TechU

IBM

NVMe over Fibre Channel

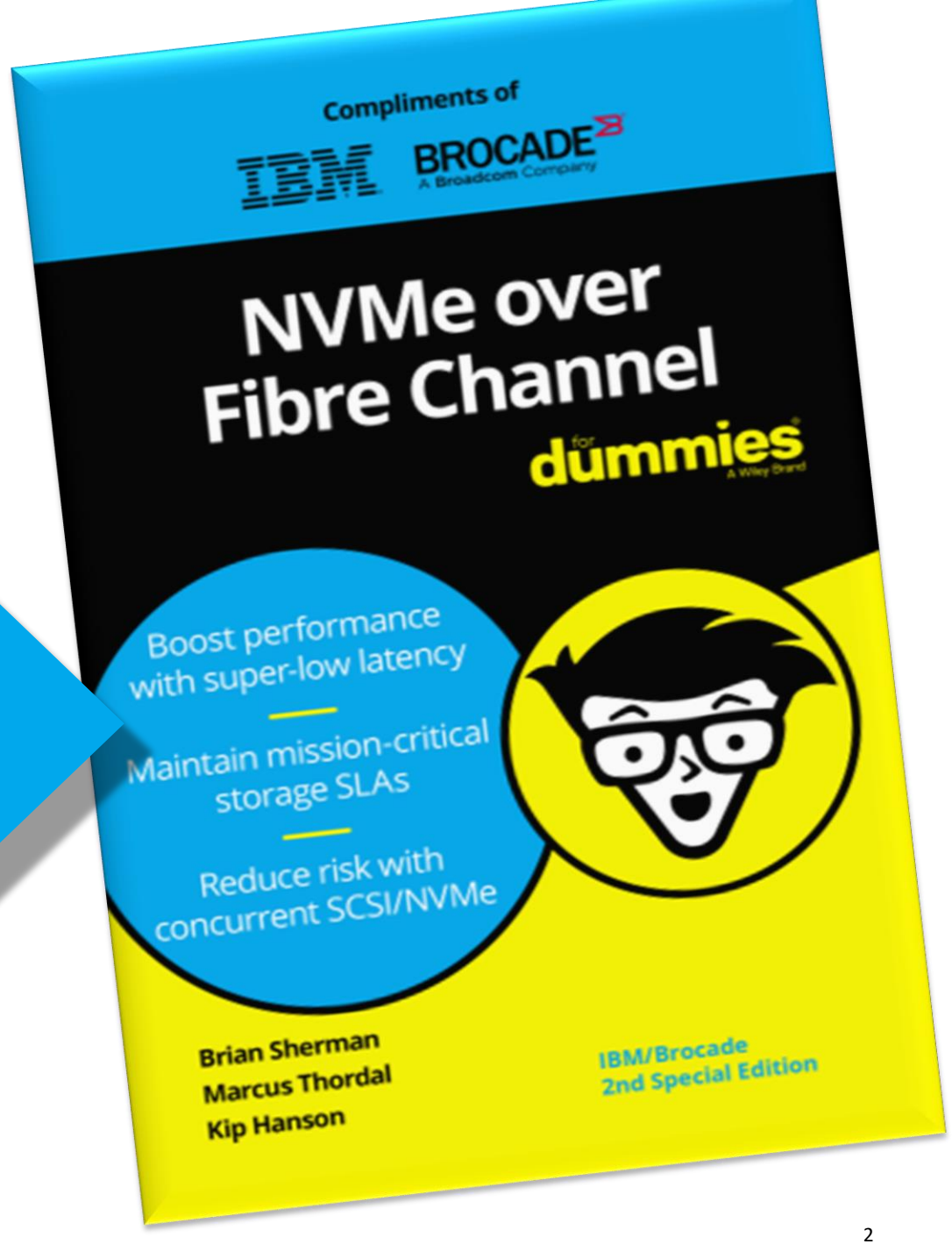
for dummies®
A Wiley Brand

IBM Systems Storage
B-Type Storage Networking

Want to get up to speed on NVMe Fast?

Get the Book!!!

Download your free copy today!



Scan for quick download

© Copyright IBM Corporation 2019

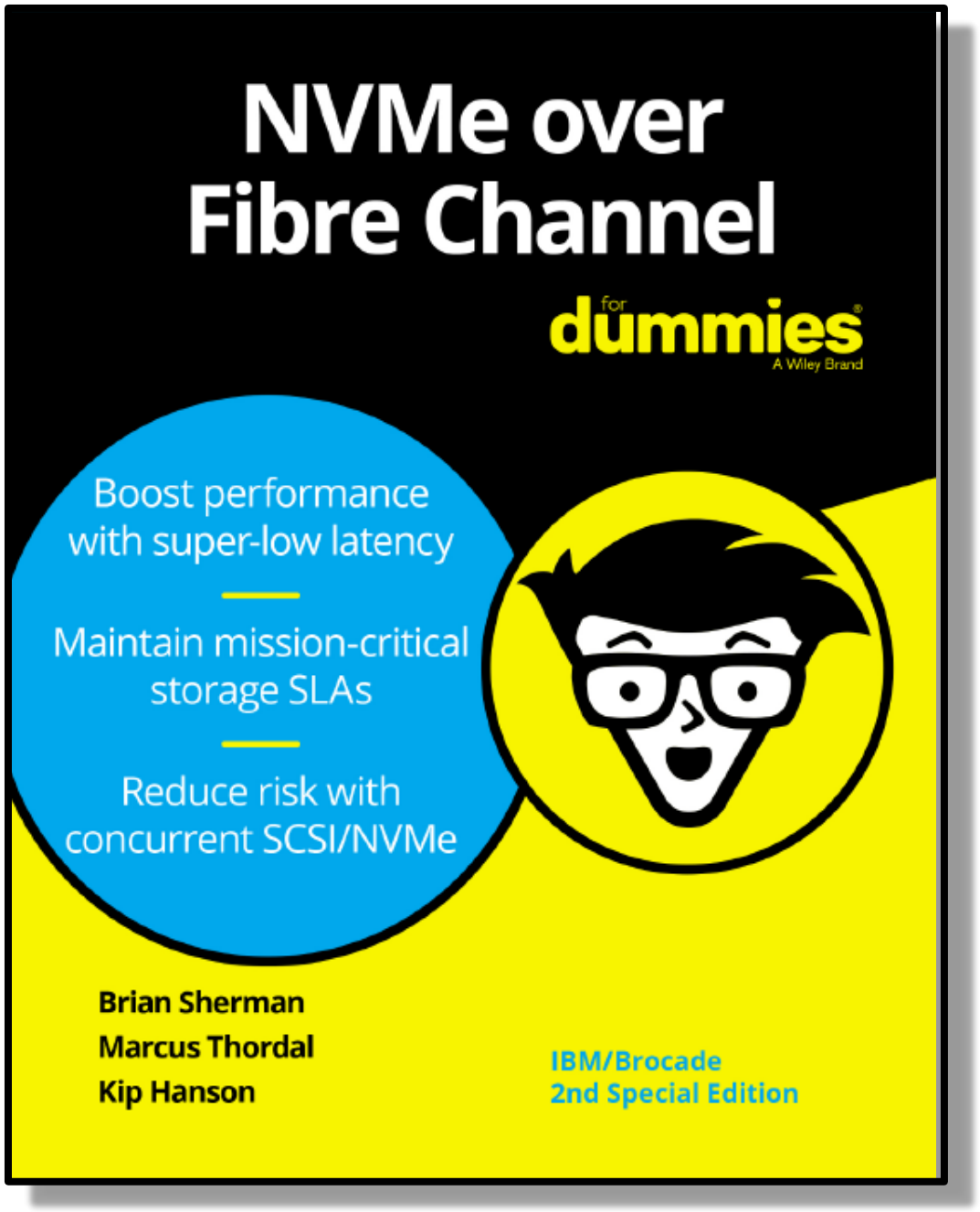
Objectives

- Review trends of storage evolution driving flash and NVMe arrays
- Understand the key reasons why the network matters for NVMe
- Articulate how Gen 6 enhances and optimizes next generation storage solutions
- Provide ways to get more information

© Copyright IBM Corporation 2019

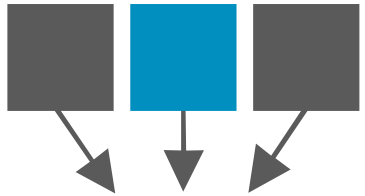
What are the current Data Center Trends?

And what is the impact on the Storage Network?

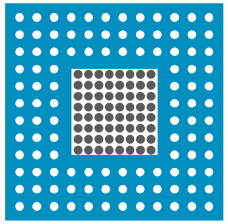


Business is Demanding More from IT

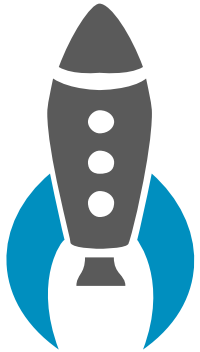
Faster application performance



Greater consolidation



Higher density



Rapid deployment

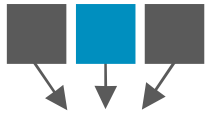
Real-time intelligence

© Copyright IBM Corporation 2019

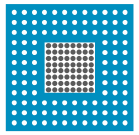
IT Responds: the Storage Evolution

Business Demanding More from IT

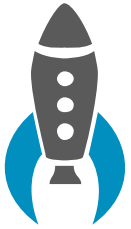
Faster application performance



Greater consolidation

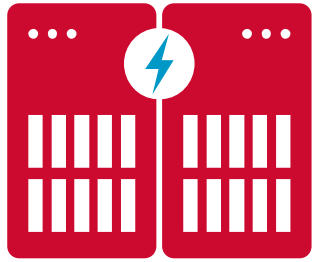


Higher density



Rapid deployment

Real-time intelligence



Flash

>53% of enterprise storage arrays are all-flash

NVMe-oF

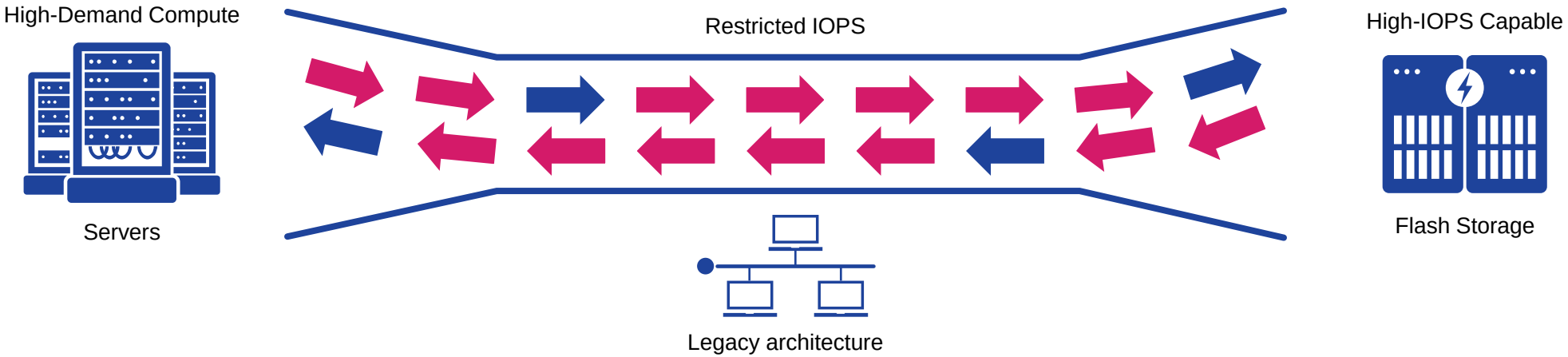
Will become the protocol of choice for flash storage

AI & ML

Virtually every industry will be impacted by AI & Machine Learning

The Impact on the Storage Network

Legacy Storage Networks are too slow



…and could become a bottleneck

© Copyright IBM Corporation 2019

The Network Matters for NVMe

"Future protocols (such as 40GbE used for iSCSI), file-based protocols (such as NFS and SMB) and current block protocols (such as 16Gb/sec FC) will be too slow for the next generation of solid-state storage and hybrid arrays."

Gartner®

"The Future of Storage Protocols," Valdis Filks, Stanley Zaffos, 29 June 2016

The Business Value of NVMe

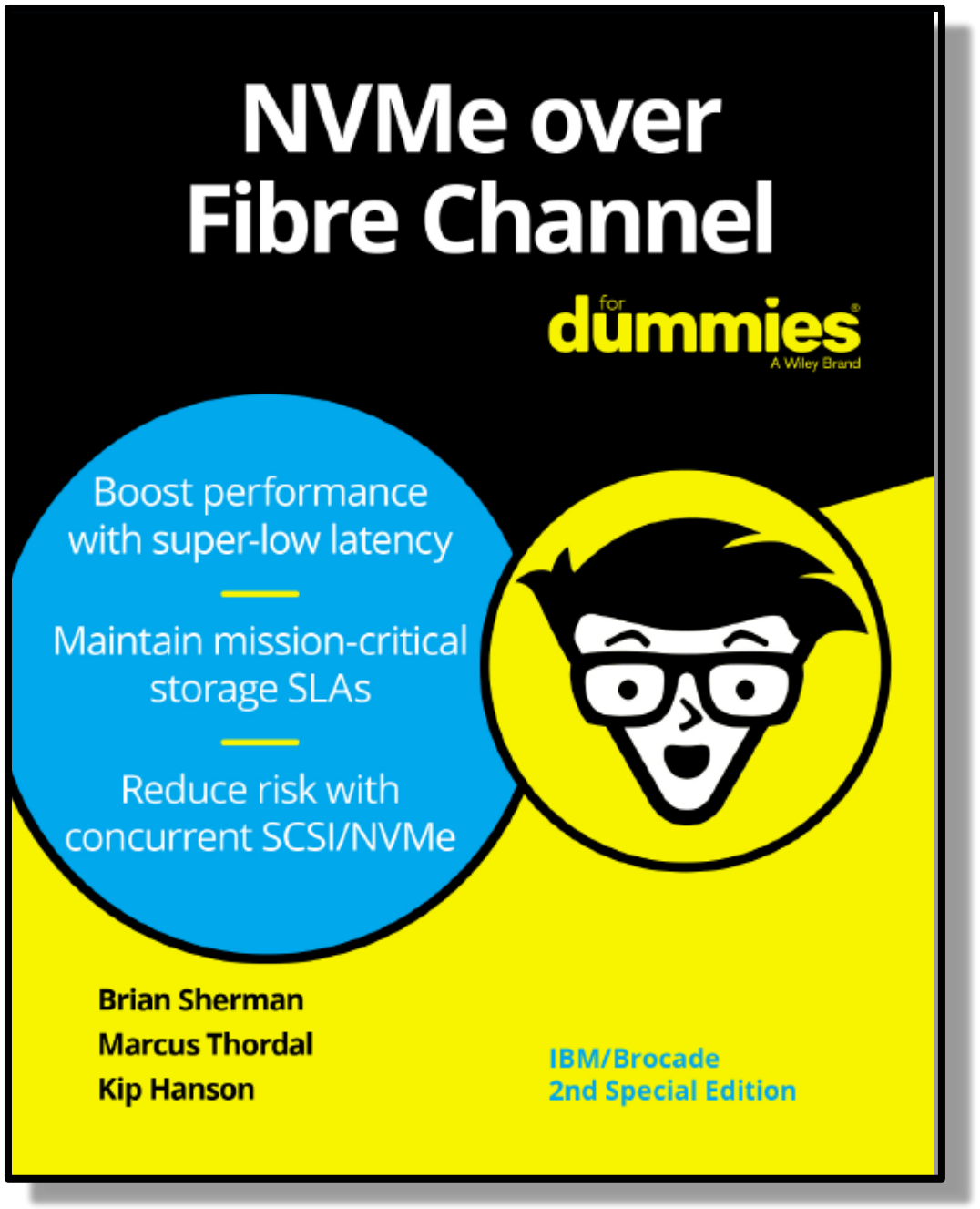
Lower latency makes flash perform like memory

- Process transactions faster
- Increase the number of database queries
- Maximize virtual machine (VM) density per server
- Improve mixed workload performance in virtualized environments

With NVMe you can support workloads that have high IO requirements with significantly smaller investment in infrastructure

What is NVMe and NVMe-oF?

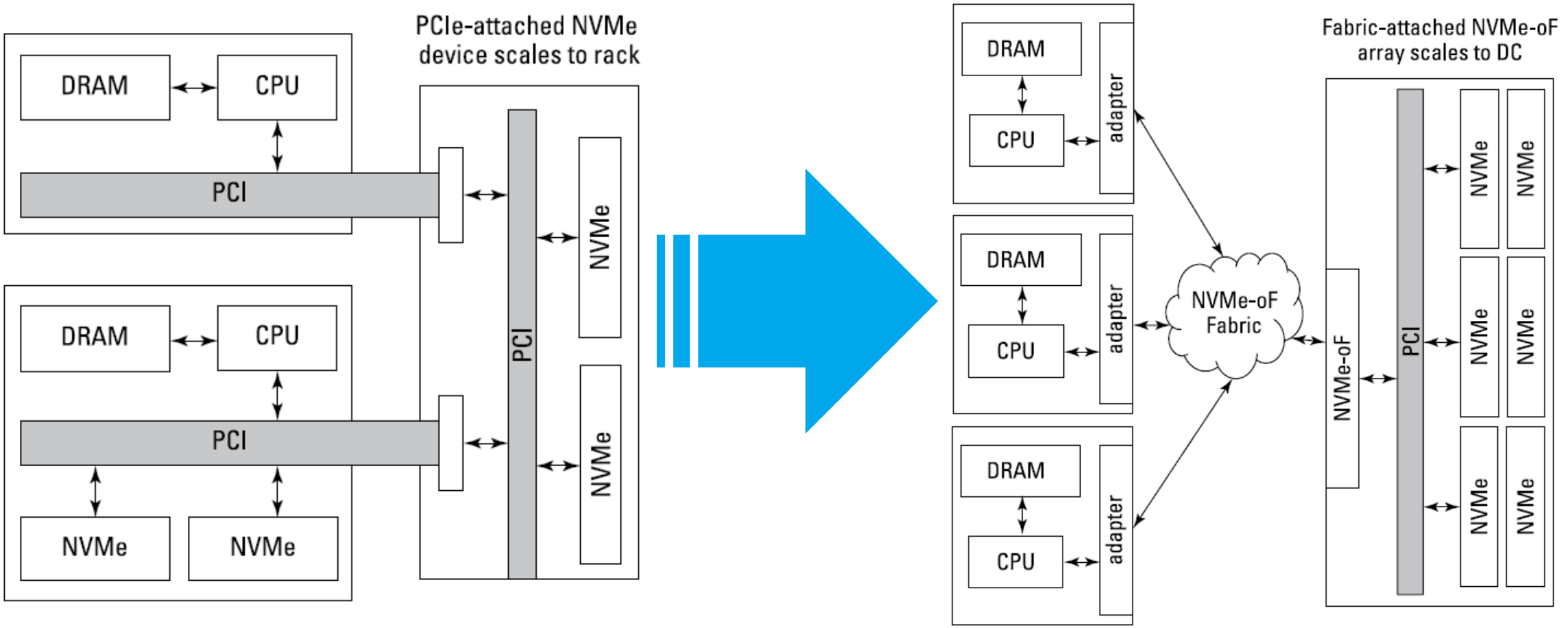
What will I need to run it?



NVMe – The essentials of what you need to know

- **Latest disk connection protocol** (e.g. SCSI, SAS, SATA)
- **Utilizes the PCIe bus**
  - Can be installed with local storage
  - Can be extended using NVMe-oF (NVMe over Fabrics)

NVMe connects to a server PCIe bus … Internally, Externally, and over Fabrics

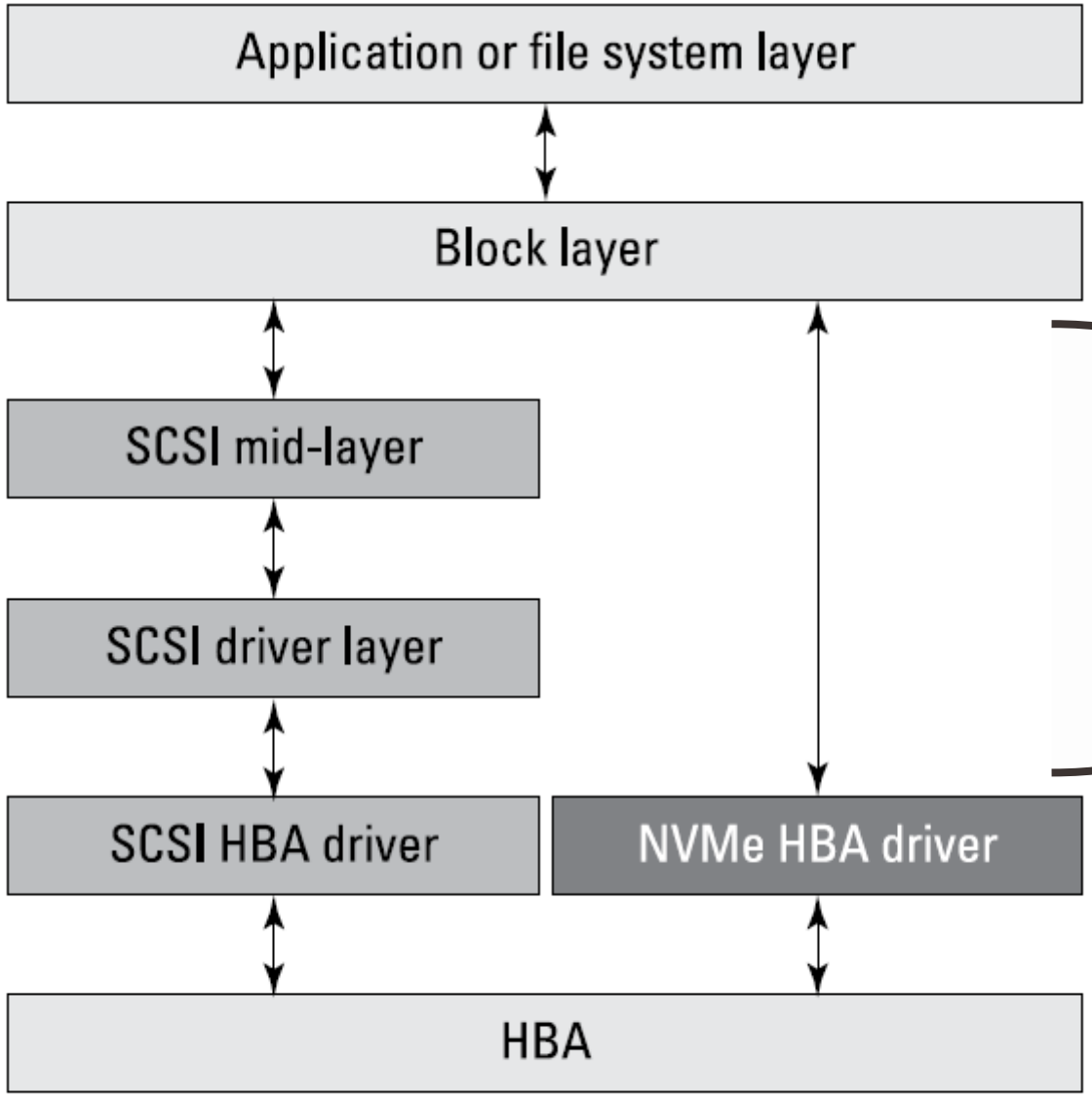


See pages 4-5……

NVMe – The essentials of what you need to know

- **Latest disk connection protocol** (e.g. SCSI, SAS, SATA)
- **Utilizes the PCIe bus**
  - Can be installed with local storage
  - Can be extended using NVMe-oF (NVMe over Fabrics)
- **Designed and coded for modern FLASH storage**
  - Assumes no rotational latency, head positions, etc. of older hard drives
  - Much more efficient than older protocols

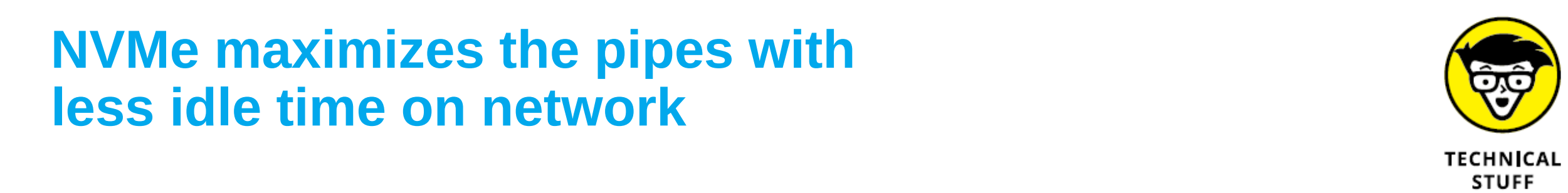
Why NVMe? Designed and Coded for Flash Storage



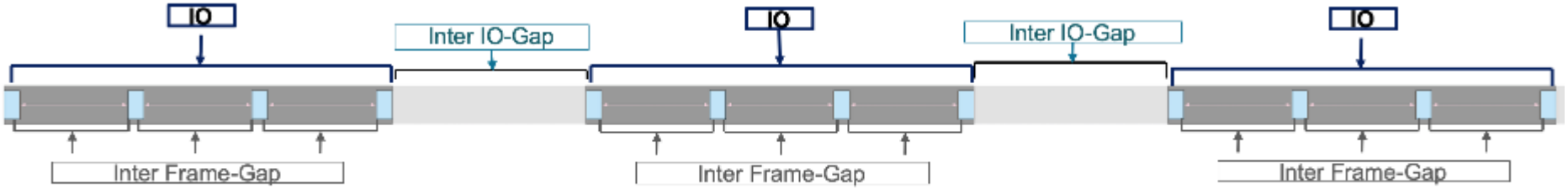
See page 10……

© Copyright IBM Corporation 2019

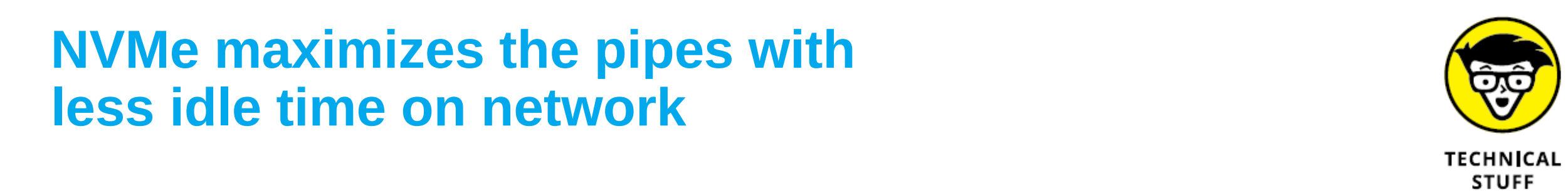
NVMe maximizes the pipes with less idle time on network



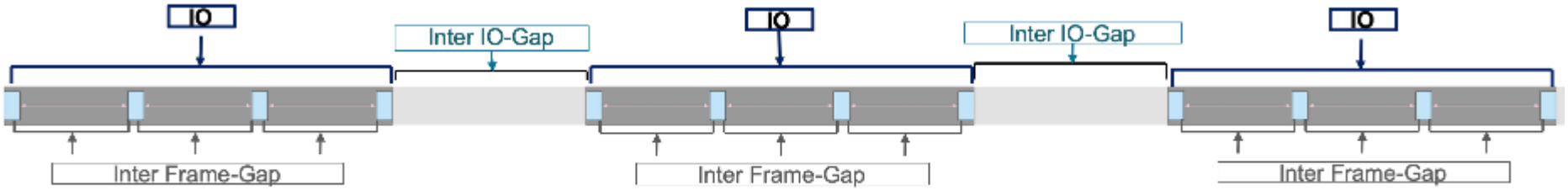
Disk Array (SCSI)



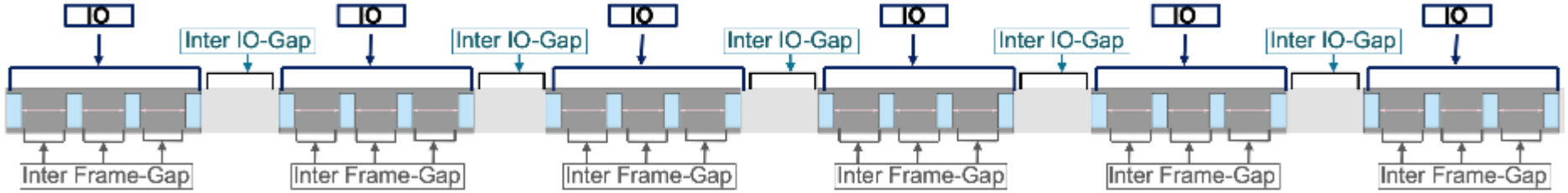
NVMe maximizes the pipes with less idle time on network



Disk Array (SCSI)

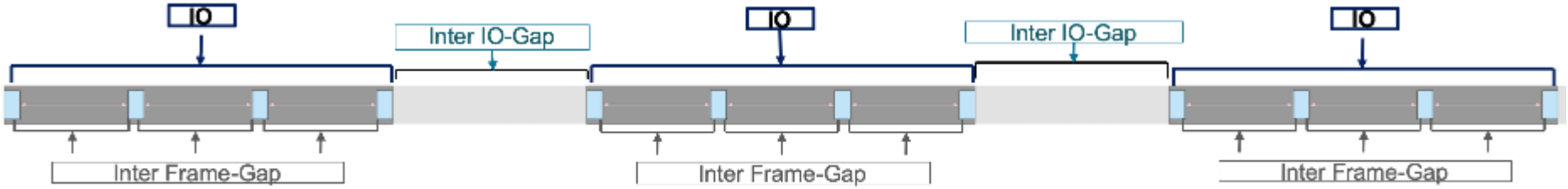


Flash Array (SCSI)

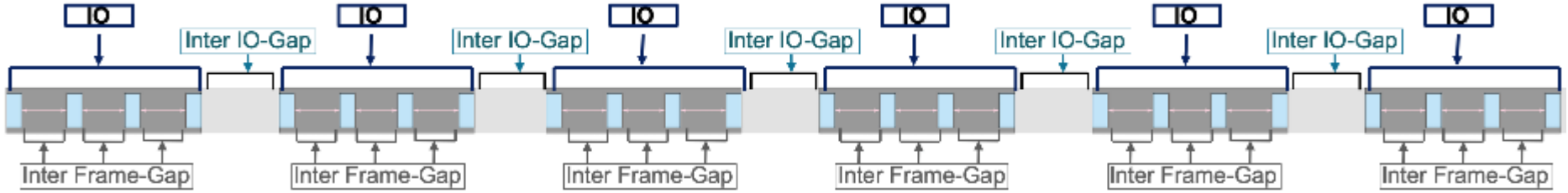


NVMe maximizes the pipes with less idle time on network

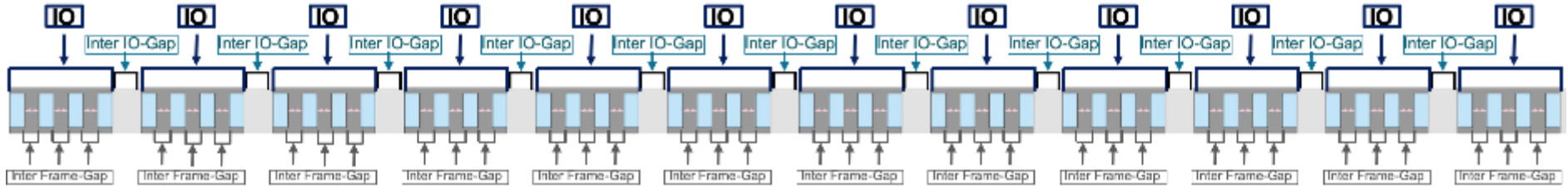
Disk Array (SCSI)



Flash Array (SCSI)



Flash Array (NVMe)

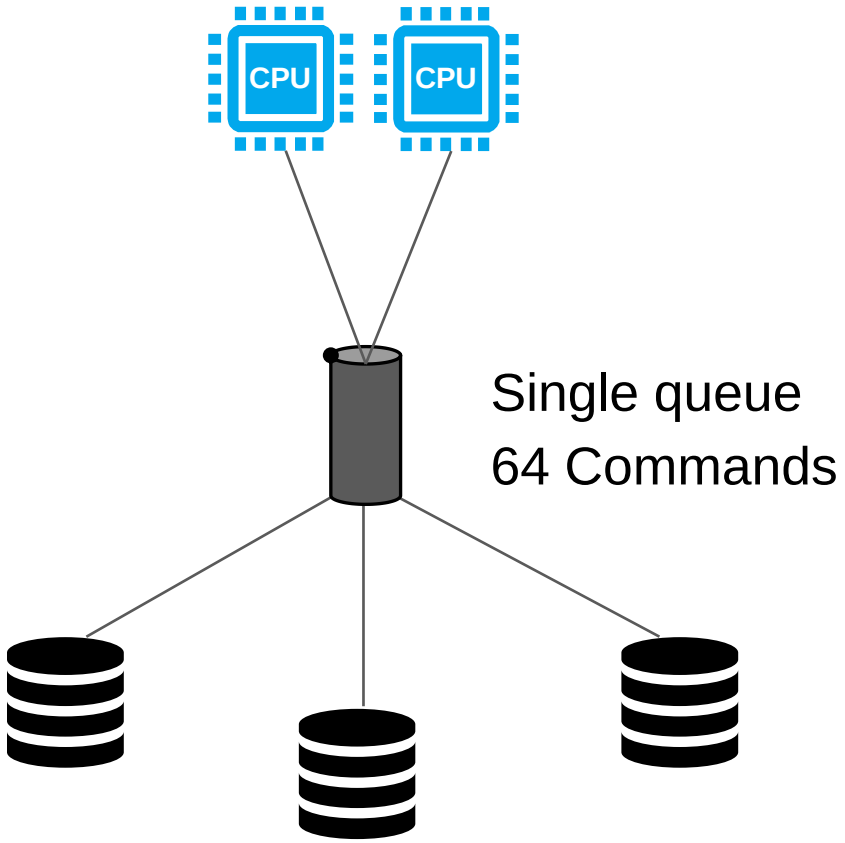


NVMe – The essentials of what you need to know

- **Latest disk connection protocol** (e.g. SCSI, SAS, SATA)
- **Utilizes the PCIe bus**
  - Can be installed with local storage
  - Can be extended using NVMe-oF (NVMe over Fabrics)
- **Designed and coded for modern FLASH storage**
  - Assumes no rotational latency, head positions, etc. of older hard drives
  - Much more efficient than older protocols
- **Enhanced Queuing and Massive parallelism**
  - SCSI: single queue with a depth of 64 commands each
  - NVMe: 64,000 queues with a depth of 64,000 commands each

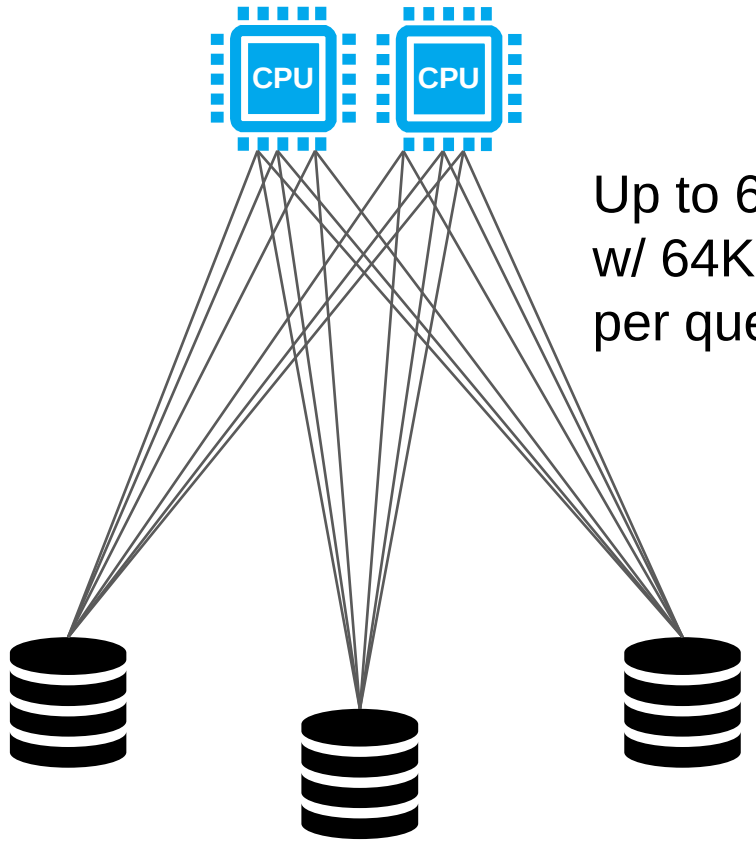
Why NVMe? Massive Parallelism = Efficiency!

SCSI



Single queue
64 Commands

NVMe



Up to 64K queues
w/ 64K commands
per queue

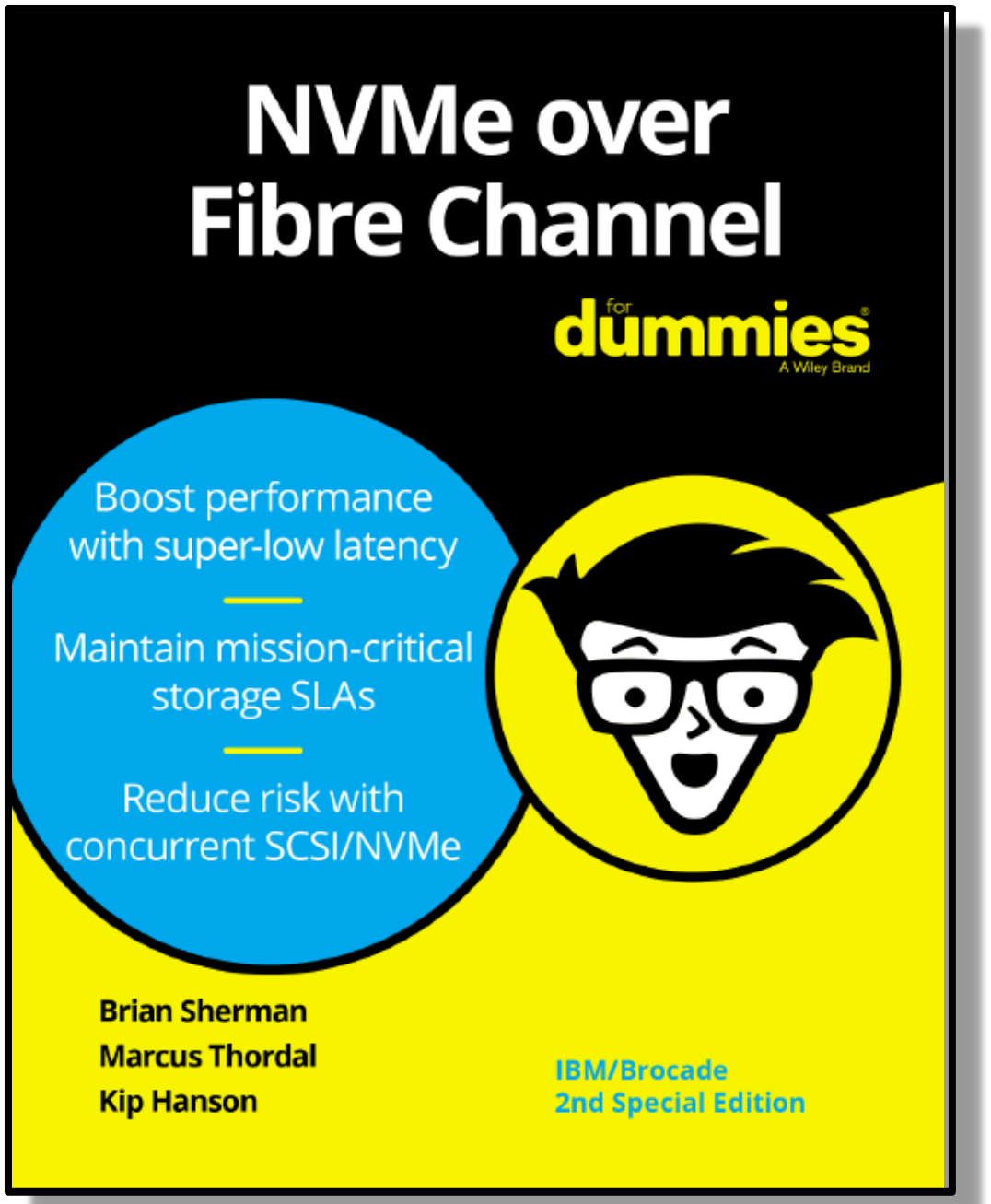
© Copyright IBM Corporation 2019

NVMe – The essentials of what you need to know

- **Latest disk connection protocol** (e.g. SCSI, SAS, SATA)
- **Utilizes the PCIe bus**
  - Can be installed with local storage
  - Can be extended using NVMe-oF (NVMe over Fabrics)
- **Designed and coded for modern FLASH storage**
  - Assumes no rotational latency, head positions, etc. of older hard drives
  - Much more efficient than older protocols
- **Enhanced Queuing and Massive parallelism**
  - SCSI: 8-32 queues with a depth of 512 commands each
  - NVMe: 64,000 queues with a depth of 64,000 commands each
- **What you need to run NVMe:**
  - NVMe capable adapter & driver (HBA)
  - NVMe capable network
  - NVMe capable storage

NVMe-oF requires a Network….

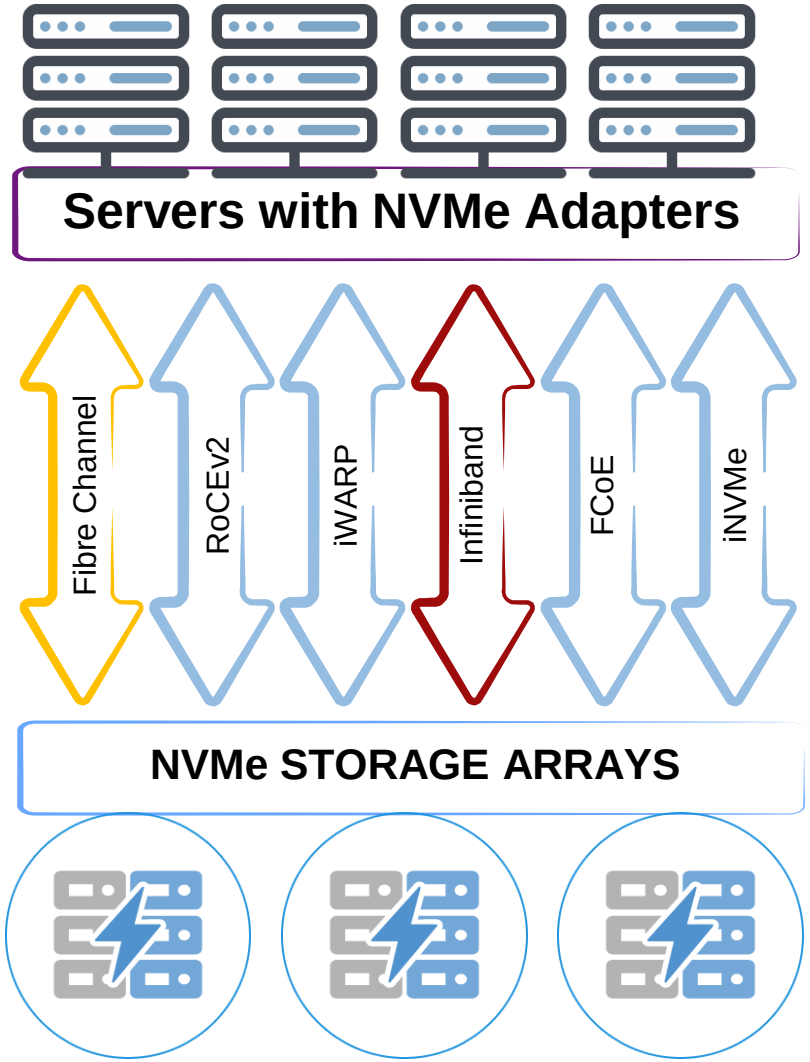
Which one is best for you?



Enterprise NVMe requires a Robust Network

NVMe-oF options:

- Fibre Channel
- Four IP version (all incompatible)
- Infiniband



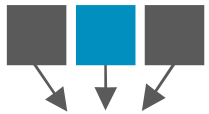
Which network to choose?

© Copyright IBM Corporation 2019

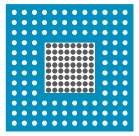
Why choose IBM b-type NVMe over Fibre Channel

Business Demanding More from IT

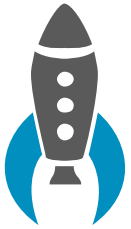
Faster application performance



Greater consolidation



Higher density

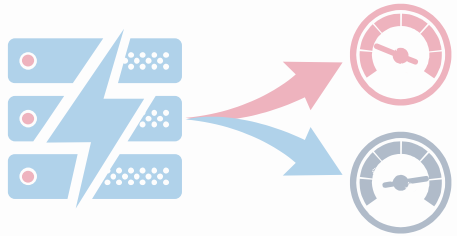


Rapid deployment

Real-time intelligence

Performance

NVMe increases application performance & CPU efficiency compared to traditional SCSI device



Flexibility

Concurrently run NVMe and SCSI on the same network! (FICON, too!)

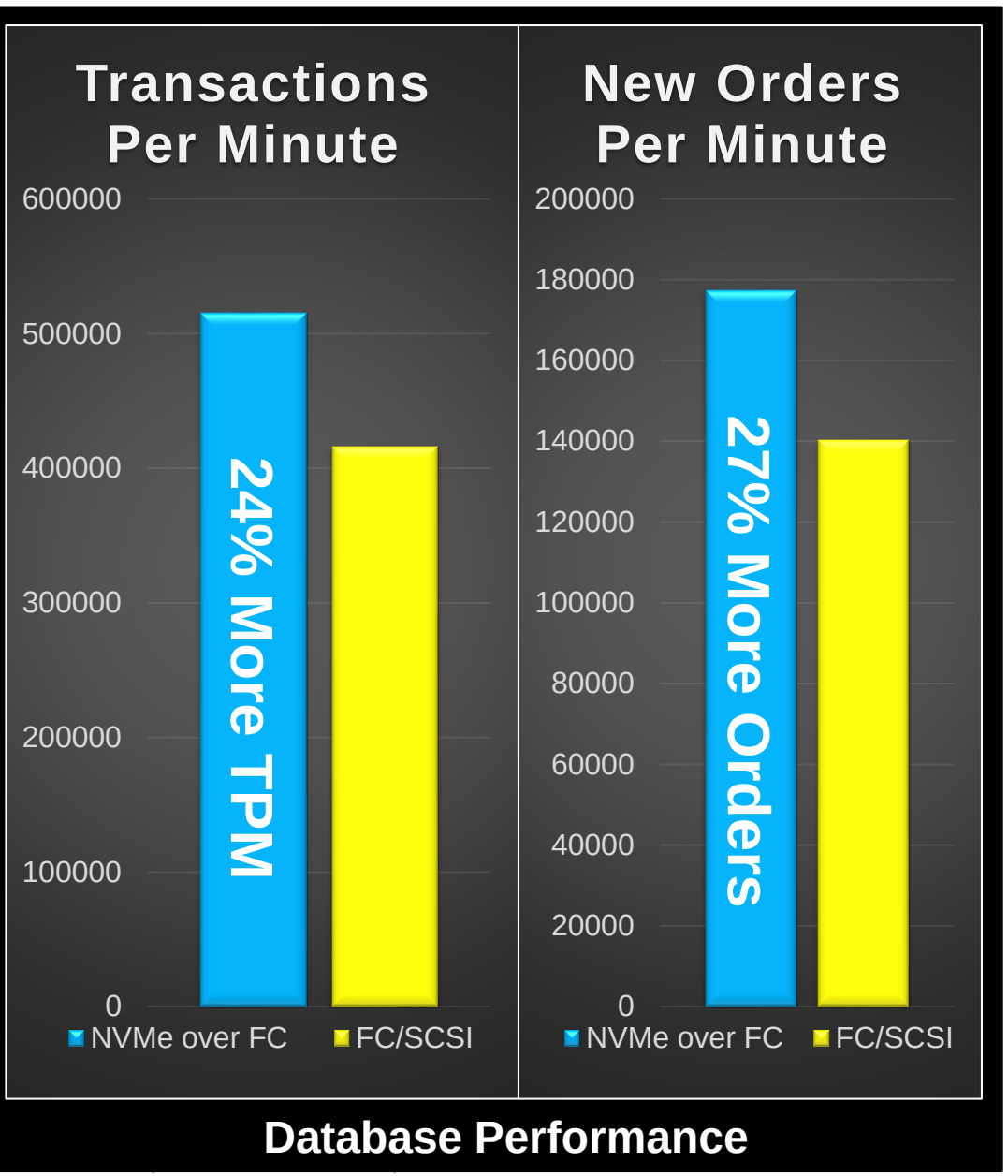
Visibility

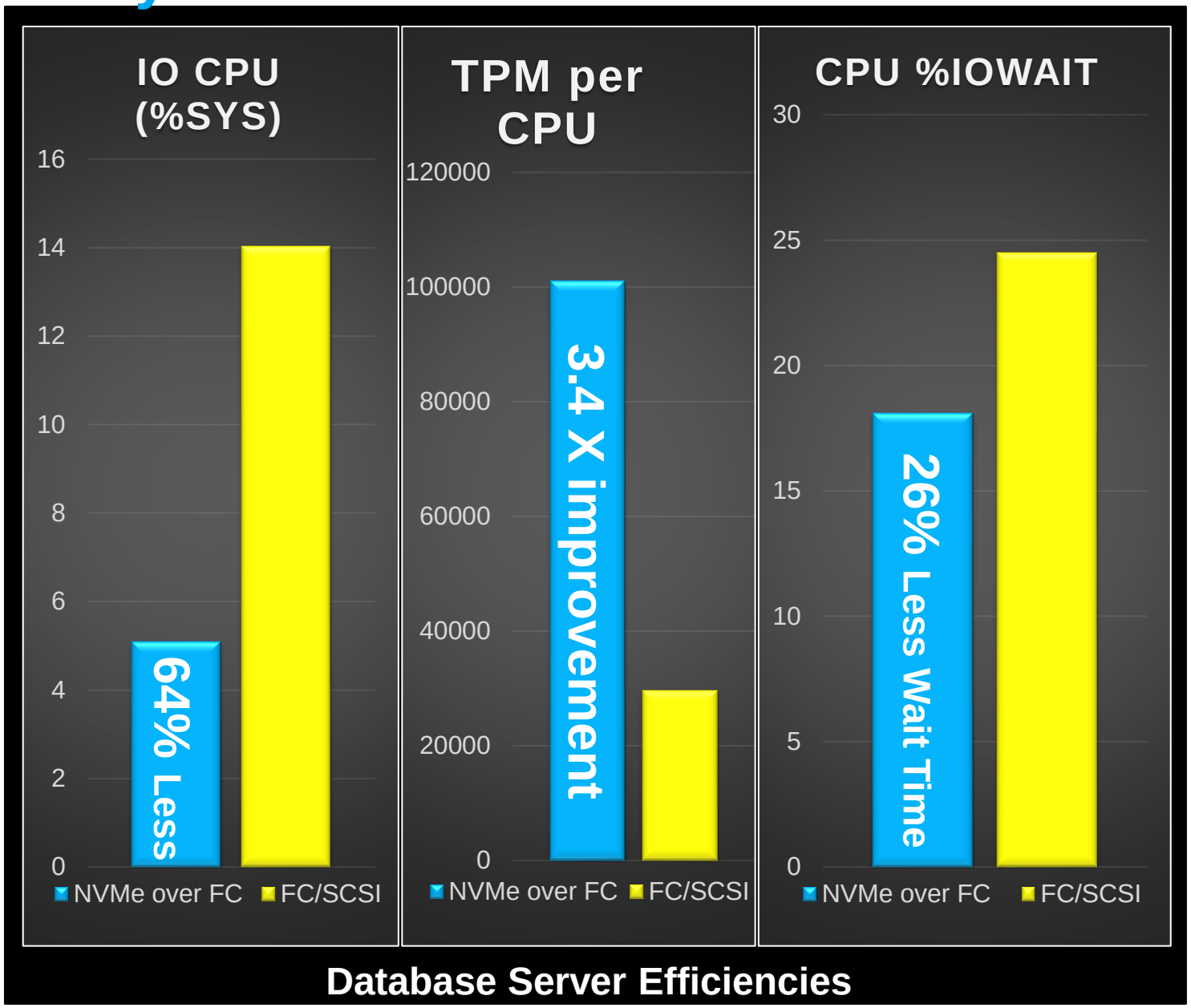
Gain granular visibility into SCSI and NVMe IO performance and health for individual devices

© Copyright IBM Corporation 2019

Speed is the new currency of business
Marc R. Benioff
Chairman and CEO, Salesforce

NVMe Performance:
Oracle 12C TPC-C on IBM FlashSystem 9150*

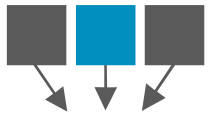




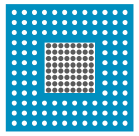
Why choose IBM b-type NVMe over Fibre Channel

Business Demanding More from IT

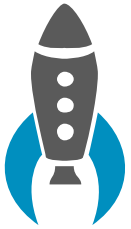
Faster application performance



Greater consolidation



Higher density

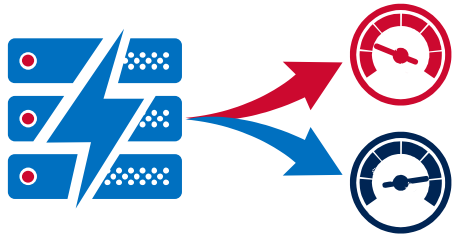


Rapid deployment

Real-time intelligence

Performance

NVMe increases application performance & CPU efficiency compared to traditional SCSI device



Flexibility

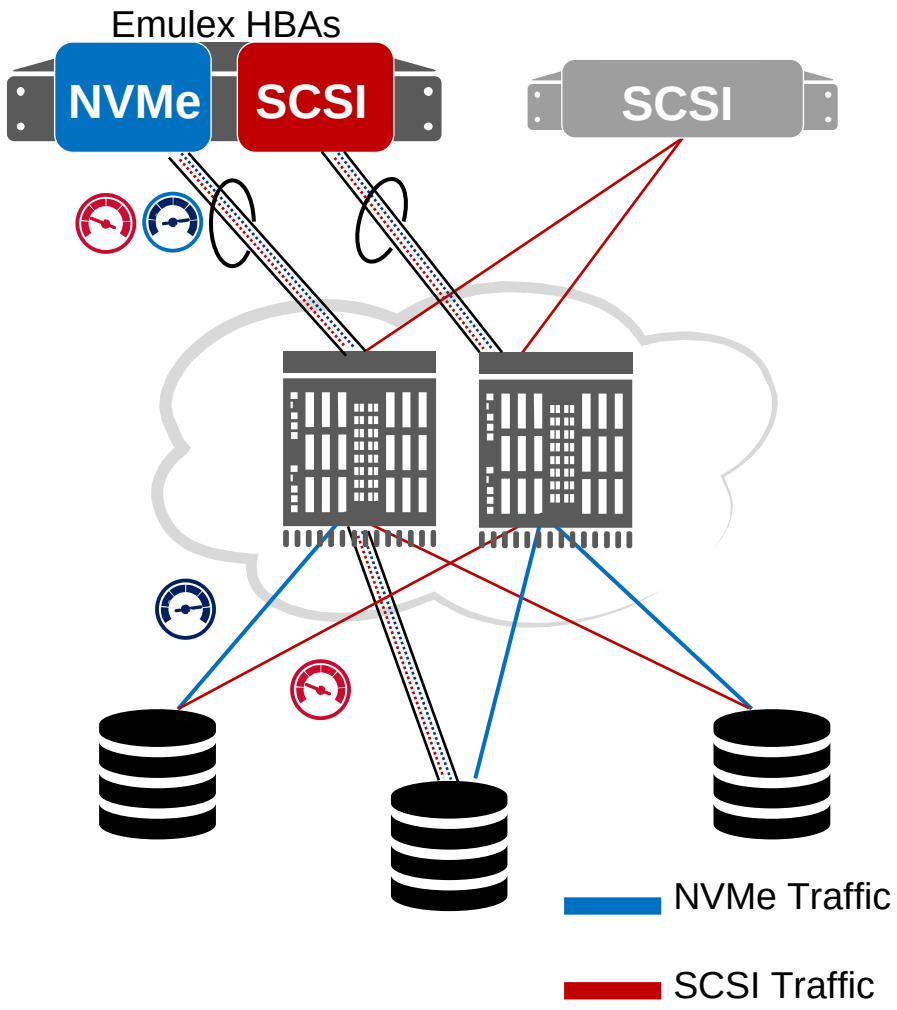
Concurrently run NVMe and SCSI on the same network! (FICON, too!)

Visibility

Gain granular visibility into SCSI and NVMe IO performance and health for individual devices

© Copyright IBM Corporation 2019

Flexibility: Migrate to NVMe without Disruption



REMEMBER

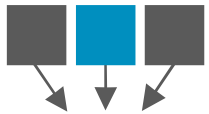
- Run NVMe and SCSI concurrently on same SAN & HBAs with familiar fabric services
- Clone & remap (w/ easy low-risk rollback) your existing SCSI LUNs to NVMe NSIDs
- Leverage NVMe/SCSI use cases:
  - E.g., clone SCSI DB snapshots to low latency NVMe for data mining
- Enhance your existing SAN's performance; avoid painful duplication or replacement
- Full fabric awareness, visibility and manageability with existing Brocade Fabric Vision technology

© Copyright IBM Corporation 2019

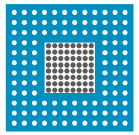
Why choose IBM b-type NVMe over Fibre Channel

Business Demanding More from IT

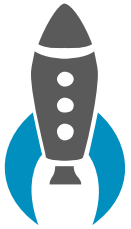
Faster application performance



Greater consolidation



Higher density

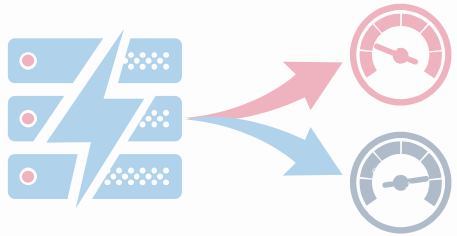


Rapid deployment

Real-time intelligence

Performance

NVMe increases application performance & CPU efficiency compared to traditional SCSI device



Flexibility

Concurrently run NVMe and SCSI on the same network! (FICON, too!)

Visibility

Gain granular visibility into SCSI and NVMe IO performance and health for individual devices

© Copyright IBM Corporation 2019

Visibility into SCSI and NVMe IO Performance and health

Real-time and historical metrics:

- Read/write I/O latency and first response times (including both average and maximum values)
- Read/write IOPS transfer rate
- I/O queue depth (pending IOs)
- All metrics retained based on data size
- 2 year historical metric retention via Brocade Network Advisor

FPI

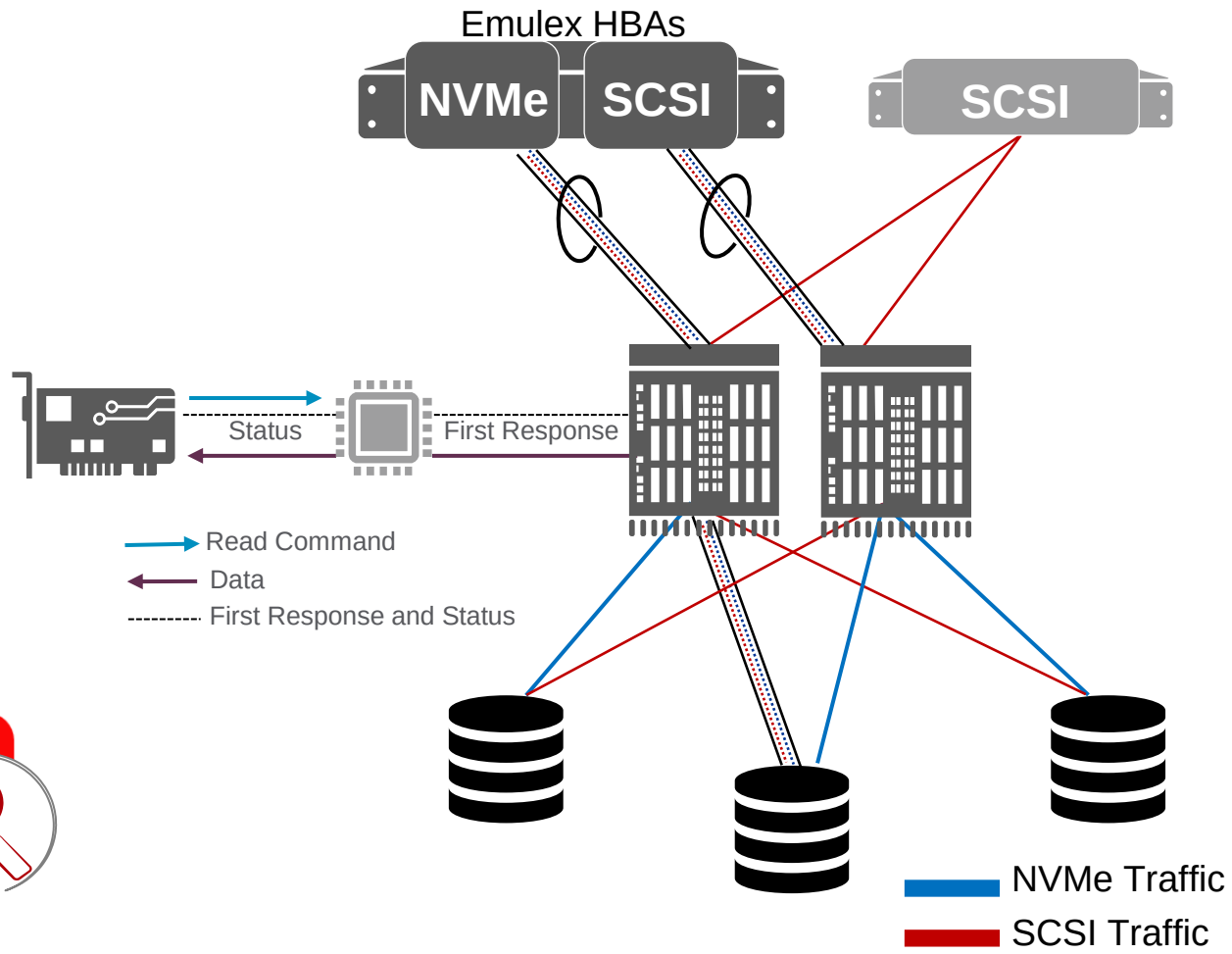
Flow Vision

VM Insight

IO Insight

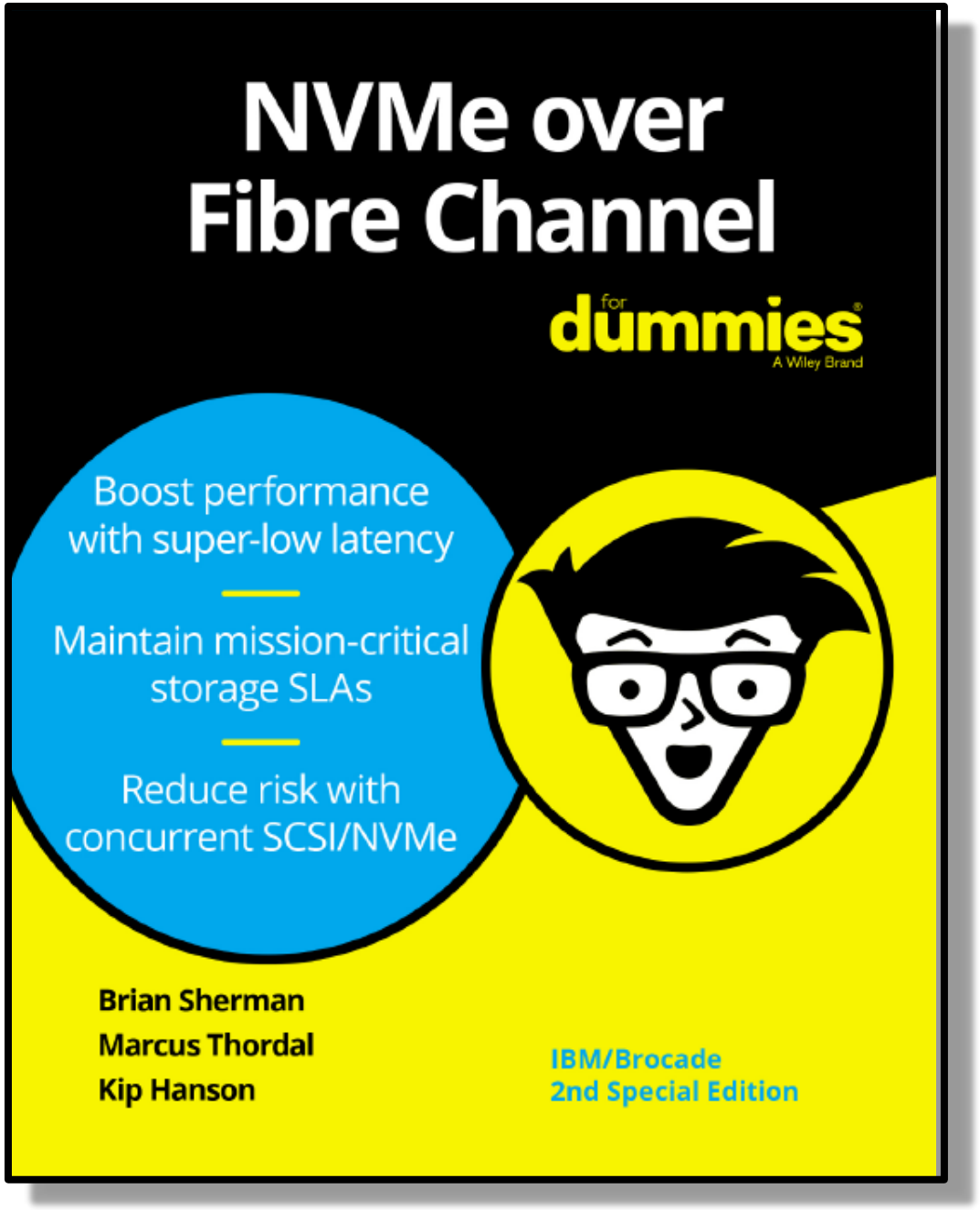
See page 18……

Non-disruptively monitor application flows of interest and obtain device-level IO insight



© Copyright IBM Corporation 2019

What do you need to get started?



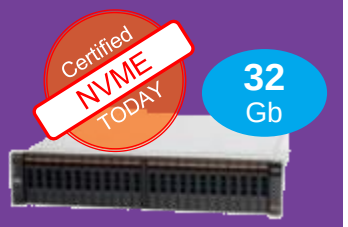
"Include **32 Gbps FC** and/or 25 Gbps Ethernet options when doing any **storage area network (SAN)** infrastructure upgrade to take full advantage of **NVMe-oF storage**."

Gartner®

2018 Strategic Roadmap for Storage, March 12, 2018

IBM Building Blocks for a Modernized Storage Infrastructure

V5100/5100F



Virtualization for Entry / Mid-Range

V7000F

Virtualization for Mid-Range

FS9100/9150

Enterprise Class NVMe Accelerated

IBM Spectrum Accelerate

A9000

Cloud Service Providers

A9000R

All-Flash Data Centers

IBM Spectrum Virtualize

DS8900F

High End Server zOS Power HA

FlashSystem 900

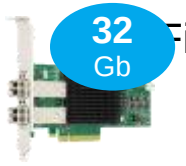
FlashCore Technology Application acceleration

SVC

Heterogeneous Virtualization

Enterprise Replication

Power



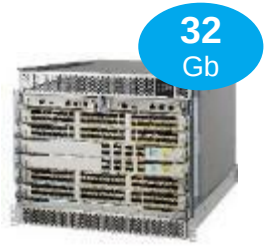
Fibre Channel Adapters & Storage

SAN24B-6

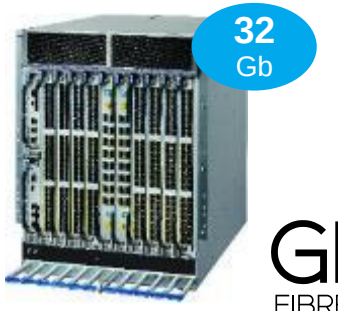
SAN64B

128B-6

CERTIFIED NVMe TODAY



SAN256B-6



SAN512B-6

GEN6 FIBRE CHANNEL

Extension Solutions

SAN18B-6

SAN42B-R

SAN24B-5

SAN96B-5

SAN48B-5

SAN384B-2

SAN768B-2

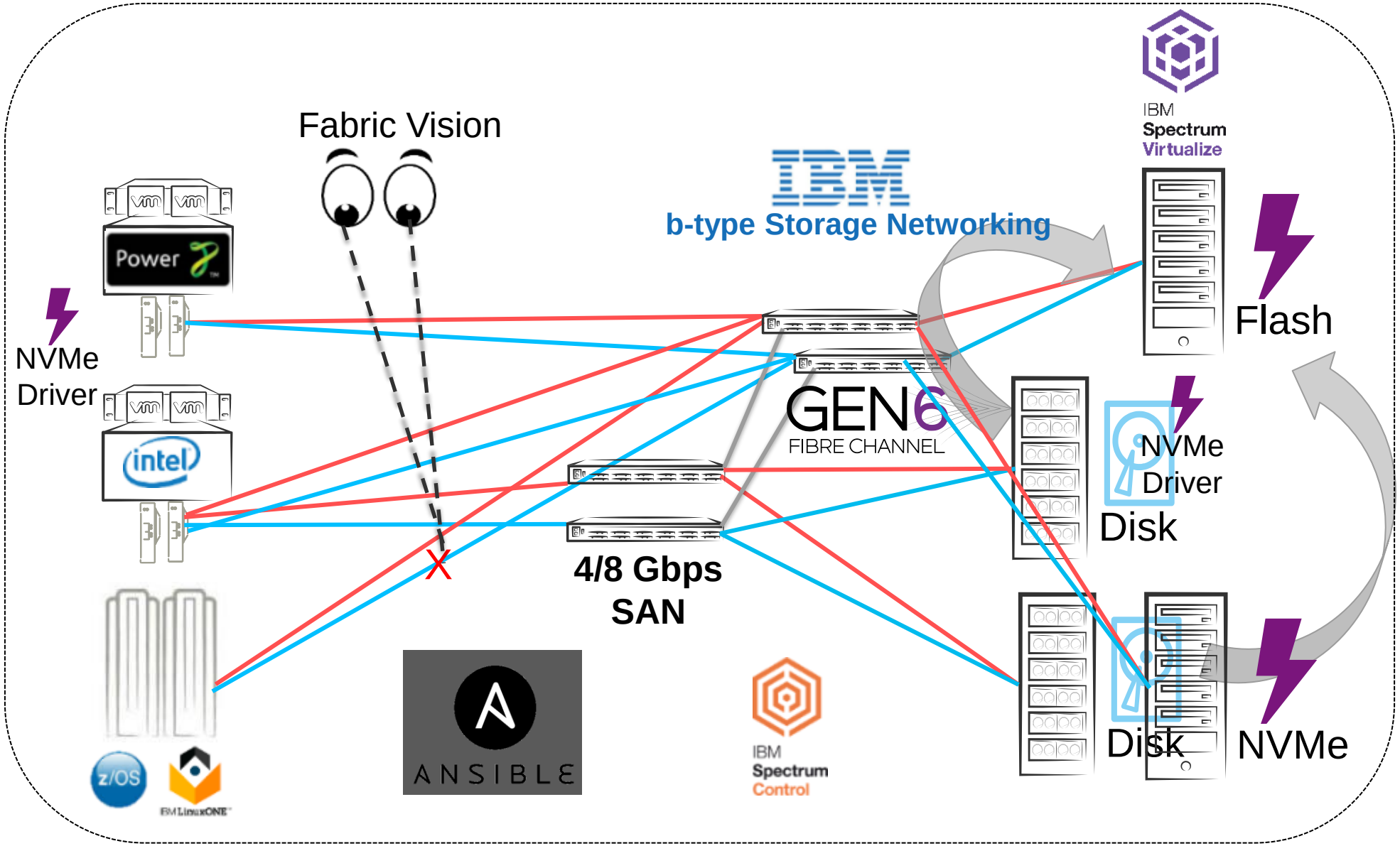
GEN5 FIBRE CHANNEL

“**NVMe** is finally changing the status quo, and it's poised for **widespread adoption** in a few years.”

2018 Strategic Roadmap for Storage, March 12, 2018

Simple Steps for Modernization

See page 25……



- Add New Hardware
- Non-disruptive SAN Growth
- Virtualize & Migrate Data
- Consolidate as needed
- Monitor with Fabric Vision
- Automate with Your Tool of Choice
- Add NVMe when Ready

© Copyright IBM Corporation 2019

IBM NVMe Resources

NVMe over FC For Dummies

Introduction Video for NVMe over FC For Dummies

NVMe-oF Expert Video Series

What is NVMe?

What are the risks for deploying NVMe?

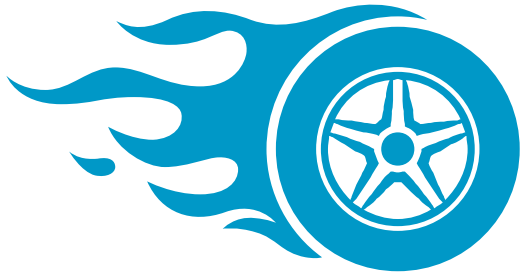
Is NVMe all about Speed?

When should I adopt NVMe?

© Copyright IBM Corporation 2019

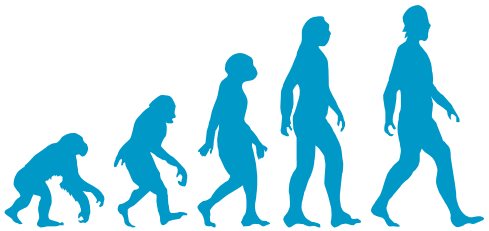
Key takeaways

Flash Changes Everything



- NVMe offers new type of low latency storage
- NVMe will quickly evolve to array-based solution

Fibre Channel is the Natural Evolutionary Path



- NVMe requires a lossless, low latency, and scalable network
- Fibre Channel is the right choice, it just works!

Gen 6 is the Right Choice

- Lowest risk solution
- Investment protection
- 55% lower latency

© Copyright IBM Corporation 2019

Take the 10 minute test.

Two ways to access the test:

Click Here:
https://www.surveymonkey.com/r/IBM-Brocade-NVMe-Quiz

or

Scan this code with your phone:

Thank You!

© Copyright IBM Corporation 2019

Notices and disclaimers

- ©2019 International Business Machines Corporation. No part of this document may be reproduced or transmitted in any form without written permission from IBM.
- **U.S. Government Users Restricted Rights — use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM.**
- Information in these presentations (including information relating to products that have not yet been announced by IBM) has been reviewed for accuracy as of the date of initial publication and could include unintentional technical or typographical errors. IBM shall have no responsibility to update this information. **This document is distributed "as is" without any warranty, either express or implied. In no event, shall IBM be liable for any damage arising from the use of this information, including but not limited to, loss of data, business interruption, loss of profit or loss of opportunity.** IBM products and services are warranted per the terms and conditions of the agreements under which they are provided.
- IBM products are manufactured from new parts or new and used parts.
  In some cases, a product may not be new and may have been previously installed. Regardless, our warranty terms apply."
- **Any statements regarding IBM's future direction, intent or product plans are subject to change or withdrawal without notice.**
- Performance data contained herein was generally obtained in a controlled, isolated environments. Customer examples are presented as illustrations of how those
- customers have used IBM products and the results they may have achieved. Actual performance, cost, savings or other results in other operating environments may vary.
- References in this document to IBM products, programs, or services does not imply that IBM intends to make such products, programs or services available in all countries in which IBM operates or does business.
- Workshops, sessions and associated materials may have been prepared by independent session speakers, and do not necessarily reflect the views of IBM. All materials and discussions are provided for informational purposes only, and are neither intended to, nor shall constitute legal or other guidance or advice to any individual participant or their specific situation.
- It is the customer's responsibility to insure its own compliance with legal requirements and to obtain advice of competent legal counsel as to the identification and interpretation of any relevant laws and regulatory requirements that may affect the customer's business and any actions the customer may need to take to comply with such laws. IBM does not provide legal advice or represent or warrant that its services or products will ensure that the customer follows any law.

© Copyright IBM Corporation 2019