Hewlett Packard Enterprise

HPE 3PAR StoreServ with server virtualization and home directory consolidation

HPE 3PAR StoreServ Storage, HPE ProLiant servers, and HPE FlexFabric

Contents

Technical white paper

Executive summary

Many organizations today have begun the process of transitioning toward simplification and efficiency around managing on-premise infrastructure in today's data centers. A few of these technologies include public or private clouds, converged infrastructure, and integrated systems. All these technologies use resources more efficiently and simplify the underlying technologies of compute, network, and storage. Often the overall solution is only as good as the weakest link in the chain. The storage tier of a traditional infrastructure stack is still considered as the most complex to manage.

HPE reduces the complexity of managing on-premise storage by offering a converged block, file, and object access to storage solution that provides simple administration of block and file resources from a single interface. These features are available on the new HPE 3PAR StoreServ 7000c with converged controllers. With these features, HPE has completely converged the HPE 3PAR StoreServ Storage offerings by tightly integrating the file services (HPE 3PAR File Persona Software) within the same mesh-active architecture and the HPE 3PAR Operating System Software that previously only provided block services. Both the file and block services share the underlying virtualization services and features of the HPE 3PAR StoreServ technology.

This paper demonstrates how the deployment of both block and file workloads sharing the same storage device can reduce storage silos, discovery costs, and complexity without significantly affecting the performance of either workload.

Target audience

The intended audience includes IT professionals responsible for designing and implementing a storage solution that consolidates diverse workloads often found on virtualized servers, to a single storage platform. Readers of this paper should have a functional understanding of Microsoft® Exchange, VMware®, and other networking concepts and technologies.

Introduction

The so-called "unified" solutions in the market today already support both block and file protocols. However, these currently available solutions employ architectures that essentially bolt file capabilities onto existing block capabilities or vice versa. As your business grows, these superficial solutions cannot deliver the flexibility and efficiency of true multiprotocol convergence. While you may be able to meet today's needs with a pseudo-unified storage solution, or the addition of a file-serving gateway in front of your existing block storage array, future growth will require a more robust solution.

As your environment grows and as you continue to evolve your infrastructure, a truly converged primary storage platform will allow you to natively address a broad spectrum of workloads—including home directory consolidation and group shares—efficiently, effortlessly, and without compromise.

HPE 3PAR File Persona Software offers native file and object access capabilities with the HPE 3PAR StoreServ 7000c models (7200c, 7400c, 7440c, and 7450c). HPE 3PAR OS along with the array's converged controllers, enable these capabilities. This approach offers a unique solution that incorporates multiprotocol support into the system architecture to deliver a tightly integrated, truly converged solution for provisioning both block storage volumes and file shares from a single storage system. Unlike existing solutions, this truly converged solution extends the architectural benefits that the HPE 3PAR StoreServ Storage system already delivers—block workloads to file shares and object access. The solution is simple to deploy and administer.

As your environment grows and as you continue to evolve your infrastructure, a truly converged primary storage platform allows you to address a broad spectrum of workloads, as shown in figure 1. Benefits of the HPE approach for converging block, file, and object access, include:

- **Less administration overhead:** HPE reduces the complexity of managing on-premise storage by providing a converged block, file, and object access storage solution that offers simple administration of block and file resources from a single interface.

- **Fewer data silos:** Optimized storage utilization means that you can deploy block, file, and object access within a single storage platform without expanding the storage hardware footprint.

- **Efficient data storage:** Data storage is more efficient because file and block share the same groups of drives equally.

- **Increased value of existing storage resources:** Combining the simplicity and efficiency of adding file services to existing block services lowers the overall total cost of ownership (TCO).
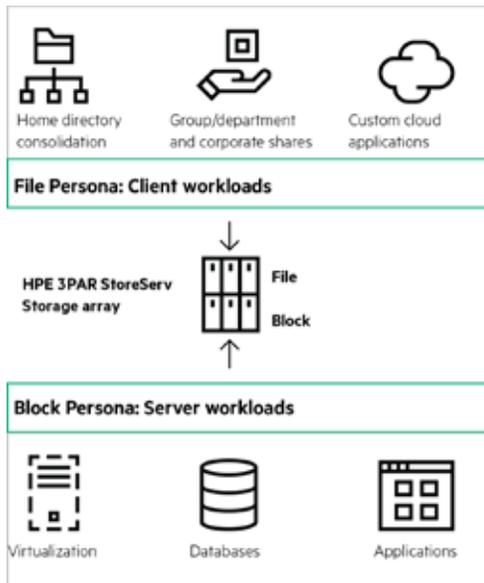
Figure 1. Block and file workloads co-existing on a single storage platform

Solution overview

This paper demonstrates that deploying file workloads along with block workloads on a single storage platform such as the HPE 3PAR StoreServ 7400c does not significantly affect the block performance. The block and file workloads are deployed on virtualized servers running VMware ESXi 5.5. This further demonstrates that file workloads can be easily deployed alongside block workloads in existing data center environments, reducing the overall hardware footprint and TCO.

Use case demonstrated in solution

The tested solution deploys home directory consolidation as a file workload and Microsoft Exchange 2013 as a block workload.

Home directory consolidation provides central management, security, and efficiency for users' home directory environment. HPE 3PAR File Persona Software supports several Microsoft features, which tightly integrate with home directory consolidation and group or corporate shares. Features such as folder redirection, roaming user profiles, access-based enumeration, offline files integration with Microsoft DFS Namespace make it easier for a storage administrator to manage user data and enhance the users' experience at the same time.

HPE 3PAR StoreServ addresses the storage challenges of growing Exchange environments by decoupling many of the storage management functions from day-to-day Exchange administration. Advanced functionality such as chunklet-based RAID and wide striping of data across multiple hard drives improves I/O performance and increases data resiliency. Thin provisioning and non-disruptive scalability of storage further reduces administration by allowing storage capacity for Exchange to grow as needed without affecting mailbox users.

Additional solution details are found in the Workload description and Configuring Block and File Persona sections of this paper.

How the solution was tested

Block and file workload testing was performed on a single HPE 3PAR StoreServ 7400c, with four controller nodes over 8 Gb Fibre Channel for the block workload and 10GbE for the file workload. Microsoft Exchange Server Jetstress 2013 Tool created the block workload, which was configured to simulate 3,000 Microsoft Exchange 2013 mailbox users. The Microsoft File Server Capacity Tool creates the file workload, configured to simulate 3,000 home directory users. The tools used to generate the storage workloads are installed on virtualized servers with VMware ESXi 5.5 providing the virtualization features. All workloads share the same group of drives; 48 3 TB NL SAS drives configured into a single common provisioning group (CPG) with RAID 1 data resiliency.

HPE 3PAR File Persona Software tightly integrates into new and existing data centers by supporting the industry-standard NAS protocols, file service ecosystems such as authentication and authorization methods, antivirus servers, and variety of client OSs. It manages it all with a single streamlined interface. The tested configuration takes advantage of Windows® Active Directory for home directory authentication and Microsoft Server Message Block (SMB) protocol for file share data transport.

Solution highlights

- Single management interface for block and file through either HPE 3PAR StoreServ Management Console (SSMC) or HPE 3PAR OS command line interface (CLI).

- HPE 3PAR File Persona Software supports the security, performance, resiliency, and efficiency features of the SMB protocol.

- HPE 3PAR File Persona Software benefits from the inherited HPE 3PAR StoreServ Storage resiliency. In case of an event requiring node-failover, such as a controller failure or HPE 3PAR OS upgrade, file services will failover to the other controller node in the node pair. Depending on the protocol, the failovers are transparent to the file services users.

- HPE 3PAR StoreServ has sufficient headroom to support block and file workloads running on virtualized servers.

- HPE 3PAR StoreServ is a scalable storage solution that enables incremental customer purchases, allowing the storage to grow as Exchange messaging requirements grow, for maximum return on investment.

- HPE 3PAR StoreServ ensures 99.9999 percent data availability with all HPE 3PAR 7400c Storage with four nodes giving you the peace of mind to deploy mission-critical applications such as Microsoft Exchange 2013.

Licensing

HPE 3PAR File Persona Software uses a capacity-based licensing approach. There is a 1 TB software license to use (LTU) for each HPE 3PAR StoreServ 7000c model (7200c, 7400c, 7440c, and 7450c). The 1 TB software LTU for a particular platform is a single SKU irrespective of the drive type or drive capacity, which includes all file protocols SMB, NFS, and Object Access API and core file data services.

The only additional hardware required for the HPE 3PAR File Persona Software suite is the Ethernet HBAs in the HPE 3PAR StoreServ array: the 4-port 1GbE or the 2-port 10GbE.

For additional file and block licensing details, see the HPE 3PAR StoreServ 7000 Storage QuickSpecs

Solution components

Figure 2 provides a high-level view of the major hardware components described in this paper and their role in the overall block, file, and object access solution. See the bill of materials for a detailed description and part numbers.
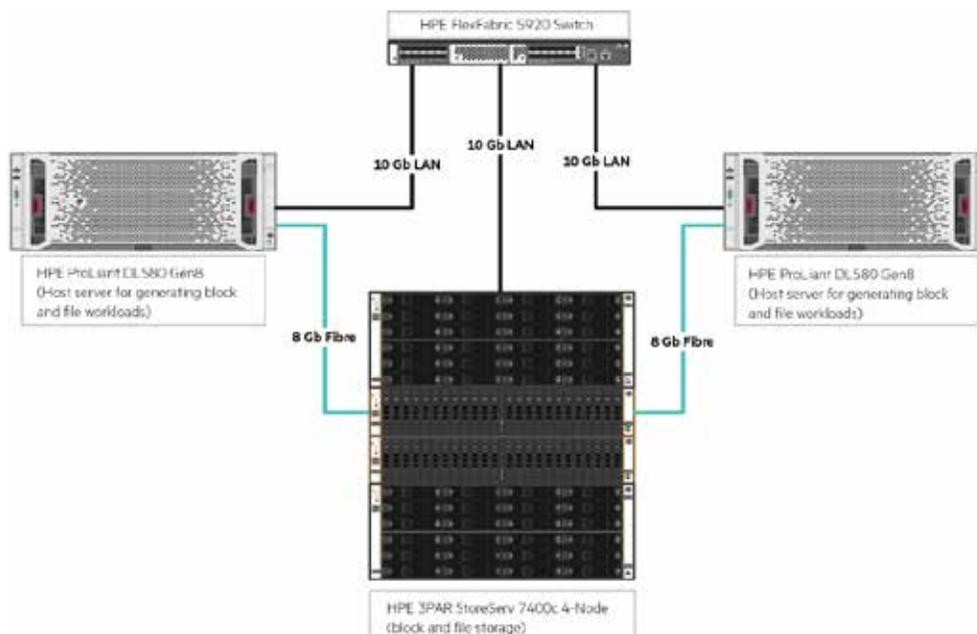
Figure 2. High-level view of the major hardware components in the block, file, and object access solution

Data movement in this solution used 10GbE and 8 Gb Fibre connectivity. However, to make the solution more cost-effective, each component offers a variety of direct and non-direct connectivity options to meet any budget.

HPE 3PAR StoreServ Storage

HPE 3PAR StoreServ 7400c Storage shown in figures 3 and 4 offers enterprise tier-1 storage at a midrange price. Spend less time managing storage, get more features for less money, and do it all without sacrificing performance or future scalability. HPE 3PAR StoreServ 7000c Storage provides high performance and guarantees to double your virtual machine density. With hardware-assisted thin storage, it is the only platform that guarantees a 50 percent reduction in capacity requirements. HPE 3PAR StoreServ Storage is also the first product family with a common architecture, capable of six nines availability that meets small and midsize business needs. HPE 3PAR StoreServ Storage spans to the largest global enterprise, giving you access to the same features as the world's largest service providers. You can start small and grow without painful upgrades down the road.

Key features
- **Grow with freedom in any direction:** HPE 3PAR Operating System delivers a tightly integrated, converged solution for provisioning block storage volumes, as well as file shares from a single capacity store.

- **Scalable storage:** HPE 3PAR StoreServ 7400c provides affordable entry pricing and unique, non-disruptive scalability to four nodes.

- **High availability:** With the "Get 6-Nines Guarantee", HPE ensures 99.9999 percent data availability with all HPE 3PAR 7400c Storage with four nodes. It gives you the peace of mind to expand deployment of mission-critical applications to midrange storage.

- **Effortless management:** HPE 3PAR StoreServ Management Console provides a modern look and consistent feel for all HPE 3PAR StoreServ Storage, offering the ability to manage block, file, and object access from a single interface for maximum agility.

For more product information and configuration options, visit hpe.com/storage/3PAR.

Figure 3. HPE 3PAR StoreServ 7400c Storage

Figure 4. HPE M6720 3.5-inch 4U SAS Drive Enclosure with 24 SAS NL drives

HPE 3PAR File Persona Software

The HPE 3PAR File Persona Software is a licensed feature of the HPE 3PAR OS that enables a rich set of file protocols and core file data services on an HPE 3PAR StoreServ Storage. As a feature of the HPE 3PAR OS, the File Persona inherits the industry-leading architecture and Block Persona benefits of HPE 3PAR StoreServ Storage. It extends the spectrum of primary storage workloads natively addressed by HPE 3PAR StoreServ Storage from virtualization, databases, and applications via the Block Persona to also include client workloads such as—home directory consolidation, group/department shares, and corporate shares via the File Persona—all have truly converged controllers, truly agile capacity, and truly unified management.

File Persona is supported on the HPE 3PAR StoreServ 7200c, 7400c, 7440c, and 7450c. It requires the installation of 1GbE (E7X97A) or 10GbE (E7X96A) Ethernet HBA cards. For more product information and configuration options, visit hpe.com/go/3PAR/filepersona.

HPE 3PAR File Persona concepts and terminology

HPE 3PAR StoreServ File Persona Software suite comprises the following managed objects:

- File provisioning groups (FPGs)

- Virtual file servers (VFSs)

- File stores

- File shares

The File Persona Software suite is built upon the resilient mesh-active architecture of HPE 3PAR StoreServ and benefits from HPE 3PAR storage foundation of wide-striped logical disks and autonomic common provisioning groups (CPGs). A CPG is shared between file and block to create the File Shares or logical unit numbers (LUNs) to provide the true convergence.

Figure 5 represents the four managed objects for HPE 3PAR File Persona Software Suite within HPE 3PAR OS.
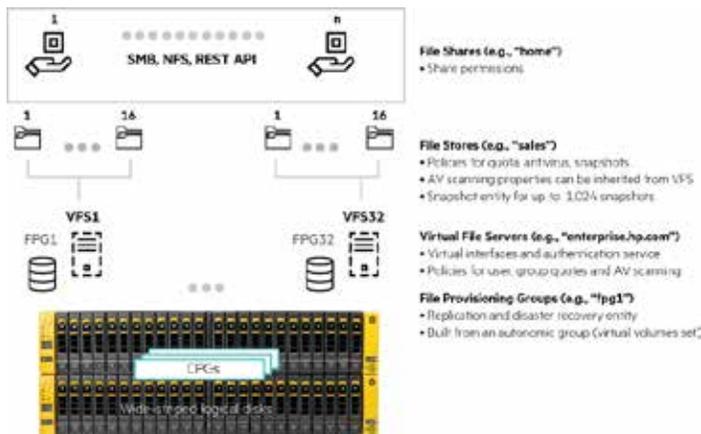

Figure 5. HPE 3PAR File Persona logical view

File Provisioning Group is an instance of the HPE intellectual property Adaptive File System. It controls how files are stored and retrieved. Each FPG is transparently constructed from one or multiple virtual volumes, and is the unit for replication and disaster recovery for File Persona Software suite. There are up to 16 FPGs supported on a node pair.

Virtual File Server is conceptually like a server. As such, it presents virtual IP addresses to clients, participates in user authentication services, and can have properties for things such as user or group quota management and antivirus policies. There are up to 16 VFSs supported on a node pair, one per FPG. VFSs also provide antivirus quarantine, file snapshot capabilities, and implement the quotes for users and groups.

File Stores are the slice of a VFS and FPG, where snapshots are taken, capacity quota management performed, and antivirus scan service policies customized. There are up to 256 File Stores supported on a node pair and 16 File Stores per VFS.

File Shares are what provide data access to clients via SMB, NFS, and Object Access API, subject to the share permissions applied to them. Multiple File Shares can be created for a File Store and at different directory levels within a File Store.

File Shares and VFSs are managed as normal operations via HPE 3PAR SSMC. File Stores and FPGs are typically managed explicitly for advanced operations only.

HPE 3PAR StoreServ Management Console

Effective array management helps lower cost of ownership by simplifying the management of the storage array and improves data center performance. By developing an effective storage management interface, HPE allows companies to save time and reduce the number of IT staff needed to maintain the HPE 3PAR StoreServ Storage systems.

HPE 3PAR SSMC software shown in figure 6 provides contemporary browser-based interfaces for monitoring HPE 3PAR StoreServ Storage. The SSMC streamlines management tasks using a simple, clean view array. Designed through a user-centered methodology, the SSMC focuses on the common tasks for mainstream users. This fresh approach to storage management enables the IT operations staff to concentrate on other areas of the data center.

The SSMC user tasks are accomplished in seconds and not minutes. Automation, combined with a consumer-inspired user experience simplifies basic tasks and everyday processes on HPE 3PAR StoreServ arrays.

For more product information, see HPE 3PAR StoreServ Management Console 2.0 User Guide.

Figure 6. HPE 3PAR SSMC main menu with File Persona advanced menu enabled in SSMC environment settings

HPE ProLiant servers

HPE ProLiant DL580 Gen8 Server shown in figure 7 is an enterprise-grade, four socket (4S) x86 server, offering breakthrough performance, rock-solid reliability, compelling consolidation, and manageability efficiencies. It is ideal for mission-critical enterprises, business intelligence, and database applications.

Featuring Intel® Xeon® E7-4800 v2 processors, the DL580 Gen8 offers blazing-fast results with enhanced processor performance, more memory slots (96 DIMMs), greater I/O bandwidth (9 PCIe Gen3.0 slots), and increased storage performance (12 Gbps SAS). The DL580 Gen8 has security and data protection features for system resiliency that your business can depend on. With intelligent manageability through HPE OneView, HPE Integrated Lights-Out 4 (iLO 4), and user-inspired features, you get faster, lower-cost infrastructure management.

Key features
- **Breakthrough performance:** Provides up to 2X processor performance and 50 percent more cores with Intel Xeon E7-4800 v2 processors than the previous generation.

- **Leading availability and reliability:** Provides increased system availability and less need for service with enhanced error recovery, improved error diagnosis, and built-in redundancy.

- **Intelligent manageability:** Embedded manageability with HPE iLO 4, HPE Agentless Management, HPE Active Health System, HPE Intelligent Provisioning, and HPE Embedded Remote Support.

- **Scale-up consolidation:** Provides total cost of ownership savings with scale-up consolidation efficiencies and software licensing cost savings.

For more product information and configuration options, visit hpe.com/servers.

Figure 7. HPE ProLiant DL580 Gen8 Server

HPE FlexFabric Switch

HPE 5920 Switch Series shown in figure 8 is made up of high-density 10GbE, ultra-deep packet buffering, top-of-rack (ToR) switches. These switches are part of the HPE FlexNetwork Architecture's HPE FlexFabric solution module and are ideally suited for deployments at the server access layer of large enterprise data centers. HPE 5920 Switch Series is also designed for content delivery networks, especially when used to reduce network congestion at the I/O associated with the heavy use of server virtualization, burst multimedia, storage applications, and other critical services.

With the increase in virtualized applications and server-to-server traffic, businesses now require ToR switch innovations to meet their needs for higher-performance server connectivity, Ethernet and storage traffic convergence, capability to handle virtual environments, and ultra-deep packet buffering—all in a single device.

Key features

- **High-performance 10GbE switching:** Enables you to scale your server-edge 10GbE ToR deployments with 24 high-density 10GbE ports delivered in a 1RU design. Delivers a 480 Gbps (357.12 Mpps) switching capacity in addition to incorporating 3.6 GB of packet buffers.

- **Ultra-deep packet buffering:** Provides up to a 3.6 GB packet buffer to eliminate network congestion at the I/O that is associated with the heavy use of server virtualization, file services, and other critical services.

- **Jumbo frames:** With frame sizes of up to 10,000 bytes on Gigabit Ethernet and 10-Gigabit ports, high-performance remote backup, replication, and disaster-recovery services can be enabled.

- **Higher scalability:** HPE Intelligent Resilient Framework (IRF) technology simplifies the architecture of server access networks; up to four HPE 5920 switches can be combined to deliver unmatched scalability of virtualized access layer switches and flatter, two-tier FlexFabric networks using IRF, which reduces cost and complexity.

For more product information and configuration options, visit hpe.com/go/flexfabric.

Figure 8. HPE FlexFabric 5920 network switch

Capacity planning and sizing the solution

Below are a few of the variables to consider when determining the amount of required storage and servers to support the Exchange and home directory consolidation workloads:

- Number of Exchange users

- Size of Exchange users' mailbox

- Number of Home Directory users

- Size and number of file shares

- Exchange and home directory workload profiles

Storage Personas comprise data access protocols and data services for presenting storage to hosts and clients. Specifically, HPE 3PAR StoreServ features a Block Persona and a File Persona that are engineered into the core of the HPE 3PAR OS and system architecture. It is managed seamlessly together via HPE 3PAR SSMC and HPE 3PAR OS CLI. Through these Storage Personas, HPE 3PAR StoreServ Storage provides truly converged block, file, and object access to simultaneously support an expanse of workloads, while allowing the best storage approach to be employed for a given workload.

The solution in this paper is sized to support the following workloads on a single storage platform.

- Block Persona
  - 3,000 Microsoft Exchange 2013 mailbox users.

  - Each mailbox user will have a 5 GB mailbox.

  - Each mailbox user will send and receive 200 messages per day.

  - 48 TB of storage to be allocated for Exchange databases and logs.

- File Persona
  - 3,000 Home Directory users connected to Microsoft Windows clients.

  - Multiple file shares to balance home directory workload across four nodes.

  - 12 TB of storage to be allocated for file services.

Testing of simultaneous block and file workloads was performed on a single HPE 3PAR StoreServ 7400c with four controller nodes of over 8 Gb Fibre Channel for the Block Persona workload and 10GbE for the File Persona workload. The Microsoft Exchange Server Jetstress 2013 Tool creates the block workload and emulates a Microsoft Exchange 2013 deployment. The Microsoft File Server Capacity Tool creates the file workload and emulates many home directory users running basic user tasks. The tools used to generate the storage workloads are installed on virtualized servers with VMware ESXi 5.5 providing the virtualization features. All workloads share the same group of drives; 48 3 TB NL SAS drives configured into a single CPG with RAID 1 data resiliency.

Table 1 provides additional details on the configuration of the HPE 3PAR StoreServ 7400c used to test the block and file workloads.

Table 1. HPE 3PAR StoreServ 7400c Storage configuration

Storage configuration	Details
Storage platform	
• Product model	HPE 3PAR StoreServ 7400c
• Number of controller nodes	4
• Fibre Channel host ports	8 x 8 Gbps
• Ethernet host ports	8 x 10 Gb/sec
• HPE 3PAR OS version	3.2.1 MU2
CPG configuration	
• Number of CPGs	1
• Number and type of drives	48 x 3 TB 6G SAS 7.2K 3.5-inch NL HDD
• RAID Level	RAID 1
• Set size	2 data
• Step size	512 KiB
Capacity in use by block and file workloads	80%

HPE ProLiant DL580 Gen8 Servers were used to support the creation of the virtualized file and block workloads. Sizing the server to support the block workload was based on the Microsoft's Exchange 2013 Server Role Requirements Calculator. For more information, visit gallery.technet.microsoft.com/office/Exchange-2013-Server-Role-f8a61780. Sizing the server to support the file workload was based on Microsoft File Server Capacity Tool User Guide. For more information, visit microsoft.com/en-us/download/details.aspx?id=27284.

Table 2 provides additional details on the configuration of the HPE ProLiant DL580 Gen8 Servers used to test the file and block workload solution.

Table 2. HPE ProLiant DL580 Gen8 Server configuration

Server configuration	Details
Number of physical servers	2
Server platform	
• Product model	HPE ProLiant DL580 Gen8 Rack Server
• CPU	2 x Intel Xeon E7-4870 v2
• Memory	512 GB
• Number and type of drives	2 x HPE 800 GB 12G SAS VE 2.5-inch SC EV SSD
• Fibre Channel HBA	2 x HPE SN1100E 16 Gb 2-port FC HBA
• Ethernet HBA	2 x HPE Ethernet 10 Gb 2P 530SFP+ Adptr
	HPE 1GbE 4-port 366FLR Adapter FIO Kit
Operating system/version	VMware ESXi 5.5 with Update 2

Workload description

When evaluating the scalability and performance of block and file workloads in a lab environment, you can use tools provided by Microsoft to generate simulated Exchange and home directory, consolidation workloads, and analyze the effect of the workloads.

Microsoft Exchange Server Jetstress 2013 Tool

Microsoft Exchange Server Jetstress 2013 is a tool for simulating Exchange database I/O load without requiring the installation of Microsoft Exchange. This tool validates the physical deployment against the theoretical design targets that were derived from the design phase. The design phase for Exchange typically derives from the Microsoft Role Requirements Calculator.

To simulate the complex Exchange database I/O pattern effectively on the Block Persona, Jetstress makes use of the same ESE.dll that Exchange uses in production. It is, therefore, vital that Jetstress use the same version of the Extensible Storage Engine (ESE) files that your Exchange infrastructure will use in production.

Microsoft recommends using Performance Monitor, Event Viewer, and the Exchange Server Database Utilities (eseutil.exe) tools in conjunction with Jetstress to verify that your disk subsystem meets or exceeds the performance criteria you establish. After successful completion of the Jetstress disk performance and stress tests in a non-production environment, you will have verified that your Exchange disk subsystem is adequately sized (in terms of the performance criteria you establish) for the user count and profiles you selected. For more information on Jetstress, visit: microsoft.com/en-us/download/details.aspx?id=36849.

Jetstress workload profile

To ensure the Jetstress test is representative of production, HPE recommends running Jetstress on every set of disks that will hold mailbox database copies (active, passive, or lagged). The test is designed to validate the storage system. It is important when you have multiple Exchange servers using the same storage system, the servers are tested in parallel simulating the production workload. Table 3 provides additional details on the block workload profile.

Table 3. Summary of workload profile for Block Persona

Workload profile	Details
Workload type	Microsoft Exchange 2013
Number of mailbox users	3,000
Mailbox size	5 GB
IOPS or mailbox	0.160 (200 message sent/received, per user, per day)

Microsoft File Server Capacity Tool

Microsoft File Server Capacity Tool (FSCT) helps estimate the maximum number of users that a file server can support under a specific home directory workload; it can help you understand when and where bottlenecks occur.

Microsoft created FSCT to analyze the workload of production file servers storing users' home directories. The tool helps simulate a typical file server's workload in a lab environment. It is designed for file server testing focused on capacity planning and identifying bottlenecks. FSCT can simulate multiple TCP connections and sessions, with each client test machine simulating multiple users. It can also exercise certain sequences of file operations to simulate the behavior of real users.

Results provided by the tool include the maximum number of users for a server configuration, throughput for a server configuration (measured in scenarios per second), scenario response time, and performance counters for servers and clients. These values are influenced by several factors, some of which include processor speed, available memory, disk speed, network throughput, and latency and the speed the SMB or NFS requests are processed.

For more information on FSCT, visit: microsoft.com/en-us/download/details.aspx?id=27284.

FSCT workload profile

To run FSCT, you need at least one file server and two computers. Microsoft calls the file server a **control server**: it is the system under test. The control server can run any OS that supports SMB or NFS transport protocols. In our solution, the OS is the HPE 3PAR OS using the SMB transport protocol. Next, you need to designate one of the two computer as the **client**. The client runs the workload against the control server, simulating multiple SMB users. The second computer is called the **controller** and it is responsible for coordinating the work of the client, capturing performance counters, and compiling the results. With FSCT you can have many clients, but only one control server and one controller.

For the workload, we used the Microsoft-provided "HomeFolders" workload to simulate home directory user requests over SMB. This workload simulates basic user actions such as deleting a file from the command line, copying a file with Windows Explorer, or opening a file in Microsoft Word.

Table 4 provides additional details on the file workload profile

Table 4. Summary of workload profile for File Persona

Workload profile	Details
Workload type	Home directory consolidation
Number of home directory users	3,000
Transport protocol	SMB

Figure 9 provides details on the layout of the virtualized servers to support the block and file workloads.
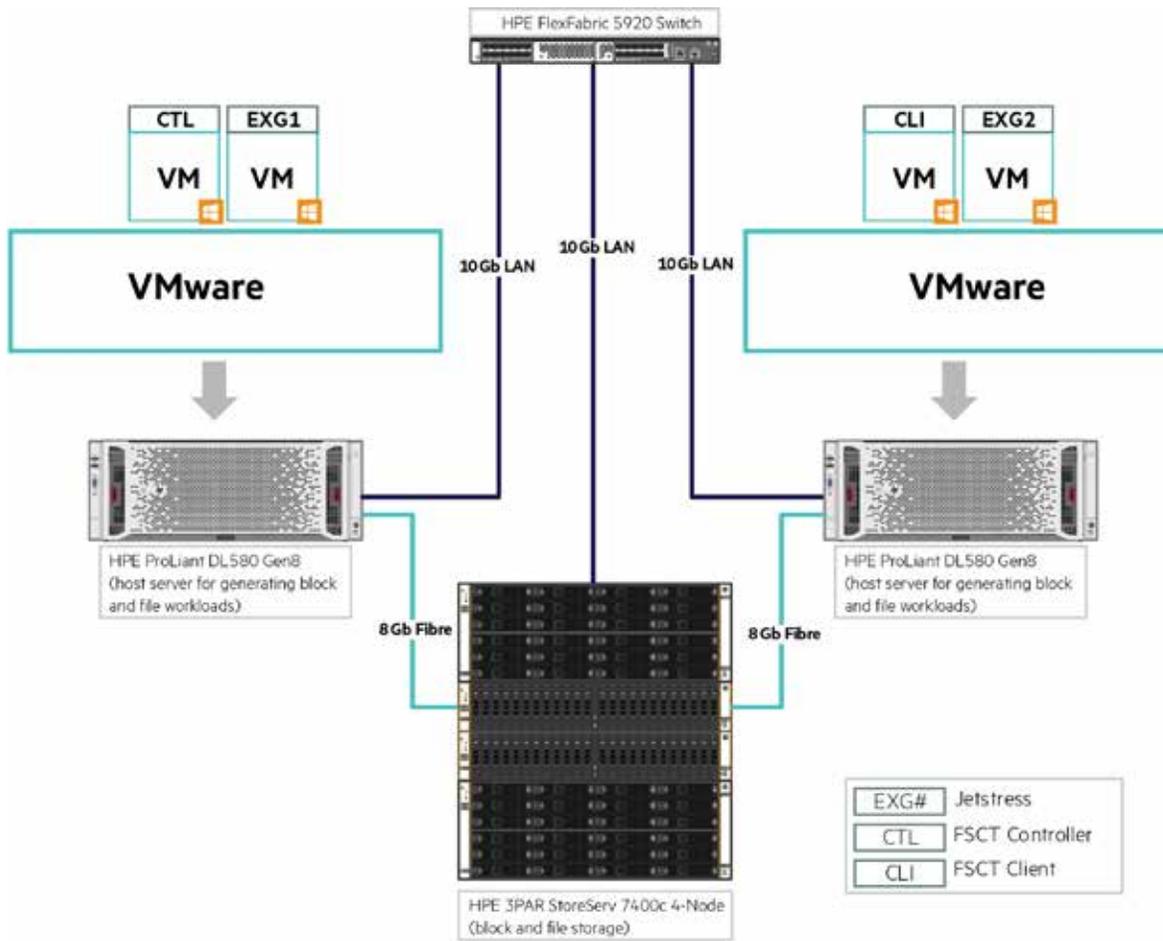

Figure 9. Virtualized server layout for block and file workloads

Configuring Block and File Persona

As mentioned in the previous section, block and file capacity planning and performance testing tools can be valuable to help determine the correct hardware configuration to purchase, identify the capacity of existing hardware, locate existing bottlenecks, and plan for resource expansion before any resource exhaustion. The topics in this section cover the specific variables used to configure the Block and File Personas to support the Exchange and home directory consolidation workloads.

Block Persona

Block Persona showcases HPE 3PAR StoreServ Storage in the form of block volumes to server hosts via Fibre Channel, iSCSI, and FCoE.

Table 5 provides details on the virtual volumes and virtualized server environment used to support the block workload tested in this solution.

Table 5. Block workload environment details

Virtual machine configuration	Details
Number of virtual machines (virtual mailbox server)	2
Guest OS	Microsoft Windows Server® 2012 R2
CPU	4 vCPU
Memory	512 GB
Disk	40 GB
Host bus adaptors	10GbE 8 Gb Fibre Channel
Storage configuration	**Details**
Total number of LUNs	16 (8 per virtual machine)
Size of each LUN	3 TB
Type of provisioning	Fully provisioned
Exchange configuration	**Details**
Number of mailboxes	3,000
Mailbox size	5 GB
Messaging workload profile	Up to 200 messages sent and received for each user, each day
Database Availability Group (DAG) configuration	
• Number of DAGs	1
• Number of virtual mailbox servers per DAG	2
• Number of active mailbox users per virtual mailbox server	1,500
• Total number of mailbox databases	16 (8 per virtual mailbox server)
• Total database size	28.8 TB
• Number of mailbox database copies	2 (1 active and 1 passive)

Best practice guidance

The servers and storage listed in the bill of materials provide sufficient headroom to support 3,000 Exchange 2013 mailbox users in a mixed workload setting on a single storage platform.

The tested solution used the following best practices and recommendations:

- **Drivers and firmware:** Ensure that firmware and drivers for all hardware in the solution are up to date.

- **Hyper threading:** Turn it off. Hyper threading is known to improve CPU throughput for most applications. However, the benefits to Exchange 2013 do not outweigh the negative impacts. It turns out that there can be a significant impact to memory usage on Exchange servers when hyper threading is enabled, due to the way the .NET server garbage collector allocates heaps.

- **Multipathing:** Enable round-robin multipathing in VMware ESXi 5.5 for the raw disk volumes containing the Exchange databases.

- **RAID level:** RAID 1 is the recommended RAID configuration, based on the type of drives used in the solution. Microsoft recommends RAID 1 for large form factor drives providing storage for Exchange databases.

- **Mailbox database copies:** Microsoft recommends at least two copies of the Exchange databases, with three copies being the ideal preference. The third copy can be another mailbox server, disk-based backup, or tape-based backup.

- **Follow hypervisor vendor guidance:** Always consult the hypervisor vendor for best practices and recommendations when virtualizing Exchange deployments.

For information on tested Exchange deployments with HPE Storage, visit technet.microsoft.com/en-us/office/dn756396.

For specific deployment options and additional Exchange sizing best practices, HPE has developed HPE Sizer for Microsoft Exchange Server 2013 or 2010 to assist customers with proper server and storage sizing and configuration for their Exchange deployments. The algorithms developed and implemented in this tool are based on HPE's extensive knowledge of both Exchange and the hardware required to run it: CPU, memory, and storage subsystems. This tool is free and designed to allow very quick "what if" modeling of various configuration and design choices. For more information, visit h20195.www2.hpe.com/v2/getpdf.aspx/4AA6-2800ENW.pdf?ver=3.0.

File Persona

HPE 3PAR File Persona is designed for client workloads such as home directory shares, group or department shares, corporate shares, and custom cloud applications by presenting file shares via SMB (CIFS) and NFS, as well as object shares via the Object Access API to client devices. File data services include User Authentication Services; capacity and user or group Quota Management; File Store Snapshots with user-driven file restore; and Antivirus Scan Services for integration with third-party antivirus software. File Persona is enabled on pairs of converged controller nodes configured with either 2-port 10 Gb or 4-port 1GbE adapters.

Table 6 provides details on the file shares and virtualized server environment used to support the file workload tested in this solution.

Table 6. Home directory configuration for file testing

Home directory configuration	Details
Total number of home directory users	3,000
File Persona configuration	
• Number of file shares	4
• Number of file stores	4
• Number of file provisioning groups	4
• Number of virtual file servers	4
• Number of file controller nodes	4
• Number of SMB users per file controller node	750
• Capacity for file use	16 TB
• File transport protocol	SMB 3.0
FSCT virtual machine configuration	
• Guest OS	Microsoft Windows Server 2012 R2
• CPUs	4 vCPU
• Memory	64 GB
• Virtual disk	40 GB
• Network adapter	10GbE

Best practice guidance

The servers and storage listed in the bill of materials provide sufficient headroom to support 3,000 concurrent home directory users in a mixed workload setting on a single storage platform.

The tested solution used the following best practices and recommendations:

- **Drivers and firmware:** Ensure that firmware and drivers for all hardware in the solution are up to date.

- **Current version of SSMC:** Verify if you have installed SSMC 2.0 or greater.

- **Enable File Persona on all node pairs:** Take advantage of processing power and data redundancy by enabling File Persona on all controller nodes in the HPE 3PAR Storage cluster.
- **Create multiple FPG/VFS:** Balance file service workloads optimally by distributing FPGs and VFSs for each controller node providing file services.
- **Verify active directory health:** Verify before enabling active directory authentication within HPE 3PAR File Persona.
- **Monitor File Persona performance and network activity:** You can monitor by using system reporter in HPE 3PAR SSMC.

Solution test objectives

The solution detailed in this paper must meet the following test objectives:

Create simulated block and file workloads on virtualized servers connected to HPE 3PAR StoreServ Storage

- Establish baseline performance for the block workload
- Add file workload to the same storage device running the block workload
- Demonstrate that HPE 3PAR StoreServ Storage is capable of running both file and block workloads simultaneously with acceptable performance

Solution test results

Testing the HPE 3PAR StoreServ 7400c with four controller nodes, configured to support both block and file services; passed all test objectives. The storage had sufficient resources to support simultaneous block and file workloads with very optimally distributed performance where file workloads have minimal impact on the block performance when running on the same storage tier.

Figure 10 provides details on the file and block testing performed on a single storage platform.
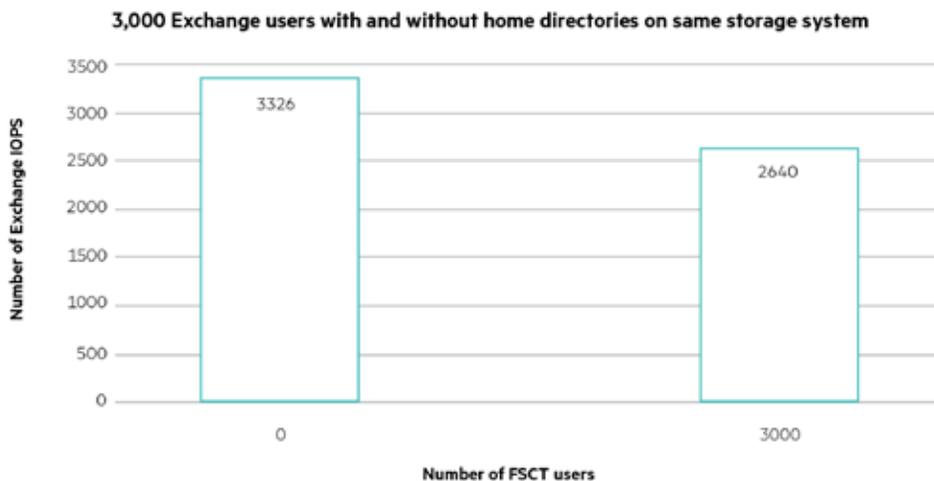

Figure 10. File and block performance comparison

Summary

HPE 3PAR File Persona Software is a licensed feature of the HPE 3PAR Operating System that enables a rich set of file protocols, an Object Access API (REST), and file data services. By unlocking File Persona capabilities, you gain the ability to provision file shares and block volumes from a single user interface. This solution extends the spectrum of primary 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 consolidation, group or departmental shares, corporate shares, and custom cloud applications—all from truly converged controllers, truly agile capacity, and truly unified management.

Key points:

- HPE 3PAR StoreServ Storage has sufficient headroom to support simultaneous block and file workloads without significantly affecting block workloads.

- HPE 3PAR StoreServ Storage provides true convergence of block, file, and object access on a single storage device.

- Enabling File Persona within your HPE 3PAR StoreServ Storage system enables new uses such as :

  - Home directory consolidation

  - Group and departmental shares

  - Corporate shares

  - Custom cloud applications

- HPE 3PAR StoreServ Storage simplifies storage provisioning and administration of block and file data services from the simple, unified HPE 3PAR SSMC.

Bill of materials

Table 7 provides the model numbers for the major storage, server, and networking components used in this white paper. However, this is not a list of all the necessary components needed to build and rack a complete solution. For a complete solution, contact your HPE reseller or HPE sales representative.

Table 7. Bill of materials

Quantity	Description	Model number
	HPE 3PAR StoreServ Storage	
1	HPE 3PAR StoreServ 7400c 4-Node Storage Base	QR513A
4	HPE 3PAR 7000 2-pt 10Gb Eth Adapter	E7X96A
2	HPE M6720 3.5in 4U SAS Drive Enclosure	QR491A
48	HPE 3TB 6G SAS 7.2K 3.5in NL HDD	QR500A
	HPE ProLiant Server	
2	HPE DL580 Gen8 CTO Svr	728551-B21
2	HPE DL580 Gen8 E7-4870v2 1P FIO Kit	728959-L21
2	HPE DL580 Gen8 E7-4870v2 1P Kit	728959-B21
32	HPE 32GB 4Rx4 PC3-14900L-13 Kit	708643-B21
4	HPE 800GB 12G SAS VE 2.5in SC EV SSD	762261-B21
4	HPE Ethernet 10Gb 2P 530SFP+ Adptr	684217-B21
4	HPE SN1100E 16Gb 2-port FC HBA	C8R39A
2	HPE 1GbE 4-port 366FLR Adapter FIO Kit	684217-B21
2	HPE 4U Security Bezel Kit	741213-B21
8	HPE 1200W CS Plat PL HtPlg Pwr Supply Kit	656364-B21
	HPE FlexFabric Switch	
1	HPE 5920AF-24XG Switch	JG296A
2	HPE A58x0AF 650W AC Power Supply	JC680A
2	HPE 5920AF-24XG Bk(pwr)-Frt(prt) FN Tray	JG297A

Terminology

Table 8 provides definitions for the terminology used throughout this white paper.

Table 8. Terminology and definitions

HPE 3par terminology	Definition
HPE 3PAR StoreServ File Persona Software suite	Provides file services on HPE 3PAR storage systems and is automatically installed on storage systems beginning with 3.2.1 MU2. Use of the File Persona feature requires an HPE 3PAR license to enable it.
HPE 3PAR StoreServ Management Console	Provides contemporary browser-based interface for monitoring and administering HPE 3PAR storage systems.
File Provisioning Group	Logical containers on a storage system that hold the VFSs. A FPG is an instance of HPE intellectual property Adaptive File System, which controls how files are stored and retrieved. It also participates in replication and disaster recovery features.
File Shares	Logical containers on a storage system that hold the files that users and groups can access over the network. A File Share can be thought of as a folder, for example, as a folder named home.
File Stores	Logical containers on a storage system that hold one or more file shares. A File Store can be thought of as a parent folder above File Shares. It is also a holder of policies inherited from VFSs and maintains snapshots.
NFS	File sharing protocol provides central management of data using client/server method. NFS protocol is the default protocol used by UNIX®/Linux® clients.
SMB	File sharing protocol provides central management of data using client/server method. SMB is the default protocol used by Windows clients.
Virtual File Server	Logical containers on a storage system that hold one or more file stores. Responsible for providing the IP interface and managing user quotas and antivirus configuration policies.
Microsoft Exchange terminology	**Definition**
Active database	The active mailbox database is the one that is currently being used by the users that have mailboxes in that database. All of the transactions for that database are generated by the mailbox server and applied to the active mailbox database.
Database copy	Copies of an active mailbox database across mailbox servers offer increased levels of mailbox resiliency.
DAG	A database availability group (DAG) is the base component of the HA and site resilience framework built into Exchange 2013. A DAG is a group of mailbox servers that hosts a set of databases and provides automatic database-level recovery from failures that affect individual servers or databases.
Mailbox server	This role is the most common Exchange server role and is at the core of an Exchange organization. Servers on which the mailbox server role is installed are called mailbox servers. The mailbox role hosts mailbox and public databases.
Passive database	Users are not using the passive mailbox database. It is simply applying a copy of transaction logs from the active mailbox database to its copy of the database to keep it up to date.

For more information

HPE 3PAR StoreServ Storage

HPE 3PAR Software Products QuickSpecs

HPE ProLiant Servers

HPE FlexFabric Networking

HPE 3PAR StoreServ Management Console 2.0 Administrator Guide

Learn more at
hpe.com/go/3PAR/filepersona

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