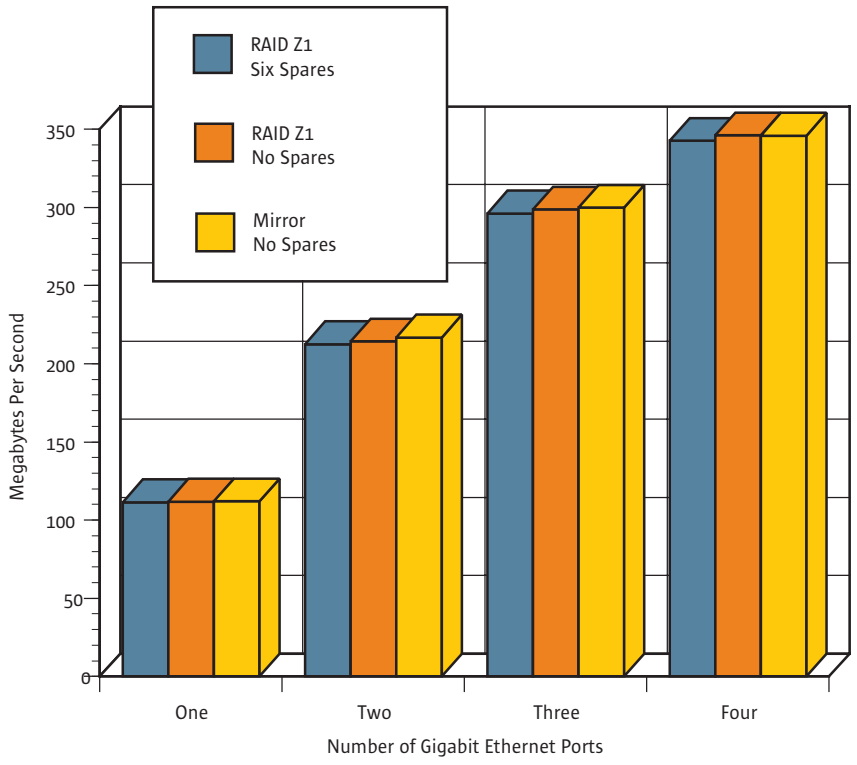


*Figure 3. A graph of the data transfer rates to disks.*

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