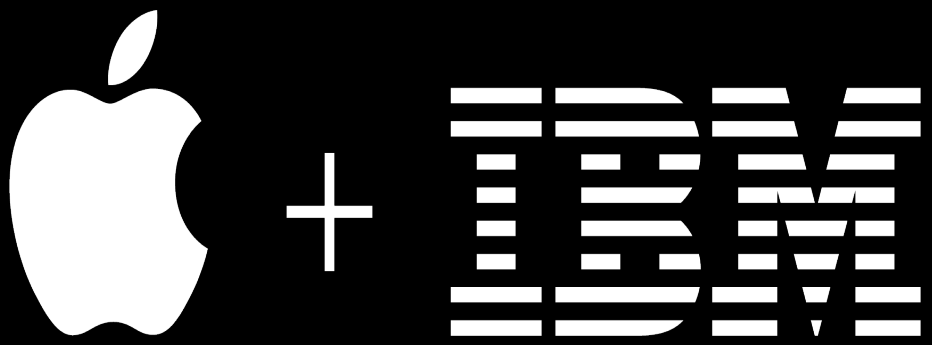
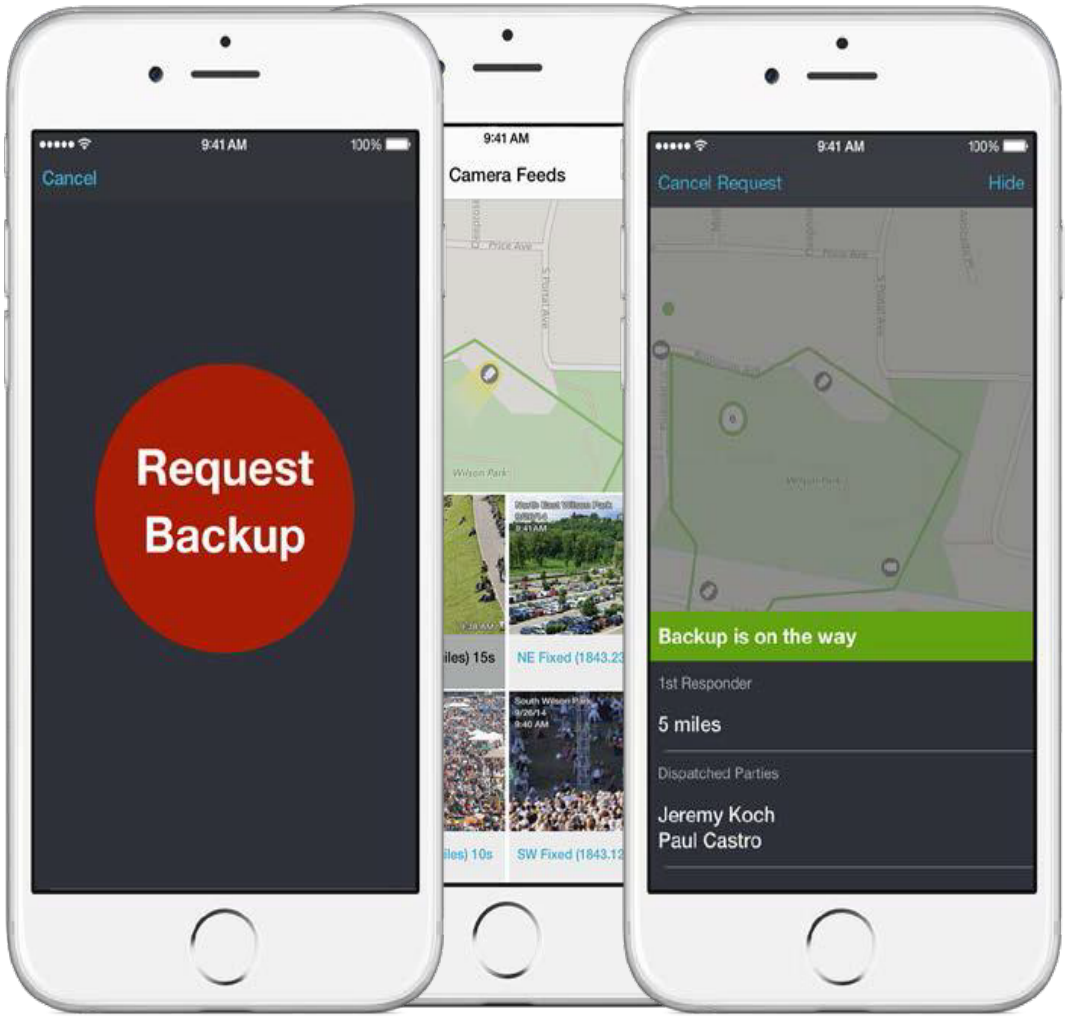
IBM Connect 2015

Seize the Moment

MM/DD/YY

IBM Flashsystem


+
IBM



Mobile Requires Extending Existing Architecture

Latency

CPU performance **up 10x** this last decade

Typical Performance Mitigation Tactics

Add More Memory

Most Costly & Volatile

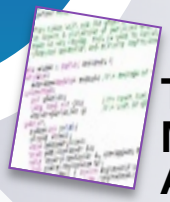
HDD Performance Enhancement

Wasteful, Expensive & Ineffective with Storage Latency Issues

Add CPUs

Expensive & Ineffective for Storage Performance Issues

Tune & Modify Application



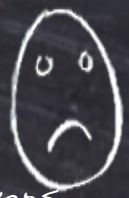
Time Consuming, Very Expensive & Risky

Data center optimized

Introducing the solution, the FlashSystem

How are FlashSystem and SSDs different?

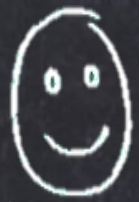
SSD is Flash memory inside a disk enclosure, managed by SW and Disk controllers.
Most of today's arrays were designed for spinning disks, not Flash.



These factors add (+) latency!

- Array operating system and SW layers
- Out-of-path array controllers
- SAS disk controllers
- SAS/SATA protocols
- Shared data path/bus
- Data protection (RAID) outside SSD
- Tiering and variable performance

FlashSystem:



These factors reduce (-) latency!

- No software layers, no operating system
- H/W-optimized and designed for flash
- Massive internal parallelism (Bandwidth)
- Purpose-built (FPGA) - Microlatency
- Chip/Module level data protection - VSR

Why do this? Performance and Economics

Enable Datacenter Consolidation

Lower Power Consumption

Improve Workforce Productivity

Drive new business opportunities with IBM FlashSystem

Run Mixed Workloads

Accelerate Infrastructure

Accelerate Latency Sensitive Applications

Accelerate Virtualization & VDI

Accelerate DBs & DWs

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

Absolute Performance
Enterprise

IBM FlashSystem

IBM FlashSystemSolutions

Engineer technology differentiation:

IBM FlashSystem

- Offer the widest set of industry enterprise features
  - Virtualization
  - Replication
  - Snapshots
  - Thin Provisioning
  - Real-time compression
  - Easy Tier
  - Preferred read mirroring to integrate 3rd party storage
- Platform independent services

IBM FlashSystem™

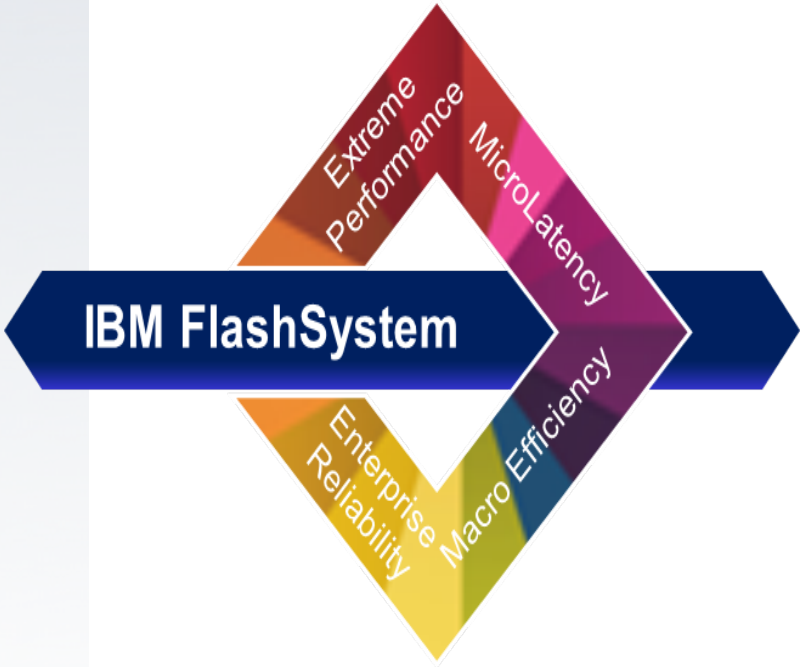
Powered by IBM MicroLatency™

Macro Efficiency

Enterprise Reliability

IBM MicroLatency™

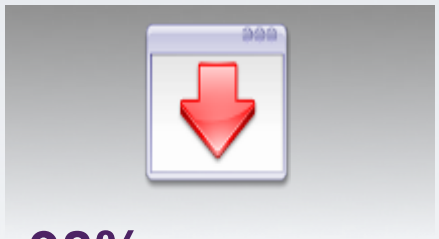
Extreme Performance



Boost IT Efficiency

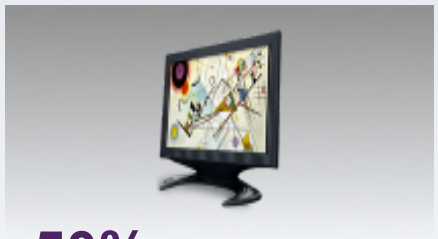
Macro Efficiency

driven by consolidation of hardware and software, deployment speed, efficient use of IT staff as well as power and cooling savings



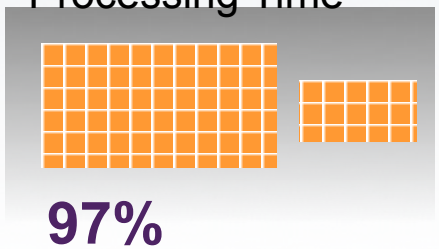
98% Reduction

in Application Processing Time



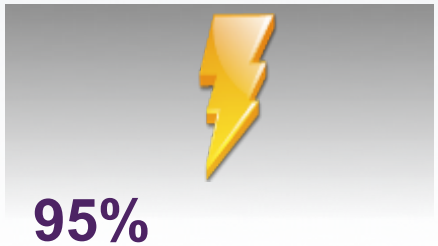
50% Reduction

in TCO



97% Reduction

in Physical Footprint



95% Reduction

in Power Consumption

A top price comparison retail site saved $1.84K in three ways.

$75K in floor space.

$1.8K in power.

$91 K in cooling.

Source: Price comparison retail site

Source: IBM Client Experiences

The data below are based on average operating conditions that may or may not be representative of a particular customer's operating environment. The use case measurements are from TMS customers using the flash technology that has been integrated into IBM's systems.

Virtualization: Marketing and Advertising Client

20U solution

VS

2 rack solution

Challenge

International leader in advertising and marketing with over 2,400 offices. Their growing client base put more demand on the system to deliver performance, and needed a way to improve response times.

Solution

•Application: Microsoft Hyper-V, Microsoft SQL 2012, IIS, Citrix and file services
•6x Flash System behind 8x SVC nodes

Benefit

•The reduction in processing times for their batch runs resulting in prompt group reports being delivered to clients
•Reduction in latency meant they had the ability to manage more online clients
•The customer is happy to see the reduction in floor space, power and cooling that he has to acquire from his data centre facilities provider, **thus saving 500k in 3 years**
•TCO advantage compared to high end disk based solution offered discussed initially

Improve Business Uptime

Enterprise Reliability

- Superior protection with multiple RAID layers
- Advanced wear leveling and over-provisioned space
- Non disruptive maintenance and current code load

"IBM FlashSystem ticks all the boxes for us."

Reliability. ✓

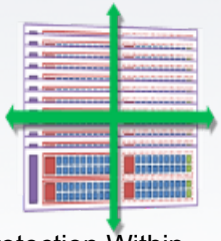
Ease of setup. ✓

Source:
Technical Analyst, Rathbone Brothers Plc. case study

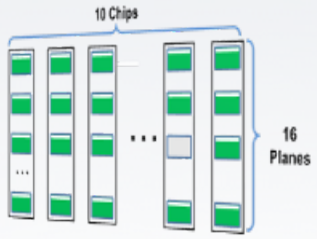
Superior Protection: *Beyond Disk RAID*

Variable Stripe Sizes
Read Disturb Mitigation
Automatic Read Sweeper
High-Speed Clock Recovery

Advanced Engineering = Less Maintenance

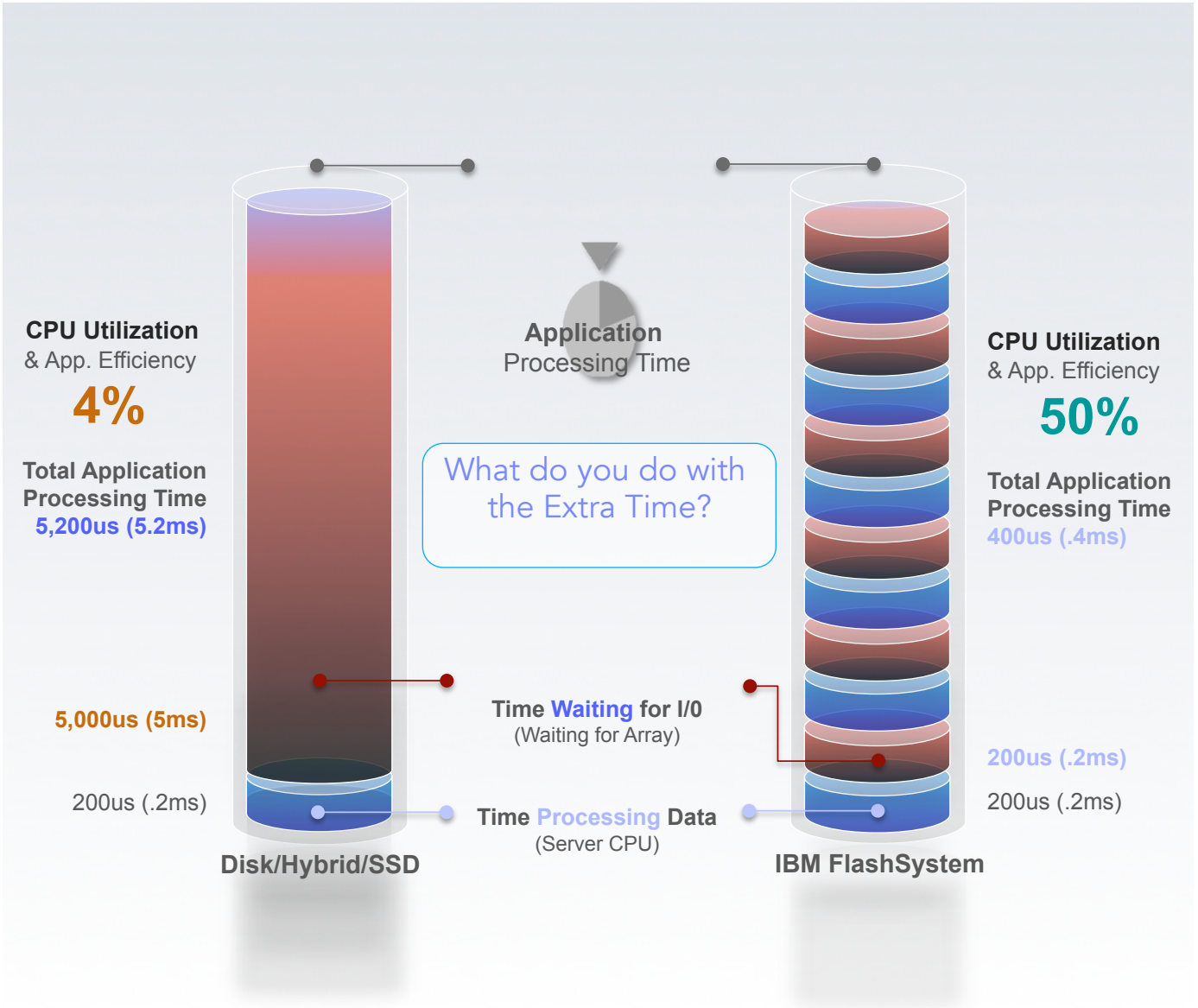


Protection Within ***And*** Across Flash Modules

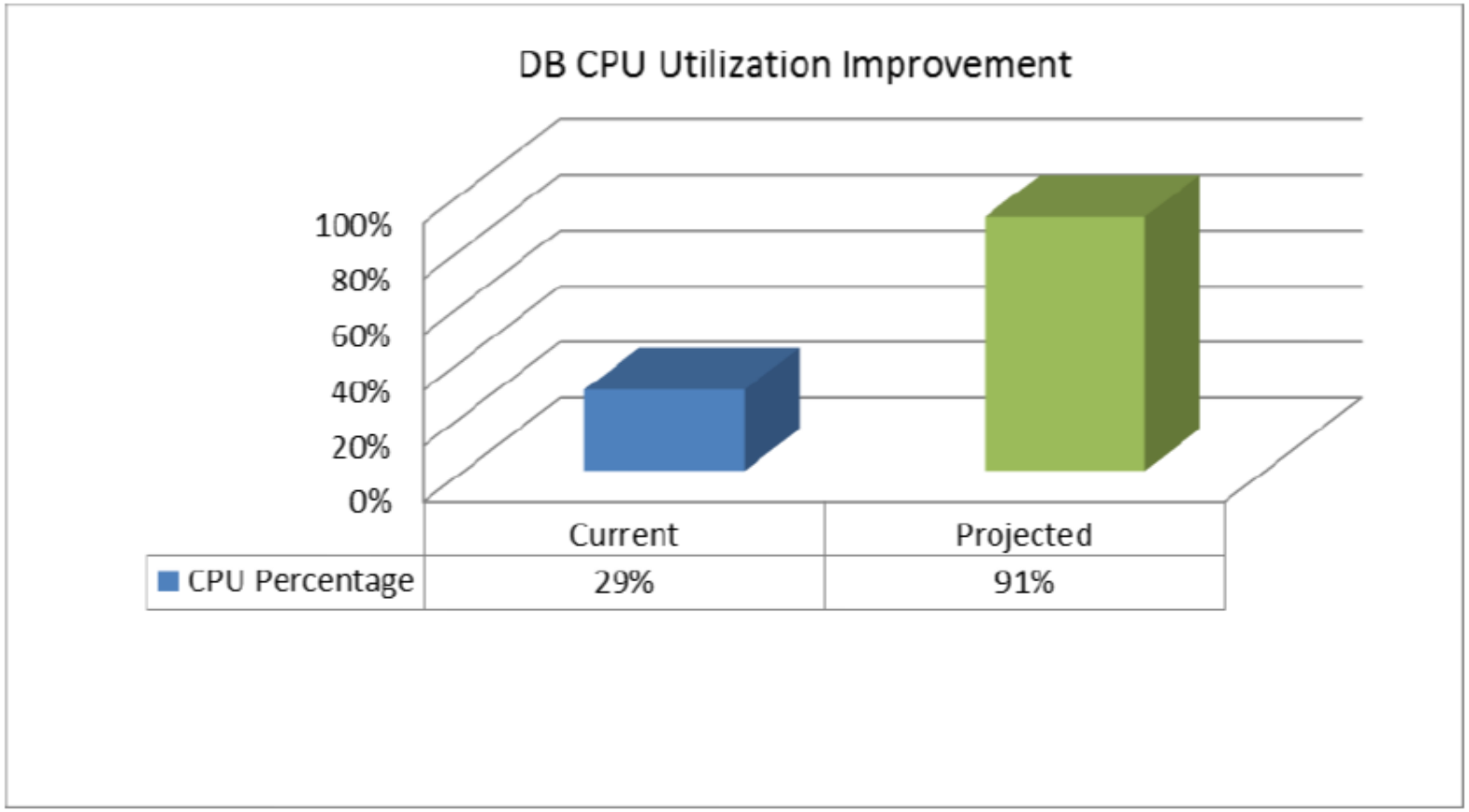


Self-Recovering Flash Modules
Avoid system rebuilds

Understanding Application Efficiency using FlashSystem

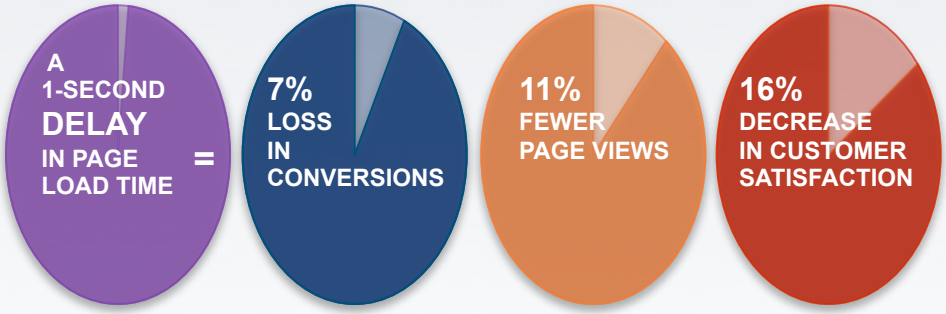


Recommendation: Using a low latency IO subsystem like a Flash System would reduce the latency for IO which would allow the CPU to be more efficiently used with the CPU utilization forecast to increase to 91%.



Extreme Performance

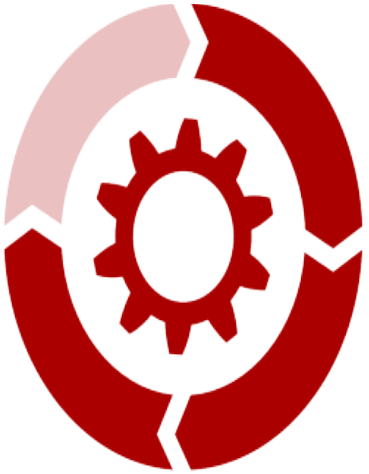
- Improved end-user experience
- Faster insights into critical applications



In dollar terms, this means that if your site typically earns $10,000 a day, this year you could lose **$250000** in sales.

Source: Aberdeen Group

CCBCC cut data processing time by 75% without replacing a single server.

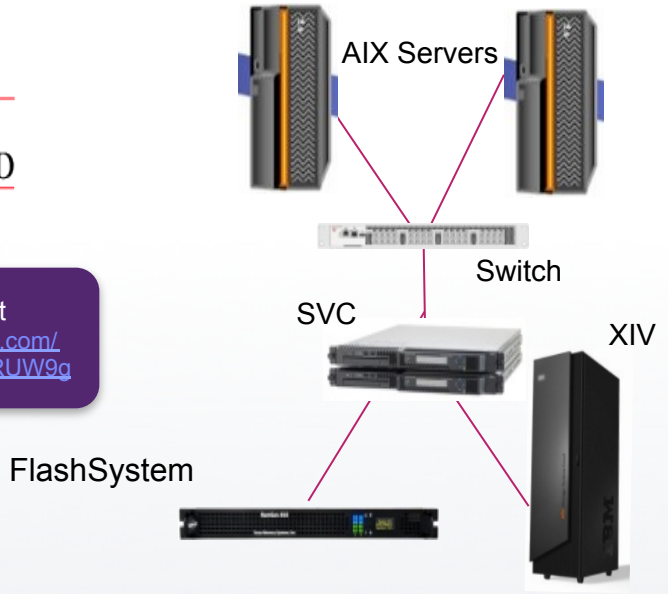


Source: Coca-Cola Bottling Co. Consolidated case study

Enterprise Solution Case Study: Wholesale Distribution

Coca-Cola Bottling Co. Consolidated

Video available at http://www.youtube.com/watch?v=vRBZaARUW9g



"Our mission statement is to make, sell and deliver Coca-Cola Company products better than anyone else. By using IBM FlashSystem to accelerate our insights into customer demand, we're better placed than ever before to offer unbeatable levels of service to our customers across the United States."

"Installing the FlashSystem technology itself took just an hour or so—it really is a plug-and-play solution."

Tom DeJuneas, Infrastructure Manager, Coca-Cola Bottling Co. Consolidated

Challenge

CCBCC needed to crunch more data without increasing time-to-insight. Requirement of meeting service level agreements.

Solution

- IBM FlashSystem Enterprise Solution
- AIX LVM host mirroring
- IBM Flash Centers of Competency - POC
- IBM Lab Services provided knowledge transfer and helped implement the FlashSystem with their existing SVC and XIV storage

Benefit

- Batch processes run 4x faster
- Process 20 x more forecasting data within the existing window and SLAs
- Reduce the risk of over- or under-stock positions
- Improve TCO profile

What have we achieved?

IBM Ranked #1 for Flash Storage(SSA) Market Share, Worldwide based on revenue for 2013 and shipment data for 2014

Global market acceptance
#1 with 25% market share

Clear leadership position
*44% greater revenue than next closest competitor**

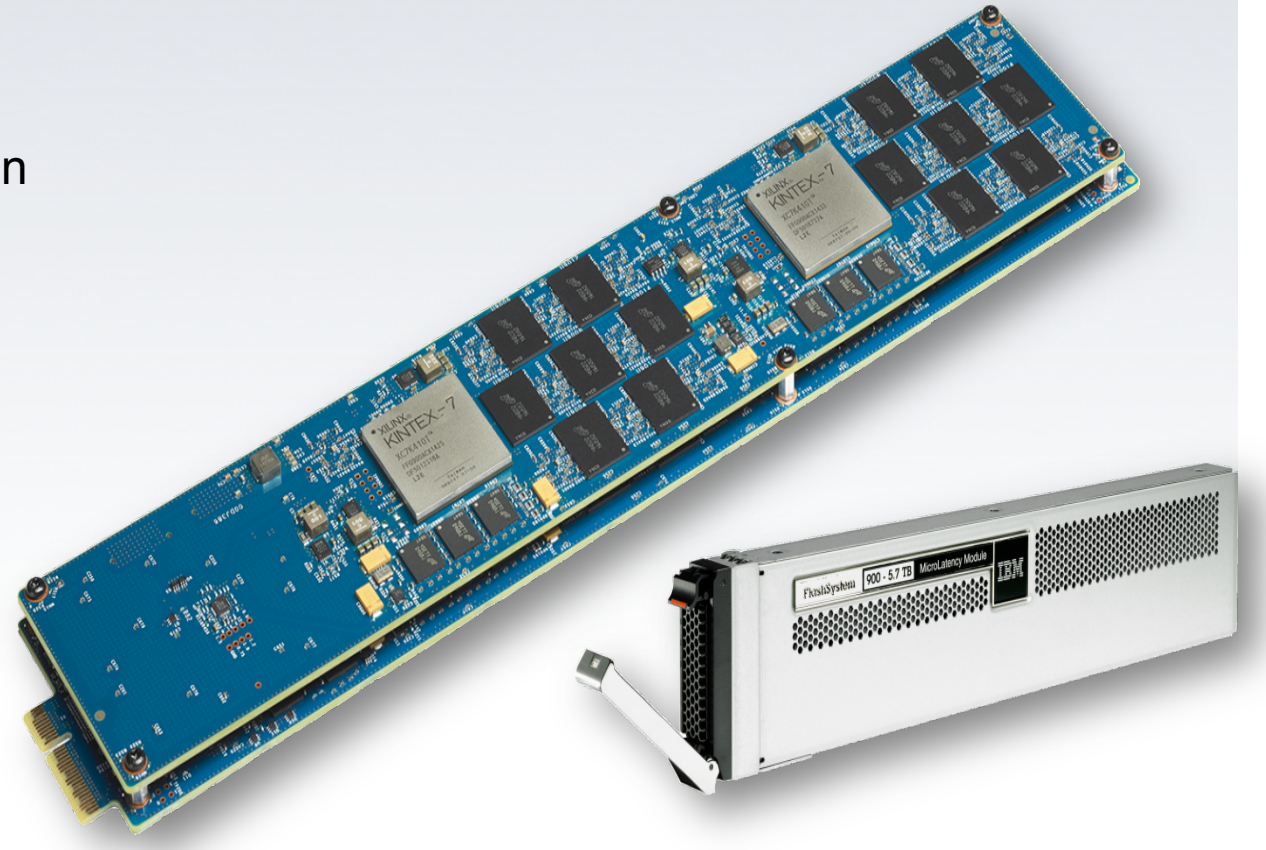
Shipped more capacity in 2014 than the two closest competitors combined**

**Calculations by IBM based on Gartner Report: Market Share Analysis: SSDs and Solid-State Arrays, Worldwide, 2013*
***Source: IDC, 2014*

FlashSystem 900
V9000

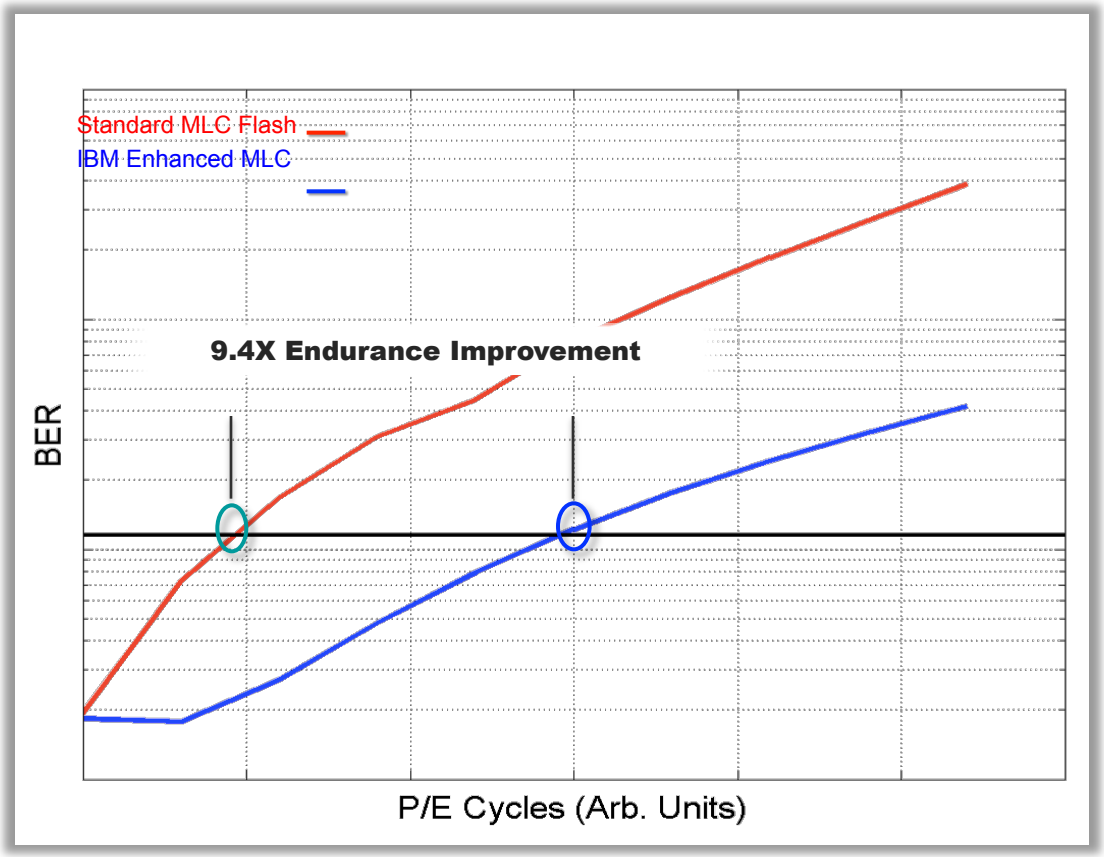
FlashCore: IBM MicroLatency™ Module

- IBM Engineered
- Massively Parallel Design
- FPGAs in the Data Path
- Distributed RAM
- High Speed Interface
- Hardware-based Data at Rest Encryption



IBM FlashCore™ Technology: Advanced Flash Management

IBM FlashCore™ enhances endurance 9x over an industry standard MLC implementation



Industry Standard Interface Technology

Powered by
IBM FlashCore™ Technology

- Hardware Accelerated I/O
- IBM MicroLatency Module™
- Advanced Flash Management

IBM Enhanced
Micron Technology

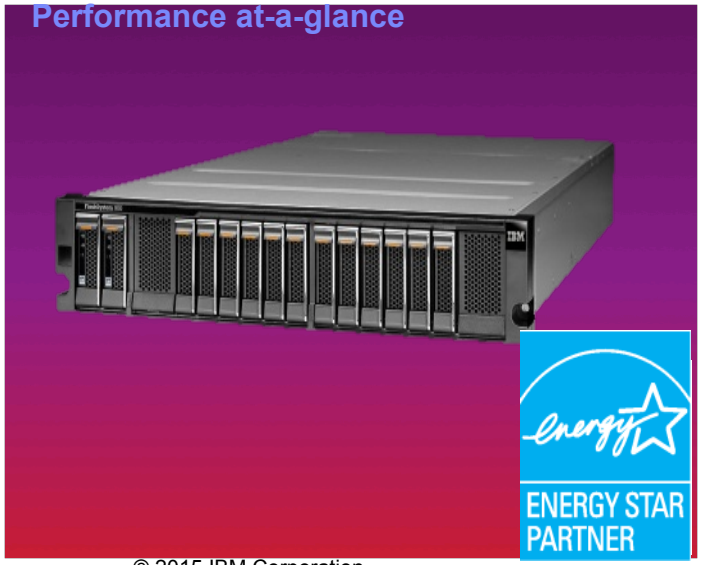
IBM FlashSystem 900
the next generation

- IBM MicroLatency™ with up to 1.1 million IOPS
- 40% greater capacity compared to previous generation
- IBM FlashCore™ technology, our secret sauce

Technical collaboration with Micron Technology – flash chips

Improved integration with Vmware

Module type	1.2 TB					2.9 TB				5.7 TB			
Modules	4	6	8	10	12	6	8	10	12	6	8	10	12
RAID 5 capacity	2.4	4.8	7.2	9.6	12	11.6	17.4	23.2	29.0	22.8	34.2	45.6	57.0
Raw Capacity	7.1	10.7	14.2	17.8	21.4	26.3	35.1	43.9	52.7	52.7	70.3	87.9	105.5




IBM’s premier, fully-integrated, Tier 1, all-flash offering
FlashSystem
V9000

IBM Storage Portfolio

Enterprise

XIV

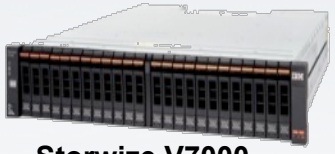
DS8870

FlashSystem Family

FlashSystem V9000

FlashSystem 900

Midrange



Storwize V7000

Storwize V5000

Entry

Storwize V3700

Performance increase, with common features

Introducing IBM's choice for open system Tier 1 storage

IBM FlashSystem V9000

Scalable Performance

Enduring Economics

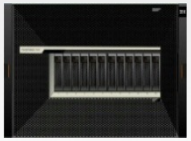
Agile Integration

Powered by IBM FlashCore™ Technology

FlashSystem V9000 options for deployment
Scalable Performance

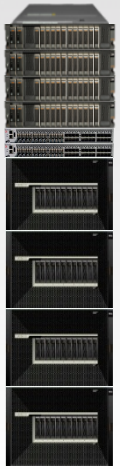
Application Accelerator

- Great for database and VDI workloads
- Accelerate, migrate, tier, clone, snapshot, replicate, compress existing storage
- Up to 630K IOPS, 200µs
- Up to 57 TB usable, 285 TB effective



Public or Private Cloud

- Great for Tier 1 disk replacement
- Scale up and out for more processing, more capacity and more I/O
- Up to 2.5M IOPS, 200µs
- Up to 456 TB usable, 2.2 PB Effective



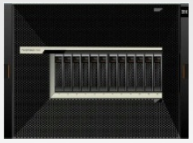
Small Data Center

- Great for large data sets with big I/O requirements and needing storage services
- Scale up for more all flash capacity
- Up to 630K IOPS, 200µs
- Up to 285 TB usable, 1.4 PB Effective

Mixed Workload Accelerator

- Great for multiple mixed workloads that drive huge I/O
- Scale out for more all flash capacity, IOPS and bandwidth
- Up to 2.5M IOPS, 200µs
- Up to 228 TB usable, 1.1 PB Effective

Virtualized Data Center

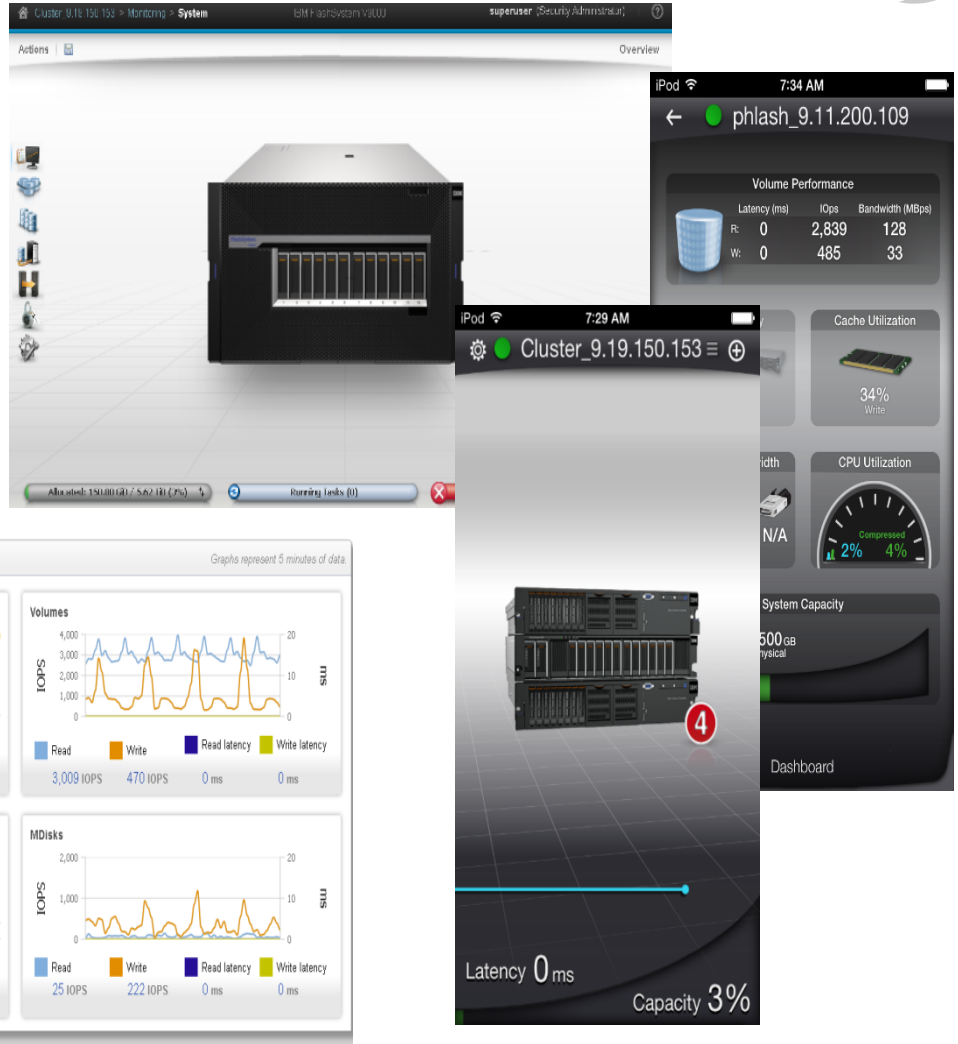


- Great for data centers with heterogeneous storage
- Extends core feature set to other storage arrays
- Up to 2.5M IOPS, 200µs
- Up to 3 Exabytes virtualized

Fully integrated system management
Agile Integration

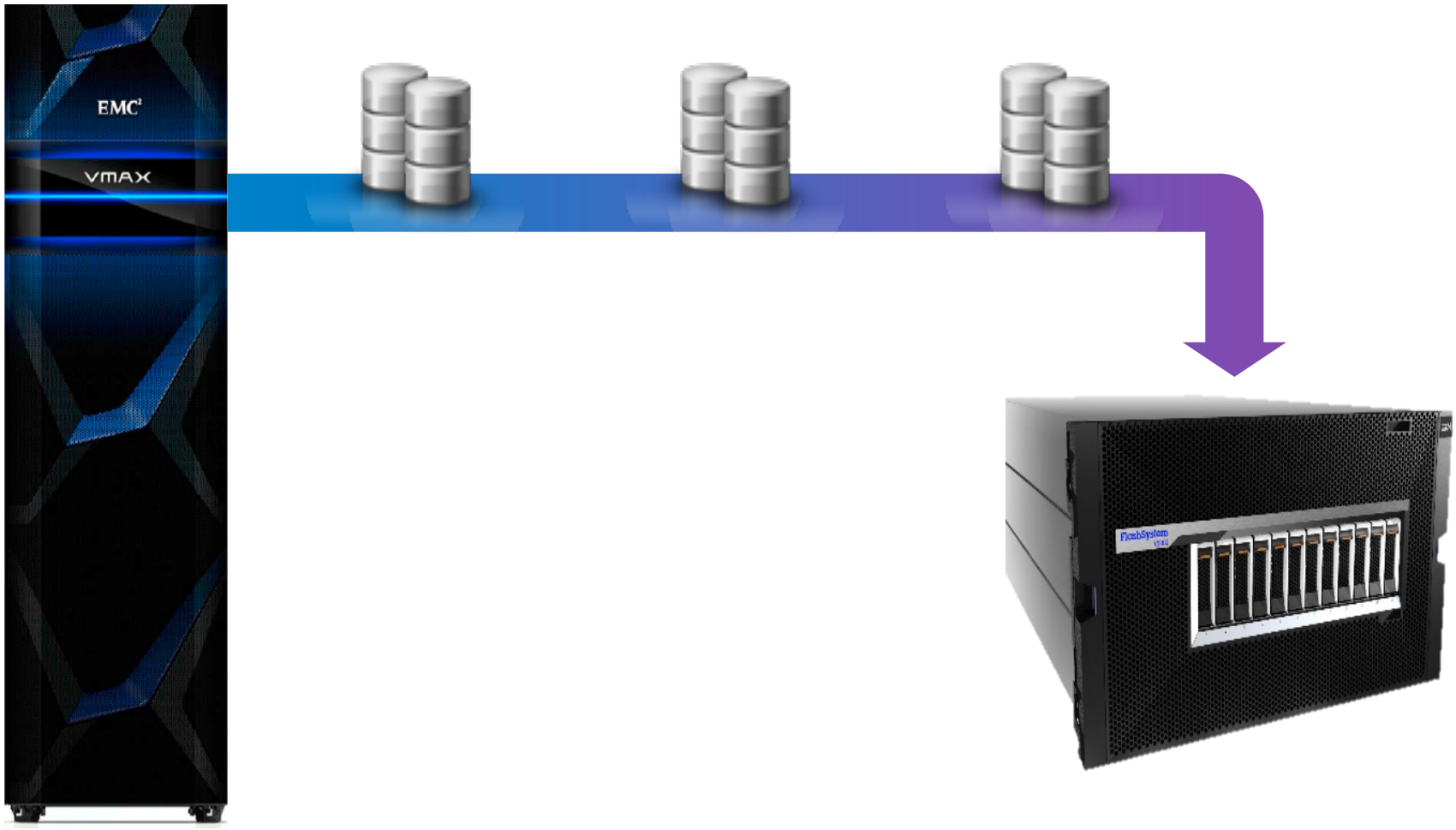
Agile Integration

- Improve workforce productivity
- Simplify management
- Single name space



Flexible volumes
Agile Integration

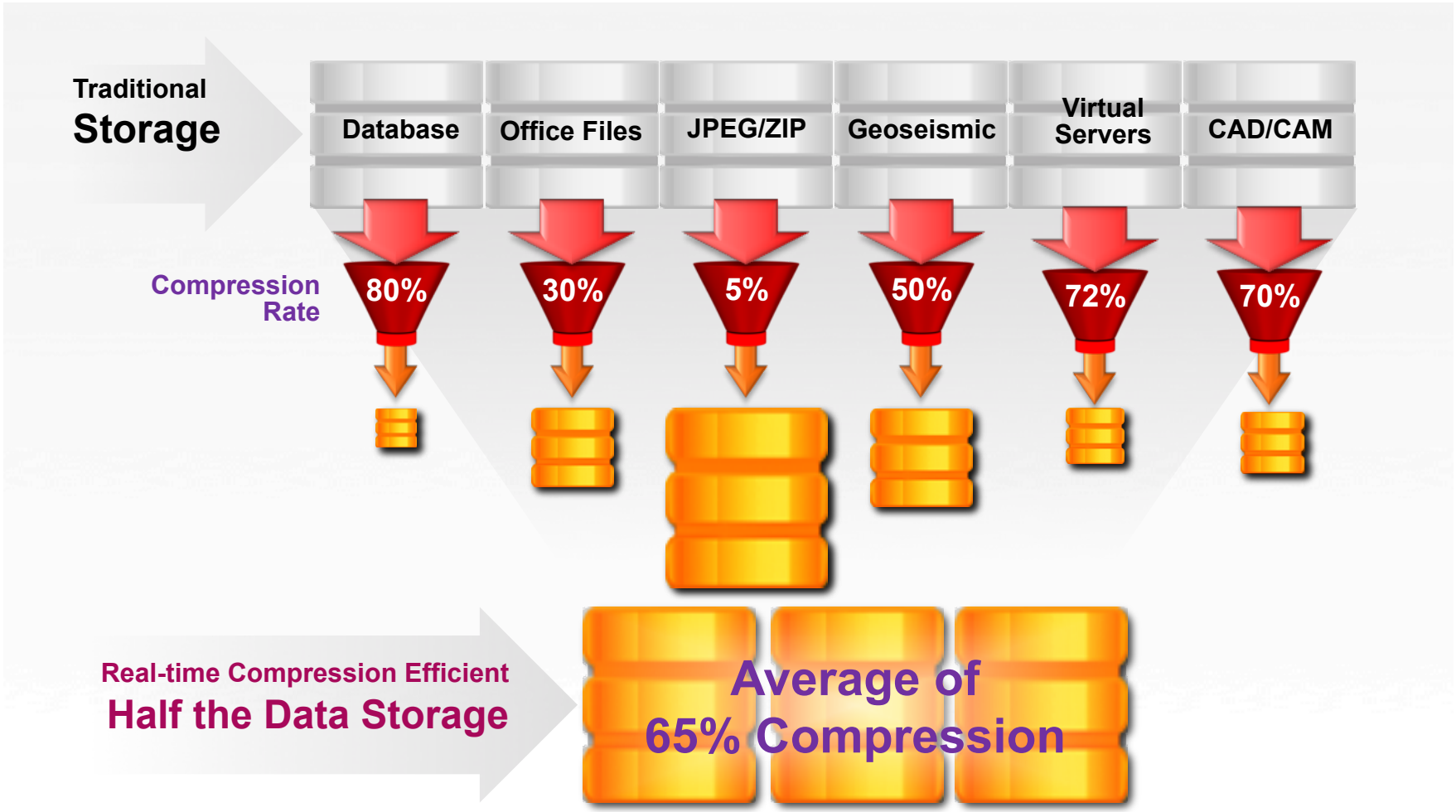
Non-disruptive data migrations
Agile Integration



Flash for less than the cost of Tier 1 disk
Enduring Economics

Enduring Economics

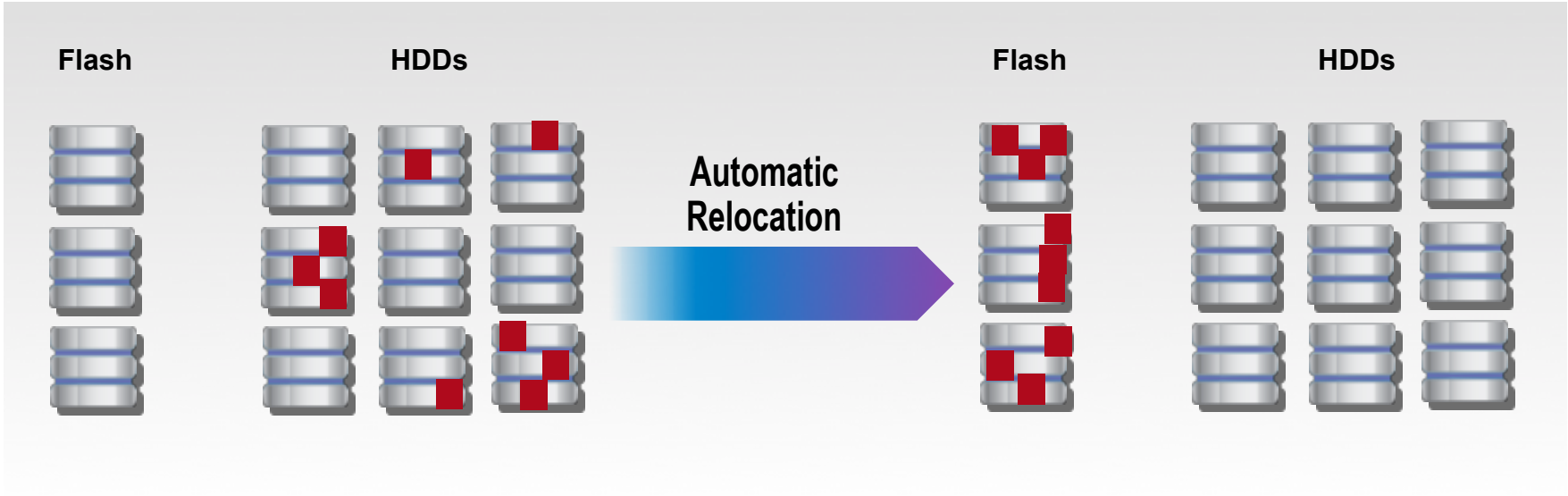
Real-time Compression, for active and inactive data



Storage virtualization
Enduring Economics

Preserve your **existing** investment in storage

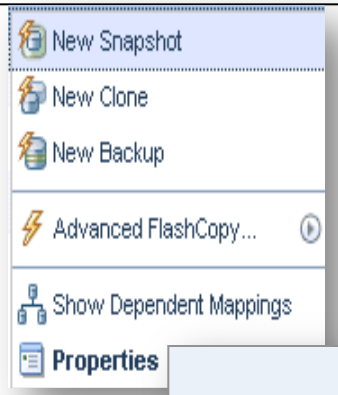
- ✓ Manage
- ✓ Tier
- ✓ Protect
- ✓ Compress with Real-time Compression

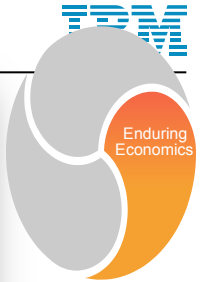


IBM Easy Tier® flash storage management

Optimized performance at lower overall cost

Infrastructure continuity
Enduring Economics





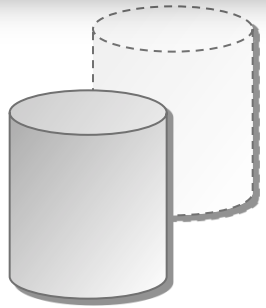
Full set of **disaster recovery tools**:

- **Snapshot**
- **Clone**
- **Backup**

Metro Mirror – Synchronous
–
Global Mirror – Asynchronous

FlashCopy Options

- Full or “thick”
- Thin nocopy
- Incremental
- Cascading
- Multi-target
- Consistency groups
- Reverse



IBM FlashSystem family

IBM FlashSystem V9000

Scalable Performance: Grow capacity and performance with up to 2.2 PB scaling capability

Enduring Economics: Next generation flash media for less than the cost of HDD

Agile Integration: Fully integrated system management to simplify management and improve workforce productivity under a single name space

IBM FlashSystem 900

Extreme Performance with IBM MicroLatency™: Delivers 100 microsecond response times

Macro Efficiency: Lowest latency offering with >40% greater capacity

Enterprise Reliability: IBM enhanced Micron flash technology which contains MLC offering with Flash Wear Guarantee

Powered by
IBM FlashCore™ Technology

IBM Flash Storage Sweet Spots
Do More, Do it Faster…

OLTP Databases

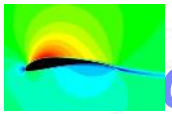
Financial, gaming, real-time billing, trading, real-time monitoring, query acceleration (DB2/Oracle)…

Analytical Applications (OLAP)

Business intelligence, batch processing, ERP systems, reporting, massive data feeds…

Virtual Infrastructures

VDI, Consolidated virtual infrastructures, user profiles…



HPC, Computational Applications

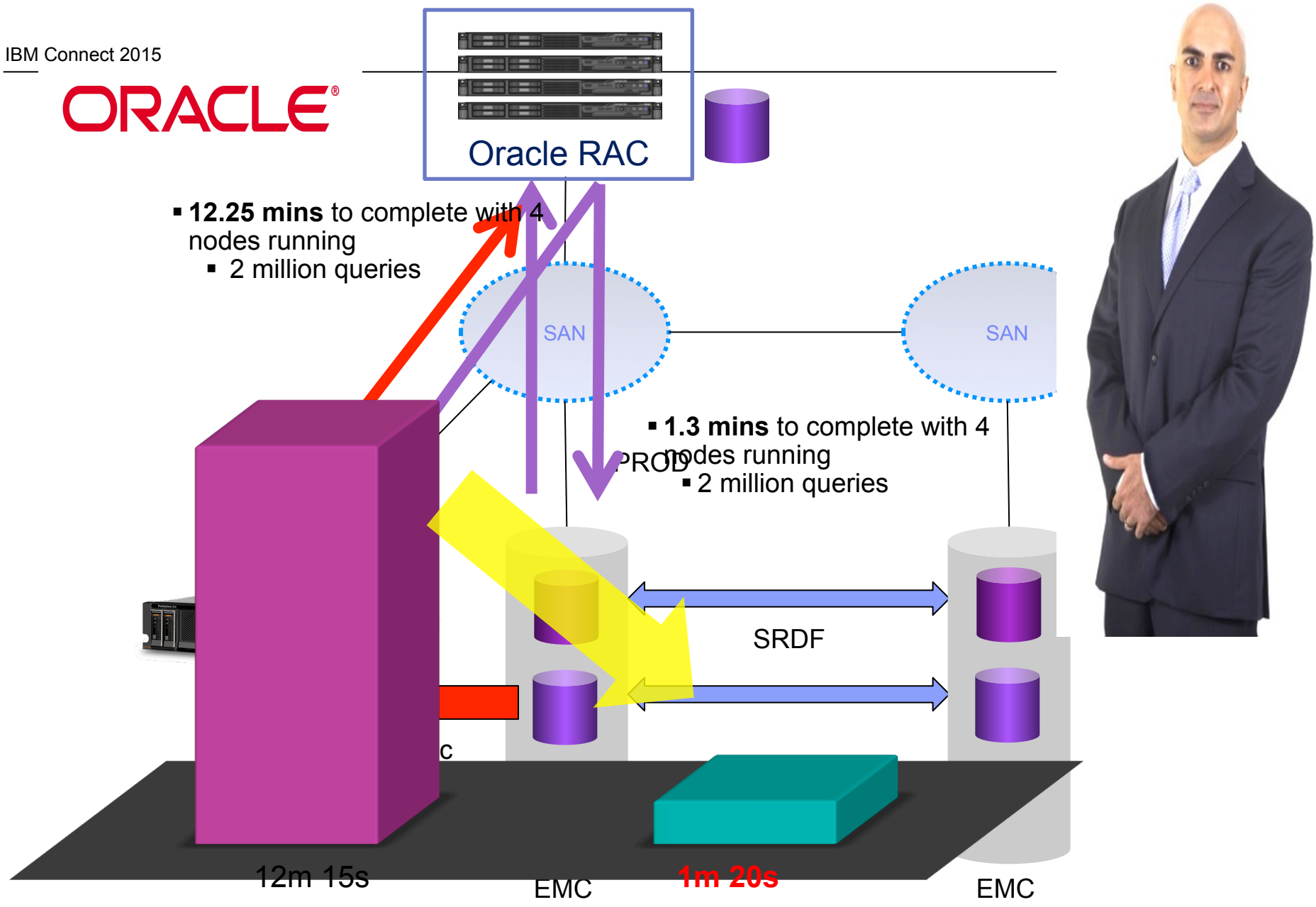
Simulation, modeling, rendering, FS metadata, scratch space, video on demand, thread efficiency…

Cloud-scale Infrastructures

On-demand computing, content distribution, web, caching, metadata, GPFS, active file management…

Financial | **Government** | **E-Commerce** | **HPC** | **Telecom**

ORACLE®



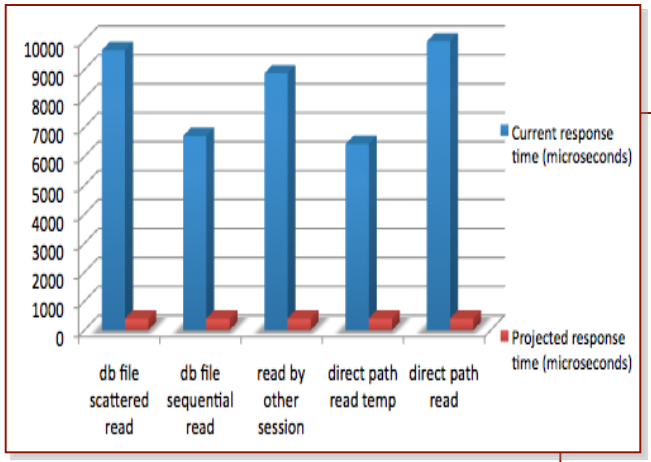
Final Thoughts

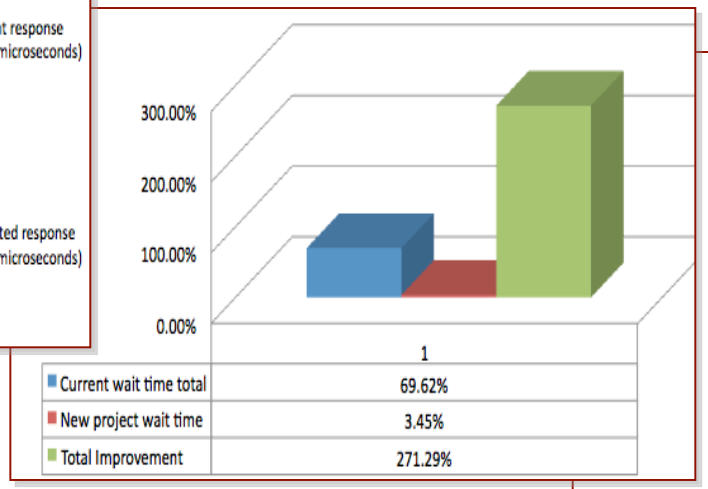
Flash Realized. It's about *time.*

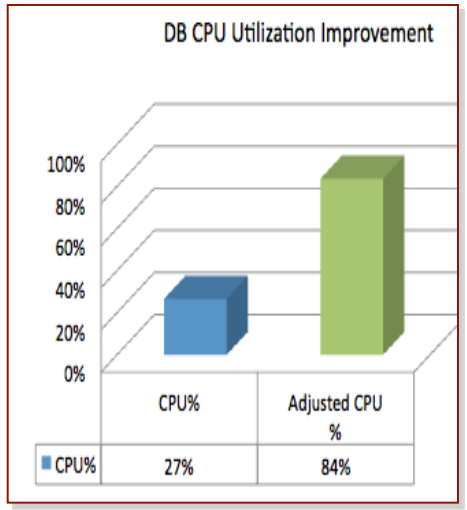
AWR/Statspak analysis

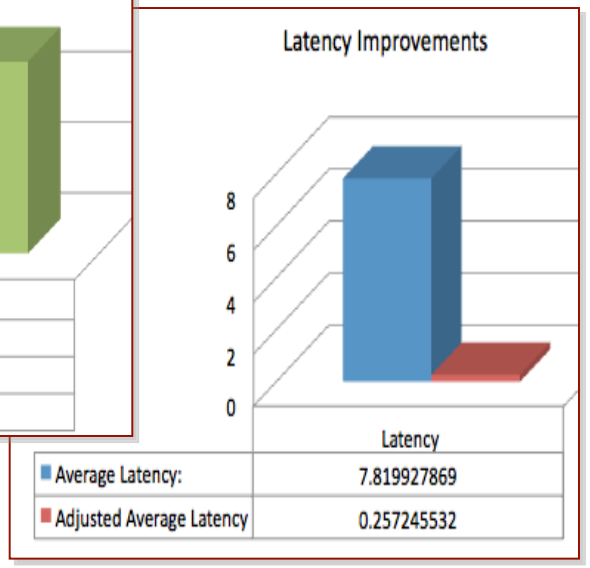
SIO Flash Program with Arxview

PoC









Summary

- **Flash is breaking new ground** and changing how we look at IT infrastructure and how we define performance.
- The **hard disk drives continues to have a future** in your data center… storing the data you rarely need to access.
- The **IBM FlashSystem family enables a new future** where IT is no longer constrained and pained by the need to deploy HDD for performance.