

# EMEA Infrastructure: Storage Networking

Name

Date



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# Industry Trends Driving Storage Modernization

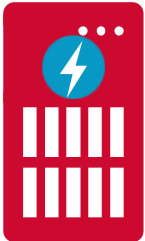
Digital transformation is pushing the limits of storage infrastructure



Virtualization



Data growth



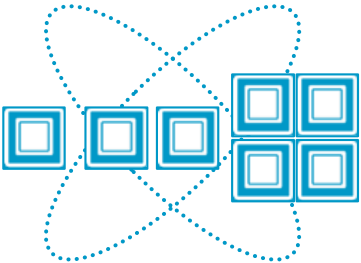
Flash/NVMe/SCM



Increased Complexity



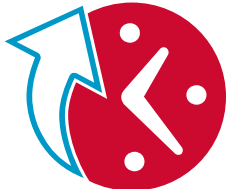
Artificial Intelligence



Machine Learning



Real-Time Analytics



Rising SLAs

# Critical Infrastructure Capabilities Required by Businesses



## Availability

Reliability and resiliency



## Scalability

Ability to support large-scale deployments



## Performance

Speed, throughput, IOPS, and latency



## Agility

Ease of scale to accommodate growth



## Manageability

Simplified management based on integrated tools and automation



## Security

Prevention of unauthorized access, modification, misuse of network resources



## Acquisition & ownership costs

Initial and ongoing costs to operate

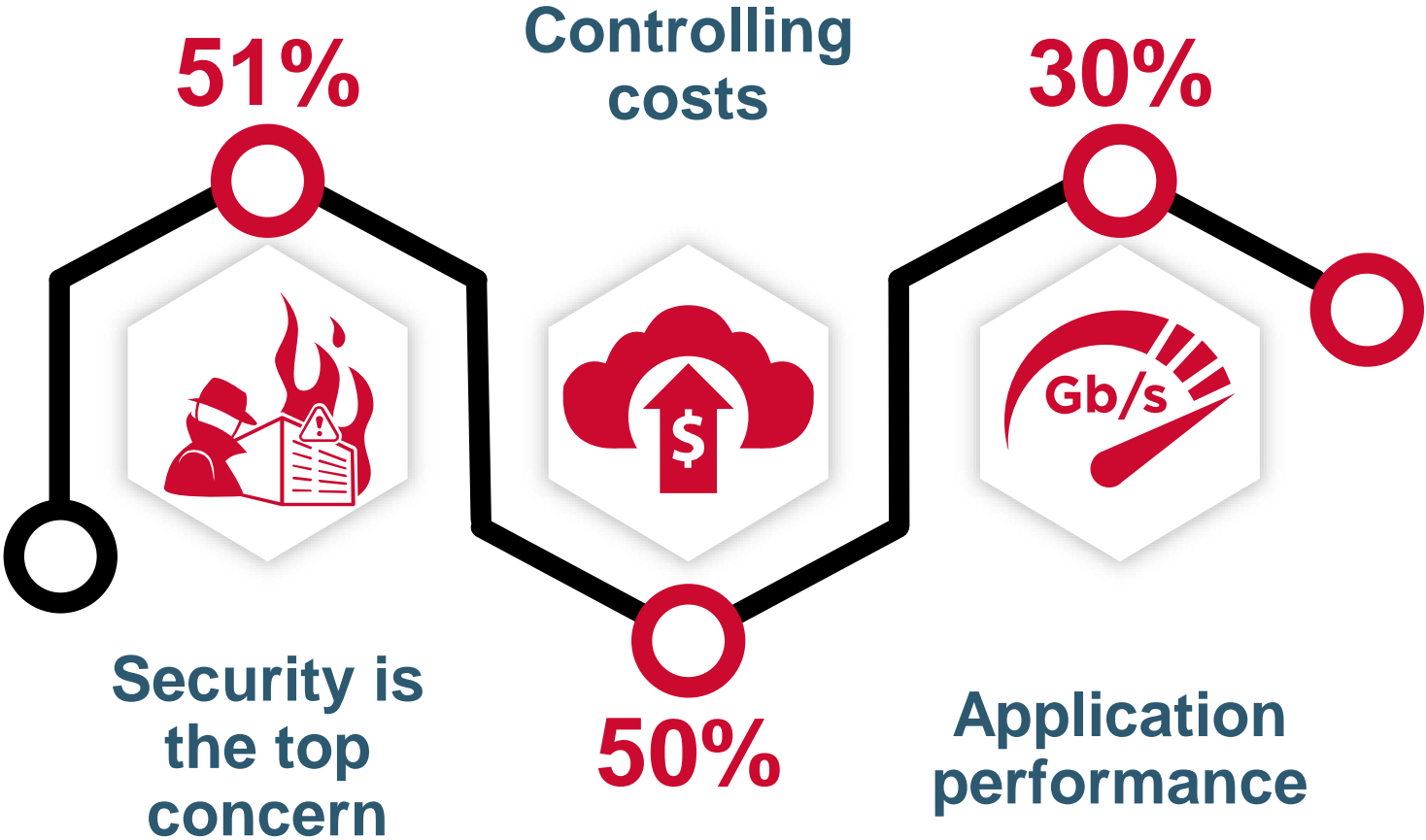


## Extensibility

Adaptability to future technology enhancements

# Where to run Critical Workloads

## Enterprises decide to run On-Premises



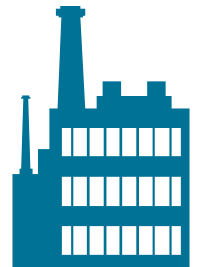
## Workloads considered On-Premises

- OLTP - Online Transactional Processing
- ERP - Enterprise Resource Planning
- CRM - Customer Relationship Management
- Engineering/R&D
- Advanced data analytics/processing
- Application testing and development

Source: 451 Research, Voice of the Enterprise: Cloud, Hosting & Managed Services, Workloads and Key Projects 2019

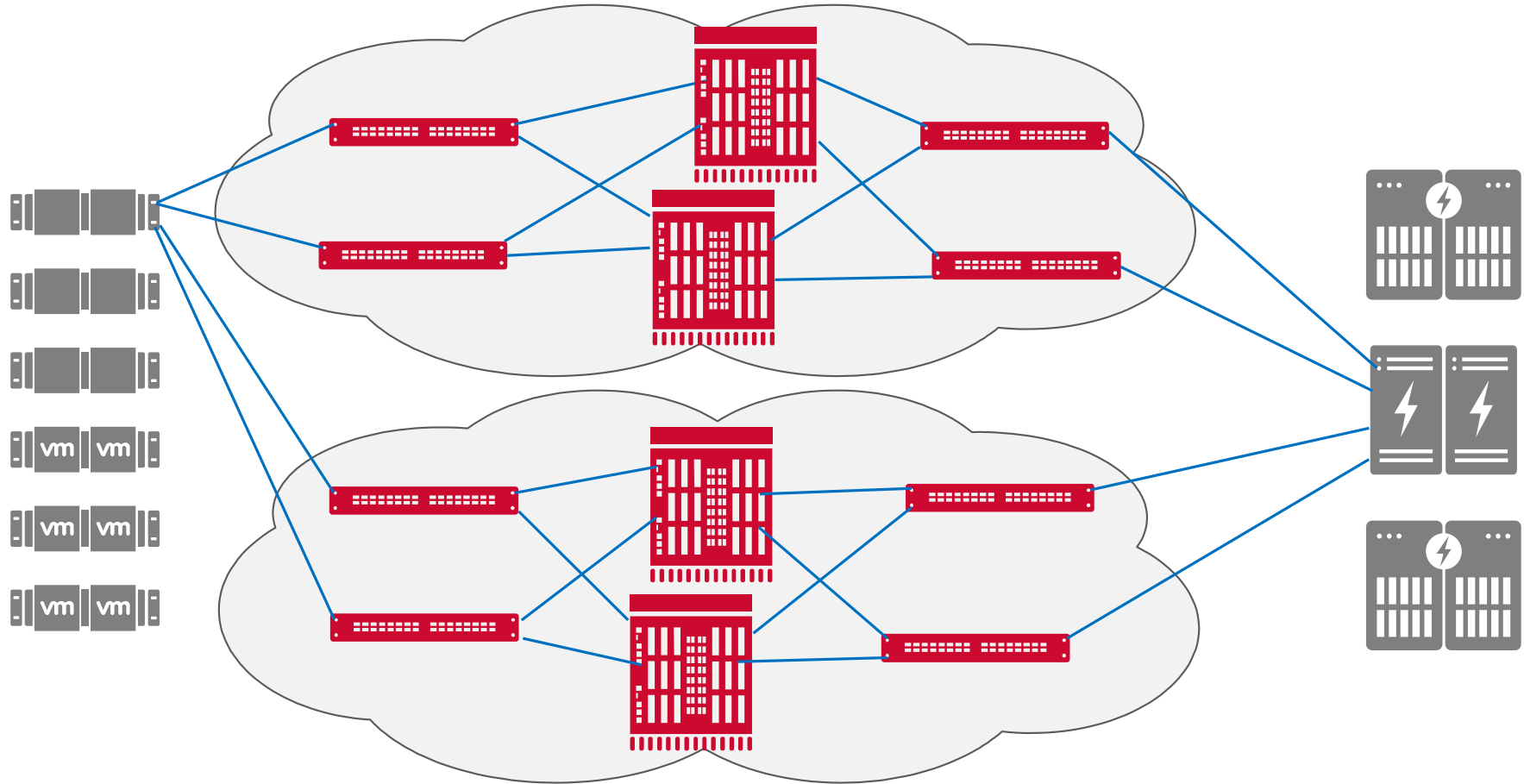
# The Importance of Fibre Channel

- Essential businesses in the current crisis
  - Healthcare, grocery, food, media, banking, government, and critical infrastructure
- Fibre Channel is foundational technology for business continuity
  - Unmatched reliability and resiliency
  - Architected to mitigate local and widespread disruptions and outages
- Fibre Channel is the safe and proven choice
  - Deployed in mission critical infrastructure for decades
  - Proven through many disaster scenarios



# What is a Storage Area Network (SAN)?

A purpose-built network connecting mission-critical servers to storage



Critical Workloads

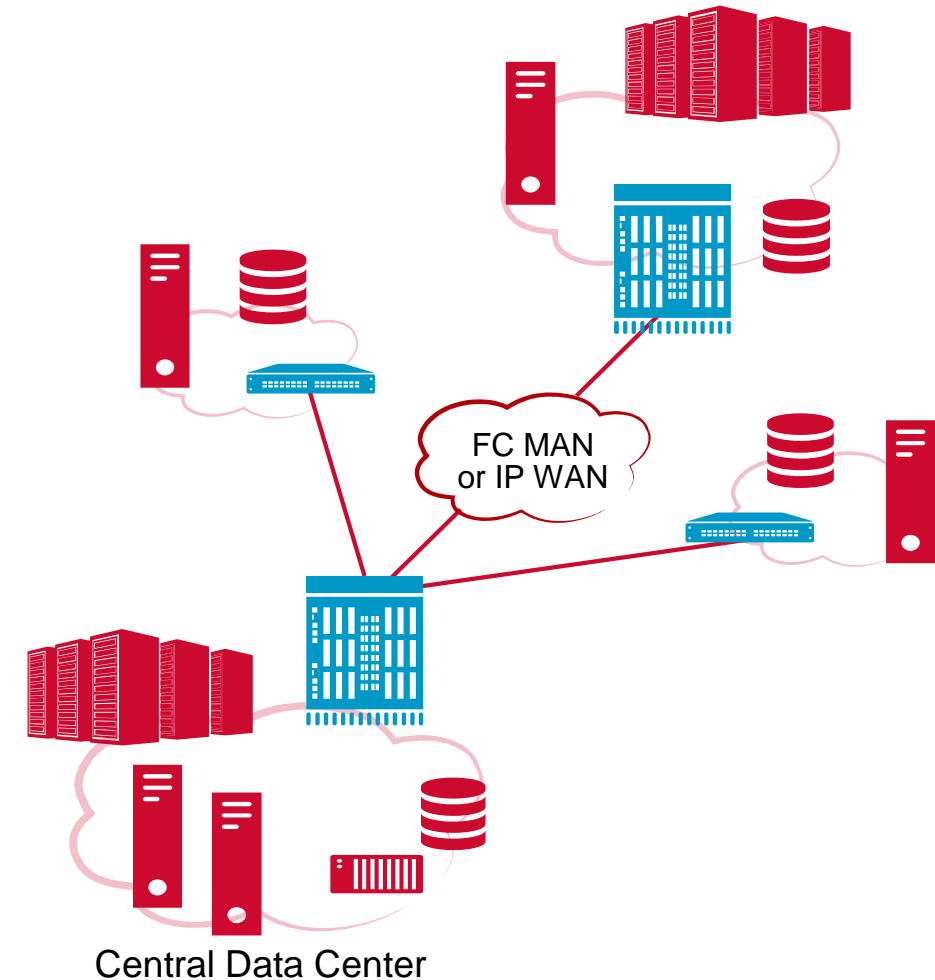
Servers

Storage Area Network

Enterprise Storage

# Business Continuity and Disaster Recovery (BC/DR)

- Flexible business resiliency/disaster recovery solutions
  - Multi-site synchronous and asynchronous disk replication
  - Centralized storage backup, recovery, and archiving
  - Global data migration, distribution, and sharing
- Delivers higher value
  - Shorter synchronization and backup windows
  - Faster recovery times, more granular recovery points
  - Integrated network optimization and security
- Proven enterprise-class extension
  - Open Systems and Mainframe





# SLAs of Applications

## RPO and RTO

- When describing a Service Level Agreement (SLA) to the application owner or business line the questions are these:
  - Recovery Point Objective (RPO) is simply the question “how much data can your application lose and you’re still okay?”
  - Recovery Time Objective (RTO) is simply the question “what is the cost opportunity of the application being offline?”

# Fibre Channel: Optimized for Mission Critical Storage

## Non-stop Availability



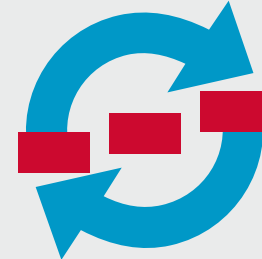
Designed to eliminate disruptions and outages

## Predictable Performance



Deterministic for maximum application performance

## Enterprise Scale



Scales easily for workloads, servers, and storage

## Powerful Security



Integrated into the protocol, hardware, and software

**Fibre Channel is purpose-built network, optimized for mission critical storage**

# Brocade Solutions



# New Technologies Accelerate the Delivery of Data and Services

The SAN needs to evolve to keep pace with innovations and modern day demands

**Critical Applications**

ORACLE®

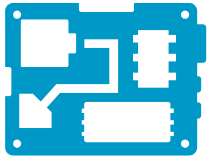


vmware®

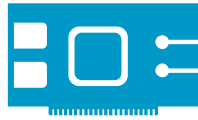
CITRIX®



## Next-Gen Servers (2020-2021)



Intel, Whitley  
AMD, Milan



PCIe 4



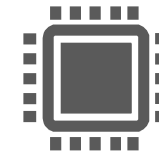
Storage Area Network



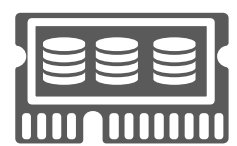
## Enterprise Storage



All Flash



NVMe



SCM

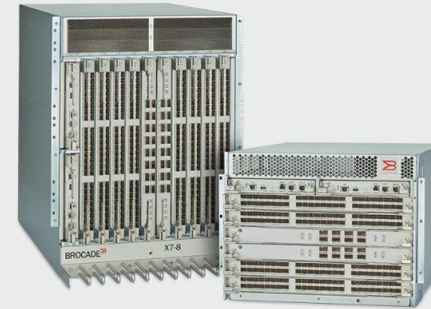
Drastically improves server performance and doubles IO in the same footprint

Insanely fast storage with parallel, low-latency data paths

# What About the SAN?

# Introduction to Brocade Storage Networking

- **96%** of the world's banks, telecoms, and retailers run on Brocade networks
- Design and develop hardware, software, and services
  - Directors and switches
  - Management, analytics, and automation
  - Global support for OEMs and direct customers
- Global networking supplier to the world's leading data storage companies



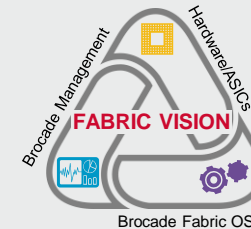
Directors



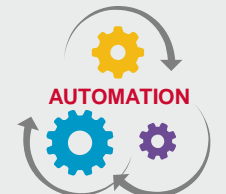
Switches



Brocade SANnav Management Portal



Brocade Fabric Vision

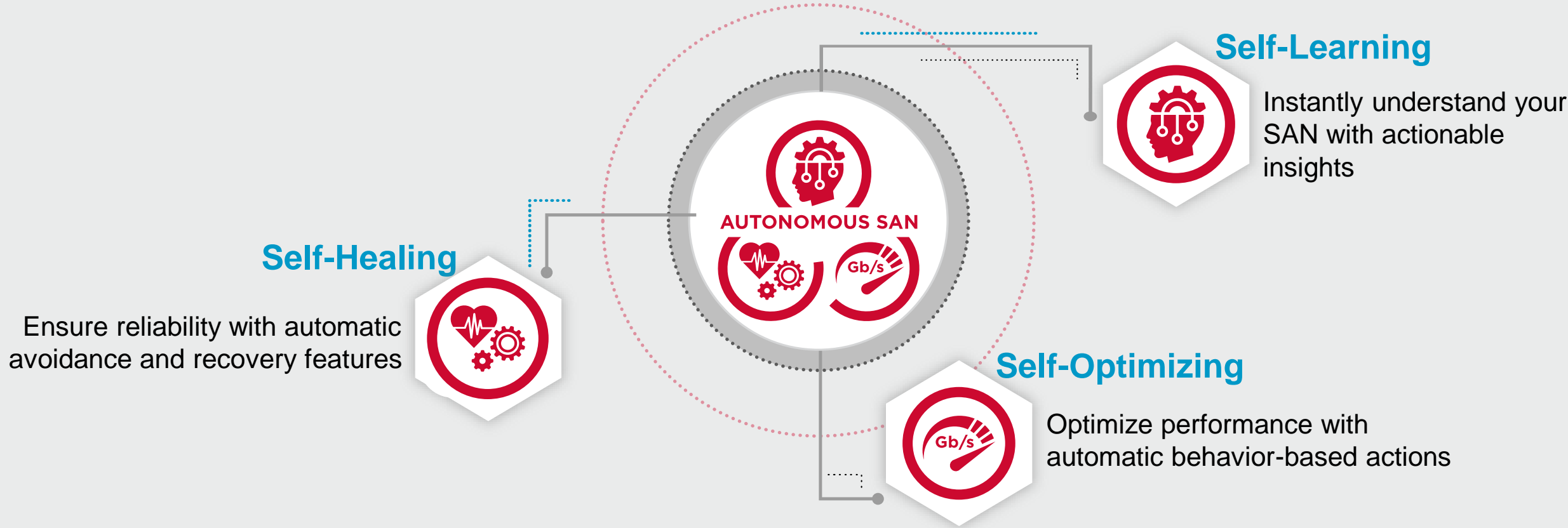


Rest API

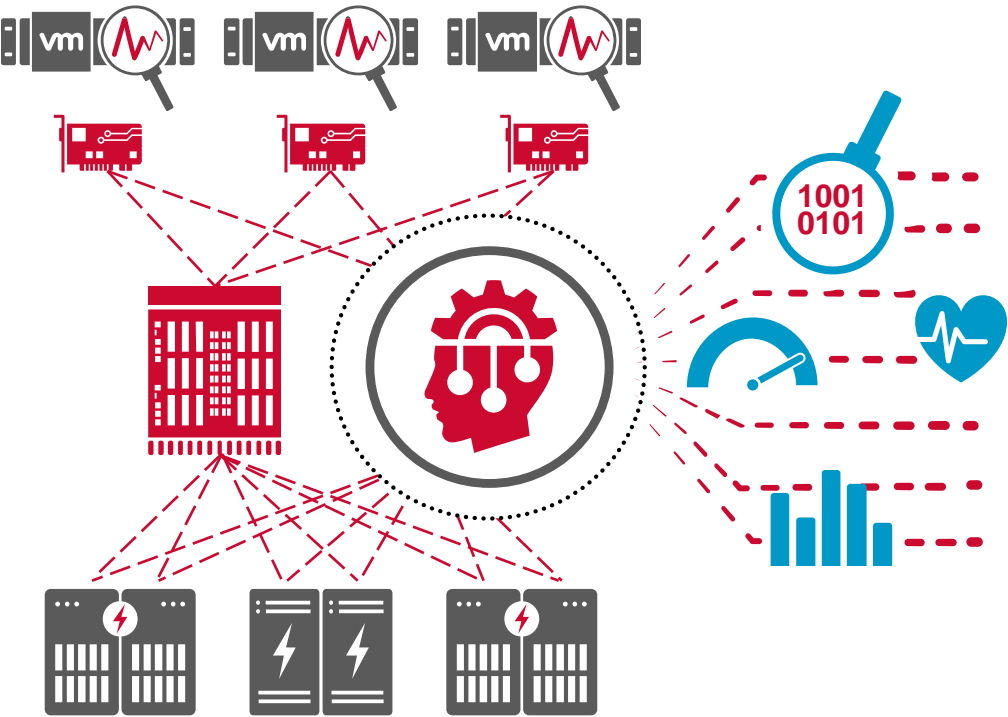


Brocade Global Services

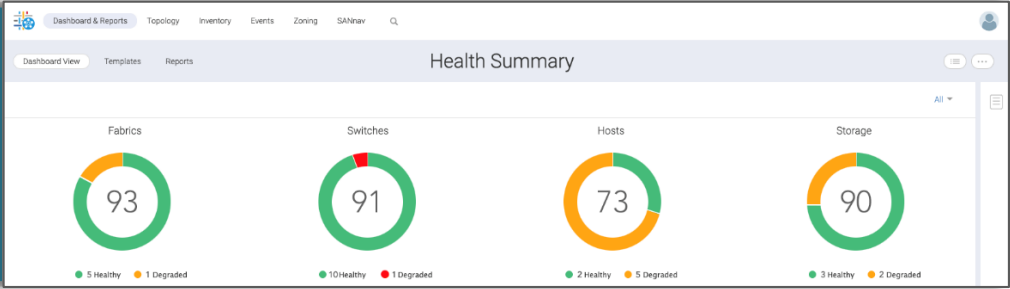
# Realize an Autonomous SAN with Gen 7 Fibre Channel



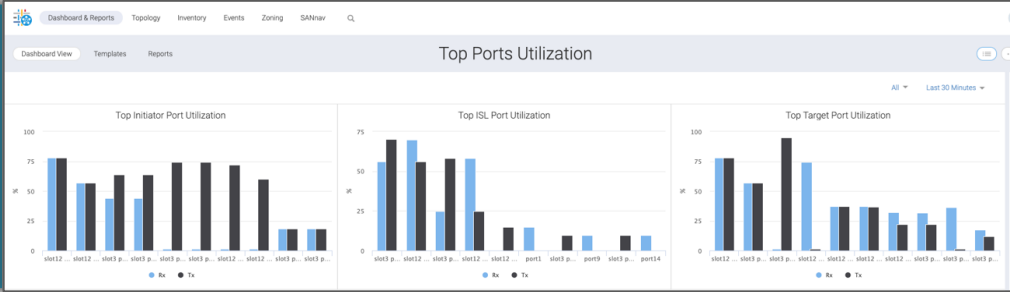
# Self-Learning Transforms Data into Actionable Intelligence



Instantly correlates data into health scores



Summarizes critical data into easy to read dashboards



Learn how application traffic flows through the network

Switches ▾ Flows ISL Trunks ▾ Collections (8)

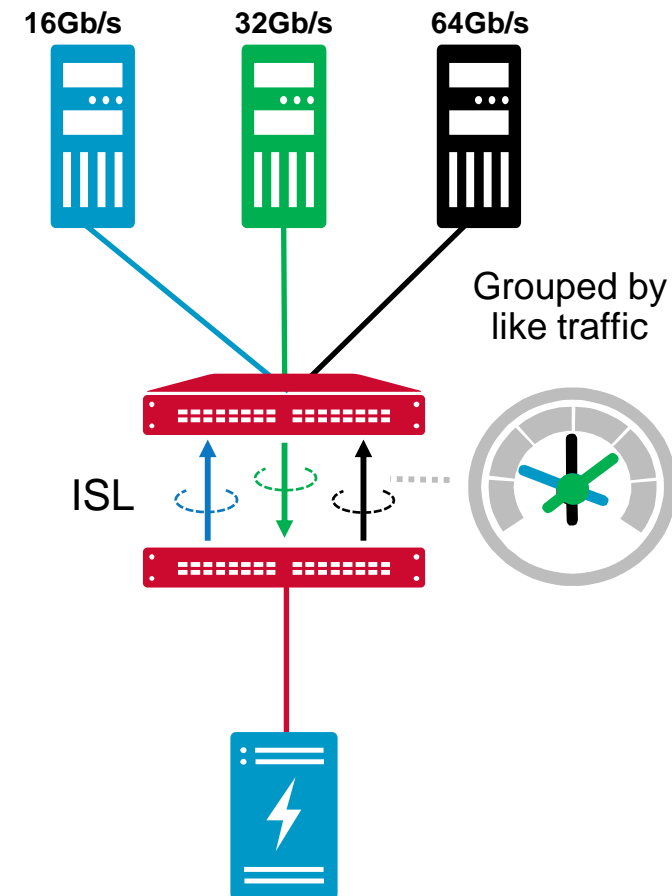
Name	Description	Total Flows	Active Flows	RD ECT (ms)	WR ECT (ms)	RD FRT (ms)	WR FRT (ms)	RD IOPS
+ ESX87	-	48	48	0.309	0.466	0.186	0.174	35741
+ ESX130	-	408	408	0.302	0.763	0.256	0.087	36186
+ FID50	-	16	16	0.562	0.53	0.103	0.098	10029
+ PIO	-	16	16	-	1.178	-	0.406	-
+ ROS	-	4	4	1.441	-	0.852	-	6476

Quickly understand the impact of current or trending problems

# Self-Optimizing Maximizes Performance Based on Learned Behavior

Traffic Optimizer automatically isolates traffic by speed to optimize performance

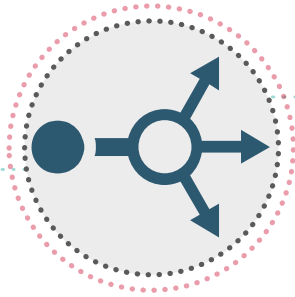
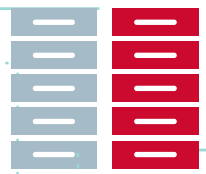
- Mixing workloads can cause slow downs and congestion
- Eliminate common oversubscription and congestion issues caused by mismatched speed
- **Optimize and guarantee application performance** by prioritizing and grouping traffic based on like characteristics





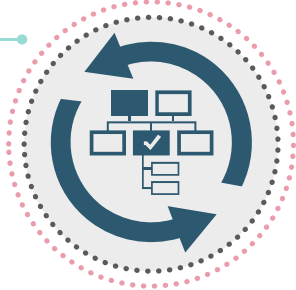
# Self-Healing: Ensure Reliability with Automatic Avoidance and Recovery Features

Instantly notify end-devices of congestion for automatic resolution



Ensure data delivery with automatic failover from physical or congestion issues

Eliminate performance impacts by automatically taking corrective action on misbehaving devices



Detect and automatically reconfigure out-of-compliance fabrics

# Enterprise Workloads... The change w/ NVMe



# What is NVMe?

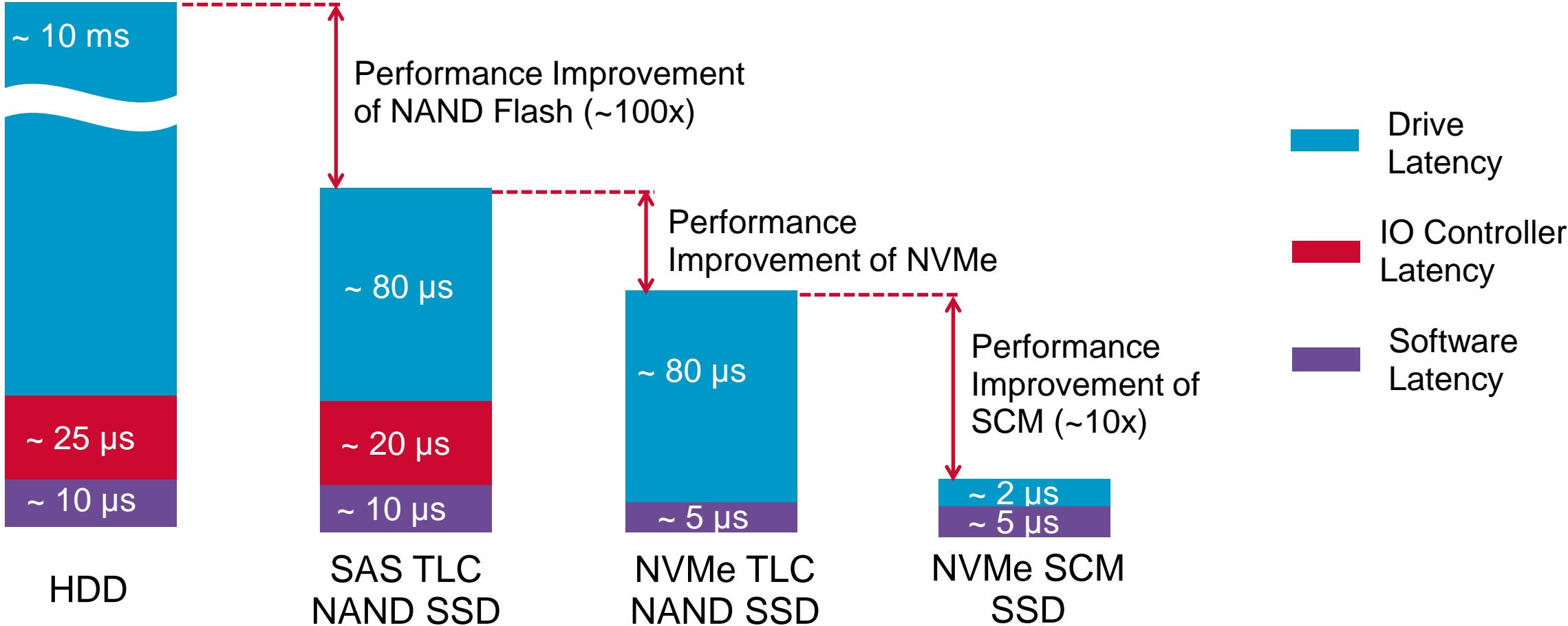
The next evolution in high performance storage is NVMe

- NVMe stands for Non-Volatile Memory Express
  - An interface to the controller for NVM providing commands to the storage device
  - Developed by NVM Express™ organization, a consortium of 75+ companies
- NVMe is a purpose-built protocol for Flash storage
  - Replaces SCSI protocol
  - Dramatically reduces latency through efficient protocol and parallelism (64K queues)
- Originally, NVMe is a direct attached storage (DAS) technology over PCIe
- Has been widely available in the market since 2013
  - Supported on all major operating systems



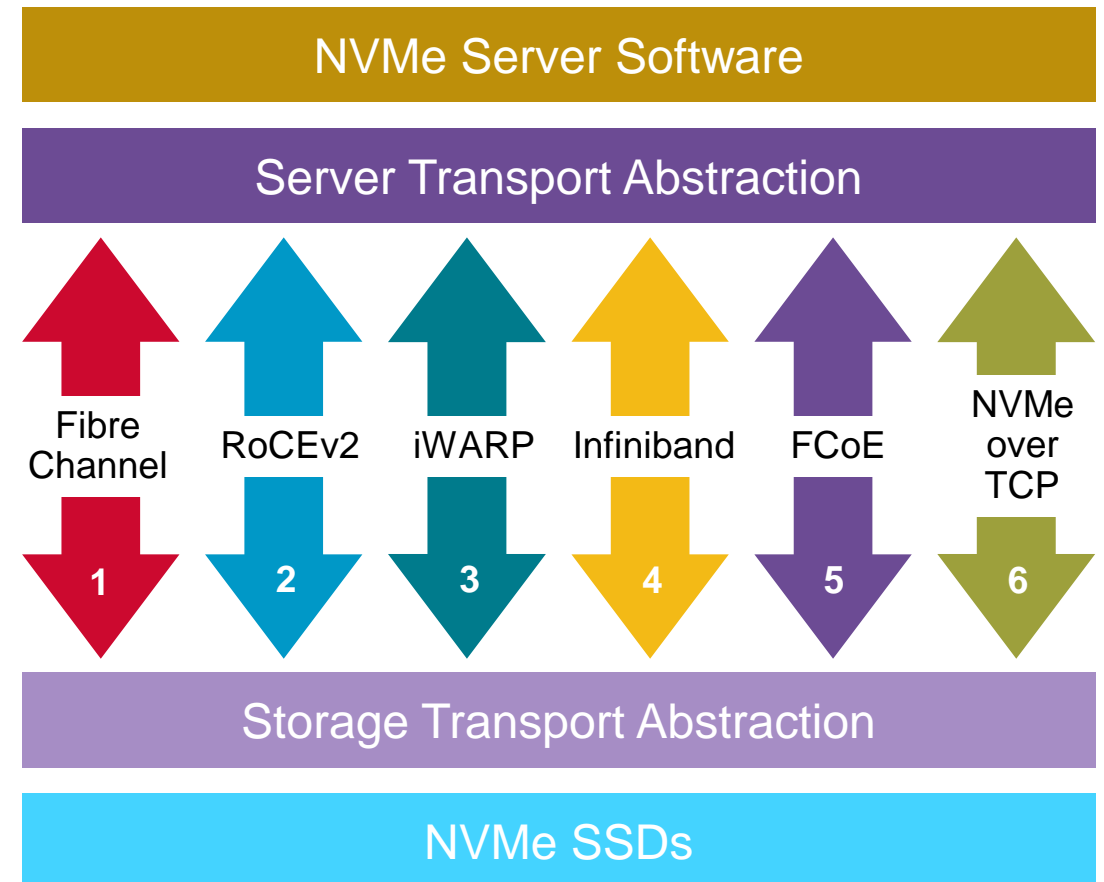
# NVMe™ Is Just The First Step

A necessary step, but not the ultimate goal



# NVMe over Fabrics Transport Options

- For Enterprise Storage, the choice is clear
  - Most of today's AFAs are deployed on Fibre Channel
  - Robust fabric services
  - Deterministic fabric behavior based on credit-based flow control
  - Proven technology for mission-critical storage flows
- Ethernet also supports NVMe
  - RoCEv2 requires lossless Ethernet (DCB), special NICs (RNICs), congestion notifications (ECN)...
    - It's not "just Ethernet"
  - iWARP is slow and not widely deployed
  - NVMe over FCoE comes along with FC, but niche usage only (Cisco UCS)
  - NVMe/TCP is recently standardized, just coming out
    - Software-only implementation, no special hardware required
    - Used for commodity connectivity, not performance
  - None of the above interoperate, so any choice is risky
    - NVMe/TCP is least risky because, like iSCSI, it needs no special hardware



# NVMe over Fabric Technical Characteristics

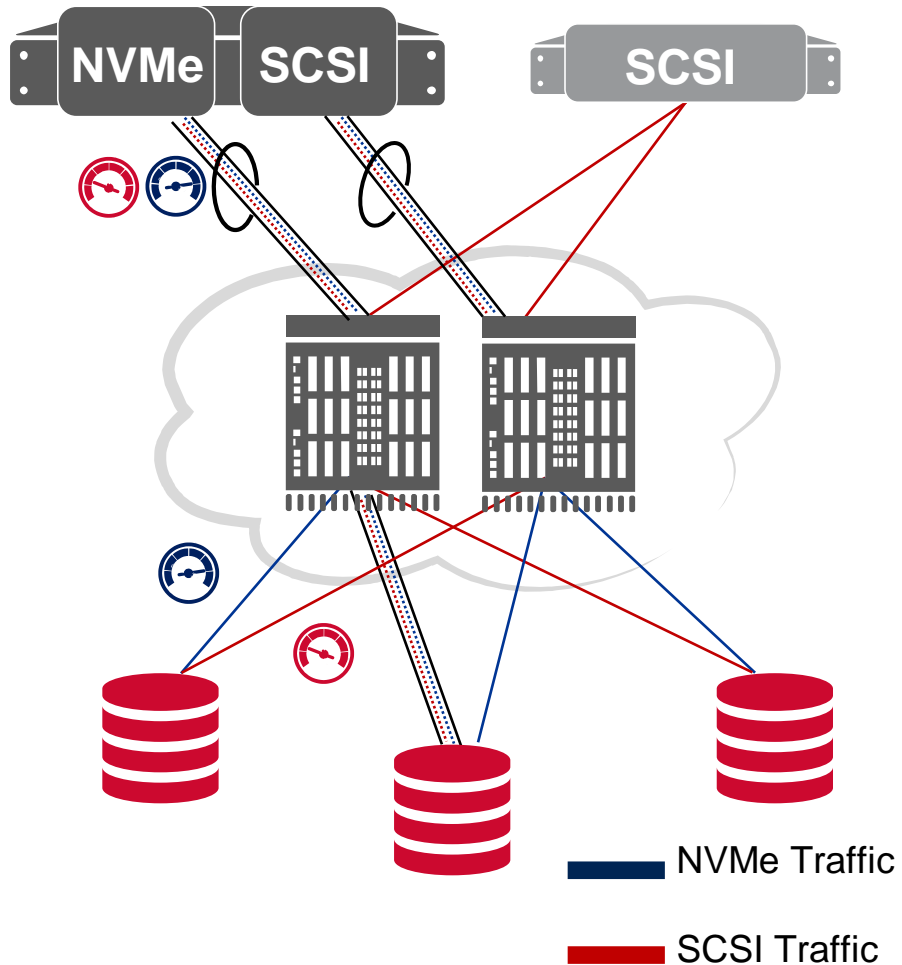
As described by the NVM Express organization

«Obviously, **transporting NVMe commands across a network requires special considerations** over and above those that are determined for local, in-storage memory. For instance, in order to transmit NVMe protocol over a distance, **the ideal underlying network or fabric technology will have the following characteristics:**

- **Reliable, credit-based flow control and delivery mechanisms.** This type of flow control allows the network or fabric to be self-throttling, providing a reliable connection that can **guarantee delivery at the hardware level without the need to drop frames** or packets due to congestion. **Credit-based flow control is native to Fibre Channel, InfiniBand and PCI Express® transports.**»

Source: [http://www.nvmexpress.org/wp-content/uploads/NVMe\\_Over\\_Fabrics.pdf](http://www.nvmexpress.org/wp-content/uploads/NVMe_Over_Fabrics.pdf)

# Key Attributes of NVMe over Fibre Channel



- NVMe over Fibre Channel (NVMe/FC) standardized by T11/INCITS in 2017
- Supported **today** by **Gen 5, Gen 6 and Gen7** fabrics, and by Gen 6 and Gen7 HBAs
- Supported **today** by most **major storage OEM vendors**
- Seamlessly leverages **fabric-based services** like zoning, name services, discovery, etc.
- Leverages **decades of development** in **SAN performance management, troubleshooting and analytics tools**
- Built to run **concurrently** with SCSI FCP (or even with FICON) on the same infrastructure
- In short, Fibre Channel offers **smoothest path** from SCSI FCP to NVMe/FC

# Concurrent SCSI/NVMe Use Cases Speed Adoption of NVMe

## Analytics on Active DB

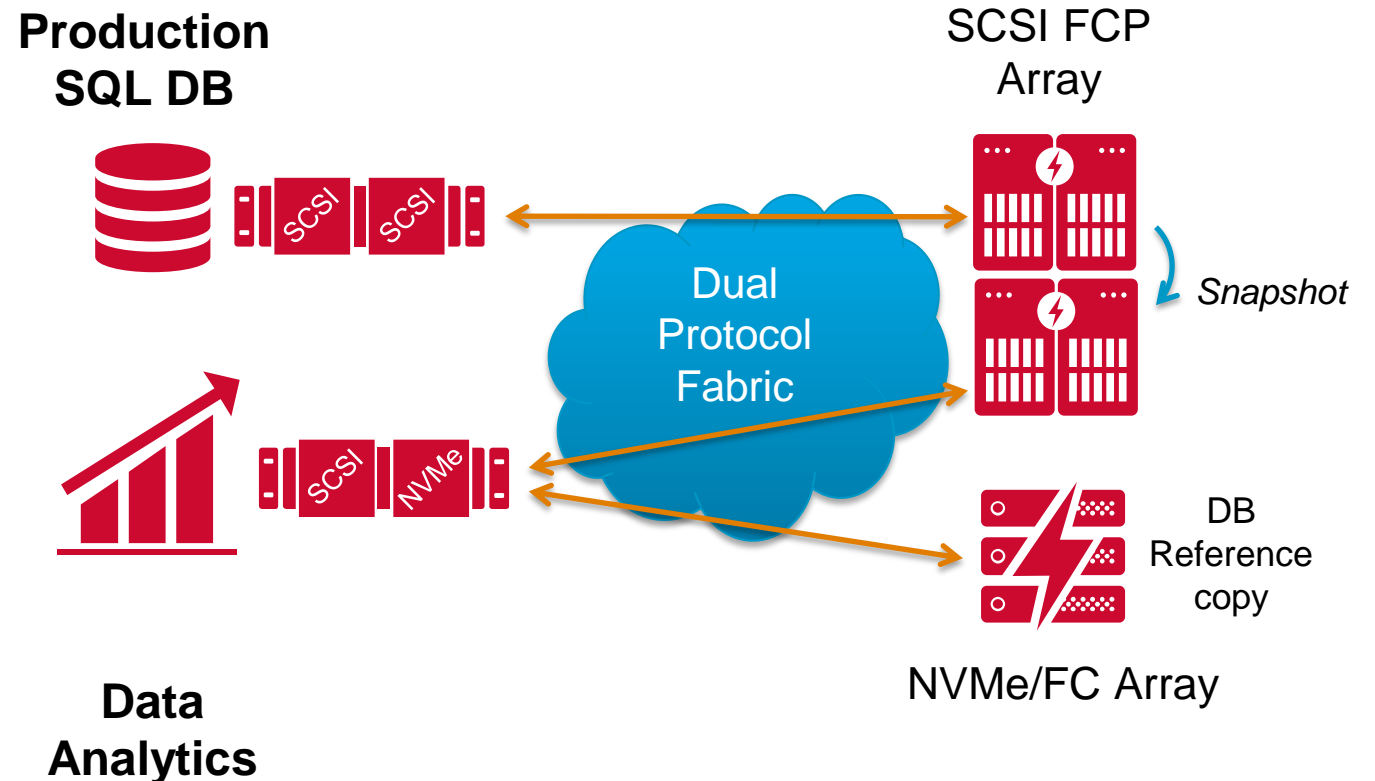
- Using sensitive data for ML is an effective mechanism to:
  - Increase revenue
  - Build customer loyalty
- Clone data to Latency-optimized storage on Fibre Channel
  - Keep sensitive data on FC SAN
  - Run ML on ultra-fast array
- Highest bandwidth & lowest latency

## Leverage Legacy Backup

- Some still use SCSI Tape or VTL

## Transitional Volume Migration

- Incremental moves are operationally easier with rollback options that reduce risk

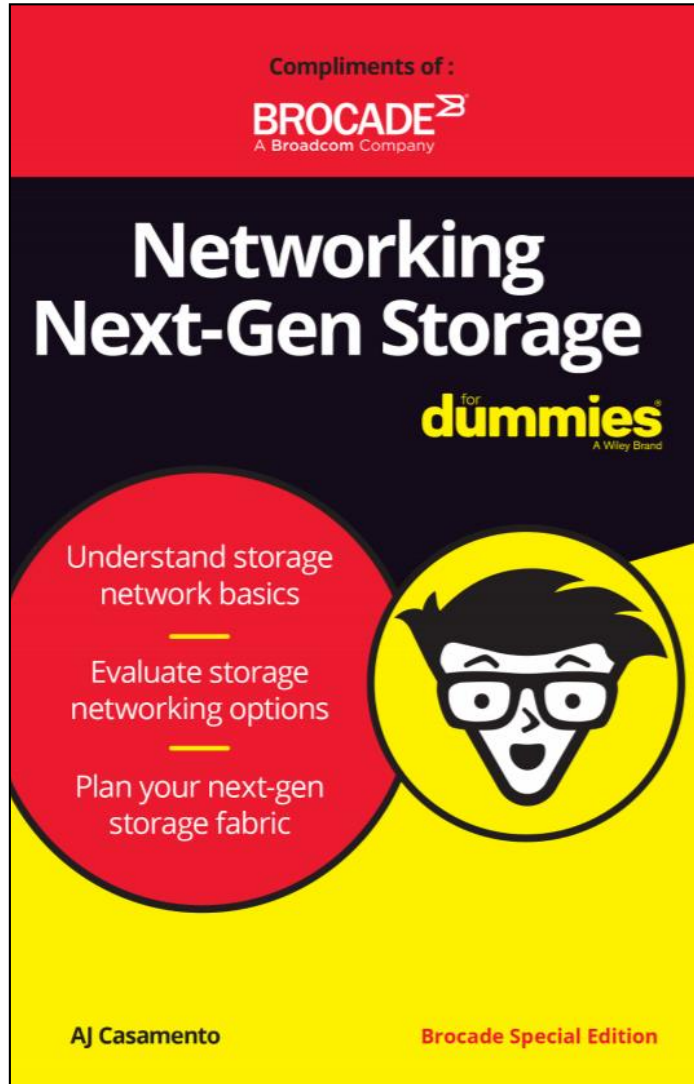




# Additional Resources



# Get Your Networking Next-Gen Storage eBook Instantly!



An easy-to-understand introduction to storage fabrics for the non-technical person, this eBook explains what **next-generation storage fabrics** are, how they are commonly implemented, and what advantages they offer compared to less modern and less robust technologies.

Armed with this information, you'll be able to make smart decisions about how storage fabrics fit into your business's IT plan.

**Scan the QR code below to get this eBook instantly!**

### Inside...

- Learn about data, storage, and networks
- Explore storage network types
- Increase customer satisfaction
- Balance measurement and performance
- Understand how Non-Volatile Memory Express (NVMe) improves performance
- Plan your next-gen storage fabric



# NVMe over Fibre Channel for Dummies

Second edition now available!

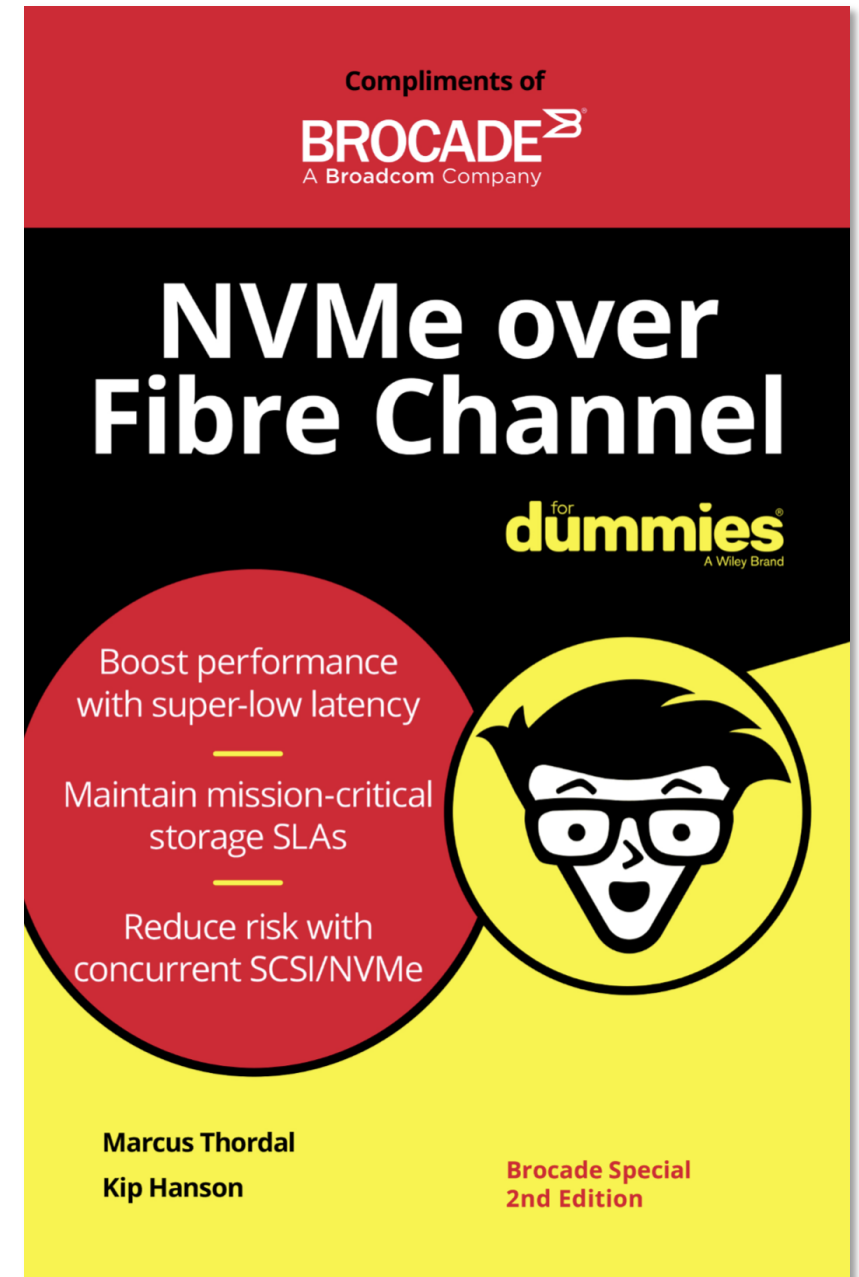
Fibre Channel, the premium datacenter fabric is ideal for NVMe-based fabric-attached enterprise storage. This book helps you create an adoption strategy and shows you the way forward.

## Inside...

- Adopt NVMe at your pace at low risk
- Deliver speed and reliability
- Increase IOPS with enhanced queuing
- Protect high-value storage assets
- Leverage concurrent SCSI and NVMe
- Simplify storage purchase decisions
- Analyze and optimize with Fabric Vision

## Download:

<https://docs.broadcom.com/docs/12395299>



# Fibre Channel Never Dies

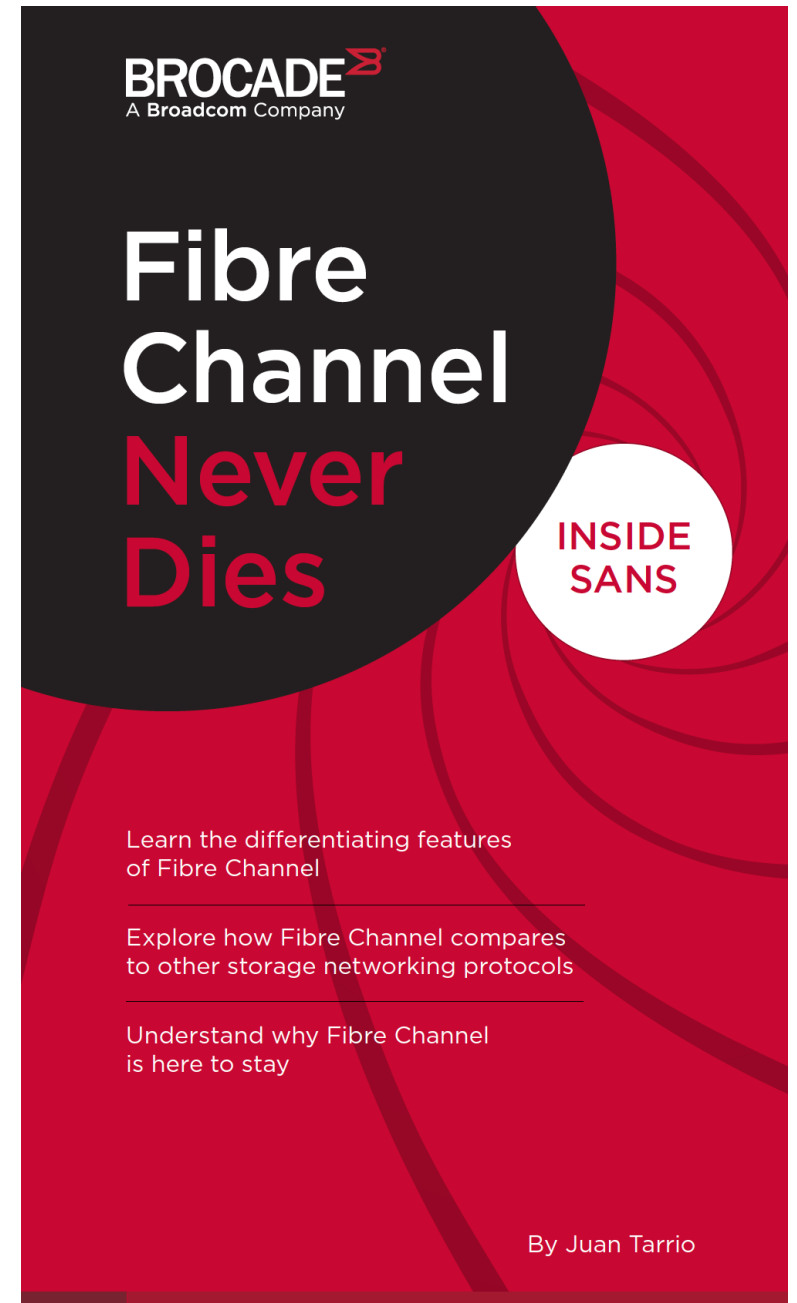
Dispel the myths and half-truths about Fibre Channel and its alternative technologies with the new “Fibre Channel Never Dies” Inside SANs ebook.

This book was written by Juan Tarrío and discusses the key characteristics that make Fibre Channel the gold standard for storage connectivity to mission-critical applications in the most demanding data centers in the world.

- Learn the differentiating features of Fibre Channel
- Explore how Fibre Channel compares to other storage networking protocols
- Understand why Fibre Channel is here to stay

## eBook Link:

<https://docs.broadcom.com/doc/fibre-channel-never-dies-inside-sans>





# Questions?





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