Data center modernization with HPE Gen6 Fibre Channel Networking
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16  **Summary**
Embracing the all-flash data center and taking advantage of new technologies like storage class memory (SCM) and Non-Volatile Memory Express (NVMe) over fabrics are IT trends garnering more and more attention these days. However, to reap the full benefit of these and other new emerging technologies requires a holistic approach to data center modernization that includes a close look at the storage area network.

This paper takes a look at emerging trends and technology advancements and explains how HPE helps customers reap the full benefit of data center transformation initiatives such as the shift to all-flash storage with the latest generation of Gen6 Fibre Channel networking solutions featuring HPE PowerPack+ Software which includes Fabric Vision™ technology with IO Insight from Brocade.

As an essential element of any data center modernization initiative, HPE StoreFabric Gen6 32 Gb Fibre Channel and HPE StoreFabric B-series Power Pack+ Software networking solutions deliver the application performance, operational stability, and business agility needed to help businesses of all sizes reap the full benefits from flash storage, SCM, NVMe and other next-gen memory technologies.

Business leaders are embracing the digital transformation as a critical factor for success, and they expect IT to help them innovate faster, increase profitability, and gain competitive advantage. But digital transformation is putting new pressures on IT organizations and pushing mission-critical IT storage environments to the limit. Faced with exponential data growth, hyperscale virtualization, evolving workloads, and new demands for always-on business operations, the IT storage infrastructure must evolve to enable businesses to thrive in this new era. The legacy infrastructure was not designed to support today’s pace of business and growing requirements. IT organizations need to modernize the data center and deploy a storage infrastructure that can deliver greater consistency, predictability, lower latency, and higher performance.

The unprecedented speed and rapidly increasing cost-effectiveness of flash-based storage has already resulted in all-flash data center transformation, which is now in its third wave. In its infancy, flash storage was seen as a performance accelerator for niche applications. From there, businesses began to see the operational benefits of flash, and eventually the economics enabled more widespread deployment. And as flash becomes the new normal, customers are driving additional requirements, like Hybrid IT automation, integrated data protection, and flexible consumption models. Looking to the future, next-generation flash storage based on Non-Volatile Memory Express (NVMe) over fabrics could provide even greater value.
However, taking full advantage of these innovations requires a holistic approach to ensure that the storage network is modernized to support this new technology innovations. As companies redefine application performance with flash storage, they require storage area networks that deliver ultra-low latency, higher-capacity bandwidth, and greater reliability. If storage area networking needs are not taken into account, aging network infrastructure can result in limiting the performance of the all-flash data center, essentially shifting the bottleneck from storage to the network.

HPE Gen6 Fibre Channel networking components with HPE Fabric Vision technology are the network innovation required for the virtualized, all-flash data center. HPE StoreFabric Gen6 Fibre Channel combines innovative hardware, software, and integrated network sensors to deliver the highest levels of operational stability and redefine application performance. In addition, HPE PowerPack+ Software with Fabric Vision technology enhances visibility into the health of storage environments for SCSI and NVMe fabrics, delivering greater control and insight to quickly identify problems and meet stringent service level agreements (SLAs).

Breakthrough 32 Gb performance accelerates application response time by up to 72 percent, reduces IO bottlenecks, and unleashes the full performance of flash and next-generation storage based on SCM and non-volatile memory technologies. In addition, with diverse deployment options and futureproof integration, organizations can seamlessly adapt, transform, and enhance their businesses to meet next-generation storage requirements based on the use of NVMe over fabrics. By leveraging HPE Gen6 Fibre Channel, organizations can modernize their networks and enhance virtualized applications to take advantage of the full capabilities of a future-ready, all-flash data center.

Gen6 Fibre Channel’s automation technology transforms SAN management by simplifying operations and freeing up resources, allowing organizations to focus on business optimization and revenue opportunities. This technology enables DevOps resources to quickly automate and orchestrate SAN resources through open APIs and the Ansible automation engine. With Brocade automation, organizations can reliably perform resource-intensive tasks, such as provisioning, and operationalize the continuous monitoring of the network, so that tasks can be completed in a fraction of the time, while eliminating human error.

By leveraging HPE Gen6 Fibre Channel, organizations can modernize their networks and optimize virtualized applications to take advantage of the full capabilities of a future-ready all-flash data center that can accommodate SCSI and NVMe over fabric protocols in the same fabric as well slower FC speeds.
Network innovation for the virtualized, all-flash data center

It is easy to understand the most obvious benefits of upgrading networking technology to increase the speed of data transfers and decrease the number of links and devices that are required to accomplish network tasks. Yet the question often arises as to whether this higher level of infrastructure performance and throughput are essential to an organization’s network. The answer is a clear yes. New server and storage technology advancements like flash-based storage are driving up storage network bandwidth demand well beyond current capabilities. In addition, requirements for higher-density server virtualization, new latency-sensitive applications, mixed/dynamic workloads, and overall application growth are all placing unprecedented demands on the network.

Flash-based storage is driving exponential advances in storage, enabling faster block-and-file-based storage performance for high-density virtualized workloads and traditional mission-critical applications. As a result, many enterprises are moving to an all-flash environment to eliminate performance issues and scalability challenges. This move, however, drives the need for higher IO bandwidth performance and greater availability from the storage network. The use of NVMe over fabrics will place even greater demands on the network. Demartek testing\(^1\) of a data warehousing application workload shows that even when using an all-flash array with 8 Gb target ports, substantial improvements in application performance can be achieved by upgrading the network to 32 Gb with Gen6 Fibre Channel—without requiring any changes to the target storage system. In their testing, query completion time was a full 72 percent faster with Gen6 Fibre Channel compared to a legacy 8 Gb network, enabling faster decision making and offering substantial business value (see Figure 1).

The breakthrough application performance and throughput delivered by HPE Gen6 Fibre Channel networking components is mandatory to meet these performance requirements and fully leverage new flash storage capabilities. But, it is also crucial to address requirements for greater availability and predictability from the storage network.

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\(^1\) Gen 6 Fibre Channel Evaluation of Products from Emulex and Brocade
demartek.com/Reports_Frees/Demartek_Emulex_Gen6_Fibre_Channel_HBA_Evaluation_2016-03.pdf

**Figure 1.** Accelerate 8 Gbps flash storage with 32 Gbps networking
HPE StoreFabric Gen6 Fibre Channel addresses such requirements by going beyond performance to offer a variety of unique innovations delivered through the Gen6 Fibre Channel Application-Specific Integrated Circuit (ASIC) from Brocade, in combination with HPE B-series Fabric OS (FOS) and HPE SAN Network Advisor.

Together, these new capabilities enhance operational stability and increase business agility, providing the mission-critical foundation required to support always-on business operations and to seamlessly integrate next-generation storage.

**HPE’s Unique Innovation**

The unparalleled bandwidth, scale, and performance of HPE Gen6 Fibre Channel are not sufficient on their own to meet the demands of customers who manage a mission-critical IT infrastructure. The drivers behind the bandwidth and performance gains provided by Gen6 Fibre Channel, such as higher-density virtualization and flash-based storage, also require that they are deployed easily and operated consistently—with low OPEX. The ability to simplify SAN management, provide deep and granular visibility into storage performance, accelerate troubleshooting, and enable performance improvement are essential to facilitate operational consistency and stability for any large-scale environment.

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**HPE Smart SAN for 3PAR**

- Automated SAN Orchestration end-to-end from HPE 3PAR—FC Standards-based, Target Driven Peer Zoning (TDPZ), and HPE 3PAR orchestrated Federated Peer zoning for simplified host provisioning in clicks, not hours
- Standard-based FC device registration via FDMI protocols
- Supported on HPE 3PAR StoreServ Storage Systems and HPE StoreFabric B-series FC switches and FC HBAs

HPE StoreFabric Gen6 Fibre Channel addresses such requirements by going beyond performance to offer a variety of unique innovations delivered through the Gen6 Fibre Channel Application-Specific Integrated Circuit (ASIC) from Brocade, in combination with HPE B-series Fabric OS (FOS) and HPE SAN Network Advisor.

The need to further simplify all-flash SAN deployments and make end-to-end SAN zoning configuration, less tedious, error-free, and more resilient are HPE innovations that led to the development of HPE Smart SAN for 3PAR technology. With over 15 patents filed to date, HPE Smart SAN for 3PAR utilizes a software-defined networking (SDN) architecture to automate SAN host orchestration (SAN zoning) and more—all orchestrated from the 3PAR flash array.

HPE Smart SAN for 3PAR is distributed software that spans HPE 3PAR StoreServ All-Flash Storage, StoreFabric (32 Gb, 16 Gb, and 8 Gb FC) B-Switch Series and StoreFabric FC HBAs and is accessed from the 3PAR StoreServ Management Console (SSMC) or 3PAR CLI. Click here to review an ESG Lab Review: Accelerating Time to Value: Automated SAN and Federated Zoning with HPE 3PAR and Smart SAN for 3PAR.
Unprecedented visibility into storage performance

HPE StoreFabric Gen6 Fibre Channel offers several breakthrough technologies that go beyond throughput performance to enhance operational stability and increase business agility. One of the key capabilities, HPE Fabric Vision technology, provides unprecedented visibility and insight across the storage network, through powerful monitoring, diagnostic, and management tools that dramatically increase uptime, facilitate performance, and reduce costs.

HPE Gen6 Fibre Channel, HPE PowerPack+ with Fabric Vision technology includes the HPE IO Insight capability. IO Insight extends HPE Fabric Vision technology by proactively monitoring SCSI and NVMe over FC IO performance and behavior through integrated network sensors, providing deep insight into storage performance problems and helping to facilitate service levels. This capability nondisruptively gathers IO statistics from any device port, feeding a monitoring policy that measures thresholds and generates alerts. Integrated application- and device-level IO latency and IOPS monitoring provides the ability to baseline application performance and detect degraded performance. The integrated network sensors of IO Insight provide IO performance management that is designed to avoid dependence on invasive and disruptive physical taps.

IO monitoring allows greater insight into storage performance and provides demonstrable evidence of achieving critical SLAs. IO Insight enables proactive IO monitoring of:

- Total IOs at a flow level to monitor workload profiles over time
- First response times (maximum and average) for an IO request
- IO latency for Exchange Completion Time (ECT), maximum and average
- Outstanding IOs in the queue, maximum and average

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Figure 3. HPE 3PAR One-click SAN Zoning Accelerates Time to Value
By coupling IO Insight with the built-in monitoring, management, and diagnostic tools of HPE Fabric Vision technology, IT organizations can make more intelligent resource allocation decisions based on advanced tools that help them more effectively manage operational objectives and facilitate peak performance across the storage network.

HPE B-series Network Advisor 14.0.1 supports the IO Insight metrics displayed in the Flow Vision real-time performance graph. The screen capture in Figure 3 displays the IO Insight metrics for a flow. Administrators can save this performance graph as a widget and add it to the HPE Network Advisor dashboard for at-a-glance performance view of the important IO flows.

**VM Insight**

A lack of visibility into VM-level performance metrics across the SAN places an additional burden on administrators when they try to enforce SLAs—as they cannot identify VMs in the storage fabric. HPE PowerPack+ with Fabric Vision has extended capabilities with VM Insight integrated sensors to help organizations achieve greater visibility into VM-level application behavior. VM Insight delivers unparalleled end-to-end visibility into the storage performance of individual VMs to optimize VM performance and availability in a virtualized data center. VM Insight uses standards-based VM tagging to enable monitoring of VM-level performance issues in a Gen6 Fibre Channel SAN. Using this information, storage administrators can establish baseline application performance behavior and quickly identify anomalies to fine-tune the infrastructure and to meet service-level objectives. VM Insight also enables quick correlation with other Fabric Vision metrics to identify the root cause of problems before operations are affected.
Increased Fibre Channel Productivity with Automation

The rapid pace of innovation in the data center is increasing the complexity of managing the infrastructure. More time is spent on deployment, configuration, and troubleshooting tasks to maintain service-level agreements and keep up with demands. IT organizations spend nearly half of their time performing repetitive daily management tasks, such as zoning, inventory reporting, and operational validation checks. Brocade automation is powerful for DevOps, simple with Ansible and open for communities. It leverages open-source technology to automate and orchestrate repetitive tasks, enabling IT organizations to significantly improve their efficiency and decrease the risk of operational mistakes. Automation in large-scale IT environments integrates diverse infrastructure components with consistency and predictability to deliver greater operational efficiency and agility. By Brocade introducing REST APIs directly into its switch and management products, it allows HPE StoreFabric B-Switch Series the flexibility to offer a broad range of choices to automate any SAN management solution. IT organizations that combine Brocade’s automation with orchestration tools (such as Ansible) gain the ability to automate configuration tasks and to monitor and detect any performance or health changes. In turn, these automation tools dramatically increase the amount of infrastructure that any single administrator can manage, thus freeing up resources for higher-value tasks.

Brocade automation solutions are based on these pillars:

• REST APIs are available directly from the switch automates repetitive daily tasks, such as fabric inventory, provisioning, and operational state monitoring

• Open-source PyFOS, a Python scripting language, simplifies common SAN management practices

• Ansible integration enables automation and orchestration across the entire infrastructure

Simplified management and accelerated deployments

HPE Network Advisor simplifies Gen6 Fibre Channel management and helps organizations dramatically reduce deployment and configuration times by allowing fabrics, switches, and ports to be managed as groups. Customizable dashboards graphically display performance and health indicators out of the box, including data captured using HPE Fabric Vision technology and IO Insight. To accelerate troubleshooting, administrators can use dashboard playback to quickly review past events and identify problems in the fabric. Dashboards and reports can also be configured to show only the most relevant data, enabling administrators to more efficiently prioritize their actions and maintain network performance.

HPE Network Advisor provides organizations with a programmable web-based interface through a standard Representational State Transfer Application Programming Interface (REST API) that reduces operational tasks by automating zoning, scripting, and reporting. To further simplify management tasks, administrators can quickly search through events, historical data, and base inventory and can apply filters. In addition, the standard REST API leverages HPE Fabric Vision technology to gain fabric-wide health and performance visibility via easy-to-read dashboards.

HPE StoreFabric (storage networking) simplifies management further by integrating with leading Host Bus Adapter (HBA) vendors. By sharing technology and partnering with leading HBA vendors, HPE Gen6 Fibre Channel with Fabric Vision technology is able to simplify and accelerate server deployments, facilitate predictable performance across both the server and storage IO infrastructure, consolidate and simplify end-to-end management, and quickly identify and isolate optics and cable problems (see Figure 5).
Together with its HBA partners, HPE Gen6 Fibre Channel with Fabric Vision technology and IO Insight helps organizations increase business agility by offering enhanced, end-to-end storage network stability and predictability, increased performance, and flexibility.

**Multiprotocol replication over distance**

Leveraging the purpose-built, highly scalable HPE Extension Blade for Fibre Channel and IP storage replication, administrators can accelerate data replication over distance to meet recovery objectives and secure data flows at full line-rate speed without compromising performance. With industry-leading port density and with up to 80 Gbps application throughput with compression per blade, as well as unique multiprotocol and bandwidth enhancement technology, this HPE Gen6 Fibre Channel and IP replication solution moves data faster and easily scales to support the world’s most demanding environments. It delivers business resiliency at scale with 32 Gb Fibre Channel and 1/10GbE IP storage replication over 1/10/40GbE IP Wide-Area Network (WAN) connections to handle the unrelenting growth of data traffic between data centers. To provide nonstop operations, the HPE Gen6 replication solution delivers holistic management through HPE Fabric Vision technology, providing greater control and insight and simplifying troubleshooting of end-to-end IO flows over distance.

For SMBs and smaller enterprises with TOR configurations who often deploy smaller Fibre Channel SAN switches typically less than 24-ports, HPE offers the affordable HPE SN3600B Gen6 Fibre Channel Switch (8–24 ports in a 1RU form). The SN3600B offers Gen6 functionality at prices starting less than a typical Gen5 16 Gbps FC switch. The switch can be configured with 32 or 16 Gbps optics and replaces three generations of Fibre channel, while offering Gen6 performance, investment protection and its NVMe over Fibre Channel ready too, it's really the time to switch!

**Flexible deployment options**

The HPE StoreFabric Gen6 portfolio offers flexible deployment offerings to help organizations grow their infrastructure, increase business agility, and enable scalability on demand. The HPE SN8600B Director, for instance, is available in two modular form factors, the eight-slot and the four-slot with 48-port and 64-port blades allowing massive scalability in a smaller footprint. This modular chassis design increases business agility with two optional blades to seamlessly deliver storage connectivity and support disaster recovery and data protection storage solutions over long distances.
Deployment flexibility is also available with the HPE SN6600B Fibre Channel Switch. The HPE SN6600B provides the industry’s highest port density solution in a compact 1RU form factor, along with pay-as-you-grow scalability with its 24 to 64-ports, for on-demand flexibility. The switch also comes with (four) Q-Flex ports—with each port able to support either 4x32 Gbps or 128 Gbps speeds for ISL or device connectivity—providing unmatched deployment flexibility and the ability to transparently meet changing connectivity requirements.

**HPE Gen6 Fibre Channel in action**

HPE Gen6 Fibre Channel delivers industry-leading 32 Gb performance to accelerate data access without oversubscription. With HPE Fabric Vision technology and IO Insight, Gen6 Fibre Channel provides a more stable, predictable network and the transparent adaptability to meet next-generation storage requirements.

Benefits of HPE Gen6 Fibre Channel include:

- Breakthrough application performance
- Enhanced operational stability
- Increased business agility

**Breakthrough application performance: The need for speed**

Performance matters for critical applications, demanding workloads, and flash-based storage architectures. Gen6 Fibre Channel delivers the throughput and low latency that are needed to meet these new and evolving server and storage performance requirements. You can lower latency and gain some performance benefits by simply upgrading the figure channel switches and HBAs to Gen6 even when connected to storage targets supporting 16 Gbps FC. The following use cases highlight the benefits of HPE Gen6 Fibre Channel.

**Application growth use case**

The big growth in all computing environments is the increasing size and number of software applications and workloads that are considered Tier 1, mission-critical. Large and growing transactional databases and virtual server environments with mixed workloads are putting tremendous strain on the existing infrastructure, driving greater storage capacity and bandwidth requirements.

Gen6 benefit: HPE Gen6 Fibre Channel with 32/128 Gbps links dramatically increases IO performance and throughput to complete workloads faster, while providing a highly scalable infrastructure that supports massive application growth.

**Higher-density server virtualization use case**

Virtual Machine (VM) densities (the number of VMs hosted on each physical server) continue to rise from 10–20 VMs to 40–50 VMs per physical server—all booting from the Storage Area Network (SAN) and accessing SAN resources. Increased density of VMs is enabled by new, more powerful 16+ core servers, Peripheral Component Interconnect express (PCIe) Gen3 technology running at 256 Gbps, and terabytes of RAM that allow VMs and applications to run at their full potential, driving demand for higher performance (bandwidth and IO).

Gen6 benefit: The higher throughput delivered by HPE Gen6 Fibre Channel supports double the VM density of Gen5 Fibre Channel, providing greater server utilization and facilitating higher performance for high-density VM deployments. Leveraging the 128 Gbps links available in some HPE B-series FC switches, Gen6 Fibre Channel offers up to 8X the bandwidth compared to Gen5 Fibre Channel, enabling full utilization of today’s more powerful server and IO infrastructures, as well as scalability for the growing VM environment.
Deploying new infrastructure

Exponential data growth and evolving workloads, are demanding business to deploy new infrastructure to support today’s business requirements. In order for IT organizations to modernize their data center quickly, they must be able to simplify operations and free up resources to focus on business optimization and revenue opportunities.

Gen6 Benefit: With Brocade automation, organizations can quickly and reliably perform resource-intensive tasks, such as provisioning and operationalizing the continuous monitoring of the network, so that tasks can be completed in a fraction of the time. HPE B-series Gen6 switches will be able to leverage integrated REST APIs directly into HPE B-series switch and management products enabling IT organizations to deliver seamlessly automated provisioning, configuration, and management across the Fibre Channel network infrastructure.

Flash-based storage use case

Recent flash technology advancements enable scalability of up to hundreds of terabytes in a compact form factor, and faster flash arrays are now capable of millions of IOPS, further accelerating application performance. To make flash even more attractive, the cost of flash has dropped considerably. For these reasons, many enterprises are moving to an all-flash data center to eliminate performance issues, simplify management, and reduce data center footprint. This move, however, drives the need for higher IO bandwidth performance, and it will only increase with flash storage based on NVMe over fabrics.

Gen6 benefit: Breakthrough Gen6 Fibre Channel performance accelerates application response time by up to 72 percent, reducing IO bottlenecks and unleashing the full performance of flash and next-generation NVMe-based storage.

High-performance OLTP use case

Online Transaction Processing (OLTP) is foremost about improving speed. High-performance OLTP transactions require higher IOPS and lower latency than currently available, to accelerate application response time and complete the workload faster in order to generate more revenue. The infrastructure must also be highly scalable to meet requirements during peak periods and support application growth.

Gen6 benefit: In addition to completing workloads 72 percent faster, Gen6 Fibre Channel delivers lower latency and faster application response times for demanding application workloads. In the Demartek benchmark testing, the data warehouse workload query time and latency for both target and initiator was cut almost in half compared to Gen5 Fibre Channel. Speeding up data-intensive application response times allows more transactions to complete in less time and enables improved service levels while providing a highly scalable infrastructure to support peak loads. Revenue-producing OLTP workloads benefit by generating more revenue for the business and enabling delivery on customer SLAs.

High-resolution video use case

With the advent of faster frame rates, 4K and 8K resolution, the amount of digital data created has grown by an order of magnitude almost overnight. The result for post-production editors is that real-time video editing is now bottlenecked by a legacy SAN infrastructure deployed to support historical performance requirements.

Gen6 benefit: HPE Gen6 Fibre Channel removes the SAN bottleneck and provides 32/128 Gbps line rate performance on every port to support 4K and 8K video editing.

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1 Gen 6 Fibre Channel Evaluation of Products from Emulex and Brocade
   demartek.com/Reports_Free/Demartek_Emulex_Gen6_Fibre_Channel_HBA_Evaluation_2016-03.pdf
Replication over distance use case
IT organizations continue to be challenged with effectively managing the growing amount of data that needs to be replicated between data centers. Not only is the amount of data growing, the type of workloads and application data that needs to be protected is expanding beyond the traditional Fibre Channel/FICON block storage to include more business-critical IP-based storage data. The storage network must be able to scale to move more data faster over any distance.

Gen6 benefit: The purpose-built, highly scalable Gen6 Fibre Channel and IP extension solution from Hewlett Packard Enterprise accelerates data replication to meet recovery objectives and secure data flows over distance at full line-rate speed—50 times throughput than native IP storage replication.

In order to deliver the promised breakthrough application performance required by these server and storage infrastructures, HPE Gen6 Fibre Channel is closely integrated with—and has deep ecosystem support from—HBA vendors. Leveraging the rich feature set of Gen6 HBAs together with the breakthrough performance of Gen6 Fibre Channel switches, administrators can provide Quality of Service (QoS) for critical applications.

Enhanced operational stability: Driving always-on business
Required service levels continue to rise, with users expecting data to be accessible from any location, at any time, on any device, instantly. The goal is very little downtime.

The use of virtualization, flash storage, and automation tools has allowed applications and services to be deployed faster and shatter performance expectations. But the unprecedented number of application and service interactions has also increased the complexity, risk, and instability of the overall infrastructure. As a result, getting actionable intelligence about any performance issues across the storage network is critical for delivering stable operations.

Hewlett Packard Enterprise goes beyond Gen6 Fibre Channel standards to deliver the innovations and capabilities required to meet these new requirements, enhancing operational stability and providing the foundation required to enable always-on business operations. HPE Gen6 Fibre Channel with HPE Fabric Vision technology and IO Insight give data center administrators the needed visibility into application IO performance, to facilitate SLA compliance, quickly troubleshoot IO performance problems, and improve storage performance. These use cases are discussed below.

Mandate storage performance SLAs use case
When administrators are responsible for guaranteeing a certain level of performance and application response times in a customer SLA, throughput and latency are often the key metrics they use. For instance, in an environment with mixed storage arrays that support mixed workloads, administrators may be required to guarantee that latency for IO operations is under 25 milliseconds to ensure adequate application response. For specific latency-sensitive applications that are provisioned on all-flash arrays, latency may need to be under five milliseconds, for example.

Gen6 benefit: The built-in capabilities of HPE Fabric Vision technology with IO Insight non-disruptively and non-intrusively collect IO metrics needed to provide SLA compliance. Administrators can simply define which data flows they want to monitor using Flow Monitor, import the flows into the Brocade Monitoring and Alerts Policy Suite (MAPS) with the required latency thresholds, and proactively monitor those flows to provide compliance. If the required latency threshold is violated, administrators are notified to take early action before customers request support. Reports can also be generated to track SLA compliance over time.
Storage performance troubleshooting use case
When applications experience IO-related performance problems such as slow response, time-outs, or even a crash, administrators are under great pressure to resolve the issues quickly. Because there are many components in a storage network that can impact performance, the administrator must first try to isolate the root cause of the problem, whether it is within the fabric or a storage device or if the culprit is a slow-drain host. Uncovering the root cause of the performance issue can be extremely difficult and time-consuming.

Gen6 benefit: HPE Fabric Vision technology with IO Insight is able to quickly—with just a few commands or mouse clicks—identify the root cause of performance issues. Using Flow Monitor, data flows can be defined on storage ports to obtain the latency and performance metrics of storage devices. If metrics are abnormal, it is very likely that the problems are due to a slow drain device rather than the fabric. If the metrics are within normal range, the problems are most likely within the fabric or coming from the hosts. With HPE Gen6 platforms, administrators can then further troubleshoot by defining a flow on the host ports. If the metrics are within normal range, then the problem is probably a host side issue. If the metrics are abnormal, problems within the fabric or a slow draining host are likely causing the slow response. Administrators can also confirm whether the host is a slow drain device by correlating with Fabric Performance Impact monitoring from Hewlett Packard Enterprise. If not, it is likely that fabric congestion is negatively impacting performance of the flow. The IO performance metrics provided by IO Insight dramatically accelerate troubleshooting performance issues, helping organizations avoid disruption to operations and reducing costs.

Storage performance enhancement use case
The demand has dramatically increased for a large-scale storage network with peak performance delivered consistently and with operational stability. However, to facilitate that peak performance is consistently delivered—cost-effectively—requires in-depth intelligence and IO metrics.

Gen6 benefit: HPE Fabric Vision technology with IO Insight can also be used to improve the performance of a storage infrastructure. For latency-sensitive applications, administrators can use IO Insight metrics to directly measure IO latency to any given storage target from the host to help make informed decisions to properly provision and deploy these applications. Administrators can also use IO Insight metrics to tune and improve the overall network connecting hosts and storage. By using the Pending IO metric in conjunction with the number of servers to a storage port and the number of Logical Unit Numbers (LUNs) to a storage port, administrators can determine if settings for Queue Depth (the number of IOs that can be supported concurrently) should be raised or lowered to provide that performance is customized for latency-sensitive, mission-critical applications as well as less critical applications.

Leveraging HPE Gen6 Fibre Channel with HPE Fabric Vision technology and IO Insight, IT organizations could have the predictable application performance they require, as well as unprecedented visibility and insight into highly virtualized application data flows, simplifying management and meeting their always-on business requirements.

Other features of HPE Fabric Vision technology—such as Forward Error Correction (FEC) at 16 Gb, ClearLink Diagnostics, and Virtual Channel (VC) level Credit Loss Recovery—enhance reliability, enable easy pre-deployment testing and post-deployment troubleshooting, and protect against performance degradation due to physical link-level issues. These capabilities lead to greater overall operational stability.
Increased business agility: Adapting and optimizing business

To realize the full benefits of flash storage, organizations will be transitioning their high-performance, latency-sensitive workloads to flash-based storage and with next-generation NVMe over fabrics as the technology evolves. The simplicity and efficiency of NVMe over Fibre Channel (FC) enables significant performance gains for flash storage. Moreover, NVMe over fabrics enables users to achieve faster application response times and harness the performance of hundreds of SSDs for better scalability across virtual data centers with flash.

HPE StoreFabric Gen6 Fibre Channel

HPE Gen6 Fibre Channel offers the industry’s broadest storage connectivity and deployment offerings to meet evolving storage requirements, both today and tomorrow. HPE Gen6 increases business agility by allowing organizations to:

• Integrate seamlessly next-generation NVMe over fabrics with Gen6 Fibre Channel networks without a disruptive rip and replace
• Mitigate risk with backward compatibility to existing infrastructure, while protecting investments with Gen7-ready storage networking infrastructure
• Automate and simplify SAN deployments for 3PAR StoreServ All-Flash Storage
• Extend replication over distance with a highly scalable extension solution for Fibre Channel, IP
• Gain operational efficiency with flexible cooling deployment options
• Reduce power consumption by 28 percent, saving power for new data center components.

Organizations can seamlessly integrate HPE StoreFabric B-series Gen6 Fibre Channel networks with next-generation NVMe over fabrics without a disruptive rip-and-replace. With the efficiency of NVMe over Fibre Channel, combined with the high performance and low latency of HPE Gen6 Fibre Channel, organizations can accelerate IOPS to deliver the performance, application response time, and scalability needed for next-generation data centers. NVMe over fabrics is already moving forward and can provide the required networked storage to make clustering and VM mobility a reality.

For investment protection, Hewlett Packard Enterprise offers three generations of backward-compatibility support for connectivity to 4, 8, and 16 Gb Fibre Channel products. Furthermore, the HPE SN8600B Director supports future Fibre Channel generations as a Gen7-ready storage networking platform, allowing current Gen6 and future-generation switch blade modules to be added to the chassis.
Summary

Data center modernization starts with Gen6 Fibre Channel, but modern networks for the all-flash data center need more than just higher throughput and lower latency. That’s why HPE partners with Brocade to deliver Gen6 Fibre Channel solutions with the enhanced operational stability, increased business agility, and automated operations required to thrive in the modern data center. This includes innovations from Hewlett Packard Enterprise like HPE Smart SAN for 3PAR, which automates SAN zoning all orchestrated from 3PAR without errors and without having Fibre Channel expertise in clicks not hours to make all-flash SAN deployments simplified, error free, and more resilient. This also includes Fabric Vision technology with IO Insight, which provides a consistent, predictable, and highly scalable foundation that organizations can use to improve their business and seamlessly adapt to meet next-generation requirements for storage based on NVMe over fabrics. Moreover, the addition of Fibre Channel automation technology to Gen6 Fibre Channel transforms SAN management by simplifying operations and freeing up resources on business optimization and revenue opportunities. HPE Gen6 Fibre Channel, IT organizations can make sure that their current storage networks are adaptable and future-ready, enhancing virtualized applications and unlocking the full capabilities of the all-flash data center both today and into the future.

Learn more at hpe.com/storage/gen6switch