Impact of Flash Trends On Hyper Converged Infrastructure (HCI)

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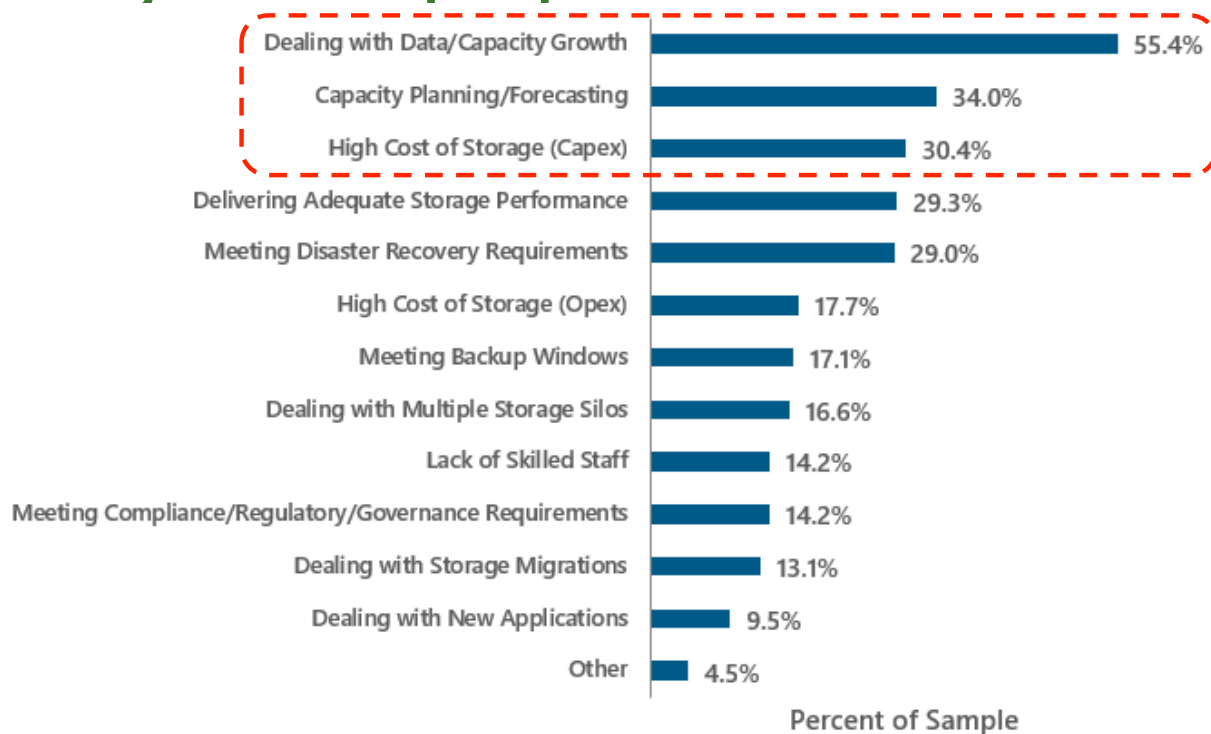# Data has tremendous potential…

2X Information Growth

From now until 2020, the size of the digital universe will about double every two years

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…If you can cope up with the volume!

Q: What are your organization's top three pain points from a storage perspective?

	Percent of Sample
Dealing with Data/Capacity Growth	55.4%
Capacity Planning/Forecasting	34.0%
High Cost of Storage (Capex)	30.4%
Delivering Adequate Storage Performance	29.3%
Meeting Disaster Recovery Requirements	29.0%
High Cost of Storage (Opex)	17.7%
Meeting Backup Windows	17.1%
Dealing with Multiple Storage Silos	16.6%
Lack of Skilled Staff	14.2%
Meeting Compliance/Regulatory/Governance Requirements	14.2%
Dealing with Storage Migrations	13.1%
Dealing with New Applications	9.5%
Other	4.5%

n = 639

**Voice of the Enterprise: Storage Q4 2015 includes:**

721 quarterly Web-based surveys with IT End-user Decision-makers on a worldwide basis.

~25 interviews quarterly with leading-edge senior IT executives, providing a 'narrative' view of the market.

Sampling that is a representative of small, midsize and large enterprises in private and public sectors.
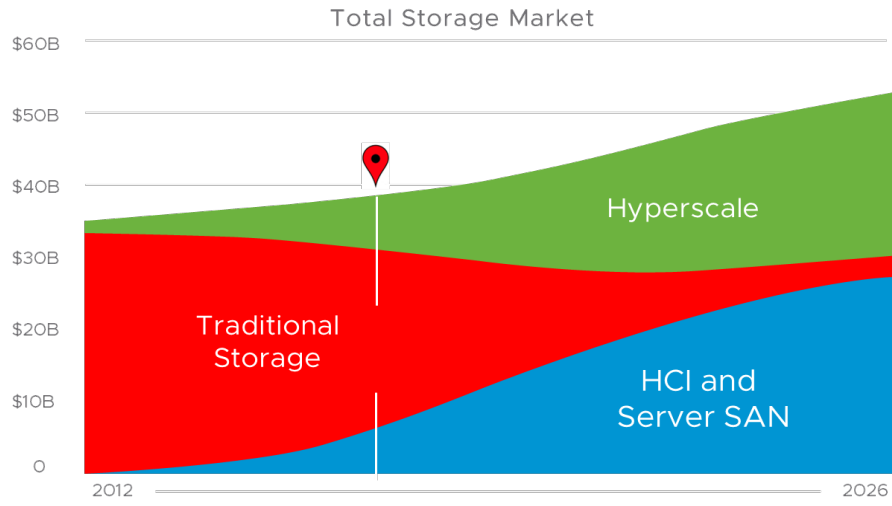
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Source: **451 Research**[*], Voice of the Enterprise: Storage Q4 2015

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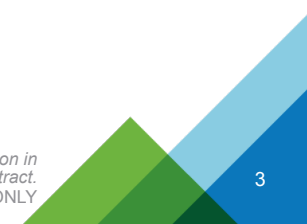
HCI is the Fastest Growing Storage Segment

HCI is replacing traditional storage in the enterprise

Total TAM for HCI by 2020 = $20 Bn

Traditional Storage Systems Shipped

Total Storage Market

$60B

$50B

$40B

$30B

$20B

$10B

0

Hyperscale

Traditional Storage

HCI and Server SAN

2012   2026

Source: Wikibon Server SAN Research Project, 2016

'10 vs '09	'11 vs '10	'12 vs '11	'13 vs '12	'14 vs '13	'15 vs '14	Q4'15 vs Q4'14	Q1'16 vs Q1'15	Q4'16 vs Q4'15
62%	58%	37%	41%	43%	28%	11%	-4%	-7%
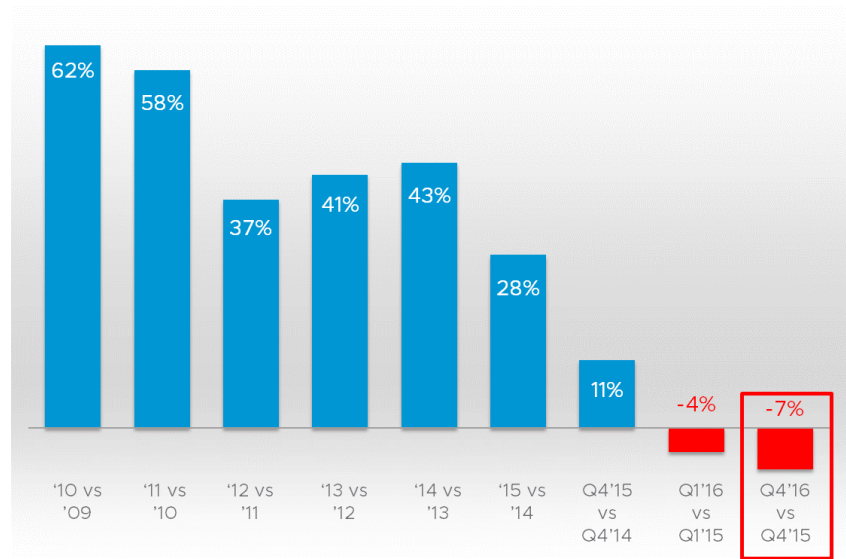
Source: IDC Worldwide Quarterly Enterprise Storage Systems Tracker

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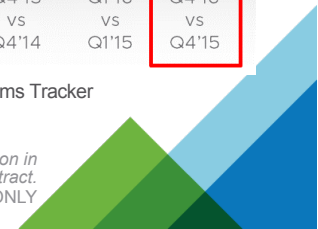
Tiered Architecture: New Era of Storage Technologies
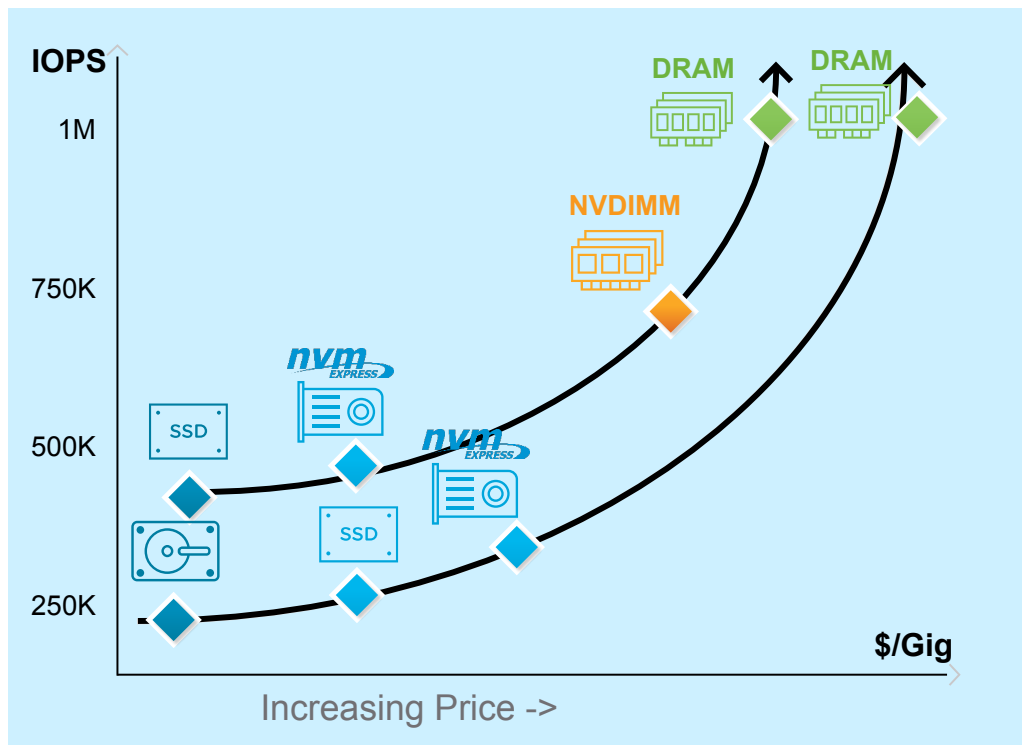
Yesterday

- Low latency devices too expensive for persistent storage
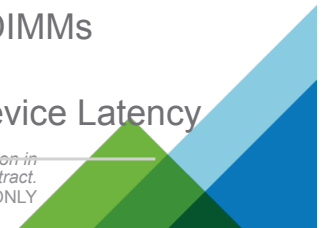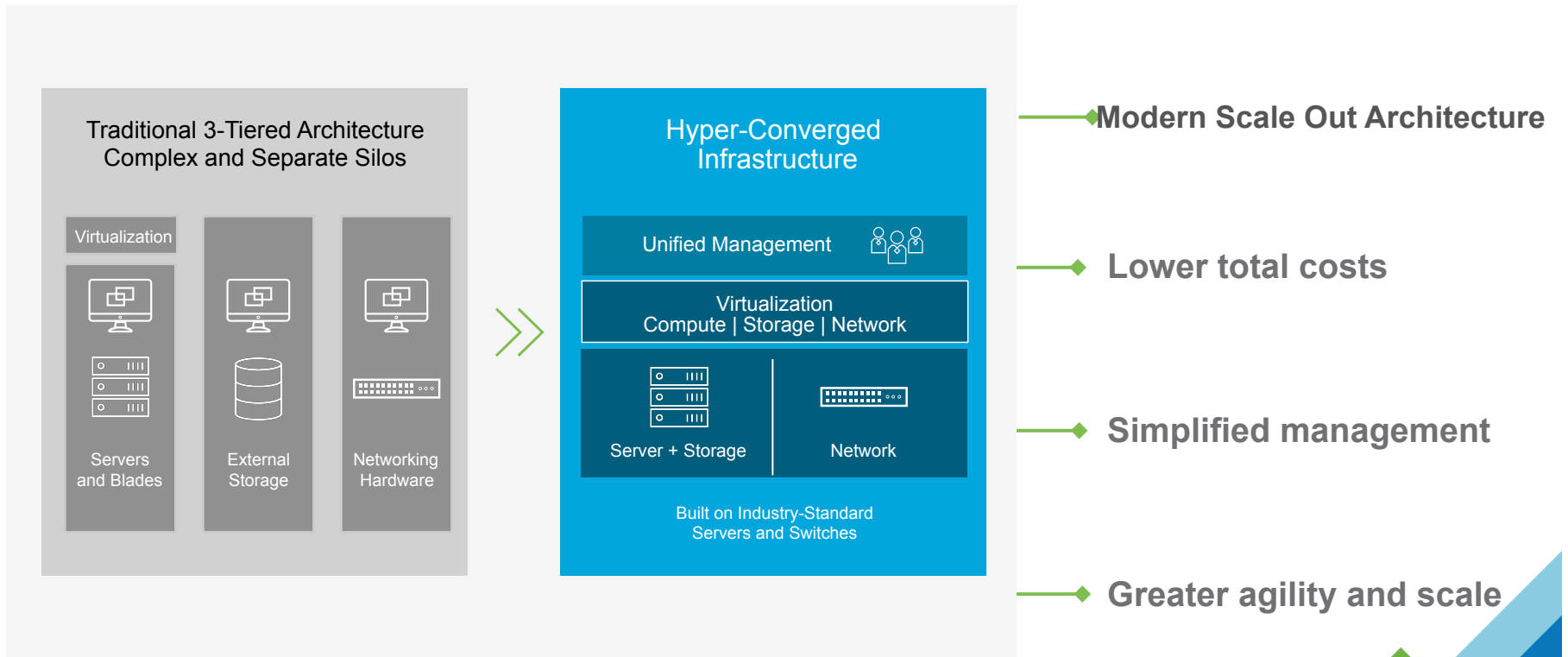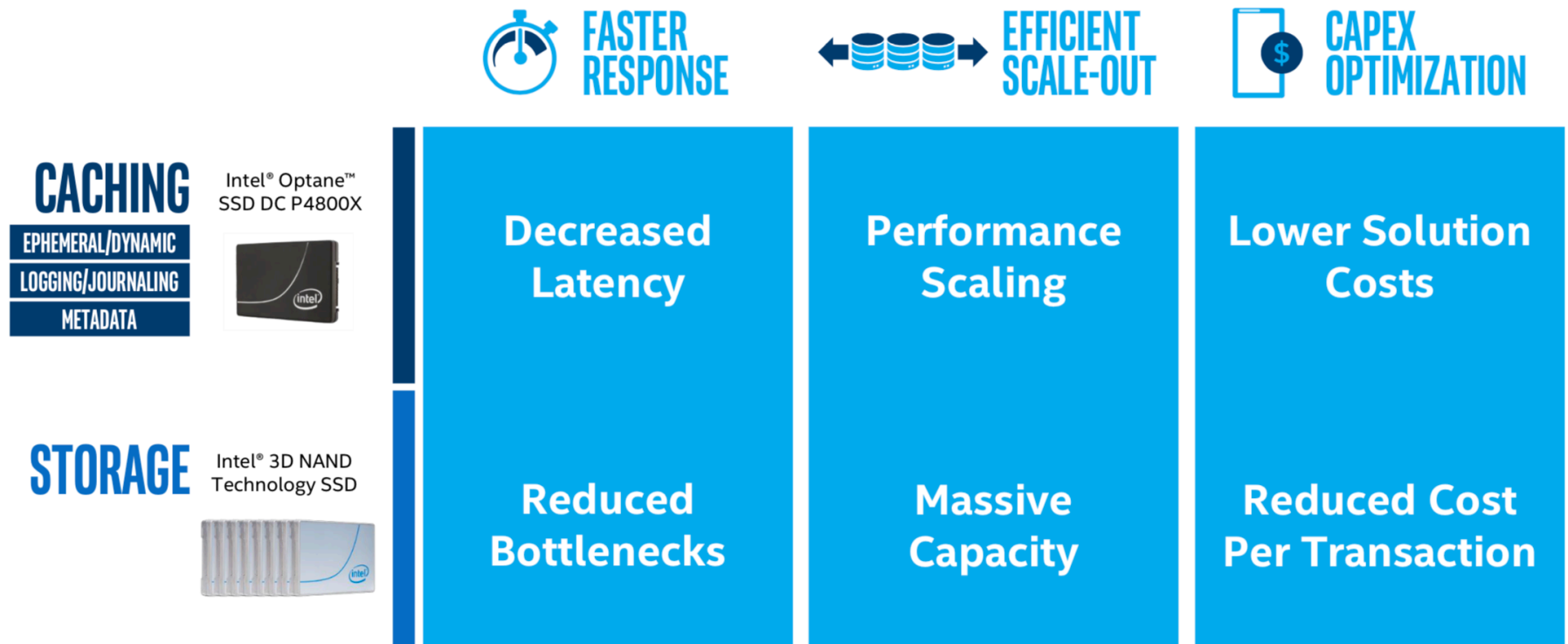
- Device latency >> Network latency

Future

- NAND Flash: the new Capacity tier

- High capacity NVMe

- Byte-addressable NVDIMMs

- Network latency >> Device Latency

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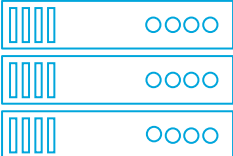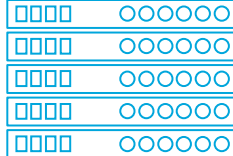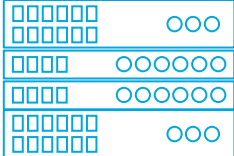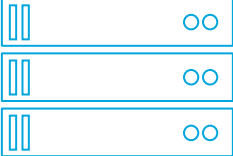
Trend 1: Modernization of the Data Center Being Fueled by HCI

Traditional 3-Tiered Architecture Complex and Separate Silos

Virtualization

Servers and Blades

External Storage

Networking Hardware

Hyper-Converged Infrastructure

Unified Management

Virtualization
Compute | Storage | Network

Server + Storage

Network

Built on Industry-Standard Servers and Switches

Modern Scale Out Architecture

Lower total costs

Simplified management

Greater agility and scale

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Trend 2: 3D NAND & Optane will drive Performance & Scale-Out for HCI

FASTER RESPONSE

EFFICIENT SCALE-OUT

CAPEX OPTIMIZATION

CACHING
EPHEMERAL/DYNAMIC
LOGGING/JOURNALING
METADATA

Intel® Optane™ SSD DC P4800X

STORAGE

Intel® 3D NAND Technology SSD

Decreased Latency	Performance Scaling	Lower Solution Costs
Reduced Bottlenecks	Massive Capacity	Reduced Cost Per Transaction

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HCI Workload Segmentation

	80% of HCI Market	**10-20% HCI Market; Emerging workloads expected to increase 3X in 2 years**			
	General Purpose	**Storage Dense**	**Compute Intense**	**Composable Infrastructure**	**Edge / IoT**
Use cases	BCA, Database, VDI, DR	Archiving, Video streaming, Analytics	Web apps, HPC, real time analytics, In-memory DB, VDI	Data warehouse, Search engine databases, Log aggregation	ROBO
Hardware Type	Rack Servers	Rack Servers	Blade Servers	Composable Infrastructure	Edge Computing
Supported Hardware Examples	Dell – R740 HPE – DL 380/360 Cisco – C 240/220 and many more	Cisco - S-series HPE - Apollo	Dell – FX2 HPE – Moonshot Cisco – Blade Servers	HPE - Synergy	Dell – R6415 (AMD EPYC) Cisco – E series

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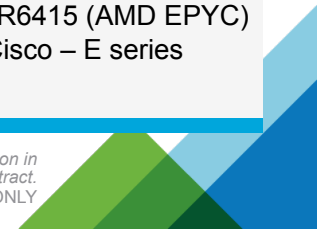
Trend 3: Disaggregation being fueled by workloads requiring different ratio of Compute & Storage

Workload Examples: Data warehouse, Search engine databases, Log aggregation, Analytics

Hardware Based Disaggregation

Composable Infrastructure

Different Ratios of Compute Blades + Storage Modules

HPE - Synergy

Software based Disaggregation

<HCI cluster> <HCI cluster> <ESXi cluster> <ESXi cluster>

<Storage shared across multiple clients: proprietary HCI protocol>

<HCI cluster boundary>

Storage only Nodes (denser storage)
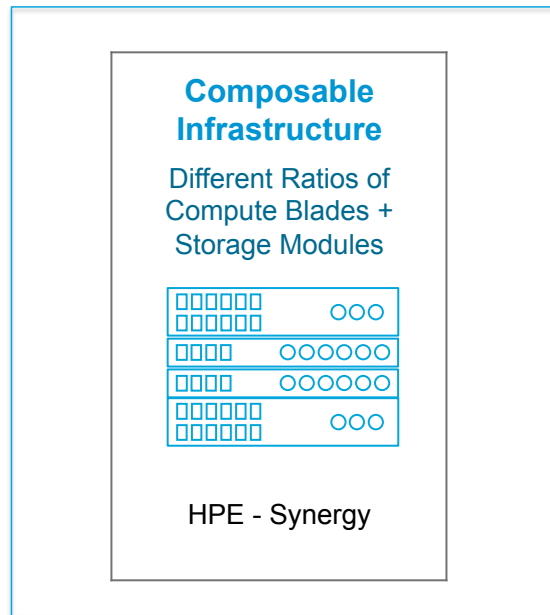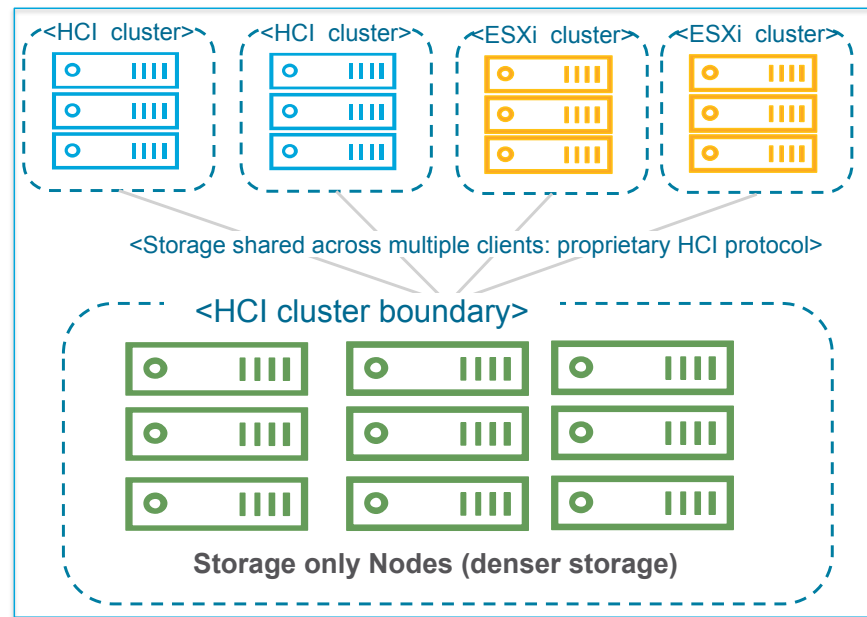
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
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Trend 4: High Speed Storage Networking Required for Compute - Storage Disaggregation

Compute Only ESXi Nodes

Compute Only ESXi Nodes

NVMe-oF
RDMA Over Converged Ethernet (RoCE)

JBOF Resource Pool - A

JBOF Resource Pool - B

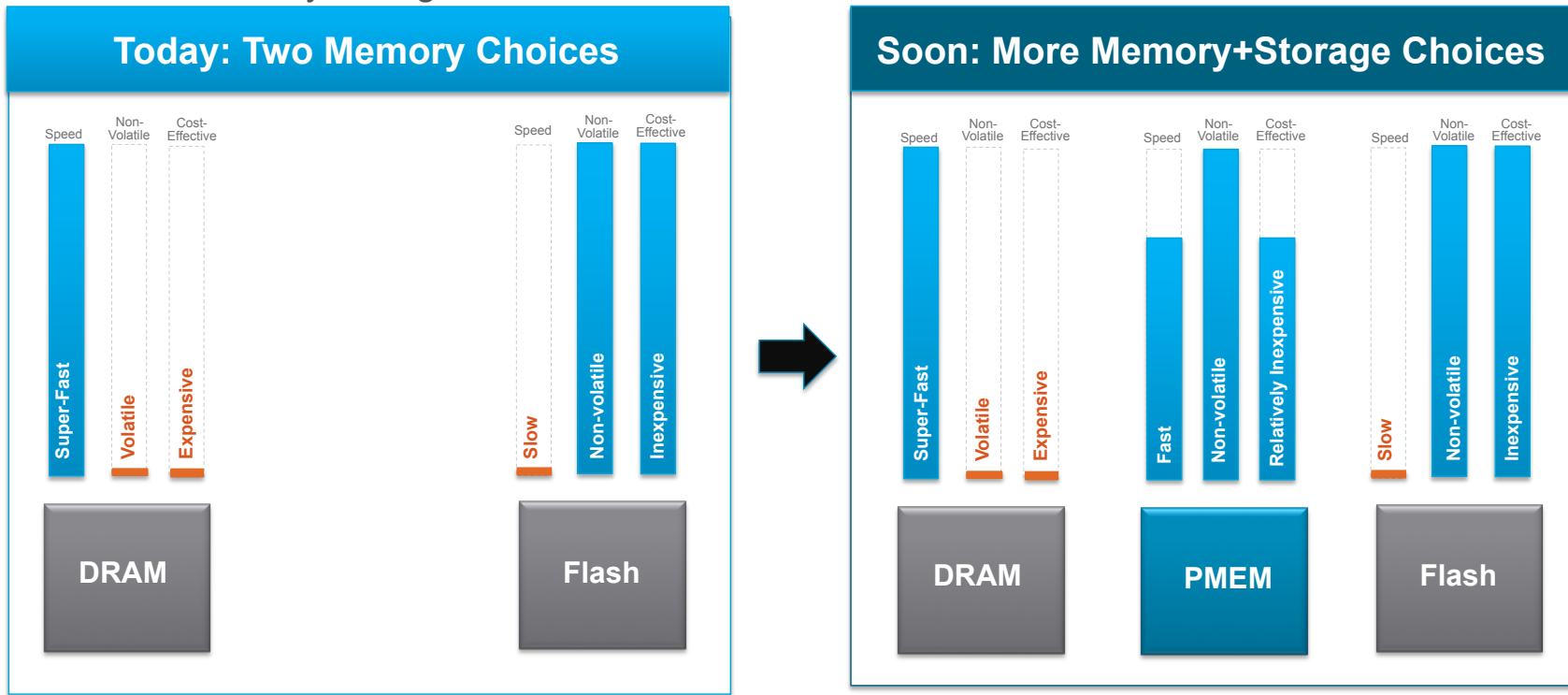**Compute – Standard x86 Server Hardware**

Storage – All NVMe JBOF
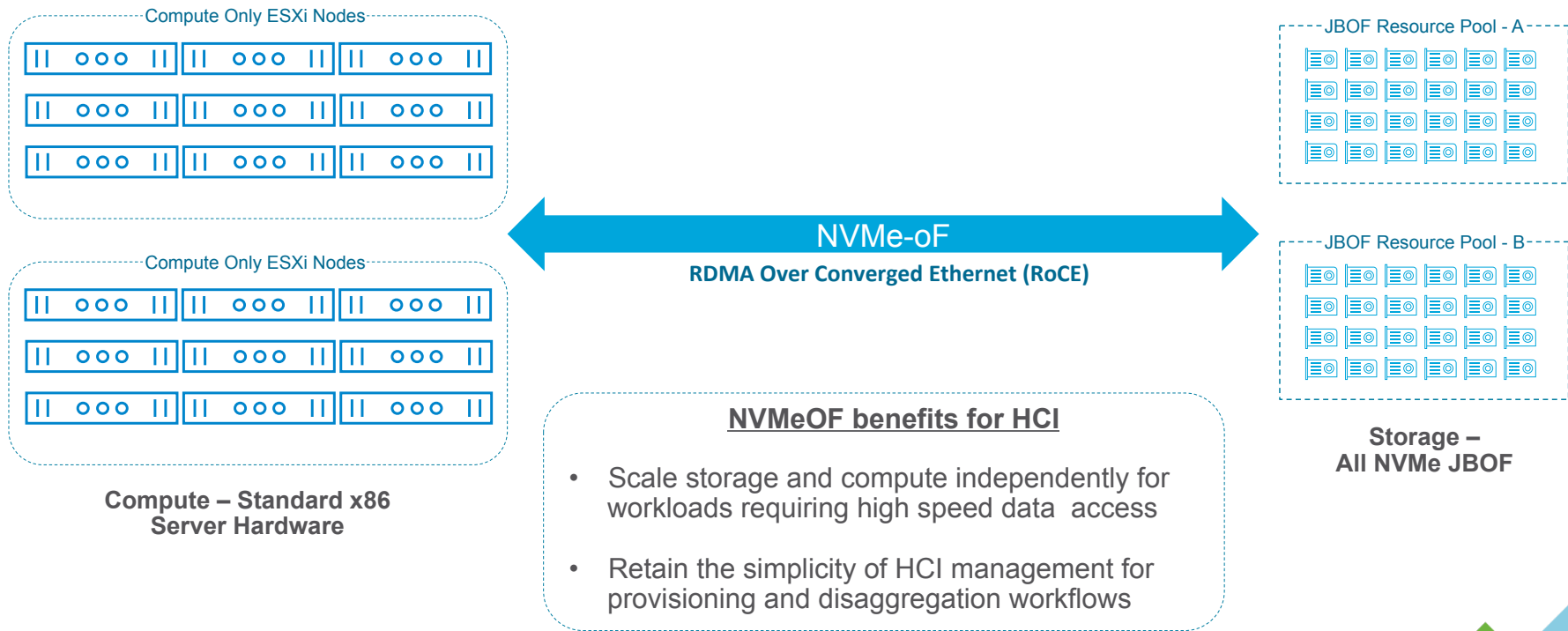
NVMeOF benefits for HCI

- Scale storage and compute independently for workloads requiring high speed data access

- Retain the simplicity of HCI management for provisioning and disaggregation workflows

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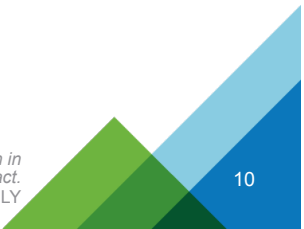
New Paradigm Shift in Application Design

New tier of memory/storage choice

Today: Two Memory Choices

DRAM — Speed: Super-Fast, Non-Volatile: Volatile, Cost-Effective: Expensive

Flash — Speed: Slow, Non-volatile, Cost-Effective: Inexpensive

Soon: More Memory+Storage Choices

DRAM — Speed: Super-Fast, Non-Volatile: Volatile, Cost-Effective: Expensive

PMEM — Speed: Fast, Non-volatile, Cost-Effective: Relatively Inexpensive

Flash — Speed: Slow, Non-volatile, Cost-Effective: Inexpensive

Developers can now make memory trade-offs to optimize apps; realize new capabilities

Trend 5: Persistent Memory Will Enable Apps with New Capabilities

Promise of PMEM for Apps such as SAP Hana, Redis & GemFire
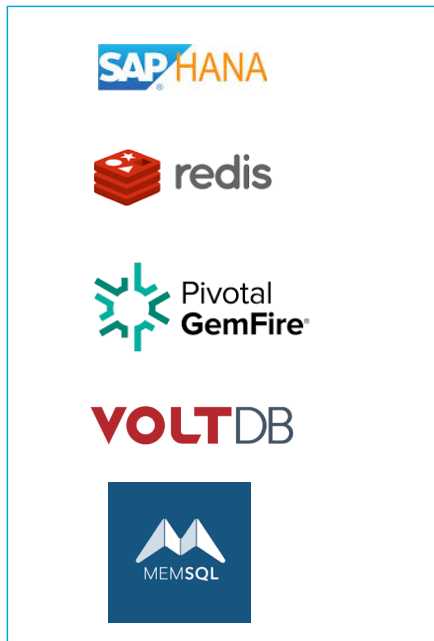
Databases that work a lot faster

Keep data in-memory rather than write to disk – faster & persistent

Applications that reboot faster

In-memory is now non-volatile

Faster streaming applications

PMEM has bigger cache than DRAM

Highly Precise Real-time processing

PMEM is byte-addressable

Applications that restart faster in HA

4 minutes with Pmem vs 50 minutes with SSD

Lower hardware TCO

PMEM is cheaper than DRAM

SAPHANA

redis

Pivotal **GemFire**

VOLTDB

MEMSQL

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