Overview

IT is undergoing an unprecedented increase in new application development. New application demands are fueling requirements for increased, and often extreme, levels of performance. As a result, it is now imperative for IT organizations to leverage not only modern storage, but also modern storage networking technology to help them keep pace and stay ahead of the technology curve. In the realm of storage, new and transformative capacity density and performance innovations—including flash, NVMe, and storage-class memory—are dramatically changing the performance and capacity profiles of storage endpoints.

As IT teams try to stay ahead of application performance-demand increases by working to integrate flash and NVMe technologies, they need to maintain the resiliency of the mission-critical applications that are in place to support the business. Essentially, today’s already-overworked IT administrators are dealing with more complexity than ever before.

The storage network plays a vital role at the heart of the data path. If the storage network can’t seamlessly accommodate and support the integration of new technologies within the existing IT infrastructure, the result will be unnecessary cost and complexity. Similarly, the storage network must be able to maximize the data performance and efficiency of the entire IT storage ecosystem, including multiple generations of storage technology, in order for the IT organization to achieve the full value of its investments.

Modern storage fabric technology is necessary to create a data center environment capable of supporting modern applications’ demands and taking full advantage of the value of the infrastructure. A modern storage fabric must:

- **Deliver persistent, essential low latency and bandwidth improvements** to accelerate new and existing applications.
- **Support end-to-end NVMe protocol communication and diagnostics**, allowing NVMe to coexist seamlessly with existing storage protocols. This capability ensures investment protection.
- **Offer integrated intelligence and automation** that is built on analytics and telemetry data to further simplify and optimize the environment.
The storage fabric not only has to keep pace as IT modernizes the rest of the business’s storage environment, but also must analyze and automate that environment. Fibre Channel offers those capabilities and goes a step further, by reducing the risk of adopting and integrating new technologies, by being able to support new protocols simultaneously with existing protocols.

**Broadcom**’s latest generation of Brocade SAN network switches, Gen 7, provides this type of strong, modern data center foundation. Gen 7 substantially augments the performance of NVMe storage by leveraging advanced intelligence and learning techniques that maximize an IT infrastructure’s efficiency from end to end.

### Addressing Performance Demands with NVMe

NVMe is a device interface specification that, unlike its predecessor SCSI, enables host hardware and software to take full advantage of the levels of parallelism possible in modern solid-state drives. NVMe not only maximizes the value of flash storage, but also supports emerging technology, such as storage-class memory (SCM). NVMe over Fibre Channel (FC-NVMe) extends the performance and efficiency benefits of the NVMe protocol over Fibre Channel storage networks.

As mentioned, IT organizations have been turning to NVMe and FC-NVMe storage to meet the high-performance demands of new (and existing) applications. Today’s advanced analytics, business intelligence, and other data-intensive workloads often require extreme levels of storage performance with greater access to data at low latencies (see Figure 1).¹

**Figure 1. Drivers for NVMe Flash Storage Adoption**

Which of the following objectives are driving your organization’s use of or interest in on-premises NVMe-based flash storage? (Percent of respondents, N=305, multiple responses accepted)

<table>
<thead>
<tr>
<th>Objective</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Increase performance of storage infrastructure to “future proof” the environment, or support new, more demanding workloads</td>
<td>56%</td>
</tr>
<tr>
<td>Improve performance of existing applications</td>
<td>55%</td>
</tr>
<tr>
<td>Cost optimization/storage infrastructure consolidation, predominantly to replace existing SAN infrastructure (which might include older all-flash arrays) with NVMe-enabled SAN</td>
<td>48%</td>
</tr>
<tr>
<td>Reduced operational expenses/IT burden of performance tuning/optimization in the storage architecture</td>
<td>48%</td>
</tr>
<tr>
<td>Cost optimization/storage infrastructure consolidation, predominantly to replace DAS infrastructure with NVMe-enabled SAN</td>
<td>45%</td>
</tr>
</tbody>
</table>

Source: Enterprise Strategy Group

### The Need for Actionable Intelligence to Optimize Performance

The demands of today’s enterprise businesses exacerbate IT complexity. Nearly two-thirds (64%) of IT decision makers surveyed by ESG believe that IT is more complex today than it was two years ago. The most commonly identified force behind this complexity increase is the massive scale of modern data volumes, identified by 37% of ESG survey respondents.

respondents. Effectively managing the scale of today's data environments requires not just larger storage capacities; it requires delivering higher levels of predictable performance to the applications, all while ensuring the continuous availability of IT services.

As a result, scaling and modernizing infrastructure to reduce latency and increase bandwidth is essential. But without intelligence to make sure that the entire data path is being optimized and utilized to its full extent, bottlenecks, abnormal behavior, and spikes in demands can cramp application performance and availability.

A way to protect the entire path from these issues is through actionable intelligence, a form of artificial intelligence that leverages telemetry data to automatically optimize performance and ensure reliability across the environment, instantly flagging potential concerns that need to be addressed. IT organizations don't have the personnel or resources to perform that level of continuous optimization, which is why the infrastructure itself must do the job. It must automate this activity, making it nearly transparent to application end-users.

What are the essential storage network capabilities that a modern data center needs to have?

- The ability to deliver a modern infrastructure foundation featuring the highest levels of performance (the levels achievable with NVMe), while supporting existing infrastructure investments, sustainably augmenting performance, and reducing latency across the environment.

- Self-learning capabilities to instantly understand your environment. Infrastructure needs to be able to monitor and learn how the application acts across the data storage network environment, then utilize that information to improve utilization and performance.

- Self-optimizing capabilities that leverage advanced analytics, transforming telemetry data into actionable insights to optimize performance and ensure reliability.

- Self-healing capabilities that automate activities to simplify management and resolve issues without intervention.

**Brocade Gen 7: The Intelligent, High-performance Foundation of Modern Data Centers**

The products that make up Brocade's Gen 7 portfolio are the new Brocade X7 Director and the Brocade G720 Switch. These solutions are equipped with higher-performing hardware to unleash NVMe technology, and they have the ability to discover and produce comprehensive telemetry data across the fabric. They analyze and take actions based on that data to optimize the storage network automatically.

**Modernize with NVMe to Achieve Lower latency and Higher Bandwidth**

According to Broadcom, Brocade Gen 7 technology substantially accelerates a data center environment, offering 50% lower latency than the previous generation, while increasing bandwidth with 64 Gb/s links. By leveraging NVMe-ready Fibre Channel technology, Brocade Gen 7 not only maximizes the performance of NVMe storage and high-transaction workloads, but also simplifies the process of integrating higher-performing NVMe storage into the environment without a rip-and-replace process.

Broadcom has simplified IT modernization efforts. The NVMe storage integrates seamlessly with existing ports: Brocade supports the concurrent use of SCSI and NVMe technologies. In fact, with the release of vSphere 7 from VMware, an

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organization can do a live migration of an individual virtual machine from SCSI to NVMe in the same Gen 6 or Gen 7 fabric without stopping the application. This result constitutes one of the most risk averse technology transitions in years.

Broadcom provides investment protection by enabling organizations to upgrade their existing Brocade Gen 6 director chassis to Gen 7. Organizations can leverage existing Gen 6 blades in Gen 7 directors, mixing Gen 6 and Gen 7 blades in the same chassis.

In addition, Brocade supports three generations of backward compatibility within the fabric. This is an important feature, as it reduces risk and maximizes the value of the organization’s existing IT investments.

**Analytics and Automation for Application Acceleration**

The self-learning and self-optimizing capabilities of Brocade Gen 7 automatically ensure that storage performance and other SAN-related activities are optimized. The collected telemetry data is composed of millions of data points. The Brocade technology leverages it automatically to learn application flows, and then create a baseline of each application’s performance from end to end across the fabric to detect when something is abnormal.

With Virtual Machine Identification (VMID) tagging, telemetry data is collected on a frame-by-frame basis to the VM. The Brocade systems then provide I/O profiles at the application level, rather than simply on a port basis. The analysis happens within the ASIC integrated circuit to ensure that performance is not impaired.

Brocade Gen 7 directors/switches are not only able to identify the root causes of data traffic congestion, but they also can automatically remediate that congestion, thus avoiding application-performance degradation. The solution guarantees application performance levels by proactively monitoring and actively shaping traffic without human intervention.

Thanks to the systems’ ability to track I/O per application, IT admins can identify which application is generating the traffic, not just which port is being affected. And when performance conflicts arise, the admins can quickly identify who is the “victim” and who is the “culprit.” This type of rapid recognition of performance issues/causes, along with fast, automated mitigation, is crucial today.

The Brocade solutions even support DevOps activities, as their automation technology speeds up resource provisioning and reduces the risk of human or process errors.

**Save Time, Optimize Operations with Autonomous SAN Technology**

The Gen 7 systems use the collected data to automate configuration, optimization, and issue-resolution activities. For example, Brocade Gen 7 can automatically:

- Instantly identify and notify IT staff when something goes wrong or changes, thereby simplifying troubleshooting.
- Identify exactly where an impact is occurring, even if the impact occurs at an endpoint (host bus adapter or storage device) because these solutions monitor both the fabric and the endpoints.
- Leverage self-healing capabilities, identifying and addressing issues automatically without human intervention.

**The Bigger Truth**

This is the time for organizations to modernize their SANs for next-generation storage. NVMe and applications that are built for performance should be allowed to take advantage of the increased performance and lower latency that Gen 7 directors and switches deliver.

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Fibre Channel architecture continues to reign. Broadcom continues to drive innovation in Fibre Channel-based storage environments that support mission-critical applications—ensuring that customers’ environments don’t go down. Broadcom has been working continuously to make SAN management easier and to make IT environments simpler by eliminating another extra box/license to manage, as well as lessening confusion about who to call if servicing support is needed. That makes it a better, less expensive, and less disruptive approach versus what other vendors are offering.

Everything in IT is becoming quite automated in general. And Broadcom is taking a big first step to delivering an autonomous SAN to its customers. That autonomous SAN comes as an integral part of Gen 7. The Brocade infrastructure hardware that Broadcom has created is going to be the foundation that enables IT organizations to apply new autonomous capabilities—complete with powerful analytics and automation.