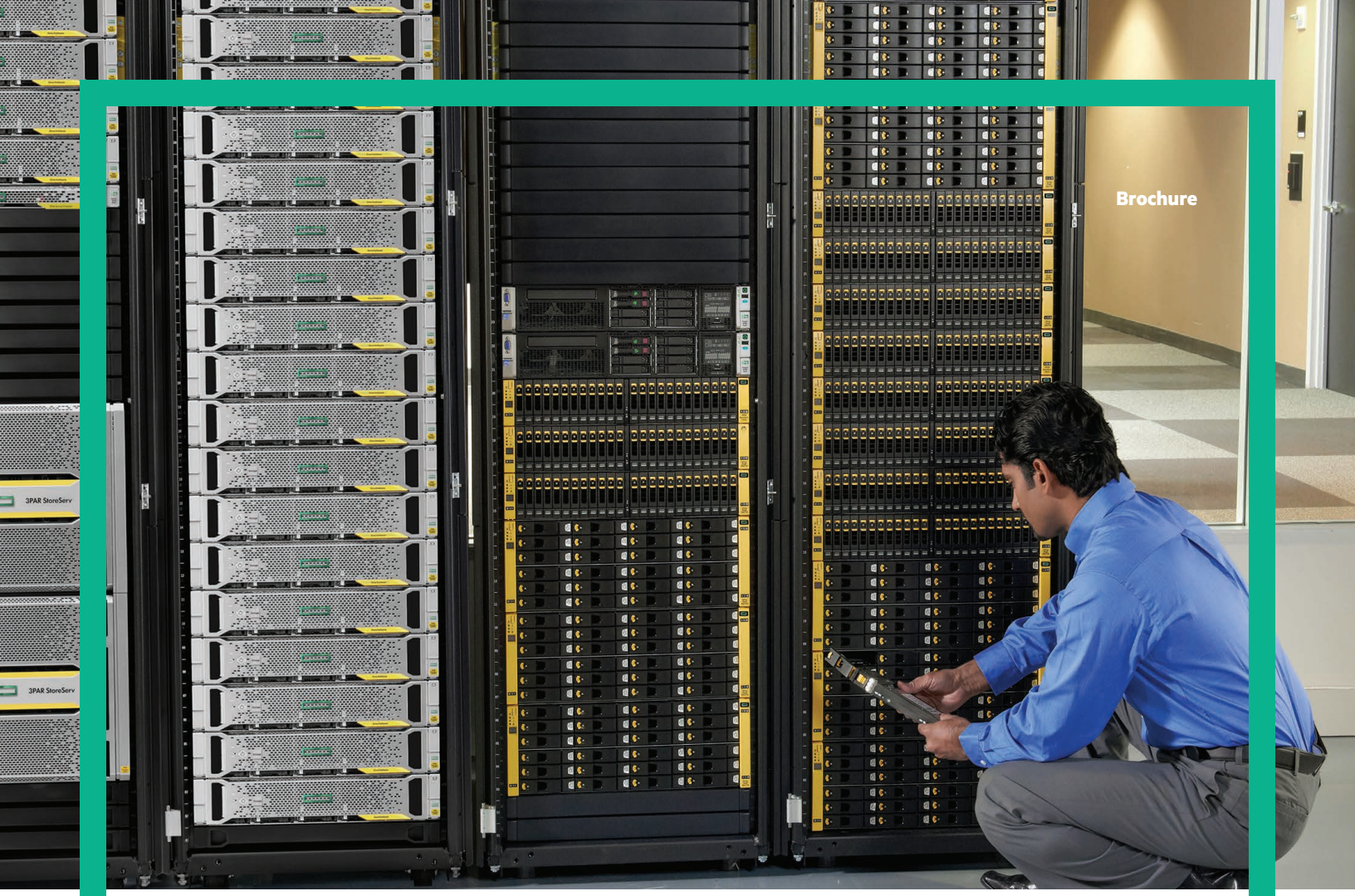

Eliminate Compromise with Flash-Optimized Storage Architecture

HPE 3PAR StoreServ Storage—the only primary storage architecture you need

Hewlett Packard Enterprise

Maintain "6-nines" uptime
HPE 3PAR StoreServ Storage systems are designed to deliver data high availability with 99.9999 percent uptime, giving you all of the benefits of HPE Storage for your mission-critical environment without the risk.

HPE 3PAR Flash Now: Maintain control of your data for less than the cost of outsourcing it to the public cloud
Evaluating the cloud but not sure you're ready to surrender your data? Looking to reduce storage costs but don't like the idea of ceding control and stomaching new security risks? Then it's time to look at new ways to plan for, acquire, and consume your data storage.

HPE 3PAR Flash Now brings public cloud-like economics to your on-prem flash storage deployment. With this program, you get only the best of on-prem and cloud with none of the drawbacks. Retaining total control and uncompromising security for the data you need to keep on-prem but benefit from converting OPEX to CAPEX and a host of other benefits that come with the program, such as non-disruptive, automated data migration and a built-in tech refresh options that keep you up to date on the latest flash and data protection technologies.

Flash-optimized architecture, modern Tier-1 storage

IT has never been more important to doing business, which means that IT infrastructure must be simpler, smarter, faster, more flexible, and more business-aligned than ever. In the idea economy, business success is defined by how quickly you can turn ideas into value. Is your infrastructure ready?

When it comes to Tier-1 storage, HPE 3PAR StoreServ Storage has you covered. The foundation of the HPE Storage portfolio, HPE 3PAR StoreServ Storage offers a range of models that give you effortless, Tier-1 flash with midrange affordability and helps you affordably consolidate all of your applications onto enterprise flash.

HPE 3PAR StoreServ Storage allows you to break down the silos that stand between you and the efficiency and agility required to succeed in the idea economy. It's the last primary storage architecture you need—regardless of whether you are a midsize enterprise experiencing rapid growth in your virtualized environment, a large enterprise looking to support IT as a Service (ITaaS), or a global service provider building a hybrid or managed private cloud.

Respond to any demand—effortlessly, without exception, and without compromise

Explosive data growth, new technology choices, and the proliferation of siloed architectures are pushing legacy storage beyond its brink. With a modern, Tier-1 architecture that is both massively scalable and flash-optimized, HPE 3PAR StoreServ Storage enables you to break down data center silos and respond to change with agility and efficiency.

- Cut capacity requirements by up to 75 percent with data compaction technologies[1]
- Provision storage instantly and manage block, file, and object access from a single interface
- Serve a broad spectrum of storage workloads including server virtualization, databases, applications, home directories and user shares, content management and collaboration, data preservation and governance
- Remove bottlenecks with a flash-optimized, scale-out architecture capable of multiple petabytes and millions of IOPS[2]
- Assure service levels with fine-grained QoS optimization tools and consistent, sub-millisecond latency
- Serve unpredictable and mixed workloads while flexibly adapting to shifts in application service levels
- Create an elastic pool of capacity for one-click workload rebalancing without external virtualization appliances or management overhead
- Address storage efficiency at the data center level with seamless data movement between arrays
- Protect your data with backup that frees you from the need for ISV software and traditional server-based backup processes[3]
- Simplify backup and restores with application-aware, storage-integrated data protection
- Achieve near-synchronous RPOs with flexible, transparent, and cost-effective remote replication
- Reduce complexity with iSCSI for Ethernet and speed configuration with automated storage networking

HPE 3PAR StoreServ Storage lets you do all of this while driving up efficiency and resource utilization with hardware acceleration that allows you to consolidate with confidence while lowering your total cost of ownership for storage.

[1] Based on the use of data compaction technologies including thin provisioning and inline deduplication.

[2] Based on SPC-1 and SPC-2 benchmarks available at **storageperformance.org**.

[3] Currently supported in VMware®, Oracle, and Microsoft® SQL Server environments.

Adaptive Data Reduction Software
A feature of the HPE 3PAR Operating System, Adaptive Data Reduction software—including inline Deduplication for any SSD tier—allows the system to run in a state of consistent high-capacity utilization without performance tradeoffs; compression with inline Express Scan removes redundant data and prevents wasted CPU cycles; Data Packing condenses data to a single page increasing storage efficiency and bandwidth. You save on the cost of a storage technology refresh and increase storage ROI by keeping incremental purchases, administration, and operating costs low over time.

HPE InfoSight: AI for the Data Center
HPE InfoSight eliminates wasted time and headaches by transforming how storage is managed and supported. Through AI, predictive analytics and machine learning, HPE InfoSight predicts and prevents problems before your business is impacted. And, as it analyzes and correlates millions of sensors every second, all customers benefit as their systems get smarter and more reliable. HPE InfoSight watches over your infrastructure 24/7 so you don't have to spend your days, nights, and weekends dealing with storage issues anymore.

For 3PAR StoreServ arrays, HPE InfoSight:

- Sees across the infrastructure stack and helps pinpoint issues beyond storage
- Simplifies planning with forecasts into capacity and resource needs
- Proactive fault detection with faster time to resolution
- Global visibility with detailed performance, capacity, and bandwidth analytics

Here are some of the benefits of choosing flash-optimized HPE 3PAR StoreServ Storage:

Consolidate with confidence for greater efficiency and agility
Serve multiple user groups and applications from a single storage system with complete confidence that access to your data will not be compromised or interrupted. Federate multiple systems to form an elastic resource pool with one-click workload rebalancing.

HPE 3PAR StoreServ offers a modern architecture that scales to more than 26 Petabytes (PiB)[4] of usable capacity, provides true convergence of block and file workloads as well as object access, and delivers Tier-1 resilience paired with secure administrative segregation of users, hosts, and application data. Industry-leading density lets you consolidate 600 Terabytes (TiB) of usable capacity in a drive enclosure and more than 11 PiB usable in a single rack while full hardware redundancy means complete system resilience—even when the unexpected happens.

Non-disruptive, bi-directional data mobility allows you to federate multiple systems to support rigorous on-demand infrastructure by forming an elastic resource pool with up to 60 PiB of usable capacity capable of serving millions of IOPS at sub-millisecond latencies with up to 300 GB/s in front-end bandwidth.[5] Single-click data movement lets you dynamically rebalance workloads to meet changing business needs and service level demands. And unlike approaches that require external SAN virtualization appliances to pool capacity, no additional hardware is required—meaning that business agility does not come at the cost of additional appliances or virtualization management overhead.

Deliver uncompromising QoS for even the most demanding workloads
Achieve higher service levels for more users and applications with less infrastructure. When combined with Tier-1 resiliency, the multi-controller scalability and extreme flexibility built into HPE 3PAR StoreServ Storage makes deploying and maintaining separate storage silos to deliver different QoS levels obsolete.

Fine-grained, system-wide striping of data across all internal resources (disks, ports, loops, cache, processors, etc.) assures high and predictable service levels for all workload types. As a result, as the use of the system grows—or in the event of a component failure—service conditions remain high and predictable.

Prioritize your most mission-critical applications and workloads by specifying performance and latency goals as well as IOPS and bandwidth caps. If goals are not met or if caps are exceeded, the system automatically adjusts the service levels of lower-priority applications and workloads in order to assure that necessary QoS levels for your highest priority applications are always met.

You can also specify thresholds to protect individual tenants as well—for example, to prevent a single workload from monopolizing array resources. This capability removes the last barrier to consolidation by allowing you to assure QoS levels without having to physically partition resources or maintain discreet storage silos.

Unlike application-centric approaches to storage, one-click autonomic rebalancing on HPE 3PAR StoreServ Storage enables you to deliver the right QoS levels at all times without service disruption, preplanning, or the need to deploy multiple arrays.

[4] When configured with 7.68 TiB SSDs and used with HPE 3PAR compaction technologies, the HPE 3PAR StoreServ 20800 and 20840 brings usable capacity to more than 20 petabytes.

[5] Based on SPC-1 and SPC-2 benchmarks available at **storageperformance.org**.

Read and Write Acceleration
HPE 3PAR Express Writes is a built-in HPE 3PAR OS write acceleration feature that manages CPU utilization to increase throughput, deliver up to 30 percent more IOPS, and reduce latency by up to 20 percent, depending on workload.[6] These benefits extend to both spinning drives and flash-based media.

For read acceleration, HPE 3PAR Adaptive Flash Cache allows SSDs to act as an extension of DRAM cache. This feature can as much as double read rates and reduce latency up to 70 percent with HPE 3PAR StoreServ Storage arrays that are configured with SSDs.

HPE 3PAR Data Reduction Guarantee
You can save on the cost of a storage technology refresh and increase storage ROI by keeping incremental purchases, administration, and operating costs low over time. These technologies help you get the most out of your system's flash capacity and reduce your total cost of storage while improving flash media endurance. In fact, the HPE Data Reduction Guarantee offers assured storage efficiency for your workload—guaranteed.[7]

To learn more, ask for your free storage assessment from HPE, which includes:
- A complete efficiency audit of your current storage
- Storage utilization ratios and standard capacity
- Array sizing needed to meet SLAs

[6] Based on a random, 100 percent write workload with an 8 KB block size.

[7] Subject to qualification and compliance with the HPE 3PAR Data Reduction Guarantee details on **hpe.com/h20195/v2/Getdocument.aspx?docname=a00020004enw**.

Accelerate performance with a flash-optimized architecture

Available in a range of models and configurations depending on your business needs, HPE 3PAR StoreServ Storage offers a single flash-optimized architecture that gives you a choice between:

- All-flash arrays
- Converged flash arrays with the option to support low-cost spinning media in addition to flash
- Tiered storage arrays capable of extending DRAM cache onto SSDs for application acceleration

HPE 3PAR flash-optimized portfolio

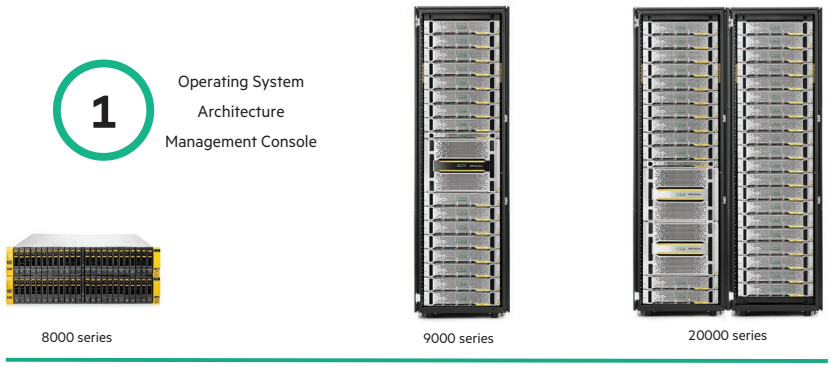

Figure 1. HPE 3PAR StoreServ Storage models

Other storage architectures cannot offer this range of deployment options, which provide you with a high degree of flexibility and adaptability as your needs change over time—all with the same operating system, the same management interface, and a robust set of data protection options.

Deliver the highest service levels at the lowest possible cost, no matter what your deployment scenario is like or how it may change. Protect your business not just from application outages due to hardware failures or data corruption, but from larger events such as corruption of an entire database and data center outages such as those caused by natural disaster.

Serve a broad spectrum of workloads

With HPE 3PAR File Persona, you can unlock the native file and object graphical access capabilities within any of your HPE 3PAR StoreServ Storage array. This approach offers a unique solution that incorporates multi-protocol support into the system architecture to deliver a tightly integrated, converged solution for provisioning both block volumes and file shares from a single storage system. Unlike traditional solutions, this converged solution extends the architectural benefits that the HPE 3PAR StoreServ Storage system already delivers for block workloads to file shares and object access in a way that is simple to deploy and administer.

HPE 3PAR File Persona enables a rich set of file protocols, file data services, and an Object Access API (REST) and gives you the ability to provision file shares in addition to block volumes from a single graphical user or programmatic management interface. This solution extends the spectrum of storage workloads natively addressed by the system's default Block Persona. The Block Persona is ideal for your virtualization, database, and application workloads with the File Persona enabling home directory and user shares, enhanced content management and collaboration, and data preservation and governance.

Respond faster with autonomic management

Simplify, automate, and expedite management with storage that is self-configuring, self-provisioning, and self-optimizing. HPE 3PAR StoreServ Storage does away with traditional manual storage planning and change management with autonomic management and optimization features that are intelligent, take place at a subsystem level, and don't require administrator intervention.

Looking to replace your HDS, IBM XIV, EMC VMAX, EMC DMX4, EMC CLARiiON CX4, or EMC VNX array?
Every HPE 3PAR StoreServ Storage system comes with **HPE 3PAR Online Import software**—giving you painless migration so you can finally say goodbye to traditional storage silos.

These features not only minimize the opportunity for human error, but they let you respond faster by shrinking provisioning time from hours, weeks, and days to just seconds. Provision a volume in only 15 seconds. Deliver high performance to all applications, even under failure conditions. Quickly adapt to the unpredictable by optimizing QoS levels with one click.

Integration with Microsoft System Center and VMware® vCenter™ gives enhanced visibility into storage for application owners while **HPE StoreOnce Recovery Manager Central** provides superior granularity and control of array-based snapshots for backup administrators using management tools provided by VMware, Oracle[8], or Microsoft.

Meet unpredictable and dynamic application demands
HPE 3PAR StoreServ Storage supports federated data mobility across HPE 3PAR and other arrays so you can manage resources at the data center level rather than the system level.

Peer-based storage federation lets you move data and workloads between arrays without impact to applications, users, or services. Scale massively without sacrificing simplicity, pool resources without the cost and complexity of external virtualization appliances, and flex to meet unpredictable workloads and business demands.

With HPE 3PAR Peer Motion, simply and non-disruptively shift data and thinly provisioned virtual volumes between any model HPE 3PAR StoreServ Storage array to boost resource utilization, avoid hotspots and bottlenecks, assure service levels, manage unpredictable growth, and meet stringent SLAs.

Move data between existing and new HPE 3PAR devices for more effective storage asset management (such as technology refreshes and asset re-purposing) without time-consuming planning and migration.

Maintain business continuity in the event of a disaster or data center-wide outage with replication and recovery between systems. Use these relationships to allow server and application maintenance operations to take place non-disruptively.

Improve data availability and protection in clustered VMware and Microsoft Hyper-V environments.

Bi-directionally replicate data volumes between StoreVirtual VSA and HPE 3PAR arrays with HPE Peer Copy—eliminating the need to use host specific or hypervisor specific tools or expensive out of band network-based appliances.

Shield your business from application downtime
Application downtime can be fatal to your business and can come from a variety of sources—from human error to natural disasters. As a result, data protection is a continuum that must cover a wide range of scenarios.

[8] Recovery Manager Central for Oracle supports RHEL and OEL environments. For Solaris SPARC, IBM AIX, and HP-UX environments, use the HPE 3PAR Applications Suite for Oracle.

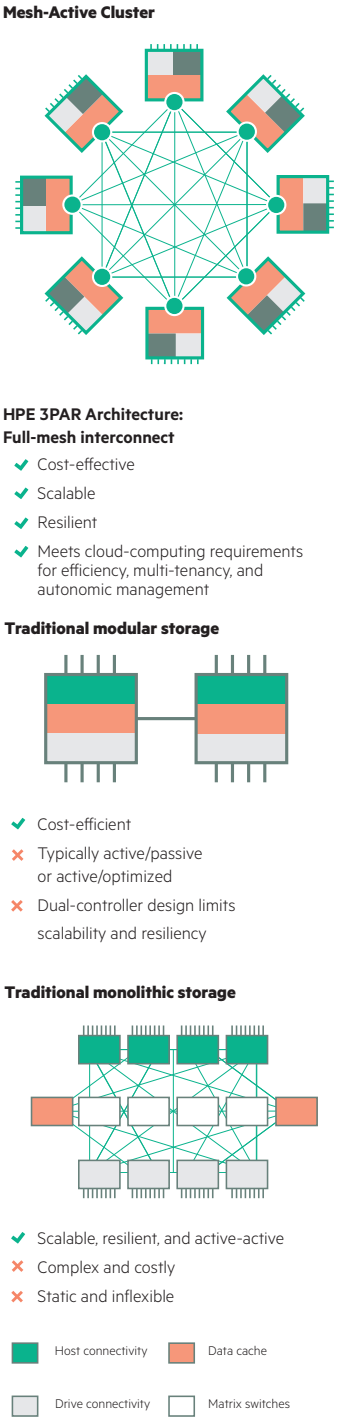

Figure 2. HPE 3PAR Architecture vs. Traditional Architectures

HPE 3PAR StoreServ Storage offers a highly resilient, Tier-1 architecture that provides the first line of defense against application outages with high availability features such as fault tolerance and hardware redundancy. In addition:

- Point-in-time (PIT) snapshots add additional protection against application errors and data corruption or loss.
- Low-cost remote replication protects against site-wide outages and natural disasters with the flexibility to replicate between any member of the HPE 3PAR StoreServ family—regardless of model.
- Asynchronous streaming replication enables replication that balances latency, distance, and recovery time and is especially well suited to the all-flash data center. Asynchronous streaming does away with the latency overhead of synchronous replication while allowing for a near-exact data copy with recovery point objectives (RPOs) that can be measured in seconds.
- Peer replication presenting a nearly continuous storage system to hosts and enabling a high-availability solution between up to three sites where failover and failback remains completely transparent to the hosts and applications running on those hosts.
- Online, disk-based backup with HPE StoreOnce Backup physical or virtual appliances protects against array failures and data corruptions for comprehensive data protection.

HPE StoreOnce Backup increases your application protection level by letting you maintain more frequent snapshots for longer and for less. Free up flash capacity on your HPE 3PAR StoreServ array by offloading snapshots to more cost-effective backup. Free your data center from dependence on traditional backup infrastructure by taking advantage of direct backup to reduce backup ISV licensing costs.

In VMware, Microsoft, Oracle, and SAP® environments, direct backup between HPE 3PAR StoreServ and HPE StoreOnce with HPE Recovery Manager Central software lets you maintain business productivity by expediting the backup and recovery process and eliminating application performance impact. This streamlined backup process also reduces total cost of ownership for storage by leveraging HPE StoreOnce physical or virtual appliances for cost-effective backup retention and reducing software-licensing costs. The native movement of snapshots from HPE 3PAR StoreServ Storage to HPE StoreOnce systems mean that any online storage threats are quickly mitigated with always-available, single-click data recovery.

Architecture that sets new standards for agility and efficiency

As IT evolves away from application-centric computing and towards more efficient and flexible service delivery models, infrastructure requirements are changing too. With a modern architecture built for virtualization, cloud, and ITaaS, HPE 3PAR StoreServ Storage anticipates these new requirements with a resilient, secure, multi-tenant platform.

Flash-optimized architecture featuring a Mesh-Active design

HPE 3PAR StoreServ Storage features a Mesh-Active design based on a unique system of controller interconnects as part of a flash-optimized architecture. This architecture combines the benefits of monolithic and modular architectures while eliminating price premiums, scaling complexities, and performance bottlenecks of legacy storage designs. As a result, the HPE 3PAR Architecture delivers sustainable performance for diverse and unpredictable workloads that scales even with extremely high levels of capacity utilization.

Unlike legacy “Active-Active” controller architectures—where each volume is active on only a single controller—the HPE 3PAR Architecture features a Mesh-Active design that allows each volume to be active on every controller in the system.

Media lifespan mechanisms extend flash storage investments
Within each storage controller, purpose-built HPE 3PAR Gen5 ASICs provide an efficient, silicon-based, zero-detection mechanism that powers **inline, thin deduplication** for block and file data compaction and the removal of allocated but unused space without impacting performance—thereby extending the life of flash-based media by avoiding unnecessary writes. Adaptive Read and Write is another feature that helps extend the life of flash drives by automatically matching host I/O size reads and writes.

Adaptive Sparing technology
HPE 3PAR Adaptive Sparing is a feature of the HPE 3PAR Operating System that leverages the system's sparing approach to improve the performance and endurance of flash. Other architectures often reserve entire drives to use as "hot" spares—these drives are not used unless another drive in the system fails which is expensive and inefficient. Instead, the HPE 3PAR architecture reserves a small amount of "spare" space in each drive. HPE 3PAR StoreServ's patented Adaptive Sparing technology takes the spare space and hands it back to the drive's firmware to increase the internal capacity used by the drive for housekeeping tasks. Adaptive Sparing allows the drive to consume all unused space on the drive to extend its internal housekeeping space. Adaptive Sparing technologies are so powerful they can increase SSD endurance up to 5X over the drive's standalone endurance capability while also increasing write performance. Adaptive Sparing is the foundation behind HPE 3PAR StoreServ's 5-year warranty and 7-years of wear out.[9]

[9] All SSDs on HPE 3PAR 8000/20000 purchased after June 1, 2015 with life left below 5% as determined by HPE and with drive age less than seven years from warranty start date and no interruption in HPE support coverage. Wear out in years six and seven applies to media and electronic failure replacements for all SSDs.

A high-speed, full-mesh interconnection joins multiple storage controllers to form a cache-coherent, Mesh-Active cluster of up to eight controller nodes for low-latency, high-performance, inter-node communication. This Mesh-Active design is one of many features that make the HPE 3PAR StoreServ Storage architecture flash-optimized, eliminating the performance bottlenecks that can choke general-purpose disk arrays once flash-based media is introduced.

The controllers that form the system's tightly-coupled, cache-coherent, Mesh-Active cluster feature Gen5 ASICs that use Direct Memory Access (DMA) to enable a local ASIC in one node to directly access memory in other nodes to reduce latency times. These ASICs also connect every controller in the system with every other controller over dedicated, high-bandwidth, low-latency links, enabling I/O workloads to be spread widely across the array.

Mixed workload support for consistently high performance

Supports mixed workloads and enables thin technologies including inline deduplication with high performance levels to alleviate legacy storage performance concerns. The ASIC supports mixed workloads with extremely high performance levels so that transaction- and throughput-intensive workloads run on the same storage resources without contention, enabling consolidation without compromise.

Fine-grained virtualization and system-wide striping

The HPE 3PAR StoreServ architecture uses three levels of storage virtualization to drive up capacity utilization and accelerate performance. This fine-grained virtualization divides each physical disk into granular allocation units, or chunklets, each of which can be independently assigned and dynamically reassigned to different logical disks that are used to create virtual volumes. Breaking media devices (both disk- and flash-based) into chunklets virtualizes physical drives to enable higher utilization and avoid stranded capacity. This fine-grained virtualization unit also enables mixed RAID levels on the same physical drive, therefore doing away with dedicated RAID groups and seamlessly supporting new media technologies as they become available.

Logical disks are the virtualization layer at which QoS parameters are applied, such as availability level, drive media type, RAID level, etc. This enables sub-LUN tiering and the system-wide striping of data and I/O for each volume across all system resources. This system-wide striping delivers simultaneously high capacity utilization and performance levels. Even a small volume can leverage the performance of hundreds of media devices and all of the system's storage controllers for optimal performance without compromising capacity utilization.

For flash-based media, fine-grained virtualization combined with system-wide striping also drives uniform I/O patterns by spreading wear evenly across the entire system. Should there be a media failure, system-wide sparing helps guard against performance degradation by enabling faster many-to-many rebuilds. Because HPE 3PAR StoreServ Storage autonomically manages this system-wide load balancing, no extra time or complexity is required to create or maintain an optimally configured system.

Dynamic caching designed for flash

Caching is an important element of the HPE 3PAR Architecture, where it is performed dynamically and in a manner that extends flash-based media longevity. The HPE 3PAR caching algorithm is dynamic in that it adapts itself to media type (HDD vs. SSD), drive type (7.2K rpm vs. 15K rpm), and workload type (random vs. sequential; read vs. write). In addition, the ability to adapt reads and writes to match host I/O sizes enables a more granular caching approach when handling flash-based media. This minimizes the number of times that data is accessed, thereby significantly reducing I/O latency, avoiding unnecessary flash media wear-out, and boosting backend performance.

To assure consistent random I/O performance with flash media even under mixed workload conditions, the HPE 3PAR StoreServ caching algorithm breaks down large sequential I/O into smaller blocks before sending them to the backend. Designed to serve unpredictable multi-tenant workloads, this caching algorithm also adjusts autonomically to changes in workload patterns. For example, autonomic offloading of cache removes cache bottlenecks by adjusting the frequency with which data is offloaded from cache to flash-based media using historical cache utilization rates.

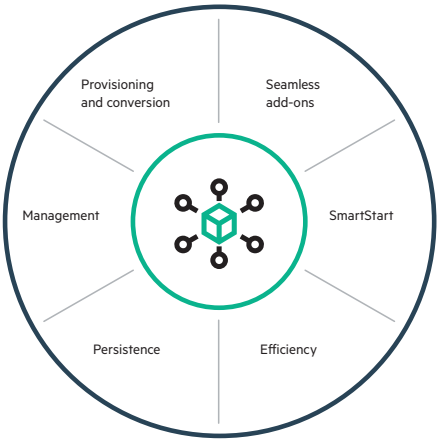

Figure 3. HPE 3PAR Software enhance the agility and efficiency of your infrastructure

Another important aspect of the cache offload algorithm is the determination of which cached data should be flushed to the backend. HPE 3PAR StoreServ Storage keeps track of read cache hits and keeps "hot" data in cache itself, thereby lowering latencies of frequently accessed data.

HPE 3PAR Software

HPE 3PAR StoreServ Storage leads the industry in providing array management features that remove the layers of complexity typically weighing down storage administration and products that enhance visibility and control while eliminating costly, repetitive, and error-prone manual tasks.

Included in the HPE 3PAR Operating System software, Hewlett Packard Enterprise offers a range of software products to enhance the agility and efficiency of your infrastructure and enable you to eliminate compromise, most at no extra charge to simplify purchasing and reduce costs.

Manage: Everything you need to get up and running quickly and efficiently
Simplified management is offered by the HPE 3PAR StoreServ Management Console (SSMC). The scriptable HPE 3PAR Command Line Interface (CLI) gives you powerful customization capabilities that are simple to configure and reduce the need for extra management tools. HPE 3PAR System Reporter helps track performance and capacity utilization trends for multiple HPE 3PAR StoreServ systems. Remote error detection along with support for diagnostics and maintenance activities is offered via HPE 3PAR Service Processor. Rich file protocols from SMB/CIFS to NFS and FTP, and a RESTful Object Access API for programmatic access to files are offered with HPE 3PAR File Persona. Built-in automated SAN configuration is offered with HPE 3PAR Smart SAN. HPE OneView integration, gives you a web-based interface that is common and across enterprise servers, storage, and networking. Support for the Storage Management Initiative Specification (SMI-S) provides simplified storage management from within the Microsoft System Center Management framework. With OpenStack® integration, over both iSCSI and Fibre Channel protocols, the flexibility and cost-effectiveness of a highly resilient cloud-based open source platform that meets the requirements of your mission-critical applications, is offered. HPE 3PAR StoreServ Storage integration with VMware vSphere® enables you to take advantage of architectural benefits such as wide striping, a Mesh-Active clustered controller design, mixed workload support, and hardware-assisted VMware vSphere APIs for Array Integration (VAAI) support. Dockers containers support helps deliver enterprise-grade storage availability, resiliency, and performance for stateful containers.

Protect: Safeguard your most mission-critical applications
HPE 3PAR Remote Copy offers simple and cost-effective data protection for efficient multi-tenant disaster recovery. HPE 3PAR Peer Persistence ensures transparent autonomic failover over metropolitan distances. HPE 3PAR Cluster Extension Software enables automatic failover across data centers using Remote Copy Asynchronous mode. HPE Recovery Manager Central allows you to create, manage, and automate crash-consistent snapshots for any application and app-consistent snapshots for VMware vSphere, Microsoft SQL Server, Oracle, and SAP HANA®. HPE 3PAR StoreServ Data-at-Rest Encryption protects data from both internal and external security breaches by securely encrypting all data as it is written to the drive. End-to-end data integrity, protection against silent corruption from the host to the storage array is offered via HPE 3PAR Persistent Checksum. HPE 3PAR Persistent Cache maintains service levels, so they are not impacted by unplanned component failures—a key requirement for the virtual data center. Non-disruptive upgrades to HPE 3PAR StoreServ Storage systems without relying on multipathing software and without initiating failover is initiated via HPE 3PAR Persistent Ports. HPE 3PAR Virtual Domains and HPE 3PAR Virtual Lock Software helps segregate access and deliver robust storage services for different applications and user groups with additional security attached to the retention of storage volumes. HPE 3PAR File Lock enables data preservation to meet the enterprise governance requirements.

Optimize: Make the best use of the available storage capacity
HPE 3PAR Adaptive Sparing leverages the system's sparing approach to improve the performance and endurance of flash. Performance acceleration is assured by HPE 3PAR Adaptive Flash Cache, which reduces application response times. HPE 3PAR Priority Optimization assures service levels with QoS controls for mission-critical applications. HPE 3PAR Peer Motion enables load balancing at will, wherein movement of data and workloads between arrays does not impact, applications, users, or services. HPE 3PAR Online Import is included to enable migration from HPE EVA, EMC, HDS, or IBM Storage systems. HPE 3PAR Adaptive Optimization improves storage utilization by enabling cost-optimized storage tiering. HPE 3PAR Express Protect enables backups to StoreOnce—all through the familiar RMC GUI. HPE 3PAR Adaptive Reads and Writes help to avoid unnecessary data reads and writes to reduce latency, enhance backend performance and extend flash media lifespan. HPE 3PAR Express Writes enhances write acceleration that helps optimize CPU utilization and depending on workload, delivers greater throughput. HPE 3PAR Autonomic cache offload helps reduce cache bottlenecks by automatically changing the frequency at which data is offloaded from cache to flash media based on utilization rate. HPE 3PAR Multi-tenant I/O processing enables performance improvement for mixed workloads or virtual desktop infrastructure (VDI) deployments by breaking large I/O into smaller chunks so that small read requests don't get held up behind larger I/O requests, ensuring reduced latency.

Efficient: Get maximum performance with minimum expenditure
HPE 3PAR Zero Detect reduces the cost of storage by identifying and removing repeated data from incoming data streams. HPE 3PAR Deduplication helps reduce the amount of flash needed to store data by preventing the storage of duplicate data. HPE 3PAR Compression helps reduce the amount of flash needed to store data by reducing the data footprint. HPE 3PAR Data Packing helps improve storage efficiency and bandwidth by condensing multiple smaller data sets together. HPE 3PAR Virtual Copy Software protects and shares data affordably with rapid recovery using reservationless, non-duplicative, copy-on-write snapshots. HPE 3PAR Thin Technologies—including HPE 3PAR Thin Provisioning, Thin Conversion, Thin Persistence, and Thin Copy Reclamation—achieve data compaction by leveraging built-in hardware capabilities. HPE 3PAR Express Layout allows HPE 3PAR controller nodes to share access to SSDs in order to drive efficiency. HPE 3PAR Express Indexing helps deduplicate data inline and with a high degree of granularity. HPE 3PAR Express Scan helps remove redundant data inline and prevents wastage of CPU cycles.

Application-managed storage solutions for any scale or performance requirement

Hewlett Packard Enterprise invests in technologies and partnerships to support key strategic IT initiatives, working with partner companies such as VMware, Citrix®, Red Hat®, Oracle, Symantec, and Microsoft to develop integrated, platform-specific storage solutions that work with HPE 3PAR StoreServ Storage.

Storage built for ITaaS, virtualization, and cloud apps
Exclusive virtualization and automation features built into HPE 3PAR StoreServ Storage work with our software products and solutions to deliver unique benefits for VMware vSphere, VMware View®, Microsoft Windows Server® Hyper-V, Citrix XenServer, Red Hat Enterprise Virtualization (RHEV), and Oracle VM.

HPE 3PAR StoreServ's advanced storage technologies and hypervisor integration optimize your VM density and storage efficiency. It's why VMware chose HPE 3PAR StoreServ as the Fibre Channel reference platform for the development of its Virtual Volumes (VVols) technology.

A flash-optimized design enables predictable and assured performance, up to 26 PB usable capacity, and rich Tier-1 data services, including a 99.9999 percent data availability guarantee program.

HPE StoreServ Integration Services
Want to maximize the benefit of HPE 3PAR StoreServ Storage? HPE Technical Services Storage Consulting now offers HPE 3PAR StoreServ Integration Services to help you realize the maximum benefit from your storage investments by integrating your new HPE 3PAR StoreServ storage solution into your existing server and SAN infrastructure. Learn more at **hpe.com/services/storage**.

How well do you know your backup environment?
Find out with a free assessment from **HPE**.

See how moving to any HPE StoreOnce solution can reduce your backup capacity requirements by up to 95%. Sign up and receive a no-obligation, no-cost, and non-invasive backup assessment. This assessment doesn't access your confidential data and will provide you with a detailed report that includes

- Your current backup capacity and performance
- Key performance indicators such as backup windows, backup success rates and more
- Opportunities for cost reduction

Register today or contact your HPE sales representative for details.

HPE 3PAR StoreServ Storage is perfect for consolidation of ITaaS and able to deliver maximum performance at the lowest possible per transaction cost without sacrificing Tier-1 availability, scale, and data services.

Flash array-integrated data protection

If you are looking for virtually instant application-consistent backups for your VMware, Microsoft SQL Server, Oracle or SAP database environment, look no further than rapid and granular backup and recovery with HPE StoreOnce and HPE Recovery Manager Central software for fast, efficient, reliable, and simple backup and recovery with your HPE 3PAR StoreServ Storage system. This solution transforms traditional approaches to backup and recovery, giving you application-aware, storage-integrated data protection that bypasses traditional backup server-based processes. Seamlessly manage snapshots, backup, and recovery directly from within VMware vCenter.

Powering the data-driven enterprise

For today's enterprises, mission-critical Oracle, SAP, and Microsoft SQL Server deployments are at the heart of revenue generating activities. Transaction speed equals revenue, but apps also require scale to support growth. HPE 3PAR StoreServ Storage provides flash performance at the same dollar per gigabyte as performance-oriented HDD-based storage, and with HPE, you can get 99.9999% availability and petabyte scale.

Tight solution integration with Oracle, SAP, and Microsoft SQL Server delivers increased levels of availability, simplified management, and increased performance. HPE StoreOnce Recovery Manager Central software support for Oracle and Microsoft SQL Server provides added resilience with ultra-fast flat backup.

Enabling workforce productivity

To be competitive, the modern enterprise needs to support seamless communications and foster richer collaboration amongst its employees while also protecting user data. A successful Exchange or SharePoint deployment requires the right storage foundation to support new growth or as part of application update and migration projects. HPE 3PAR StoreServ Storage enables you to support a large number of mailboxes with a larger size limit while reducing cost per mailbox from dollars to cents. In addition, with HPE 3PAR Recovery Manager for Exchange[10], you can recover email messages quickly, affordably, and from multiple points in time.

HPE's long-standing partnership with Microsoft provides comprehensive storage solution expertise for Exchange and SharePoint that is simple, scalable, always-on and efficient. Deploy Exchange and SharePoint on HPE StoreServ Storage with confidence by leveraging reference architectures and best practices that are tested and proven.

[10] This software title is delivered via the HPE 3PAR Application Software Suite for Exchange.

HPE 3PAR StoreServ Storage models and specifications

Model	8200	8400	8440	20800	20840	8450	9450	20450	20850
Storage controllers	2	2 or 4	2 or 4	2, 4, 6, or 8	2, 4, 6 or 8	2 or 4	2 or 4	2 or 4	2, 4, 6, or 8
Maximum host ports	12	24	24	160	160	24	-	80	160
16 Gb/s Fibre Channel	4–12	8–24	8–24	0–160	0–160	8–24	0–80	0–80	0–160
10 Gb Ethernet	0–4	0–8	0–8	0–48	0–48	0–8	0–24	0–24	0–48
10 Gb iSCSI/FCoE	0–4	0–8	0–8	0–80	0–80	0–8	0–40	0–40	0–80
Maximum initiators per system	2,048	4,096	4,096	8,192	8,192	4,096	-	8,192	8,192
Drive types (mixable)	SAS (performance, nearline, SSDs)	SAS (performance, nearline, SSDs)	SAS (performance, nearline, SSDs)	SAS (performance, nearline, SSDs)	SAS (performance, nearline, SSDs)	SAS SSDs	SAS SSDs	SAS SSDs	SAS SSDs
Max Drives (all types)	240	576	960	1920	2304	480	-	576	1152
Max Solid State Drives (SSDs)	120	240	480	1024	1152	480	576	576	1152
Maximum capacity raw	750 TiB	2400 TiB	3000 TiB	6000 TiB	9600 TiB[11]	1843 TiB (SSD-only)	6000 TiB	1966 TiB	8043 TiB[12] (SSD-only)

HPE Pointnext provides a comprehensive portfolio including Advisory and Transformational, Professional, and Operational Services to help accelerate your digital transformation. From the onset of your transformation journey, Advisory and Transformational Services focus on designing the transformation and creating a solution road map. Professional Services specializes in creative configurations with flawless and on-time implementation, and on-budget execution. Finally, operational services provide innovative new approaches like Flexible Capacity and Datacenter Care, to keep your business at peak performance. HPE is ready to bring together all the pieces of the puzzle for you, with an eye on the future, and make the complex simple.

[11], [12] Support scheduled for 2H 2016.

HPE Foundation Care Support Service

HPE Foundation Care connects you to HPE 24 hours a day, seven days a week for assistance on resolving issues. This service includes available response times of next business day, 4-hour response or 6 hours to repair with answers to software questions within two hours. HPE is the only leading manufacturer who makes this level of coverage available as a standard service offering for your most valuable servers. In addition, collaborative software support is included and provides troubleshooting assistance on industry leading software running on your server. Simplify your support experience and make HPE your first call to help resolve hardware or software problems.

HPE Proactive Care Support Service

HPE Proactive Care gives customers an enhanced call experience. When your products are connected to HPE, Proactive Care helps prevent problems and maintains IT stability by utilizing personalized proactive reports with recommendations and advice. This service includes available response times of next business day, 4-hour response or 6 hours to repair with answers to software questions within two hours. HPE is the only leading manufacturer who makes this level of coverage available as a standard service offering for your most valuable servers. This service also includes collaborative software support for Independent Software Vendors (ISVs), (Red Hat, VMware, Microsoft, etc.) running on your HPE servers.

HPE Datacenter Care service

HPE Datacenter Care helps improve IT stability and security, increase the value of IT, and enable agility and innovation. It is a structured framework of repeatable, tested, and globally available services "building blocks." You can deploy, operate, and evolve your data center wherever you are on your IT journey. With HPE Datacenter Care, you benefit from a personalized relationship with HPE via a single point of accountability for HPE and others' products.

HPE Flexible Capacity

With Flexible Capacity, you get the speed, scalability, and economics of the public cloud in the privacy of your data center. Gain the advantages of the public cloud—consumption-based payment, rapid scalability without worrying about capacity constraints. Reduce the "heavy lifting" needed to operate a data center. And retain the advantages that IT provides the business (i.e., control, security). Deliver the right user experience, choose the right technology for the business, manage privacy and compliance, and manage the cost of IT. And, you have the option to use the public cloud when needed.

HPE Hardware Installation

Provides for the basic hardware installation of HPE branded servers, storage devices and networking options to assist you in bringing your new hardware into operation in a timely and professional manner.

HPE Installation and Startup Service provides for the installation and startup of HPE technology including BladeSystem, c-Class enclosure, HPE ProLiant c-Class and Integrity server blades, storage blades, SAN switch blades, HPE Virtual Connect modules (Ethernet and Fibre Channel), Ethernet network interconnects, and InfiniBand, as well as the installation of one supported operating system type (Windows® or Linux®).

Learn more at
hpe.com/storage/3par

Make the right purchase decision. Click here to chat with our presales specialists.

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