January 16th Pre-Launch Briefing

Woody Hutsell, Sales Enablement Manager, IBM Flash
Levi Norman, Marketing Manager, IBM Flash
IBM and the Tech Analyst Community
Pre-Launch Briefing and Preview

• Deliver an update on IBM Flash
  – IBM Flash Ahead Initiative that was introduced in April ‘13 in NYC

• Introduce new products/solutions
  – IBM FlashSystem 840
  – IBM FlashSystem Enterprise Performance Solution

• Q&A

• Speakers
  – Woody Hutsell, Sales Enablement Manager
  – Levi Norman, Marketing Manager
Key Points IBM FlashSystem Announcement on January 16th, 2014

1. The STG launch is focused on Infrastructure Matters
   • Remaking enterprise IT for the new era of cloud
   • Driving business transformation with big data and analytics

2. The IBM FlashSystem 840 is data center optimized, extreme performance
   • IBM is delivering extreme performance in an optimized format with enhanced RAS features and 2x performance
   • This is the evolution of IBM’s flash efforts and reiteration of the All Flash strategy as presented in April

3. The IBM FlashSystem Enterprise Performance Solution is the right answer for Tier 1 flash requirements
   • Focus on a full flash solution with enterprise features
IBM Flash Initiative Gaining Momentum

April 11th
- $1B Flash Investment
- 12 Flash CoCs
- IBM FlashSystem 710, 810, 820, 720

June 9th
- IBM Flash Cache Storage Accelerator
- IBM Easy Tier Cooperative Caching
- Intelligent Cluster with FlashSystem 820

October 8th
- Flash Adapter 90
- FlashSystem Enterprise Solution
- Storwize V7000 FlashSystem Edition

January 16th
- FlashSystem 840
- FlashSystem Enterprise Performance Solution
- IBM X6 w/ eXFlash DIMMs

1 Year Anniversary of TMS Acquisition
IBM FlashSystem Clients

SSB

Cloud access.net

Rathbones

Established 1742

Kroger

Thomson Reuters

Kiwoom ID

SciQuest

300+ Client POCs - 1,500+ Systems Shipped - Channel Partner Growth 4X
Strong IBM Portfolio Enables Emerging Flash Storage

**Virtualized Flash Mirror / Tier**
- FlashSystem + SVC, with all LUs mirrored in SVC
- Easy Tier also supported, used by various clients

**Partially Virtualized Flash**
- FlashSystem + SVC, with some LUs exposed outside of SVC
- Provides virt. benefit + “turbo mode” for non-virtualized LUs

**Virtualized Flash NAS**
- FlashSystem + Storwize V7000 Unified, w/some LUs accessible via file and some via block

**Major Internet Company**
Business Initiatives Demand Data

Transforming Data Economics & Business Velocity

Over 700 Storage Infrastructure Studies and Industry Estimates:

…organizations use less than half of their storage but only 30% leverage data virtualization…

…over 80% of data uses the most expensive storage, only 20% needs it...

…average customer data growing 25% to 60%. Compression can shrink storage by half or more…

Costly and Time & Skill Intensive…
Radically Optimizing Data Architecture with Data Virtualization and Flash

Data Optimization
Real-time Compression, Adaptive Tiering, Copy Services…

Data Virtualization
Diverse Storage Assets…

Continuous Operations
New Apps, Capacity Growth, Data Availability…

Non-disruptive Data Migrations
Media Migrations, Future Proofing…

Optimized & Integrated with Flash
Store, Access & Analyze Fast Moving Operational Data
Comprehensive Flash Offerings Strategy

IBM FlashSystem addresses the two primary segmentations of the flash market as defined by IDC taxonomy:

**Absolute Performance** for extreme performance of throughput, IO, and latency.
**Enterprise** for full featured enterprise features sets married to flash performance

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**IBM FlashSystem**

- Standalone all flash array
  - *Also a building block*
- Eschew features that increase latency, bottleneck IOPS or cap bandwidth
- Promote use of application-level services

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**IBM FlashSystem Solution**

- Software defined storage
  - *IBM FlashSystem Enterprise Performance Solution*
  - *Storwize V7000 FlashSystem Edition*
- FlashSystem as a storage enclosure
- Promote use of SAN services
IBM FlashSystem 840 – Data Center Optimized

Data center optimized to deliver extreme performance, flexible capacity & total system protection

**Extreme Performance**
- 1.1M IOPS
- 8 GB/s Bandwidth
- 16Gb FC, 10Gb FCoE & IB

**IBM MicroLatency™**
- Low Latency 135/90 µs R/W
- Purpose-built, highly parallel design
- Maximize CPU efficiency & productivity

**Macro Efficiency**
- Field upgradeable, granular capacity
- Intuitive, standardized GUI
- Efficient 2U, 625 watts footprint

**Enterprise Reliability**
- Fully redundant & hot swappable
- Concurrent code load
- AES 256, HW based encryption
IBM FlashSystem 840 – Performance and Capacity

Data center optimized to deliver extreme performance, flexible capacity and total system protection

Performance at-a-glance

<table>
<thead>
<tr>
<th></th>
<th>Minimum latency</th>
<th>Maximum IOPS 4 KB</th>
<th>Maximum bandwidth 256 KB</th>
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<tbody>
<tr>
<td></td>
<td>Write</td>
<td>Read (100%, random)</td>
<td>Read (100%, sequential)</td>
</tr>
<tr>
<td></td>
<td>90 µs</td>
<td>1,100,000</td>
<td>8 GB/s</td>
</tr>
<tr>
<td></td>
<td>Read</td>
<td>135 µs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAID 0 usable capacity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAID 5 usable capacity</td>
<td></td>
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Capacity Options

<table>
<thead>
<tr>
<th>Flash module configuration</th>
<th>2 x 2 TB</th>
<th>4 x 2 TB</th>
<th>4 x 4 TB</th>
<th>8 x 2 TB</th>
<th>12 x 2 TB</th>
<th>8 x 4 TB</th>
<th>12 x 4 TB</th>
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</thead>
<tbody>
<tr>
<td>Raw capacity</td>
<td>5 TB</td>
<td>11 TB</td>
<td>21 TB</td>
<td>21 TB</td>
<td>32 TB</td>
<td>42 TB</td>
<td>65 TB</td>
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<tr>
<td>RAID 0 usable capacity</td>
<td>4 TB</td>
<td>8 TB</td>
<td>N/A</td>
<td>16 TB</td>
<td>24 TB</td>
<td>32 TB</td>
<td>48 TB</td>
</tr>
<tr>
<td>RAID 5 usable capacity</td>
<td>N/A</td>
<td>4 TB</td>
<td>8 TB</td>
<td>12 TB</td>
<td>20 TB</td>
<td>24 TB</td>
<td>40 TB</td>
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</table>
IBM FlashSystem Enterprise Performance Solution

Extreme Performance with Enterprise Capabilities

IBM FlashSystem Control Enclosure

- Scalable Performance to 1.5M IOPS
- Business Continuity with Copy Services
- Flash Copy for Backup & Optimal Workload Availability
- $/TB Value with Thin Provisioning & Real Time Compression
- Drive Storage Efficiency with Easy Tier
- External Virtualization
- Space Efficient Copies

IBM FlashSystem 840 Storage Enclosure

- Macro Efficiency 2U form factor
- Variable Stripe RAID™ + Two-dimensional Flash RAID for Enterprise Reliability
- Extreme Performance with IBM MicroLatency™
- All-flash 40TB protected data capacity

High performance enterprise class featured solution
Scalable to 1.5M IOPS for large scale enterprise systems performance
**Competitive Comparison IBM FlashSystem 840**

<table>
<thead>
<tr>
<th>Performance</th>
<th>IBM FlashSystem 840</th>
<th>Leading Flash Competitor</th>
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</thead>
<tbody>
<tr>
<td>1.1M IOPS/~135μs</td>
<td>750K IOPS/~500μs</td>
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</table>

<table>
<thead>
<tr>
<th>Capacity*</th>
<th>IBM FlashSystem 840</th>
<th>Leading Flash Competitor</th>
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<tbody>
<tr>
<td>40TB</td>
<td>44TB</td>
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<table>
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<th>Efficiency</th>
<th>IBM FlashSystem 840</th>
<th>Leading Flash Competitor</th>
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<tr>
<td>W/TB or W/IOPS</td>
<td>W/TB or W/IOPS</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Petabyte Density</th>
<th>IBM FlashSystem 840</th>
<th>Leading Flash Competitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2U / 1 Rack PB</td>
<td>3U / 1.64 Racks PB</td>
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**Advanced Data Services**

- Concurrent Code Load
- Encryption
- Data Reduction
- Snapshot
- Replication
- Virtualization & Tiering
- Scale Out

**Tier 0**

<table>
<thead>
<tr>
<th>IBM FlashSystem Solution</th>
<th>Leading Storage Competitor</th>
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</thead>
<tbody>
<tr>
<td>400K IOPS/~250μs</td>
<td>250K IOPS/~1000μs</td>
</tr>
<tr>
<td>40TB</td>
<td>7TB</td>
</tr>
<tr>
<td>W/TB or W/IOPS</td>
<td>W/TB or W/IOPS</td>
</tr>
<tr>
<td>6U / 3.57 Racks PB</td>
<td>6U / 20.04 Racks PB</td>
</tr>
</tbody>
</table>

**Tier 1**

- Leader
- On Par
- Laggard

* Useable & protected w/out data reduction

Under Embargo Until January 16th, 2014
Cross IBM Flash Deployment

IBM FlashSystem Family

IBM DS8000 & XIV

IBM Storwize Family

IBM Flash Adapters, DIMMs, & SSDs

IBM Flash Software for Management, Caching & Tiering

A Smarter Planet
IBM Flash in Server

Flash Adapter 90 for Power
Power Systems (AIX, Linux)
900GB eMLC

High IOPS Adapters
Flash Adapter Enterprise Value
System x, BladeCenter, Flex
365GB to 3.2TB MLC

EXP30 or EXP24S Direct
Attached Drawers
Power Systems (AIX, Linux, IBM i)
External SAS attach with 1.8” SAS SSDs

Flash Express for System z
Z/OS
Up to 5.6TB per I/O drawer

eXFlash DIMMs & SAS SSDs
DIMM, 1.8”, and 2.5” form factor
IBM Flash in Storage

**FlashSystem 840 & FlashSystem Solutions**
All Flash Array
Fibre Channel, InfiniBand, FCoE
4TB to 48TB per 3U
IBM MicroLatency™

**DS8870**
Enterprise All Flash or Hybrid
Fibre Channel, FICON
Easy Tier

**XIV**
Cloud-optimized scale-out
Fibre Channel, iSCSI
Up to 12TB Flash cache

**Storwize**
All Flash or Hybrid
Software defined storage
IBM Flash Caching

Flash Caching

Easy Tier Cooperative Flash Caching
Power System
Flash Adapter 90 or SSDs as Cache
Tier data on server and on DS8K

FlashCache Storage Accelerator
Bare metal or virtual
Cache to High IOPS Adapters, SSD
For read intensive environments
Supports VMware vMotion
Optimized IBM Flash Architectures

**Architecture**

- Flash in Server
- Flash in Storage
- Flash Caching

**Examples**

- Flash Adapter 90 for Power, Flash Express for System z, High IOPS Adapters and/or eXFlash for System x
  Flash Adapters, DIMMs, SSDs, EXP30 or EXP24S Direct Attached Drawers

- IBM FlashSystem, DS8K, Storwize
  Flash Optimized Systems, All-Flash, Hybrid Flash

- IBM FlashCache + High IOPS Adapters
  Easy Tier Server + Flash Adapter 90 + IBM DS8870 Storage System
  Flash Server Caching w/ Flash Adapters and SSDs Advanced Tiering Software w/ Flash Drawers, Adapters, SSDs
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3. The **IBM FlashSystem Enterprise Performance Solution** is the right answer for Tier 1 flash requirements
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Re-think the possible with Smarter Computing
Question and Answer