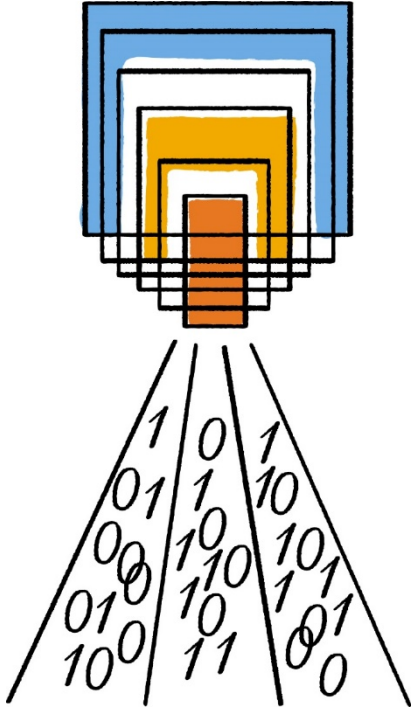


# Making Flash Work for the Enterprise Customer

Ty McConney  
Vice President, Flash Products  
NetApp, Inc.

# Impact of Flash on the Enterprise



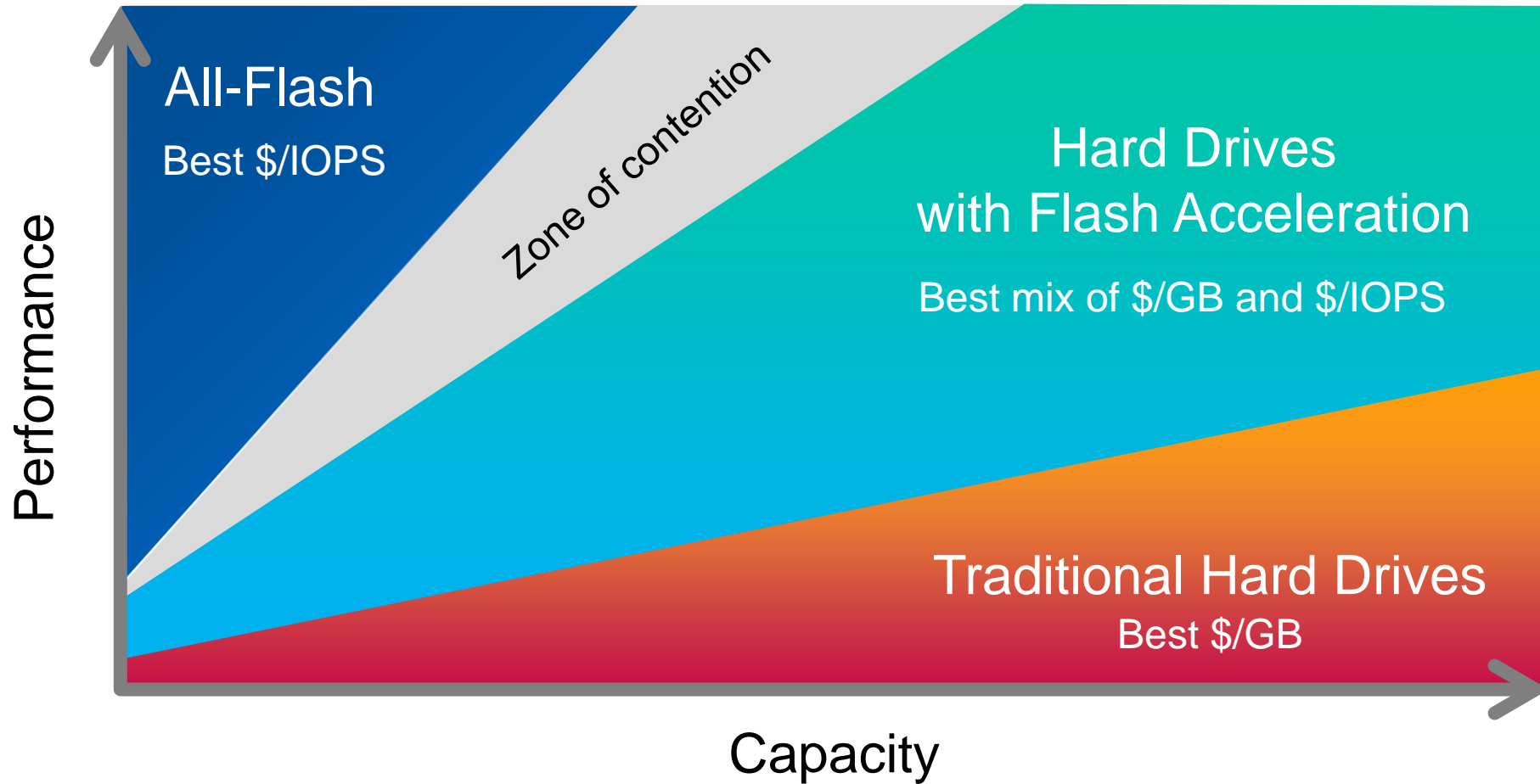
Flash can:

- deliver higher application performance,
- reduce costs, and
- enable Green IT

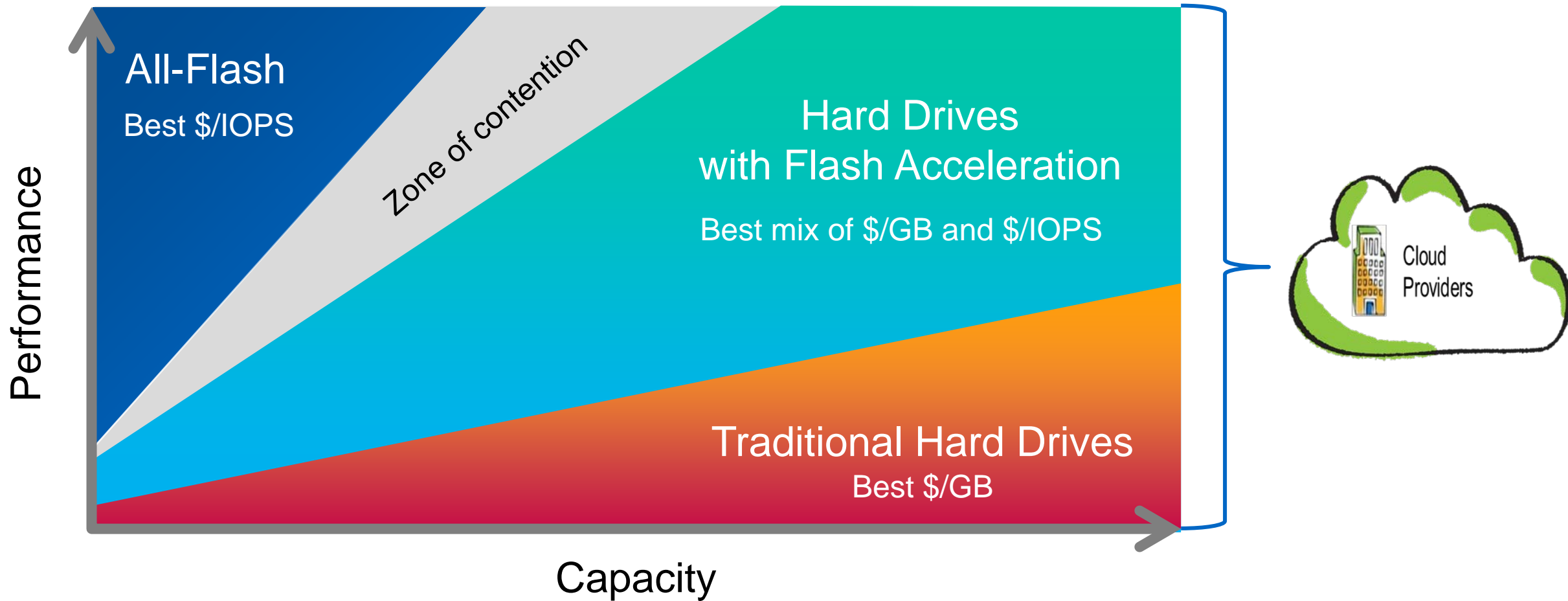
- There is **no one-size-fits-all** flash solution

Enterprise customers require hybrid and all-flash

# The Right Solution Balances Performance & Capacity

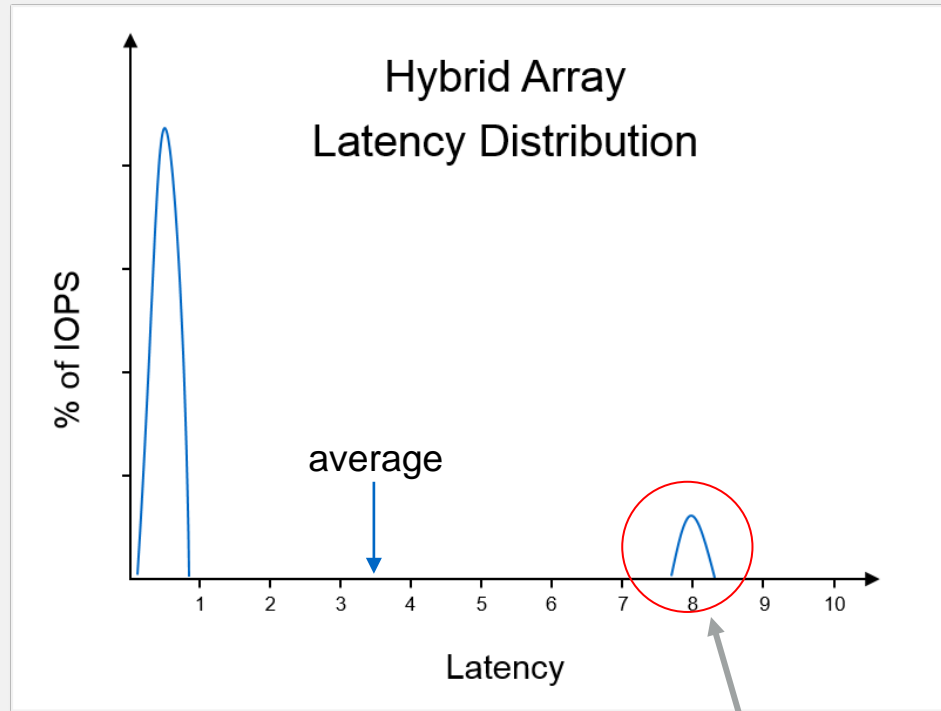


# Data Mobility: All-Flash to the Cloud...and Back

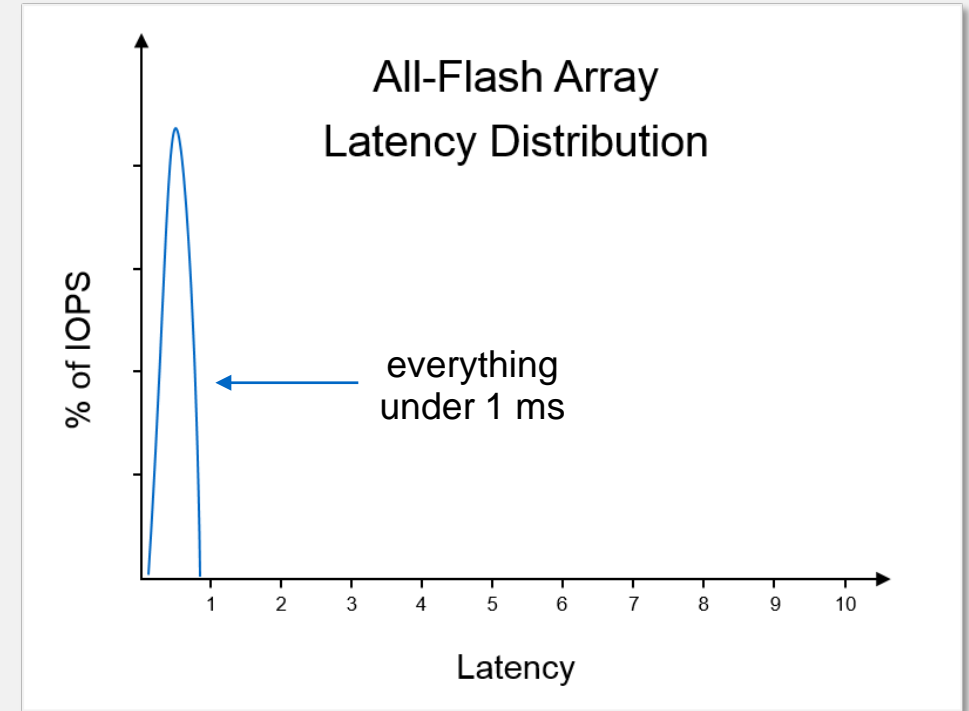


# Latency: Average vs. Predictable

- Hybrid storage: leverages flash media to provide good **average** latency



- All-flash storage: utilizes flash media to provide **consistent, predictable** low latency



All-flash storage eliminates this bump

# Flash-Accelerated Storage

## Flash + HDD



### Hybrid Arrays

- Best mix of \$/IOPS and \$/GB
- Speed of flash with capacity of disk
- Ideal for most workloads

The new normal

## Flash Only

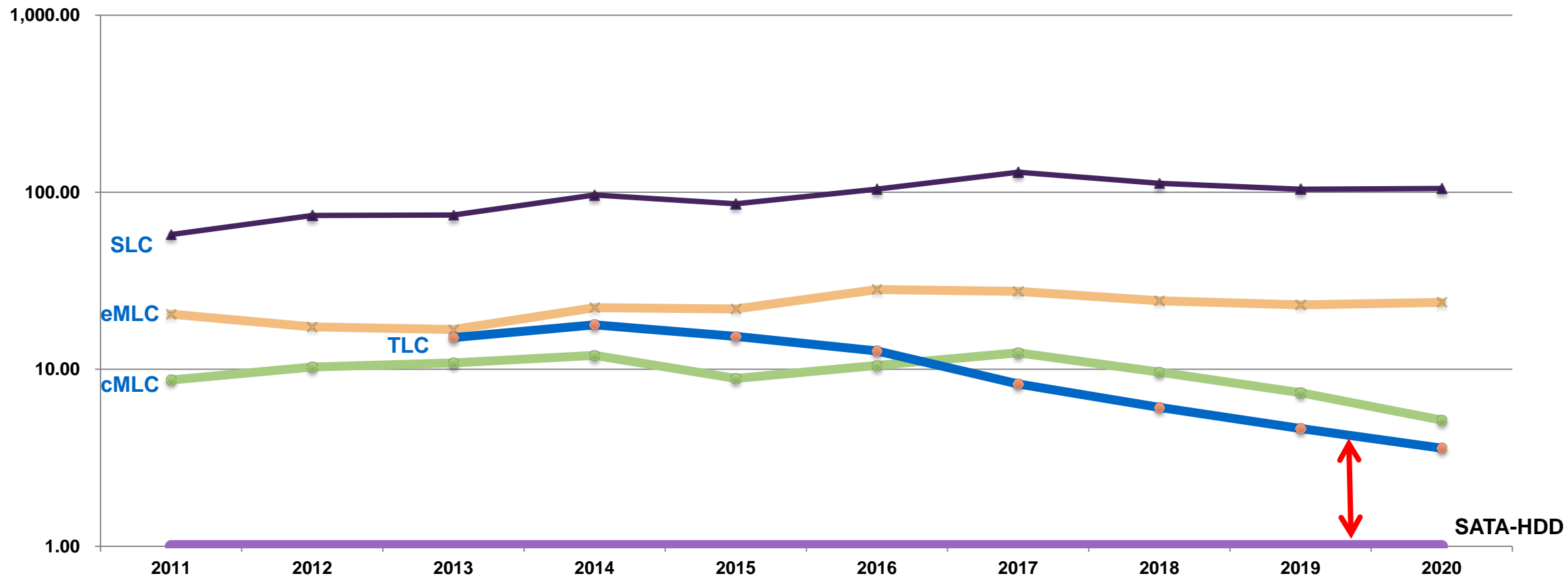


### All-Flash Arrays

- Predictable ultra low latency
- Extreme IOPS and throughput
- Ideal for performance-driven applications



# Flash Storage Media Trends vs. SATA



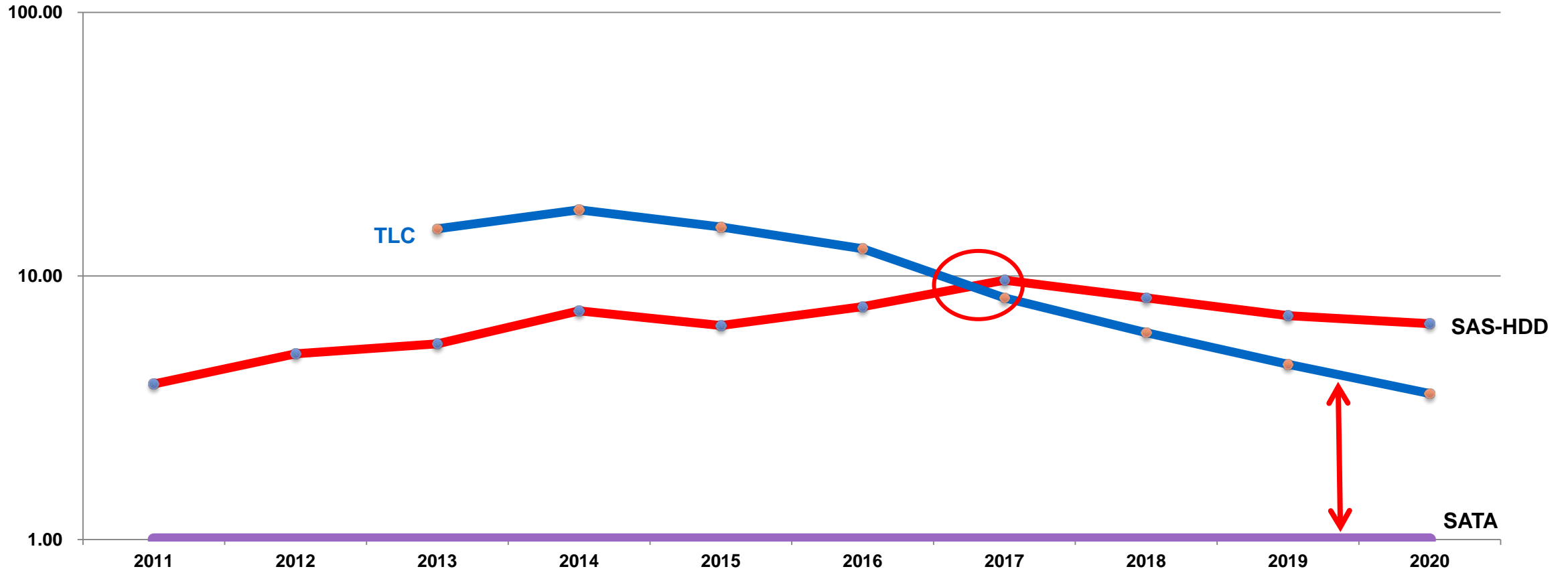
YOU ARE HERE



\* SATA is the baseline



# Cheapest Flash (TLC) vs. HDD's – Bye Bye SAS



**YOU ARE HERE** →

\* SATA is the baseline



# All-Flash Evolution vs. Revolution

## Wave 1 Explore

- New technology disruption
- Early adoption motivated by future opportunity
- Unproven reliability

## Wave 2 Adapt

- Existing solutions adapt
- Customers reassess trade-offs of Wave 1

## Wave 3 Evolve

- Flash technology evolves; adjacent/dependent technologies align
- Applications are re-architected; new applications emerge
- Expanded ability to handle multiple high-performance workloads

# Two Distinct Requirements In All-Flash Segment



Leverages **application-level** data management

## Optimized for Price/Performance

- Focus on low-latency performance
- Lightweight data management with application integration (plug-ins)
- Small footprint, low power usage
- Designed to scale-up



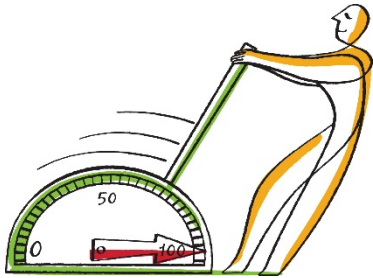
Delivers **array-based** data management

## Optimized for Rich Functionality

- Balance performance & features
- Robust data management with built-in efficiencies, protection
- Larger footprint, higher power
- Designed to scale-out

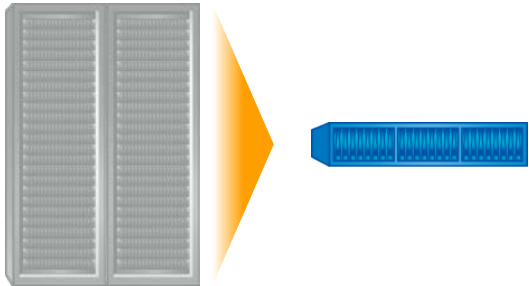
# Primary Drivers For All-Flash Arrays

Enterprises expect performance with high availability.



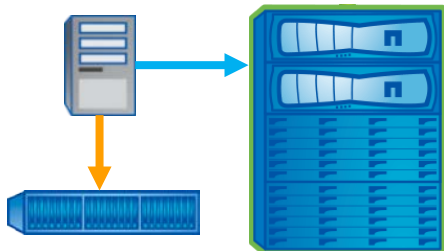
## Application Acceleration

- Business-critical apps looking for consistent, predictable, submillisecond responsiveness



## Stop Overprovisioning

- Dramatically reduce costs and increase efficiency through IOPS density

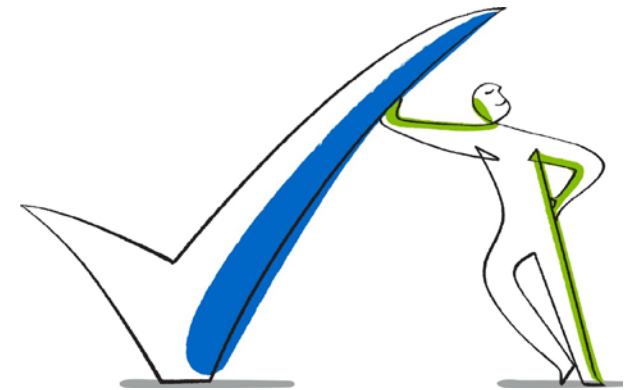


## I/O Offload

- Free core storage of I/O-intensive workloads that consume valuable shared resources

# Flash - One Size Does Not Fit All

- Data **doesn't** stay hot for life
- Customers need **data lifecycle mobility** between AFA, Hybrid & the Cloud
- Mission critical workloads require **high availability & support**
- Correctly **sizing your flash** is key to consistent performance
- **AFA's** will attract more workloads but **hybrid** will satisfy the majority



# Making Flash Work for the Enterprise Customer

Steve Knipple

*CTO / VP Engineering*

August 5, 2014

easy·street



# About Steve Knipple

- CTO, VP of Engineering at EasyStreet
  - Responsible for technology direction
- 20 years' experience in IT enterprise strategy, architecture, management and operations
- A specialist in Corporate IT transformational programs
  - ... which are always “transforming”
- Diverse experience: national and international (US, EMEA, APAC)
- Worked as both a “builder” and “buyer”
  - Prior Enterprise experience
  - Current Service provider experience



# About EasyStreet

- Specialized in personalized hybrid “IT-as-a-Service” solutions
  - Bringing together people, technology, and processes to deliver tailored, fully managed solutions
  - Colocation and fully managed clouds, data protection, compliance, and applications → ready for a hybrid world
  - Consultative approach providing strategic guidance, integration engineering, and ongoing enterprise class ITIL based operations
  - 19 year old company with 3 years operational experience using Flash (local SSD, hybrid arrays, all flash arrays)
- Based in Portland Oregon
  - National and International client base
  - Data Centers in Portland and Phoenix currently
  - Nationwide service delivery footprint expansion underway
- Two similar, but distinct client segments
  - Software Vendors – SaaS / eCommerce Applications
  - Enterprise



# Customer Segmentation

Enterprise	SaaS / Ecommerce
<p>Information Technology is not their core business but is critical to their operation.</p> <p>Information Technology can be a strategic differentiator, it can be a cost of business, it can be both</p>	<p>Information Technology is the foundation of the business</p> <p>Information Technology is the store front</p>



CIO / CFO

Requirements  
Reliability  
Predictable Performance  
Security



Developers, CTO

**EasyStreet Services**



# Storage Challenges for IaaS Providers



- High customer expectations
  - Predictable, repeatable performance (SLAs)
  - Unit pricing (\$ / GB / month)
  - Different levels of price / performance
  - Reliability, reliability, reliability
- Architectural flexibility
  - Reusability
  - Multi-tenancy
  - Scalability (very small to very large solutions)

# Use Case for Flash Arrays (AFA) ?

**Good for solutions where infrastructure provides the high availability**

- Hybrid arrays work well 90% of the time...
  - Until required data only exists on traditional disk
  - Difficult tradeoff for performance sensitive customers
  - Also difficult in shared environments
- Server-based solutions work well for environments with application-level replication

**High performance storage is business impacting for**

- SaaS/eCommerce clients
  - Faster site loads
  - Faster complex transactional queries against large data sets
- Enterprise clients
  - VDI workloads
  - Batch reporting performance (i.e. ERP systems)



# Technology Evaluation Criteria

- Company history and roadmap
  - Start-up vs. established firm
  - Product track record
  - Resources to execute on roadmap
- Performance
  - Raw IOPS and latency
  - Availability
- Operational Considerations
  - Installation and workload migration
  - Monitoring and alarming
  - Vendor support
- Pricing
  - Attractive price point for our client base



# Experience with the NetApp EF540 arrays

## ■ Testing methodology

- Deployment into EasyStreet standardized virtualization private platform
- EF540 with 12 disks (2 volumes: 6 disk, 5 disk, 1 spare), 10G iSCSI
- VMWare 5.1 at the hypervisor level
- Mix of Windows and CentOS virtual guests
- Multiple data block sizes (mainly 4k and 64k)
- Fio benchmarking tests for random and sequential reads and writes
- Iometer testing for real world mix of read/writes

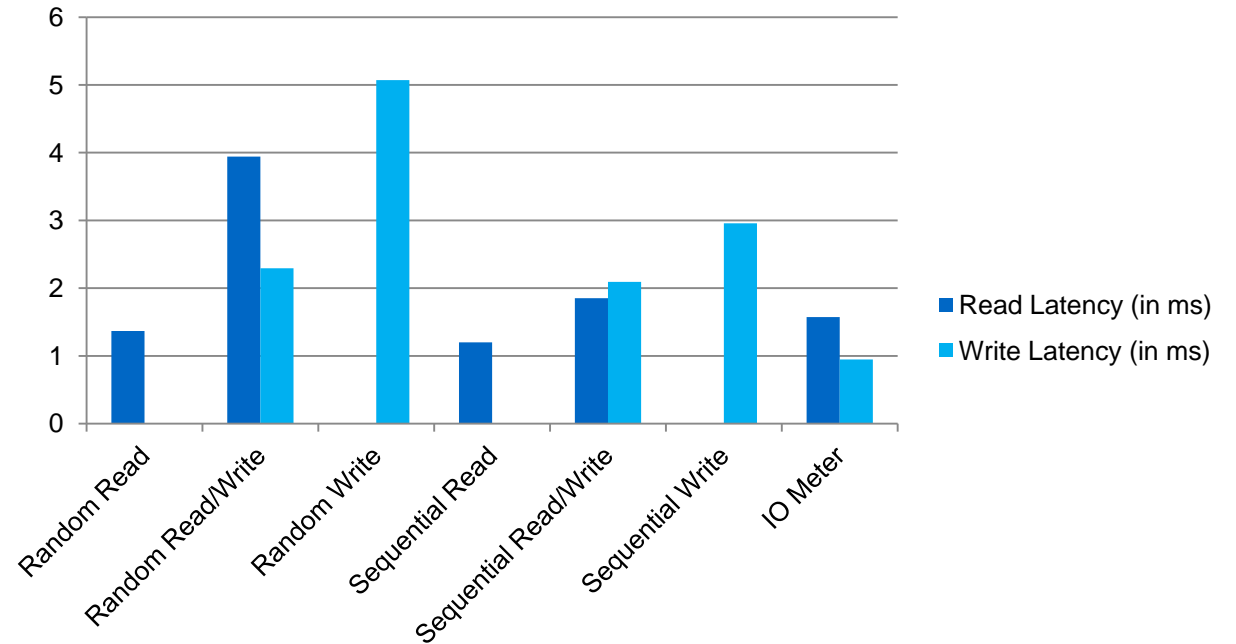
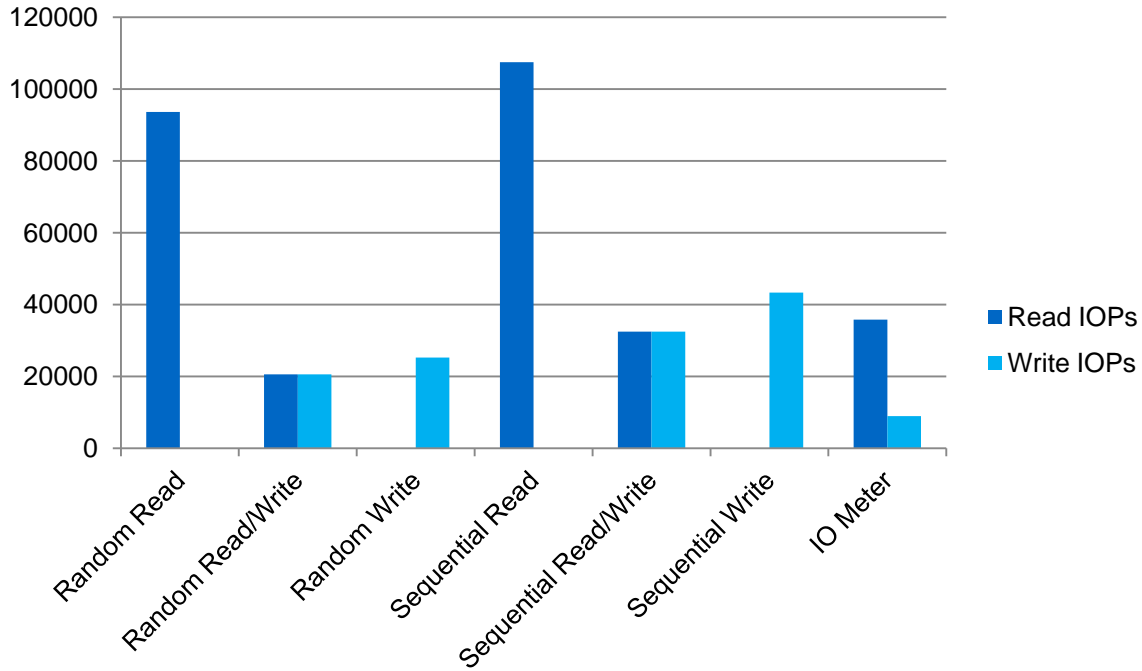
## ■ Results

- Performed as expected
- Consistently high IOP performance and low latencies
- Significantly different user experience at the virtual machine level... noticeable at first login



# EF Series Performance Results

Job Name	Read IOPs	Read Latency (in ms)	Read Bandwidth (in MB/sec)	Write IOPs	Write Latency (in ms)	Write Bandwidth (in MB/sec)
Random Read	93627.1	1.367793	365.6434658	0	0	0
Random Read/Write	20583.4	3.941817	80.43070898	20580.7	2.29418	80.42266699
Random Write	0	0	0	25230.3	5.071625	98.39324121
Sequential Read	107466.1	1.198509	419.6316465	0	0	0
Sequential Read/Write	32452	1.85117	126.8781279	32447.9	2.09274	126.8621406
Sequential Write	0	0	0	43341	2.956367	169.295543
IO Meter	35792.3	1.573101	220.5592891	8934.7	0.947288	55.0917002



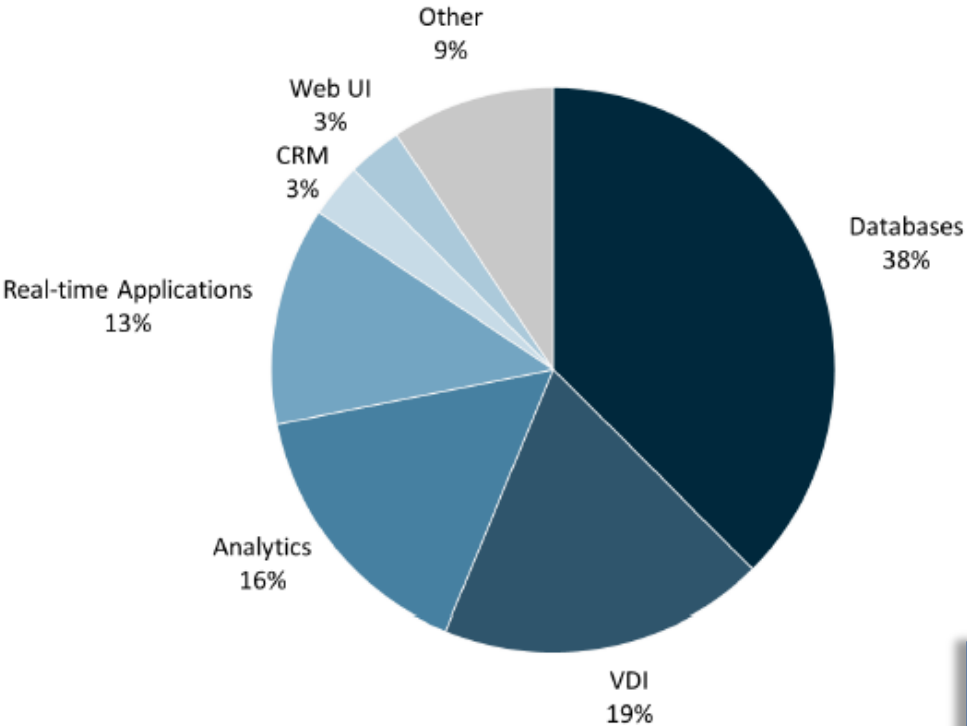
# Factors that led to NetApp Purchase



- Long relationship with NetApp
  - Good record of support and responsiveness
- Positive performance within our environment
- Experts available for installation and tuning
- Key for EasyStreet...
  - Our clients trust us to make the right technology choices for them
  - We take that very seriously
  - We back it with our SLAs

# EasyStreet Experience Consistent with Industry Research

Applications Being Moved to Flash – Excluding Autotiering



*2014 is the year of the All-flash Array  
-- 451 Research, 2014*

Q. Which category applications are being moved onto flash today? n=43.

Source: Storage – Wave 18 | © 2014 451 Research, LLC. www.451research.com

# Real Life Deployment

## Global Retailer with Worldwide ERP Hosted at EasyStreet

### EXAMPLE #1

- Large complicated supply chain with large batch jobs run on regular intervals
- Hosted on traditional SAS array
- SAS array augmented by all flash EF540
- Backup times reduced by 90%
- Batch jobs execution times reduced 20-50%



# Real Life Deployment

## Food Manufacturer with EasyStreet Managed Private Cloud

### EXAMPLE #2

- Large VDI deployment across office space and shop floor
- Diverse and unpredictable server workload mixed with and affecting VDI load
- Moved VDI load to EF540
- Login times reduced by 80%
- Significantly improved user experience

# Process for Moving Workloads

## Within EasyStreet Private and Public Clouds

- AFA (EF540) is connected via 10g iSCSI
- AFA is presented to VMWare cluster as a storage option
- VM Workloads moved with VMWare storage v-motion
- Loads moved non-disruptively between SAS arrays and AFAs
- DB LUNs are moved via file copies

# Summary

- Very pleased with AFAs (EF540)
- Excited about the future of flash storage arrays
- See flash storage significantly disrupting the storage landscape in the short term
- Multiple smaller SANs with different performance characteristics and price points are key during the transition phase from SAS to SSD
- Advanced analytics and IOP QoS will be future differentiators
- Supportability and vendor strength will be key for large investments



easy·street

## Questions and Answers

