Impact of Flash Trends On Hyper Converged Infrastructure (HCI)

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Data has tremendous potential...

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

Source: IDC* and EMC* April 2014
If you can cope up with the volume!

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

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.

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%

Percent of Sample

n = 639

HCI is the Fastest Growing Storage Segment

 HCI is replacing traditional storage in the enterprise

Total TAM for HCI by 2020 = $20 Bn

HCI is the Fastest Growing Storage Segment


Traditional Storage Systems Shipped

Source: IDC Worldwide Quarterly Enterprise Storage Systems Tracker

The information on the roadmap is intended to outline our general product direction and it should not be relied on in making a purchasing decision. It is for informational purposes only and may not be incorporated into any contract.

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

- Modern Scale Out Architecture
- Lower total costs
- Simplified management
- Greater agility and scale

Traditional 3-Tiered Architecture
- Complex and Separate Silos
- Servers and Blades
- External Storage
- Networking Hardware

Hyper-Converged Infrastructure
- Unified Management
- Virtualization
  - Compute | Storage | Network
- Built on Industry-Standard Servers and Switches
Trend 2: 3D NAND & Optane will drive Performance & Scale-Out for HCI

- Decreased Latency
- Performance Scaling
- Lower Solution Costs
- Reduced Bottlenecks
- Massive Capacity
- Reduced Cost Per Transaction
## HCI Workload Segmentation

<table>
<thead>
<tr>
<th>Use cases</th>
<th>80% of HCI Market</th>
<th>10-20% HCI Market; Emerging workloads expected to increase 3X in 2 years</th>
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</thead>
<tbody>
<tr>
<td><strong>General Purpose</strong></td>
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<td><strong>Storage Dense</strong></td>
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<td><strong>Compute Intense</strong></td>
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<td><strong>Composable Infrastructure</strong></td>
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<td><strong>Edge / IoT</strong></td>
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<tr>
<td><strong>Use cases</strong></td>
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<tr>
<td>BCA, Database, VDI, DR</td>
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<tr>
<td>Archiving, Video streaming, Analytics</td>
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<tr>
<td>Web apps, HPC, real time analytics, In-memory DB, VDI</td>
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<tr>
<td>Data warehouse, Search engine databases, Log aggregation</td>
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<td>ROBO</td>
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<td><strong>Hardware Type</strong></td>
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<td>Rack Servers</td>
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<td>Blade Servers</td>
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<td>Composable Infrastructure</td>
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<td>Edge Computing</td>
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<tr>
<td><strong>Supported Hardware Examples</strong></td>
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<tr>
<td>Dell – R740</td>
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<td>HPE – DL 380/360</td>
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<td>Cisco – C 240/220</td>
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<td>and many more</td>
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<tr>
<td>Cisco - S-series</td>
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<td>HPE - Apollo</td>
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<td>Dell – FX2</td>
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<td>HPE – Moonshot</td>
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<td>Cisco – Blade Servers</td>
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<td>HPE - Synergy</td>
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<td>Dell – R6415 (AMD EPYC)</td>
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<td>Cisco – E series</td>
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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> to <HCI cluster>
  - <ESXi cluster> to <ESXi cluster>
  - <Storage shared across multiple clients: proprietary HCI protocol>
  - <HCI cluster boundary>
  - Storage only Nodes (denser storage)
Trend 4: High Speed Storage Networking Required for Compute - Storage Disaggregation

NVMe-oF 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
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: Inexpensive

Soon: More Memory+Storage Choices
- **DRAM**
  - Speed: Super-Fast
  - Non-Volatile: Volatile
  - Cost-Effective: Expensive

- **PMEM**
  - Speed: Fast
  - Non-Volatile: Relatively Inexpensive

- **Flash**
  - Speed: Slow
  - Non-Volatile: 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