

FlashNAS™ ZFS 3400 Series

Redundant Controllers and ZFS File System Provide Enterprise-Class Data Availability and Integrity For Any Size Organization

FlashNAS ZFS Storage

Winchester Systems combines durable, redundant hardware technology with OpenSolaris and the ZFS file system to provide Enterprise-level data protection and reliability at down-to-earth prices.

Sporting controllers, power supplies and fans that are modular, redundant and hot-swappable, the FlashNAS ZFS hardware platform is *purpose-built* for continuous availability and long-term durability.

The revolutionary ZFS file system adds end-to-end error detection and correction, self-healing, and advanced SSD optimization features for unsurpassed protection of data integrity throughout the storage system. Building on this foundation, Winchester Systems FlashNAS ZFS adds advanced enterprise-grade functions such as storage-pool mirroring, remote replication, data archiving and retention compliance, anti-virus scanning, and NDMP backup and migration compatibility.

All of these capabilities are combined into a single integrated system with an easy-to-use, web based management interface. And there are no hidden, or "extra" costs to enable specific features. **All functionality is available for the base system price.**



FlashNAS ZFS 3400 Front View.

FlashNAS ZFS 3400

Data Protection

- ZFS end-to-end integrity protection detects and repairs silent data errors
- Unlimited Snapshots
- Storage-Pool Mirroring
- Remote Replication
- ICAP-based Anti-Virus Scanning
- RAID 0, 1, 5, 6, 50, 60 Storage Pools with Hot Spares
- WORM Archiving and Compliance

Performance and Efficiency

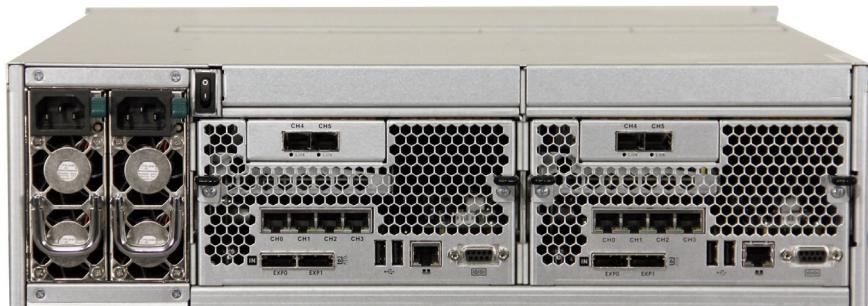
- Intelligent read/write acceleration using SSDs
- Automated Online Pool Expansion
- Compression
- Thin Provisioning

Compatibility

- CIFS/SMB, NFS, FTP, iSCSI, HTTP/HTTPS, SNMP, SMTP, NDMP, NTP, ICAP, FTPS, Secure FTP
- Active Directory, LDAP, NIS
- Windows, UNIX, Linux, Mac OS X, Solaris, AIX, HP-UX
- 1 Gbps Ethernet; 10 GbE option

Management and Support

- Easy and intuitive web GUI
- Ethernet, SNMP, E-Mail Alerts
- All system components hot-pluggable
- On-site service spares
- On-site installation
- 24x7 service available



FlashNAS ZFS 3400 rear view, showing eight 1GbE and four 10GbE Ethernet ports.

FlashNAS ZFS 3400 Specifications	
Dimensions (WxDxH)	3U Chassis: 17.6" x 25.6" x 5.2"
Processor	2 x Intel Xeon E3 Quad-Core
Controller	Dual-Redundant Controllers
Maximum Memory	64 GB
Host Connectivity	8 x 1GbE ports, optional 4 x 10GbE(SFP+ or RJ45) or additional 8 x 1GbE ports
Internal SAS Disk Bays	16
Maximum Drives	256 (via expansion shelves)
Power Supplies	Redundant 750W AC
AC Power	Dual 90-264VAC, 47-63 Hz
Cooling	4 redundant, hot-swap, temperature-driven fans
Front Panel	Removable with dust filter
Weight	81 pounds fully loaded
Operating Temp.	5 to 35°C (32° F to 95° F)
Non-Operating Temp.	-40° to 60° C
Altitude	0 - 10,000 feet
Operating Humidity	5% to 80%, non-condensing

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FlashNAS ZFS 3400 shown with
4U 60-drive Expansion Shelves

ZFS-Specific Advantages

Data Integrity Protection and Self-Healing

The majority of modern file systems and volume managers, including those embedded within most commercial NAS products, assume that no component in a storage system is safe from failure. The better ones are designed to handle the loss of one or more power supplies, fans, disks, I/O paths, and even controllers without disrupting access or losing data.

Originally developed by Sun Microsystems, ZFS is a combined volume manager and file system that takes this protective approach to a new level: assuming no component is safe from *misbehavior*. Things can go wrong within a device even though it appears to be working perfectly. That includes *silent data corruption*, an IT-staffer's—indeed any business person's—worst nightmare.

That's why Winchester Systems chose ZFS as the foundation for its latest NAS storage platform. ZFS is designed to protect the integrity of the data it manages, verifying that every byte of data read from a storage device matches what was originally written. To accomplish this, the system calculates a checksum for every block of data it stores and verifies that checksum for each block retrieved. ZFS even goes so far as to ensure checksums are not stored in the same place as the data blocks they protect; the checksum for each block of data is stored in the pointer to that block, not with the block itself. That pointer is, in turn, checksummed and the resulting value stored in *its* pointer, and so on. This includes not just file data, but the entire hierarchy of volume and file metadata throughout the storage being managed. This end to end data verification is unique to ZFS. NAS products based on older file system technology cannot match this level of data-integrity protection.

Whenever a bad block *is* detected (its checksum verification failed), ZFS automatically fetches the correct data from a redundant copy and repairs the bad block by replacing its contents with the correct data. Instead of waiting for application I/O to uncover a problem, FlashNAS ZFS also performs scheduled media scanning (also called "disk scrubbing") to proactively uncover and repair any silently corrupted blocks.

Online-Expandable Storage Pools

Instead of disk devices, ZFS always allocates space for its file systems and iSCSI targets from "Storage Pools." Each Pool is composed of virtual devices, each being a set of disks with ZFS RAID 0, 1, 5, or 6 protection. Expanding a pool involves simply adding one or more RAID sets; from then on ZFS stripes data across all RAID sets within the pool (the resulting combinations sometimes called RAID 10, 50 and 60).

Unlimited Snapshots

Snapshots preserve a self-consistent copy of an entire file system or disk volume at a specific point in time. ZFS snapshots are extremely efficient in both disk space and storage-processor usage because of the way the file system handles write operations. ZFS disk transactions use an "allocate-on-write" process. When an application updates a data block, the file system allocates a new block from the storage pool and writes the new contents in the newly-allocated block, updating related metadata pointers and checksums in a similar manner along the way.

Because they're not overwritten, old block contents and their metadata pointers can be easily retained. As a result, snapshots of a file share or volume can be created and maintained with very little processing overhead. As data within the active share/volume changes, each snapshot preserves only replaced data and metadata blocks, while also preventing them from being reused until that snap is deleted.

That means a snapshot takes up no additional space until blocks within the file share or iSCSI volume are changed. Better still, the number of snapshots possible is limited only by available storage-pool space. FlashNAS ZFS admins can also define automatic snapshot creation schedules and snapshot-deletion rules

for each share or iSCSI volume based on age or desired maximum number of snaps.

RAM and SSD Based Performance Acceleration

To increase read performance, ZFS caches recently read data blocks in RAM using an Adaptive Replacement Cache (ARC) algorithm, and uses SSDs as a second-level ARC cache (also called L2ARC). To accelerate write operations, SSDs are used to hold a copy of each write transaction in the ZFS Intent Log (ZIL) until the transaction contents are safely committed to disk media. The ZIL can also be mirrored to further protect data integrity.

In-line Compression

For space savings, and better storage efficiency, FlashNAS ZFS offers data compression on designated file shares and volumes—with faster performance for files updated in place than is possible with most file systems. If an updated data block after compression is smaller than the original compressed block, FlashNAS takes advantage of the ZFS file-system variable block size and "allocate-on-write" algorithm by simply allocating and writing a smaller-sized block. For files that are updated in place, this provides superior performance because updated blocks can be compressed without rereading and rewriting the rest of the file's content.

FlashNAS-Specific Advantages

The benefits of ZFS are compelling, but a good file system alone is not enough to comprise a reliable, easy to use, professional grade network storage product. Using over 30 years of commercial and military-grade storage expertise, Winchester Systems architects and engineers have combined OpenSolaris and ZFS with capabilities of a modern NAS storage products, including purpose-built modular hardware design, enterprise-class functionality and a straightforward management interface.

Archiving and Data Retention Compliance (WORM)

Many companies face regulations requiring them to verifiably retain data for a period of time while still providing immediate accessibility. Furthermore, some firms have decided they need to protect vital information from tampering by anyone—disgruntled employees, hackers, etc. FlashNAS ZFS helps organizations meet these requirements by creating WORM (Write Once, Read Many) folders.

Authorized users can write files to, and read files from, a WORM folder shared over the network. But they're not allowed to modify or overwrite the original data; the only way to store a modified version of a file is by creating a copy with a different name (e.g., using "Save as..." in an application). WORM can be enabled for a shared folder at any time; an IT administrator simply sets a retention period and turns it on. An admin can later extend retention periods as regulations or corporate governance requirements change.

Active-Active Redundant Controllers

The FlashNAS ZFS hardware platform is built on a foundation of modular, hot-plug technology developed for the company's flagship FlashDisk Fibre Channel and iSCSI RAID storage arrays. Powered by Intel Xeon Quad-core processors, both FlashNAS controllers actively manage and serve data. In the event of a controller failure, the second controller immediately takes over the failed unit's workload. This capability comes *without complex clustering software, cluster-management tools, or special training*.



Redundant, Hot-Plug Power Supplies and Fans

FlashNAS ZFS has modular power supplies and fans that are easily removed and replaced without special tools or training, virtually eliminating downtime—and lowering maintenance cost and risk.

Disk Roaming

When replacing or upgrading a FlashNAS system, an administrator can simply remove disk drives from the old system, and insert them into another FlashNAS ZFS system where they will be automatically recognized. Relevant pools and other settings are automatically restored and made fully operational.

Pool Mirroring

FlashNAS ZFS offers Pool Mirroring to synchronize copies of a storage pool between two FlashNAS ZFS systems. All file share and iSCSI volumes within a mirrored Storage Pool are copied, ensuring data availability even in the event of a complete system failure. Online business applications can continue to be served without major interruptions. Pool mirroring can be real-time (synchronous) or scheduled (asynchronous).

Asynchronous Remote Replication

Individual file folders or iSCSI volumes can be replicated to another FlashNAS ZFS system at a remote site to ensure data availability even in the event of a site-wide disaster. The FlashNAS ZFS system uses block bitmaps to record which data blocks have changed. Only the data blocks that have changed since the last synchronization are transmitted, even after an extended communications-link failure.

Transmitted data can optionally be compressed using LZJB, a lossless compression algorithm, and built-in encryption is available to protect the data in-flight. Replication scheduling can be highly customized to suit the needs of each organization or application.

Anti-Virus Scanning

When an application requests data from a file, and the file has not been scanned previously, the contents are first sent to an anti-virus scan engine via the Internet Content Adaptation Protocol (ICAP). If no virus is found, the file data is delivered to the user applications. If a virus is found, it's cleaned or quarantined according to scan engine policy.*

Seamless Multi-Platform Sharing and Unified Security Model

Windows, UNIX, Linux, and Mac OS X users can share files on FlashNAS ZFS seamlessly via any combination of CIFS/SMB, NFS and AFP protocols without installing additional software on their systems. FlashNAS ZFS can use Active Directory, LDAP or NIS directory services to authenticate users and control access. Users and permissions can also be added and controlled locally on FlashNAS ZFS using the administrative web-browser interface. Access may be provided to both local and domain users. Administrators can also enable or disable specific network protocols, assign quotas, and enable anti-virus scanning at the share level.

Backup Software Integration

For seamless integration with incumbent enterprise backup regimes, FlashNAS ZFS supports industry-standard NDMP compliant data backup and migration software.

Economical Pricing, Enterprise-Grade Service

FlashNAS ZFS brings enterprise-grade data protection and storage services at very competitive prices. The standard warranty includes 24x7 call center support and next day on-site service. Four hour on-site response service is also an option.

* Check with a Winchester Systems sales or support representative for currently-supported ICAP Anti-Virus scanning engines.