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Cyber-Resilient Brocade Fabric

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Abstract: The storage network lays the foundation for an application's experience, often determining the performance, flexibility, and security posture of the application ecosystem. To keep pace with demands for data-intensive workloads and increased protection from cyber threats, modern storage networks must not only deliver performance and scale, but also must improve cyber resiliency against the threats of today and tomorrow. Fortunately, Broadcom's Gen 7 networking solution delivers an autonomous SAN with next-level performance, integrated intelligence, and improved cyber resilience, helping provide the accelerated, reliable, and secure foundation that modern data centers need.

Overview

IT is undergoing an unprecedented transformation. While digital services have long been central to business operations, data now also drives customer experience and opens up revenue opportunities. As a result, businesses have increased investments in new application development, which translates to increased data growth, increased data access, and unfortunately, a pervasive and growing risk of cyber attack as well.

As IT decision makers modernize their data infrastructure to boost productivity, expectations and challenges related to data value, governance, and protection have never been greater. In an era where every facet of the business is digital, even small hiccups in access or application slowdowns become costly. To ensure fast, resilient, and safe access to data, it is imperative to modernize storage networking technology to maximize ROI, stay ahead of the technology curve, and better protect against security vulnerabilities.

With hundreds of IT security vulnerabilities uncovered every year and the definition of success for IT constantly evolving, already overworked IT administrators require more from their infrastructure. When it comes to the storage network, supporting the business's data growth and reliability requirements are no longer enough—investments must automate and optimize operations while also delivering the highest levels of security to help safeguard the storage network. Organizations need cyber resilient storage networking technology that delivers on performance while also providing greater insights and intelligence that simplifies and even automates efforts while improving visibility. If you cannot see it, you cannot manage it—thus, you cannot secure it. In addition, IT administrators need to be able to modernize without disrupting their existing ecosystem by seamlessly integrating new technologies. Otherwise, this will result in unnecessary cost and complexity.

A modern, cyber resilient storage network is essential when creating a data center environment capable of supporting the demands of modern applications 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.
- Improve the cybersecurity posture of the data storage network to reduce the risk to valuable data sets and applications as the environment scales.

- Offer integrated intelligence and automation that is built on analytics and telemetry data to further simplify and optimize the environment.

Fibre Channel technology has an established history delivering the performance and availability necessary for enterprise application environments while offering inherent benefits to cyber resiliency. Broadcom's latest generation of Brocade SAN network switches, Gen 7, provides this type of strong, modern data center foundation. Brocade Gen 7 substantially augments the performance of storage by leveraging advanced intelligence and learning techniques that maximize an IT infrastructure's efficiency from end to end.
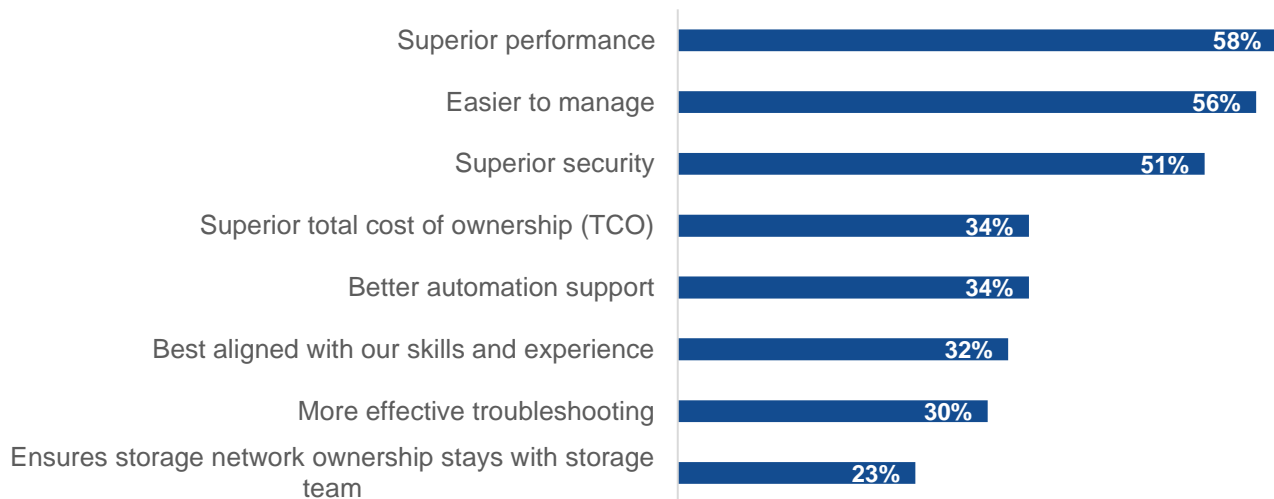
Beyond performance, it safeguards the SAN against cybersecurity and business continuity challenges that threaten to disrupt data center operations. Brocade Gen 7 also protects organizations' SANs from IT disruptions and disasters with autonomous SAN technology that learns, optimizes, and heals on its own. These capabilities automate processes to ensure optimal performance, enable non-stop operations, and maximize management automation, while strengthening the level of security in organizations' networks.

Evolving Application Dynamics Fuel Need for Modern, Cyber-Resilient Storage Network

The essential roles that data and data storage environments play in modern business operations have put renewed focus on prioritizing data resilience. According to research by TechTarget's Enterprise Strategy Group, 92% of organizations agree that data resilience must encompass all technologies, people, and processes needed to secure data assets, regardless of the threat.[1] That increased focus on both data and cyber resilience can counter the ever-increasing frequency and effectiveness of modern cyber attacks. For example, in the case of ransomware, 89% of survey respondents ranked it as a top-five threat to the viability of their organization.[2]

Figure 1. Performance, Ease, and Security Fuel Investment in Fibre Channel

You indicated Fibre Channel will be your organization's dominant storage networking architecture in 24 months. Which of the following factors are driving this? (Percent of respondents, N=108, multiple responses accepted)

Superior performance	58%
Easier to manage	56%
Superior security	51%
Superior total cost of ownership (TCO)	34%
Better automation support	34%
Best aligned with our skills and experience	32%
More effective troubleshooting	30%
Ensures storage network ownership stays with storage team	23%

Source: Enterprise Strategy Group, a division of TechTarget, Inc.

[1] Source: Enterprise Strategy Group Research Report, *Achieving Cyber and Data Resilience: The Intersection of Data Security Posture Management With Data Protection and Governance*, September 2024.
[2] Source: Enterprise Strategy Group Complete Survey Results, *2023 Ransomware Preparedness: Lighting the Way to Readiness and Mitigation*, November 2023.

The majority of IT organizations (68%) therefore expected their investments in cybersecurity to increase in 2024.[3] Those investments to improve data's cyber resilience extended to the data storage infrastructure as well as the storage network. As Figure 1 shows, storage administrators regard superior security as a top rationale for investing in Fibre Channel as their dominant storage networking technology.[4]

The Need for an Intelligent, Cyber-Resilient Storage Network Infrastructure

Simply increasing performance, however, is not enough to modernize the storage network to keep pace with demands. Enterprise-level resiliency has long been an essential requirement of Fibre Channel technology, but given the persistent and pervasive threat of cyber attacks, the definition of enterprise-level resiliency must be expanded to include improving cyber resiliency as well. Cyber resiliency is a priority in every facet of IT. When IT decision makers were asked to identify the biggest reasons why their organization's IT environment has become more complex over the past two years, the most common response was the increasing and/or changing cyber security landscape (cited by 30%).[5] In addition, when those IT decision makers were asked which technology initiatives have become significantly more important to their organization's future over the past two years, cybersecurity (57%) again was the most common answer.[6]

Meeting the demands of today's enterprise businesses, however, can quickly exacerbate IT complexity, as 68% of IT decision makers agreed that the complexity of their IT infrastructure is slowing operations and hampering digital initiatives.[7] Modernization investments, therefore, must offer integrated intelligence to reduce the burden on IT professionals. Without the necessary intelligence to make sure that the *entire data path* is being optimized and utilized to its fullest extent, bottlenecks, abnormal behavior, and spikes in demands can crater application performance, availability, and resiliency.

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 do not 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, cyber resilient data center needs to have?

- **The ability to deliver a modern infrastructure foundation** featuring the highest levels of performance, while supporting existing infrastructure investments, sustainably augmenting performance, and reducing latency across the environment to support data-intensive workloads.

- **Integrated security and autonomous SAN technology** to enable cyber resilient networks that safeguard organizations' SANs against vulnerabilities, while learning, optimizing, and healing on their own. These capabilities can automate processes to help strengthen the level of security in organizations' networks, offer multi-factor authentication, continuously protect against security threats, and help to ensure optimal performance and continuous operations.

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

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[3] Source: Enterprise Strategy Group Complete Survey Results, *2024 Technology Spending Intentions Survey*, February 2024.
[4] Source: Enterprise Strategy Group Complete Survey Results, *Navigating the Cloud and AI Revolution: The State of Enterprise Storage and HCI,* February 2024.
[5] Source: Enterprise Strategy Group Complete Survey Results, *2024 Technology Spending Intentions Survey*, February 2024.
[6] Ibid.
[7] Source: Enterprise Strategy Group Complete Survey Results, *Navigating the Cloud and AI Revolution: The State of Enterprise Storage and HCI,* February 2024.

- **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 proactively mitigate and resolve issues without intervention.

Brocade Gen 7: The Intelligent, High-Performance, Cyber-Resilient Foundation of a Modern Data Center

The products that comprise Brocade's Gen 7 portfolio are the Brocade X7 Director, the Brocade G720 Switch, and the Brocade G730 Switch. These solutions are equipped with higher-performing hardware to unleash NVMe technology and can 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 Infrastructure for Data-Intensive Workloads With 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 64G links. Low-latency access to data increasingly determines time to value for new digital initiatives, while playing a significant role in determining both customer and user experience. In an era where user expectations are becoming increasingly difficult to satisfy, leveraging an architecture that delivers best-in-class performance with low latency and bandwidth is often essential to achieving SLAs and meeting users' expectations.

Help Secure Mission-critical Workloads With Gen 7 Integrated Security

Fibre Channel fabrics are secure by design, based on controlled access between servers and storage and isolation within the data center. In addition to the inherent benefits of Fibre Channel technology, Brocade Gen 7 technology can secure storage traffic through its controlled-access and isolation technology. Brocade Gen 7 technology automatically monitors when SSL certificates are about to expire and with Brocade SANnav replacement of certificates across switches is an easier task.

Soon the Fibre Channel environment will include the ability to automatically encrypt the data streams across the fabric with a 256 bit AES algorithm using Secure HBAs that is compliant with the new CNSA standards further securing the data center network without any impact to performance.

Brocade can help safeguard mission-critical operations by validating the integrity and security of Gen 7 Brocade hardware and software to protect against intrusions in systems upgrades. The solution can also reduce the vulnerabilities from malware and hijacking attacks, as the Brocade Fabric OS (FOS) validates the integrity and security of Brocade hardware and software automatically. Features include: Secure Boot, Brocade Trusted FOS (TruFOS) Certificates, and FOS hardening with removal of root access. Brocade TruFOS Certificates ensure that enterprises running Brocade directors and switches are currently covered by support and securely enabled to perform critical operations without having to worry about potential tampering of the operating system. Brocade FOS includes support for multi-factor authentication through Federated Authentication simplifying identity management, authentication, authorization and improving security for both (human) operators and machines such as SANnav or others which execute scripts or perform other management task on the SAN.

The cyber threat landscape continues to evolve. With technologies such as artificial intelligence and quantum computing becoming available to organized and state-sponsored attackers, cyber-defense technology must evolve to compensate. This is especially true in the impact to IP storage environments because of the shared visibility and access of the hosts in the network. Fibre Channel by comparison provides a very discrete level of access between the server and its data, such that a compromised server has no access to data other than its own and no ability to affect other servers in that environment. But it's also necessary to secure data between data center rooms or

buildings in the same campus or across a metro area. To this end, Broadcom Fibre Channel Fabrics offers AES 256 encryption to secure data flows within and across data centers as part of the company's path to quantum-safe data protection. Given the lifespan of IT infrastructure, cyber resilience capabilities must be able to protect environments even as attacks evolve over the life of the infrastructure.

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 billions of data points. The Brocade technology automatically leverages it to learn application flows, and then creates 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. With VMID+, VM Insight is available end-to-end across the fabric regardless of the array type involved.

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:

- Proactively separate and group traffic and workloads with different characteristics (due to dissimilar generations of devices or protocols), thereby increasing the efficiency of the SAN. Higher-speed traffic flows are unaffected by slower traffic, meaning that the probability of congestion or having application performance impacted due to a mix of older and newer technology in the fabric is minimized.

- 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 and safeguard their storage networking infrastructure to support the coming generation of data-intensive workloads while also protecting against a new era of threats. Brocade Gen 7 directors and switches deliver improved performance to support the low-latency requirements of modern enterprises, while also helping to better secure and automate an IT environment. Everyone is worried about the ever-evolving cyber threat landscape. Brocade Fibre Channel technology can reduce the number of vectors a business needs to manage with innovation to help ensure protection continues even as threats advance.

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 securing your SAN Fabric automatic. Broadcom also simplifies IT environments by eliminating another extra box/license to manage, as well as lessening confusion about who to call if servicing support is needed.

Automation fuels success in IT operations. And Broadcom is taking a big first step toward 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 enables IT organizations to apply new autonomous capabilities that safeguard their SANs—complete with powerful analytics and automation.