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The Network Matters for Storage

Choose Fibre Channel to Take Advantage of the Full Capabilities of Modern Storage Technologies.

Making the Right Choice

Deciding when to use NVMe over Fibre Channel or TCP/IP is challenging; each has its own strengths and weaknesses. Once you fully understand the demands of your applications and the implications for your storage network, you can position each storage option in its rightful place in your business infrastructure.

Not All Storage Networks Are Created Equal

In an IT market that relies increasingly on low-latency, high-availability data to deliver next-gen applications and innovation, organizations are keen to capitalize on the advantages that new technologies—such as NVMe—can bring.

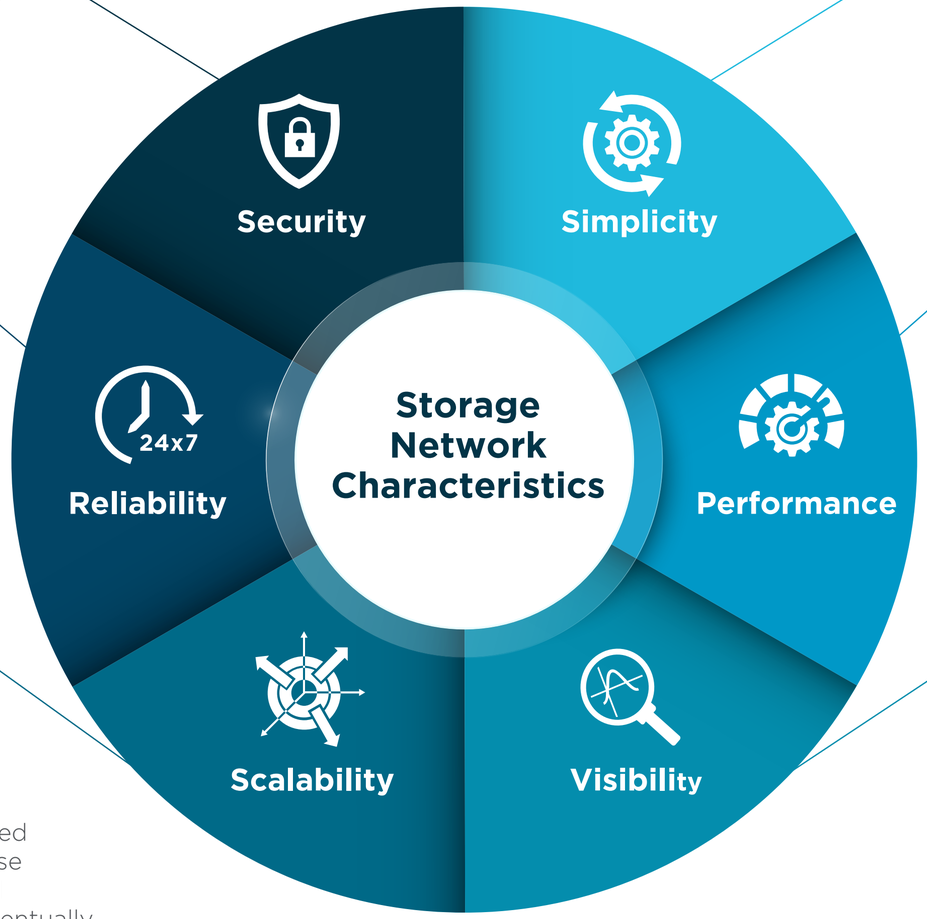
NVMe arriving in the form of software functionality on existing IT infrastructure enables applications and virtualization layers to quickly yield increased benefits.

However, taking full advantage of all that NVMe has to offer—greater IOPS, lower latency, parallelism with multi-queuing and improved resiliency—drives the need for higher IO bandwidth performance and greater availability. This places even greater demands on a storage network.

Infrastructure can help or hinder the benefits of NVMe for mission-critical and business-critical applications.

When comparing the attributes of Fibre Channel and TCP network implementations for NVMe, there are several factors to consider.

Evaluating NVMe over Fibre Channel vs TCP/IP For Mission Critical Environments



Security

Fibre Channel SANs have a much smaller threat surface, making them less of a target than other protocols and increases security by limiting storage/data visibility to allocated applications.

VS

TCP/IP servers have the potential to expose every member of the vLAN to theft or attack in the event of a breach.

Reliability

Fibre Channel is designed to never drop data; it only sends packets if it knows in advance that there is space to receive them.

VS

TCP/IP sends data without knowing if there is space to receive it, which can result in dropped packets that may not be recovered by the Upper Layer Protocol (ULP) or application.

Scalability

Fibre Channel uses a buffer-to-buffer credit mechanism which drastically reduces the fabric-based congestion that is frequently seen in TCP/IP environments.

VS

TCP/IP typically throttles flows and drops traffic at times of congestion, adversely affecting performance at scale for both TCP/IP and RoCEv2. TCP was designed to throttle flows and drop traffic, knowing that, because of its inherent management of session windowing and congestion windowing, the retry mechanism would eventually recover. RoCEv2's User Datagram Protocol (UDP) has no traffic management, session windowing or congestion windowing, and no retry mechanism.

Simplicity

Fibre Channel automates the fabric creation, addition of links to increase bandwidth, and the registration of new devices to the fabric.

VS

TCP/IP storage typically requires hundreds of command line entries or constant human intervention.

Performance

Fibre Channel is designed to perform at scale without encountering the issues typically associated with scale and performance in TCP/IP topologies.

VS

TCP/IP protocols can offer high performance in single switch clusters, but become less performant and nondeterministic the more the topology expands.

Visibility

Fibre Channel can provide visibility at scale for ingress/egress port latencies, exchange completion times, read responses, pending I/O and more, at full line rate, due to its consistent frame size and location of the header information.

VS

TCP/IP platforms can't apply deep packet inspection across the entire storage network without a performance impact.

The Right Network Matters

A storage network has to meet the demands of the applications an organization uses:

- Applications where packet loss is not acceptable
- Databases where retries significantly impact performance
- The need for consistent and narrow transaction completion
- Moments of significantly high peak traffic
- Isolating data on the server running the application

There are technologies that can perform these tasks very well in a relatively small topology and some that can provide these tasks at scale. But Fibre Channel is the only storage network that meets the performance, scalability, and reliability needed for enterprise-class deployments of NVMe.

While TCP/IP is critical to the Internet of Things, it was never designed for the lossless, low latency, deterministic delivery of storage traffic internal to a data center.

Fibre Channel is the Most Robust NVMe Fabric

Fibre Channel's integrated operational simplicity, reliability, and security features make it stand out as the most robust NVMe fabric and the best choice to harness the full benefits of NVMe.

The way a host communicates to storage is vital to any organization, ensuring applications run 24 hours a day, 7 days a week. Fibre Channel has several mechanisms that secure communications while also providing simplicity to organizations and eliminating potential errors:

- Auto-discovery as new nodes join the fabric allows zoning to be seamless, so hosts only talk to the storage they need to communicate with.
- Zero manual tasks are needed to configure the host or storage addresses on the fabric.
- Device state-change notifications means devices are automatically updated as changes happen, versus manual interventions as changes occur.

Much of this fabric authentication has been automated, so it's not a task many architectures or admins think about when comparing other protocols. Fibre Channel is the only storage protocol that makes the integration of NVMe seamless to the applications. Furthermore, workloads accessed by NVMe storage demand the sustained, predictable performance, and low latency delivered most efficiently and reliably by Fibre Channel.

Fibre Channel Is the Gold Standard for Enterprise Storage Services

Security

In a typical IP storage deployment, when a server on a storage vLAN is hacked, not only is the data assigned to that server compromised, but the hacker now also has visibility into the entire shared environment of that IP storage.

While TCP/IP storage utilizes hierarchical ownership, Fibre Channel fabrics are secure by design, based on controlled access between servers and storage. If a server on Fibre Channel SAN is compromised, attackers can neither see nor infiltrate any connected storage devices. Security is further strengthened by hardware-based authentication and additional security checks within the supply chain, while services built into Fibre Channel provide simplicity and reduce human error.

Overall, the threat surface of any IP-based storage environment is orders of magnitude greater than that of Fibre Channel. Consequently, the potential considerations or constraints on architecture and deployment of IP-based topologies due to these security concerns is also much higher.

Simplicity

An autonomous fabric doesn't require hand-holding, so admins can focus more on business challenges than on configuration tasks. Conversely, NVMe-TCP requires multiple configure steps for discovery, plus the added complexity of virtual machine management.

Built-in Fibre Channel features help you easily manage everything from the physical layer to application flows, through a modern management framework with a GUI or through APIs. As the only protocol that can manage every frame of an application flow from end to end, these advanced features can identify and mitigate issues before they become problems.

Performance

Performance is one of the most talked about topics within organizations, and performance often means something different to each stakeholder depending on their SLA requirements.

Application owners always want the best-performing servers, network, and storage. One key aspect to consider, besides low latency and high IOPs, is how you efficiently mix the old (iSCSI, TCP, FCP) with the new (NVMe-FC, NVMe-TCP). Fibre Channel includes Brocade® Traffic Optimizer, which groups different classifications of flow together by speed or protocol, ensuring high-performance flows are not impacted by slower flows. When combined with an efficient protocol stack, NVMe-FC continues to maximize performance.

Fibre Channel Is the Gold Standard for Enterprise Storage Services

Visibility

Visibility is a critical element when it comes to troubleshooting potential issues, and should be a priority when choosing a network storage technology. Issues can occur at any level within a network—from bad optics or cabling to flows starting on a virtual machine—so the network needs to be able to easily identify issues and provide simple solutions.

Brocade NVMe-FC networks can instantly identify potential congestion and know which virtual machine, optic, cable, or storage port may be the culprit. This helps administrators to solve challenges without the need to invest in the third-party tools associated with NVMe-TCP.

Scalability

Predicting growth in a constantly changing environment is a challenge for many organizations. Their network must be flexible enough to scale for connectivity while maintaining performance levels. Many networks tend to offer one or the other, and NVMe-TCP environments typically only add intelligence if storage and servers come from the same vendor.

Brocade NVMe-FC networks are a best-in-class solution, designed to scale independently of application and storage needs, and are vendor agnostic to the hardware you want to deploy.

Reliability

The primary goal of any network is to keep data and applications online. Brocade networks provide almost six 9s of uptime, thanks to robust hardware design initiatives coupled with one of the most advanced ASICs to fix underlying potential issues within a network, such as forward error correction. It is also important to consider is how the networks are built.

While NVMe-TCP relies on end devices to handle error correction, which usually involves resending the packet, slowing down overall performance, NVMe-FC has isolated A/B fabrics and uses standards-based buffer credit management to make sure data isn't sent if the link doesn't have space for it.

Unleash the Power of NVMe with Fibre Channel

Fibre Channel, the gold-standard data center fabric for enterprise storage, is the ideal choice for NVMe. Whether you want to build a new data center or expand an existing environment, Fibre Channel products are designed to leverage the full capabilities of NVMe.

Fibre Channel continues to evolve in functionality, ease of integration and scalability, making it the best possible storage network for NVMe. Fibre Channel's legacy of technical excellence, reliability, and innovation has been built over a 25-year period, and the rollout of Gen 7 solutions gives organizations a long runway for storage evolution.

Learn More About Brocade Fibre Channel

Hear Brocade experts discuss the significance and necessity of the right architecture tailored to your business and application requirements.

Watch Now

For more information on how to take advantage of NVMe over Fibre Channel and future-proof your enterprise storage infrastructure, please read our NVMe over Fibre Channel For Dummies book.

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