

A decorative graphic consisting of multiple parallel lines in various colors (purple, blue, orange, grey, green) that curve and flow from the left side of the slide towards the right, resembling a bundle of fiber optic cables.

Fibre Channel Technologies Applied to Mobility and Cloud

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➤ **Fibre Channel Technologies Applied to Mobility and Cloud**

- ◆ We are in the middle of a massive shift in how people consume and store information. Fueled by the promises of the cloud and mobility, and driven by the demands of today's data-rich applications, storage and storage networking must transform. This session will outline the critical role Fibre Channel will play to drive this important transformation through high-performance, reliable and scalable solutions.

Enterprise Data Centers

Key IT Imperatives

**REDUCE COST
AND CONSOLIDATE**



**ELIMINATE
COMPLEXITY**



**SPEED TIME TO DEPLOY
NEW APPLICATIONS**



**INNOVATE TO ACHIEVE
BUSINESS GOALS**



Public Cloud Provider Data Centers

KEY IMPERATIVES FOR DATA CENTER PROVIDERS

MULTI-TENANCY



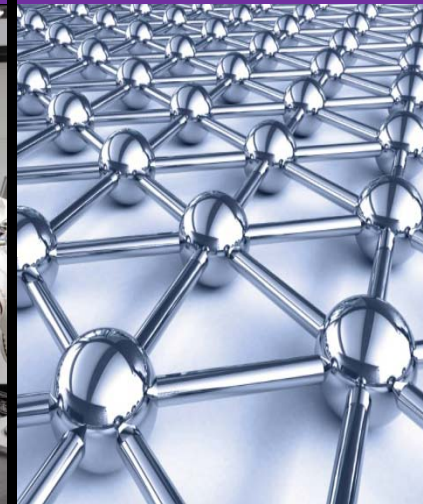
RESOURCE
FLEXIBILITY



AUTOMATION AND
ORCHESTRATION



REAL-TIME,
MASSIVE SCALABILITY



The Network Matters for Storage

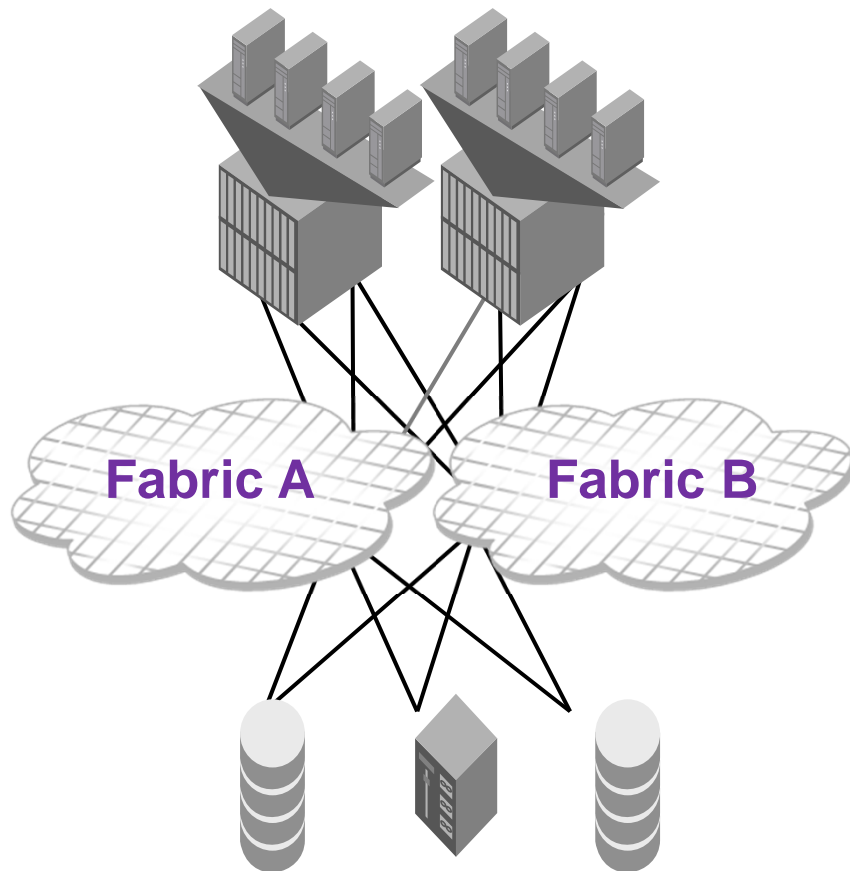
All networks are not created equal

A decorative horizontal bar composed of several colored segments: purple, grey, yellow, blue, orange, grey, purple, grey, orange, grey, blue, grey, and yellow.

- ◆ Storage requires purpose-built fabric architectures to ensure reliability and performance for critical applications and data
 - ◆ Must be built with the right characteristics (for example, bandwidth, latency, high Availability) for storage traffic
 - ◆ Customers have built their mission critical infrastructure on a SAN
 - ◆ Technology evolution in the data center can introduce significant risk to uptime
- ◆ SAN fabrics enable advanced data center technologies like flash storage, server virtualization, and cloud architectures

Fibre Channel SANs

Reliability, performance, scalability



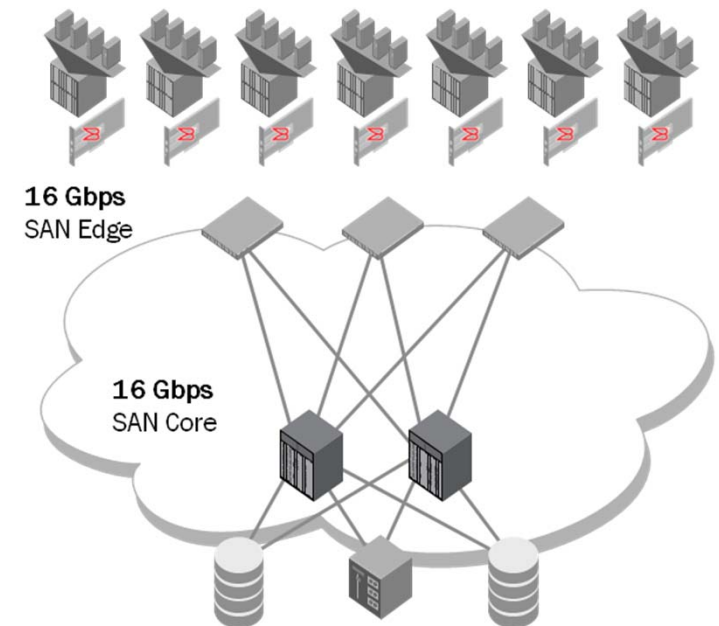
- Designed to meet the requirements of consolidated, shared storage environments
- Delivers enterprise class reliability, scalability and I/O performance
- Low latency, deterministic, lossless transmission and redundant fabrics
- Used extensively for critical business applications (ie. Oracle, ERP, CRM)
- Leverages Tier 1 storage to deliver maximum performance to critical applications

Fibre Channel Momentum

Market strength continues

➤ 4th straight record quarterly TAM for Fibre Channel SAN industry (Dell'Oro)

- ◆ 3QCY12 TAM: \$478.4M (manufacturer revenue)
- ◆ 2012 (CQ1-CQ3) TAM up 7.5% over same period in 2011



Fibre Channel Momentum

Factors driving continued strength

► Why the strength?

- ◆ Fibre Channel core values remain attractive to mid/large enterprises and service providers
- ◆ Lowest risk approach for most important applications



Fibre Channel Core Values

Values you need today, values you will need even more in the future



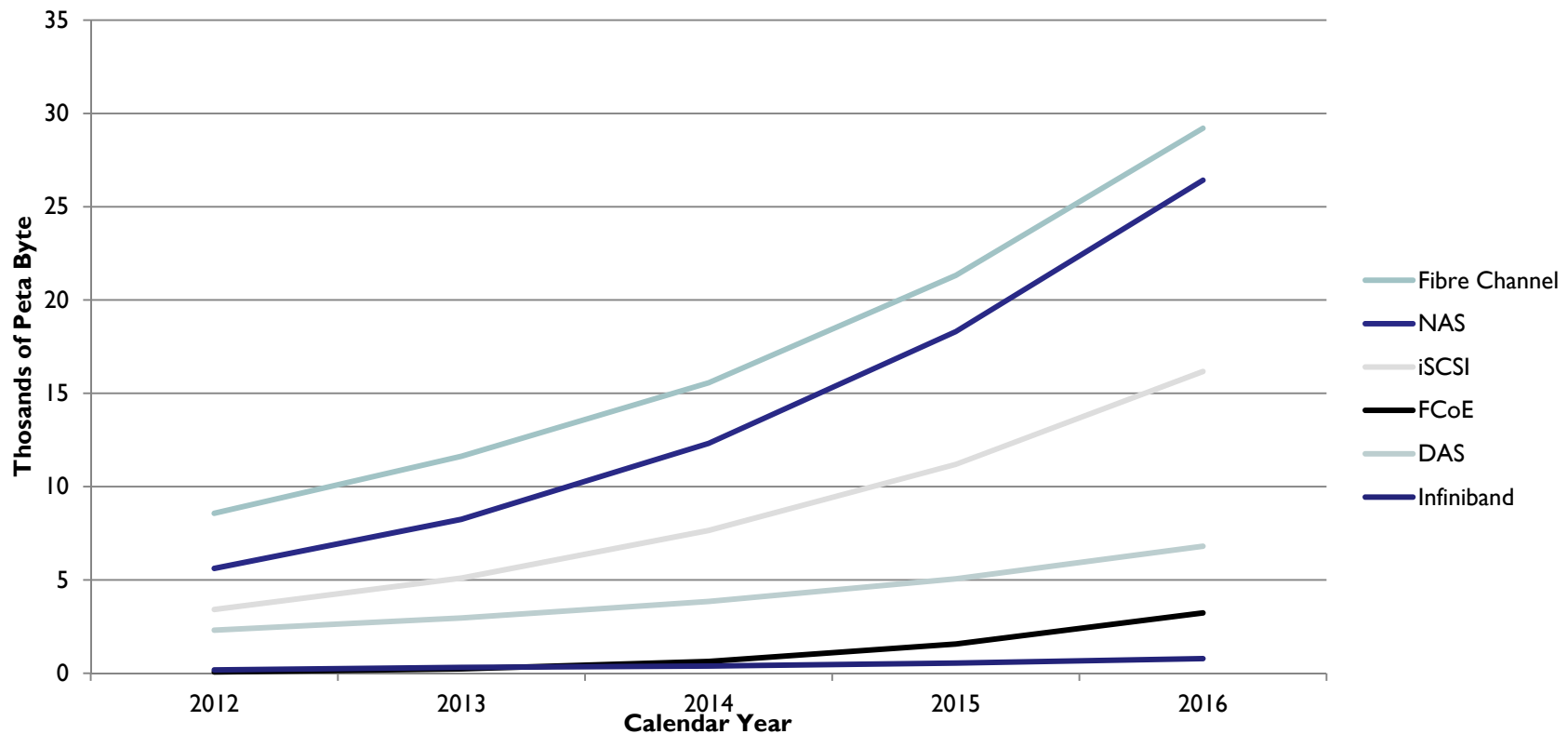
- Cloud environments have unique scalability and automation requirements
 - ◆ Fibre Channel historically has delivered enterprise class reliability and scalability
- Storage capacity growth drives demand for increased fabric bandwidth
 - ◆ From 1G/2G/4G/8G/16G and then onto 32G, Fibre Channel has evolved to meet storage demands
- High density virtualization requires high performance and unprecedented reliability due to the increased impact of a failure
- Adoption of Flash storage will outpace I/O demands as never been seen before
 - Fibre Channel Gen6 under development to stay ahead of this trend

Fibre Channel Role in the Evolving Data Center

Numerous trends pointing to a strong Fibre Channel future



Worldwide External Enterprise Storage Capacity



IDC Worldwide Enterprise Storage Systems Forecast Update, November 2012

FC storage (PB) predicted to have 36% CAGR (2012/2016)

Fibre Channel Technologies Applied to Mobility and Cloud
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Ready for Change in the Data Center?

Evolve your SAN infrastructure to scale your cloud offering

- ◆ Application and data growth requires seamless scalability
 - ◆ New Fibre Channel SAN can connect 50% more server, storage, and switch ports in same footprint (RU)
- ◆ Infrastructure complexity drives need for simplicity
 - ◆ Consolidate legacy technology and simplify management

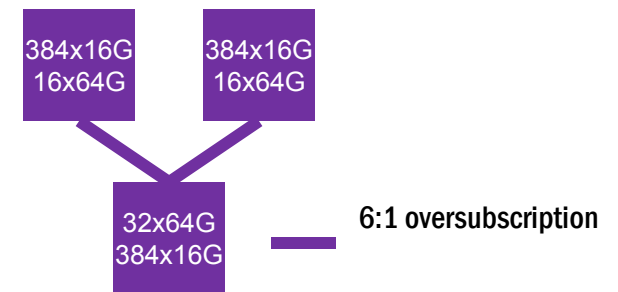


Consolidate Today → Lower Operating Costs

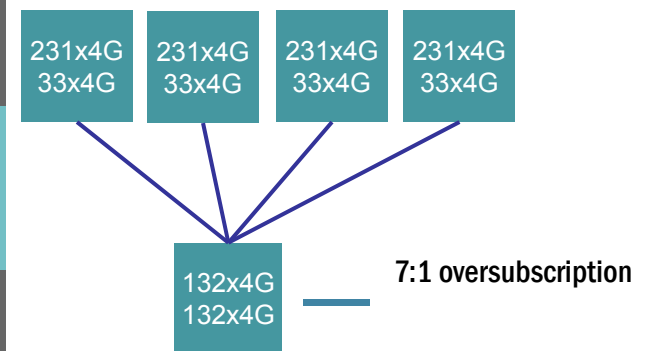
Benefits of moving off 4Gb infrastructure

	Gen 5, 16Gb FC	Legacy 4Gb FC	Customer Benefit
Total Chassis Required	3	5	2 less chassis
Total Device Ports	1152 (16Gb)	1056 (4 Gb)	4X the bandwidth
Total inter-switch Cables	32	132	75% less cables
Energy Efficiency (kWh/yr)	~55K	~101K	Uses 46% less power per fabric
Rack Units	42RU	70 RU	2 rack vs 3 racks for legacy

Gen 5, 16Gb FC

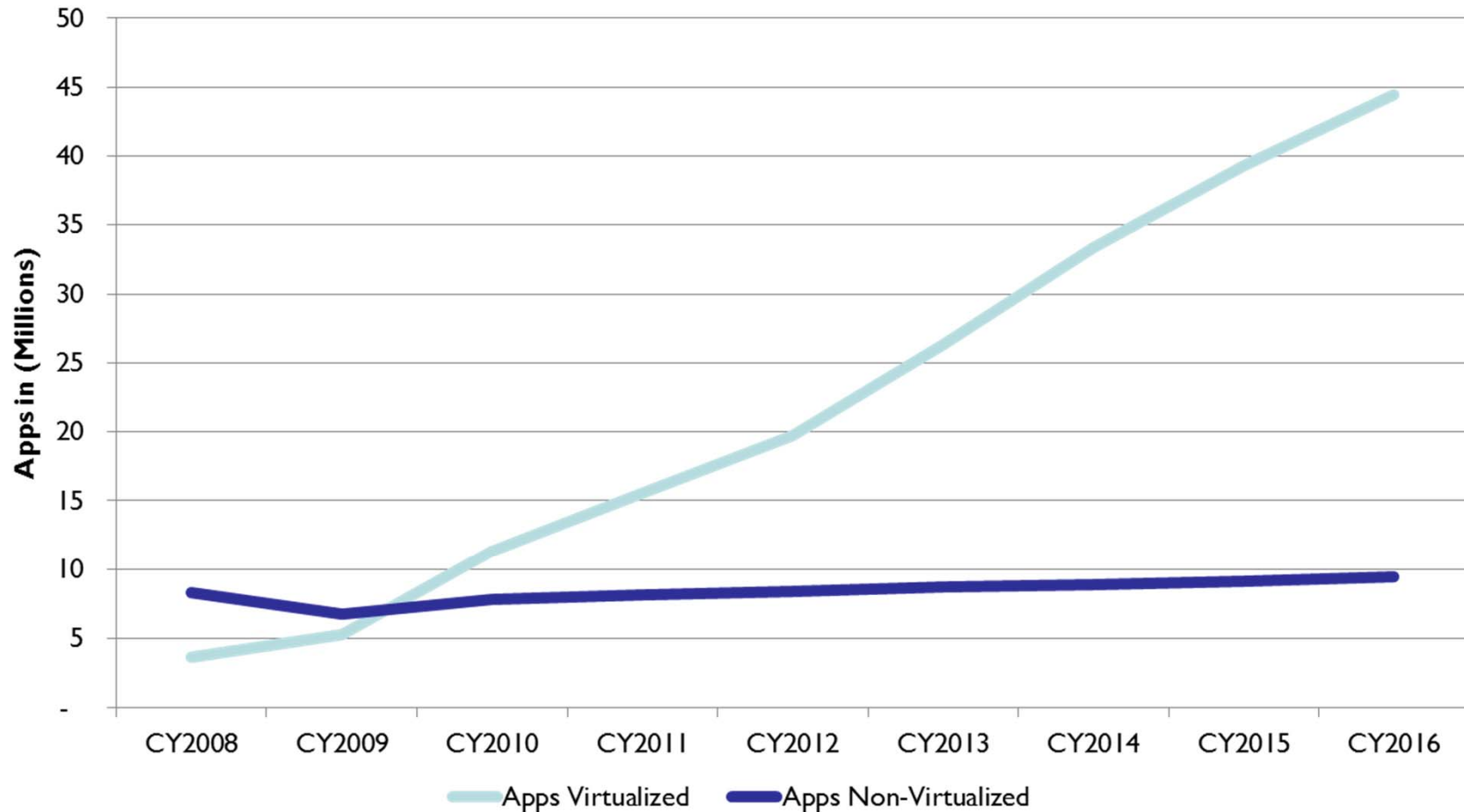


Legacy 4Gb FC



Virtualization Driving Shared Storage

More VMs one of the “high impact” factors in storage growth



Source: Gartner x86 Server Forecast CQ3'12

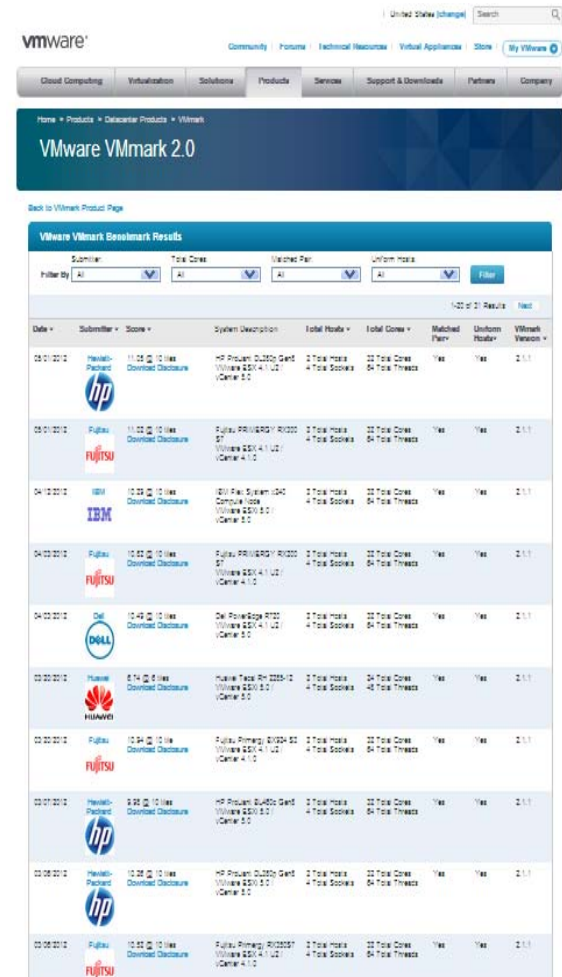
Virtual Server Performance With Fibre Channel

Fibre Channel dominates VMmark benchmarks

100%

Of the top 20
VMmark results use
Fibre Channel

Source: VMware VMmark 2.1.1— www.vmware.com/a/vmmark/



VMware VMmark 2.0

Back to VMmark Product Page

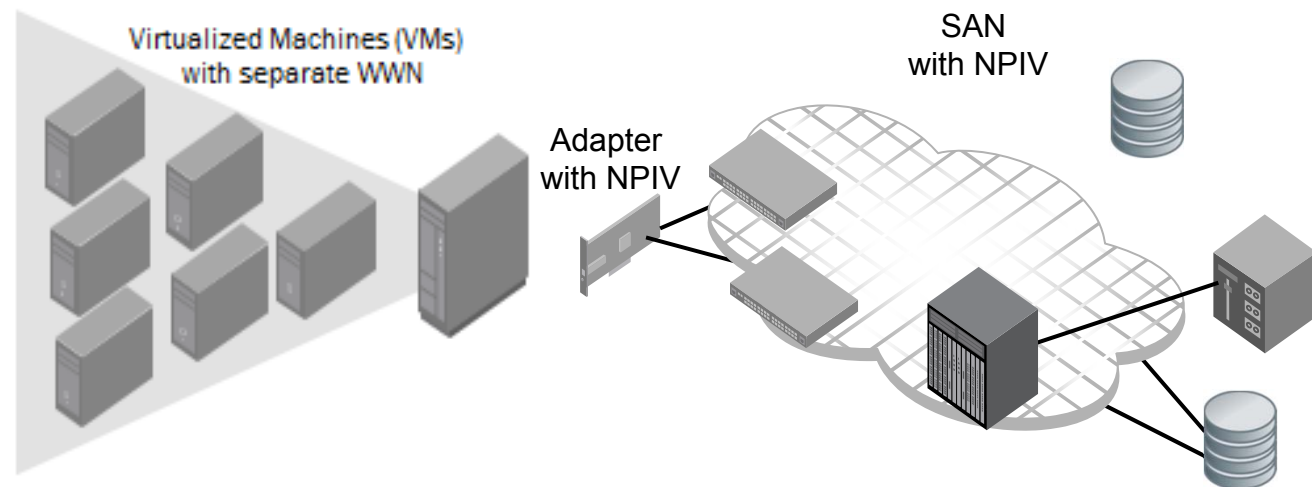
VMware VMmark Benchmark Results

Date	Submitter	Score	System Description	Total Nodes	Total Cores	Matched Pair	Uniform Hosts	VMmark Version
03/10/2012	hp	11.05	HP ProLiant DL380 Gen7 VMware ESX 4.1 U2 CentOS 5.5	2 Total Nodes 4 Total Scores	32 Total Cores 64 Total Threads	Yes	Yes	2.1.1
03/10/2012	Fujitsu	11.03	Fujitsu PR1000/R1000 VMware ESX 4.1 U2 CentOS 5.5	2 Total Nodes 4 Total Scores	32 Total Cores 64 Total Threads	Yes	Yes	2.1.1
04/10/2012	IBM	10.33	IBM Flex System S40 Compute Node VMware ESX 5.0	2 Total Nodes 4 Total Scores	32 Total Cores 64 Total Threads	Yes	Yes	2.1.1
04/10/2012	Fujitsu	10.22	Fujitsu PR1000/R1000 VMware ESX 4.1 U2 CentOS 5.5	2 Total Nodes 4 Total Scores	32 Total Cores 64 Total Threads	Yes	Yes	2.1.1
04/10/2012	DELL	10.49	Dell PowerEdge R710 VMware ESX 4.1 U2 CentOS 5.5	2 Total Nodes 4 Total Scores	32 Total Cores 64 Total Threads	Yes	Yes	2.1.1
03/20/2012	Huawei	8.74	Huawei Teles R1225-12 VMware ESX 5.0 CentOS 5.5	2 Total Nodes 4 Total Scores	32 Total Cores 64 Total Threads	Yes	Yes	2.1.1
03/20/2012	Fujitsu	10.94	Fujitsu Primergy D1304-S2 VMware ESX 4.1 U2 CentOS 5.5	2 Total Nodes 4 Total Scores	32 Total Cores 64 Total Threads	Yes	Yes	2.1.1
03/07/2012	hp	9.22	HP ProLiant BL460c Gen7 VMware ESX 5.0 CentOS 5.5	2 Total Nodes 4 Total Scores	32 Total Cores 64 Total Threads	Yes	Yes	2.1.1
03/08/2012	hp	10.28	HP ProLiant DL380 Gen7 VMware ESX 4.1 U2 CentOS 5.5	2 Total Nodes 4 Total Scores	32 Total Cores 64 Total Threads	Yes	Yes	2.1.1
03/08/2012	Fujitsu	10.21	Fujitsu Primergy R1205-S1 VMware ESX 4.1 U2 CentOS 5.5	2 Total Nodes 4 Total Scores	32 Total Cores 64 Total Threads	Yes	Yes	2.1.1

Fibre Channel enhances VM mobility

Virtual Fibre Channel for virtualized environments

- Virtual FC uses NPIV to allow each virtual machine to have a unique FC WWN
- Enables multiple VMs to share a single physical HBA and switch port
- NPIV offers several important advantages:
 - ◆ Granular security
 - ◆ Easier monitoring and troubleshooting
 - ◆ Workload mobility



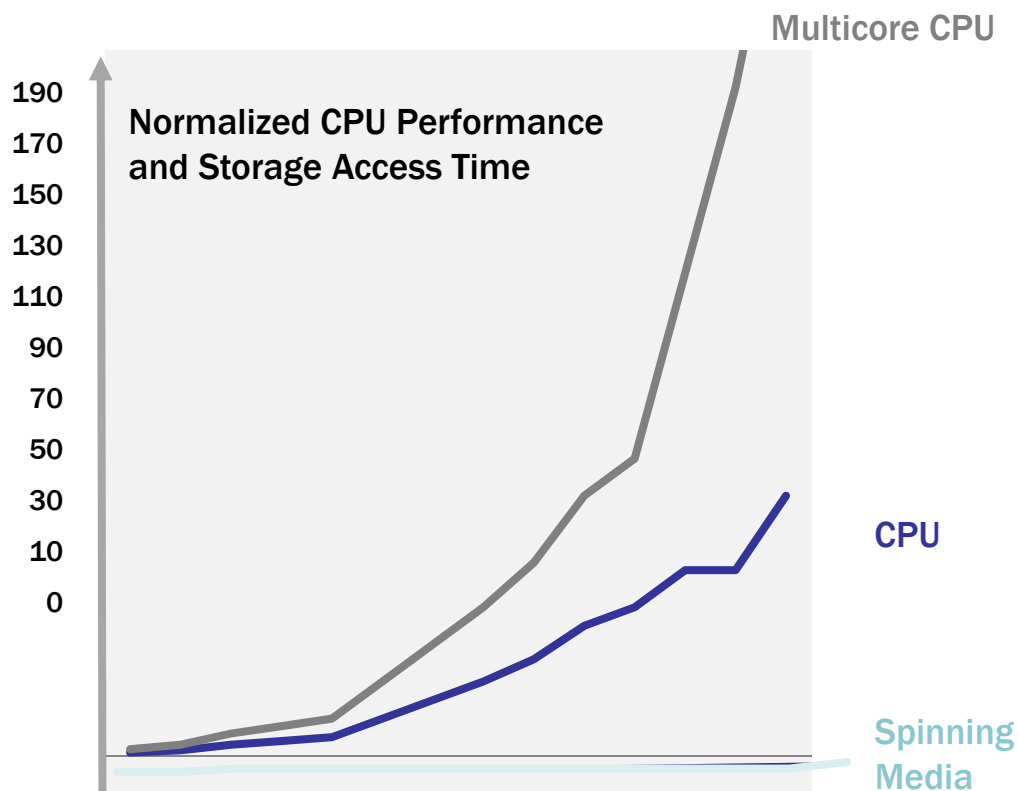
Ready for Next-Generation Storage?

Future-proof your data center for new and evolving workloads

- New workloads are forcing a storage revolution
 - ◆ Technologies like solid state drives (SSD) are minimizing I/O bottlenecks and improving reliability
 - ◆ Focus shifts from storage back to the interconnect
- Evolving high-density VM deployments and drive higher availability and performance requirements



Emerging Technologies—Solid State Disks



175x
CPU
PERFORMANCE
IMPROVEMENT

1.3x
SPINNING MEDIA
PERFORMANCE
IMPROVEMENT

OpenStack FC Proposal

Fibre Channel supported in the community

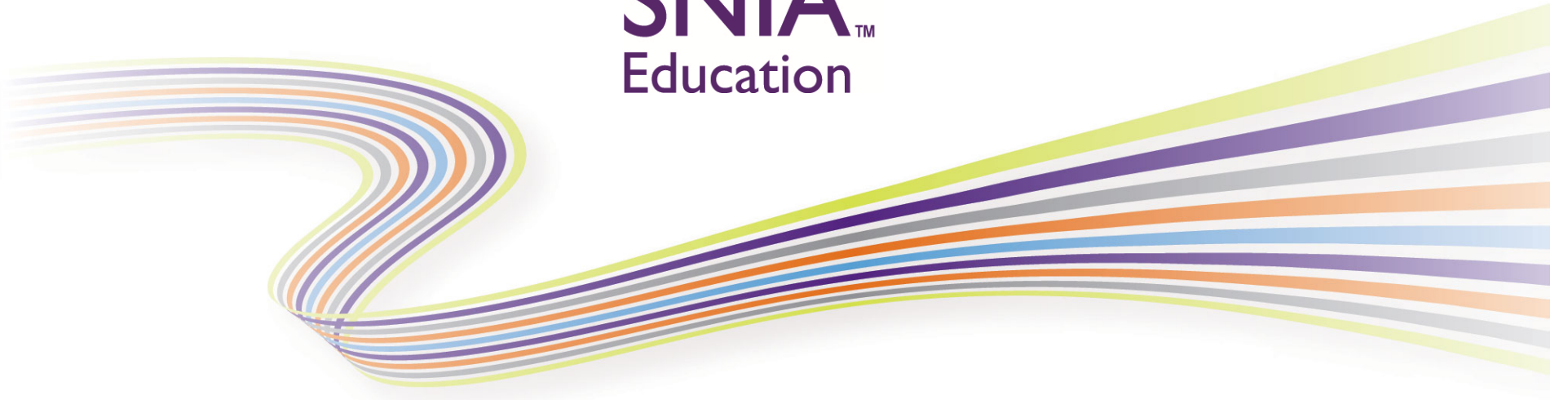


openstack™
CLOUD SOFTWARE

- Target: Existing FC customer base (moving from legacy to cloud architectures) and Service Providers
- Customer Value: Continue to enjoy the world-class reliability and performance of FC in cloud architectures
- OpenStack Foundation Progress Update:
 - ◆ FC enhancements proposed to OpenStack Cinder project in October 2012
 - ◆ In November 2012 submitted FC SAN Volume Manager, proposal was approved by Cinder team lead and targeted for Grizzly release (April 2013)
 - ◆ FC SAN Zone Manager blueprint proposal targeted to be presented at OpenStack Summit this April 2013

Summary

- Fibre Channel remains one of the best performing, lowest risk shared storage solution
- Fibre Channel storage growth fueling the need to upgrade SAN infrastructure
- New workloads and technologies perform best on Fibre Channel fabrics
- Fibre Channel roadmap positioned to lower operating costs and enhance reliability and availability



Thank You

Attribution & Feedback

The SNIA Education Committee thanks the following individuals for their contributions to this Tutorial.

Authorship History

Jack Rondoni April 2013

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