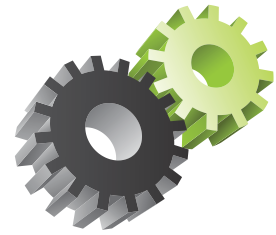




Hybrid Storage Appliance™

A New Class of Long-Term Storage



Today's Data Demands a Hybrid Approach

Corporations are experiencing an unprecedented combination of data growth, economic pressure, and regulatory compliance. Managing storage costs and meeting service levels is becoming increasingly difficult with current disk- and tape-based solutions. Many storage vendors are touting solutions to help increase storage efficiency, but little consideration is being given to the type of data being stored.

Leading analysts estimate that up to 80% of all data residing on expensive primary storage is fixed content, also known as persistent data. This data is not changing, not mission critical, and infrequently accessed. However, much of the data must be retained and retrieved quickly to satisfy increasing regulatory and legal requirements.

Disk-based systems offer online accessibility, but are expensive to operate, need to be backed up, and require expensive data migrations every 3-5 years. Tape-based systems can be cost-effective to purchase, but don't offer online accessibility, require regular maintenance, and deliver questionable reliability. Fixed content has unique requirements that demand a fresh approach that bridges the gap between disk and tape.

The notion of hybrid is simple: performance when you need it, economy when you don't. By virtualizing multiple underlying storage technologies with an intelligent file system, PowerFile's Hybrid Storage Appliance™ offers the performance of disk, the economy of tape, and superior reliability in a purpose-built platform optimized for long-term storage of fixed content.

Unmatched Reliability & Longevity

The most important aspect of any storage system is reliability, which is just as critical for long-term storage as it is for primary storage. Companies spend millions of dollars replicating and backing up primary storage because of one main reason: disk drives fail. As storage requirements grow, more disk drives must be added leading to even more failures.

Innovative Hybrid Platform

- Purpose-built appliance avoids the risk of storing valuable fixed content on volatile disk or tape media
- Intelligent file system seamlessly manages data between performance cache and virtualized archive grid
- Dedicated platform eliminates inefficiencies associated with storing fixed-content on expensive primary storage that must be frequently replaced and continually backed up

Built for the Enterprise

- Distributed processing architecture sustains up to 375MB/s of ingestion into cache and supports up to 30,000 file requests/hour from archive grid
- Data center optimized design supports up to 500TB in a standard 42U rack and scales from 25TB to 1.2PB per system to handle even the most demanding environments
- Patent-pending EVAST™ data integrity scheme offers 100x improvement over RAID 6 with less than 10% capacity overhead
- Includes key features for fixed content storage such as file-level WORM, thin provisioning, retention management, volume replication, and automated monitoring.

Green Technology

- Combines intelligent power management techniques with inherently low power storage technologies to deliver an industry-leading 4 Watts per TB
- Optional Adaptive Data Reduction (ADR) software reduces data footprint up to 7x to further improve energy efficiency
- Product line has been approved for energy incentives by major utility providers

Optional Software Features

- *Touchless DR™ WAN Replication*
Automates the replication of volumes over a Wide Area Network (WAN) for rapid recovery in the event of a disaster
- *Adaptive Data Reduction™*
Capacity optimization software increases rack density, improves energy efficiency, and reduces network traffic
- *Archive Facilitator™ Automation Tool*
Policy-based discovery, classification, and migration tool for automated archiving of fixed content



The Hybrid Storage Appliance only uses disk for performance caching and instead leverages industry standard Blu-ray™ media with a 50 year life for storing fixed content. This allows the HSA to completely avoid the risk of storing valuable fixed-content for many years on volatile magnetic media. PowerFile developed the patent-pending Extended Verification And Self-healing Technology (EVASt™) to make Blu-ray reliable for the enterprise. EVASt establishes a new standard for data integrity by delivering a 100x improvement over RAID 6 with less than 10% penalty to usable capacity¹.

Industry-Leading Power Density Factor

Efficient use of data center floor space is just as critical as low power and cooling requirements. In addition to raw rack density, companies must also take into account power/cooling requirements, and raw-to-usable capacity ratio as disk-based systems typically lose 30-40% of capacity to overhead.

The Hybrid Storage Appliance offers the Industry's best combination of density, energy efficiency, and raw-to-usable capacity by delivering up to 500TB in a standard 42U rack, consuming less than 4 Watts per TB, and offering a fixed 90% raw-to-usable capacity.

On-Demand Performance

Raw throughput is only one of the factors that must be considered when evaluating long-term storage options. In order to maximize the efficiency of storing fixed content that is infrequently accessed, consideration must also be given to random request handling and latency to data.

By leveraging quad-core processor technology, intelligent disk-based caching, and a distributed processing architecture that efficiently scales both capacity and performance, the Hybrid Storage Appliance (HSA) is able to ingest data at 375MB/s and handle up to 30,000 file requests per hour from the archive grid all while using less than 10% of the energy required for a disk-based archive solution.

Petabyte Class Scalability & Manageability

The average Fortune 1000 enterprise currently has over 3PB of fixed content and that is expected to grow to more than 24PB by 2012. Continuing to store this unchanging data on disk, constantly backing it up, and migrating to a new platform every 3-5 years is not only inefficient but also unmanageable in large scale.

The Hybrid Storage Appliance scales up to 1.2PB per system with a distributed architecture that scales performance with capacity. Ease of management is inherent throughout the design and includes key features such as file-level WORM capabilities, thin provisioning, retention management, volume replication, and automated monitoring with integrated SNMP and e-mail notification.

1. Metric: Unrecoverable Errors on Read (UERS). Dual-parity redundant arrays of independent disks (RAID 6) and enterprise-class tape (LTO-3) have been estimated to deliver UERS of 10¹⁷. EVASt delivers a calculated UER of 10¹⁹.

Hybrid Storage Appliance System Specifications

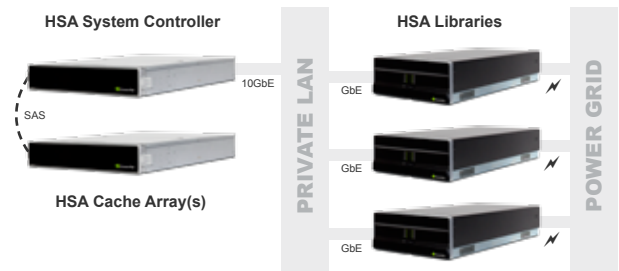
HSA Architecture

The Hybrid Storage Appliance is comprised of the HSA Controller, HSA Cache Array(s), and up to 24 modular HSA Libraries, all connected by a private LAN

HSA System Controller - A 2U front end that runs PowerFile's HybridOS Operating System and provides seamless access to over a petabyte of archived information

HSA Cache Array - A 2U, 12TB RAID array designed to boost data ingestion and access performance. Four Cache Arrays can be added to each HSA for a total system cache of 48TB

HSA Library - A 4U enclosure that houses 25TB of capacity and up to 12 Blu-ray drives. 24 libraries can be added to each HSA for a total system capacity of up to 1.2PB



HSA System Specifications

Configuration Details	Minimum Configuration	Maximum Configuration
Configuration Details	1 Library / 6 Drives / 12TB Cache	24 Libraries / 288 Drives / 48TB Cache
Capacity (native / compressed*)	25TB / 50TB	600TB / 1.2PB
Throughput (cache)	Up to 100MB/s	Up to 375MB/s
Throughput (library)	Up to 40MB/s	Up to 250MB/s
File Access Latency (minimum / maximum)	8.9 ms / 30 sec	8.9 ms / 30 sec
Request Handling (library)	Up to 700 requests/hr	Up to 30,000 requests/hr
Power Consumption	585 Watts / 11.7 Watts per TB	4,864 Watts / 4.1 Watts per TB

* Assumes a very conservative 2x reduction ratio with the Adaptive Data Reduction feature

HSA System Controller Specifications

Physical Dimensions (in/cm)	Width: 16.9 / 42.9 Height: 3.4 / 8.6 (2U) Depth: 26.8 / 68.1 Weight (lb/kg): 52 / 23.6
Agency Certifications	FCC Class B, CE
Processor	Two (2) Quad-Core Processors with 4 x 512KB L2 Cache / 2MB L3 Cache, Quad-Processor Capable Motherboard
Memory	8GB DDR2 SDRAM, 32 DIMM Sockets Support a Maximum of 128GB
OS Drives	Two (2) 147GB 15K SAS HDDs
Cache Controller	3Ware 9690SA-8E-SGL Eight (8) Port PCI-e to SAS RAID Controller / 3Ware BBU-Module-04 Battery Backup Unit
Network Interface	Ten-Gigabit Ethernet (10GbE) Uplink to CX-4 Compatible Switch
Library Interface	Ten-Gigabit Ethernet (10GbE) Downlink to Private LAN
Power	Power Supply: 1400W, 2+1 Redundant Power Rating: 100-240VAC, 50-60Hz, 10-5 Amp Power Consumption (Idle): 296W Heat Dissipation: 1,010 BTU/hr
Cooling	Six (6) Redundant, Hot-Swappable Fans / One (1) System Fan Connected to Motherboard
Environment	Operating Temperature (F/C): 41-95 / 5-35 Non-Operating Temperature (F/C): -40-158 / -40-70
Warranty	Standard: 1-Year Limited HW Warranty Optional: PowerCare 1, 3, and 5-Year Offerings

HSA Library Specifications

Physical Dimensions (in/cm)	Width: 17.5 / 44.5 Height: 6.8 / 17.3 (4U) Depth: 38.3 / 97.3 Weight (lb/kg): 98.5-105 / 44.7-47.6
Agency Certifications	UL, cUL, EN 60950, CB, CE, CISPR 22 Class A, EN 50082-1 (1992)
Library Controller	Up to Two (2) Redundant, Field Replaceable Controllers per Library
Cache Drives	Two (2) 7,200 RPM SATA HDDs per Controller
Optical Drives	Six (6) Field Replaceable Dual-Layer Blu-ray Recorders per Controller
Library Capacity	Number of Discs: 500 Raw Capacity: 25TB Usable Capacity: 20.25TB
Supported Media Types	Dual-Layer BD-R, Dual-Layer BD-RE
Cartridge Specifications	<i>Bulk Cartridge</i> <i>Shuttle Cartridge</i>
Physical Dimensions (in/cm)	Width: 5.0 / 12.7 Height: 6.0 / 15.2 Depth: 26.1 / 66.4 Width: 5.0 / 12.7 Height: 6.0 / 15.2 Depth: 3.3 / 8.4
Capacity	225 Discs / 12.5TB 25 Discs / 1.25TB
Host Interface	Two (2) Redundant Gigabit Ethernet (GbE) Uplinks to Private LAN per Library Controller
Power	Power Supply: External (see Power Grid specs) Power Rating: 48VDC, 50-60Hz, 5 Amp Power Consumption (Idle): 107W Heat Dissipation: 365 BTU/hr
Cooling	Four (4) Fans per Library Controller, Configured as N+1
Environment	Operating Temperature (F/C): 41-95 / 5-35 Non-Operating Temperature (F/C): -40-158 / -40-70
Predicted Reliability	MTBF (swaps): 1,000,000 Hours: 250,000
Warranty	Standard: 1-Year Limited HW Warranty Optional: PowerCare 1, 3, and 5-Year Offerings

Hybrid Storage Appliance System Specifications (cont.)

HSA Cache Array Specifications

Physical Dimensions (in/cm)	Width: 17.0 / 44.0 Height: 3.4 / 8.7 (2U) Depth: 21.6 / 54.8 Weight (lb/kg): 54.0 / 24.5
Agency Certifications	UL, cUL, CE, FCC Class A
Drives	Twelve (12) 1TB 7,200 RPM SAS HDDs (Hot-Swappable)
RAID Configuration	Preconfigured RAID 6 Array
Controller	Three (3) 3Gb/s mini-SAS Connectors
Scalability	Up to Four (4) Cache Arrays / 48TB per HSA
Power	Power Supply: 460W, 1+1 Redundant Power Rating: 100-240VAC, 50-60Hz, 10-4 Amp Power Consumption: 182-195W Typical Heat Dissipation: 632-665 BTU/hr Typical
Cooling	Three (3) Redundant, Hot-Swappable Fans
Environment	Operating Temperature (F/C): 41-95 / 5-35 Non-Operating Temperature (F/C): -40-158 / -40-70
Warranty	Standard: 1-Year Limited HW Warranty Optional: PowerCare 1, 3, and 5-Year Offerings

HSA Switch Specifications

Physical Dimensions (in/cm)	Width: 17.3 / 44.0 Height: 1.7 / 4.3 (1U) Depth: 15.2 / 38.7 Weight (lb/kg): 12.6 / 5.7
Switching Ports	Twenty-Four (24) 10/100/1000BASE-T Auto-Sensing Gigabit Ethernet (GbE) Ports
Uplink Ports	Two (2) 10GBASE-T Ten Gigabit Ethernet (10GbE) Ports / CX-4 Compatible
Uplink/Downlink Cables	Two (2) 5-Meter CX-4 Copper 10GbE Cables Included
Power	Power Rating: 100-240VAC, 50-60Hz Power Consumption: 39W Heat Dissipation: 133 BTU/hr
Environment	Operating Temperature (F/C): 32-113 / 0-45 Non-Operating Temperature (F/C): -4-158 / -20-70
Warranty	Standard: 1-Year Limited HW Warranty Optional: PowerCare 1, 3, and 5-Year Offerings

HSA Library Shared Power Grid Specifications

Power Grid Physical Dimensions (in/cm)	Width: 17.7 / 45.0 Height: 1.7 / 4.3 (1U) Depth: 14.0 / 35.6 Weight (lb/kg): 28.5-33.5 / 12.9-15.2
Library Support	Each Power Grid Supports up to 9 Libraries
Power Supply	Up to Three (3) 1812W Hot-Swappable Power Supplies per Grid, Configured as N+1
Input Voltage	85-264VAC (auto-sensing)
Output Voltage	48VDC
Environment	Operating Temperature (F/C): 32-122 / 0-50 Non-Operating Temperature (F/C): -40-185 / -40-85
Warranty	Standard: 1-Year Limited HW Warranty Optional: PowerCare 1, 3, and 5-Year Offerings

HybridOS™ Management Software Specifications

Network Transfer Protocols	TCP / IP
Network File Protocols	Microsoft Networks (CIFS), UNIX (NFS v3), Internet (HTTP)
Management Client	Windows: 2000, 2003, XP, Vista Linux: Red Hat, SuSE
Data Client	Windows: NT, 2000, 2003, XP, Vista UNIX: Solaris, HP-UX, AIX Linux: Red Hat, SuSE Macintosh: OS X (no resource forks)
IP Address Assignment	Supports DHCP for Automatic Assignment / Supports Static Assignment
Network Security	Microsoft Active Directory Service (ADS), Kerberos Authentication v5, Lightweight Directory Access Protocol (Client), Windows NT Domain (Member Server), UNIX Network Information Service (NIS) Support, Local Users and Groups, Secure Sockets Layer (SSL), Multiple Administrator Support
System Management	Browser-Based Console for Remote Administration, Environmental Monitoring, Email Notification Alerts, SNMP (Host Resource MIB), System Configuration Backup and Image Recovery
Data Management	Supports up to 30 Online Permanent Storage Spaces (PSS), Retention Period Management (Share Level)
Optional Features	Adaptive Data Reduction™ (ADR), Touchless DR™ WAN Replication, Archive Facilitator™ Automation Tool
Warranty	Standard: 1-Year Limited SW Warranty Optional: PowerCare 1, 3, and 5-Year Offerings