Dell Solutions Tour 2014

Share ideas, discuss trends and discover
IT solutions of tomorrow.

Redefining The Economics of Enterprise Storage
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#DellST14

Fakta

Alder: 45 år

Fritidsinteresser: alpint skiløb, cykling (MAMIL)

Bopæl: Lund

Enneagram type: 1

Agenda

How we changed the economics of storage

The future of Dell Storage

Dell Performance Analysis Collection Kit

Storage

Redefining the economics of storage with Dell

Meet diverse enterprise workload needs with agile, efficient and future-ready storage solutions
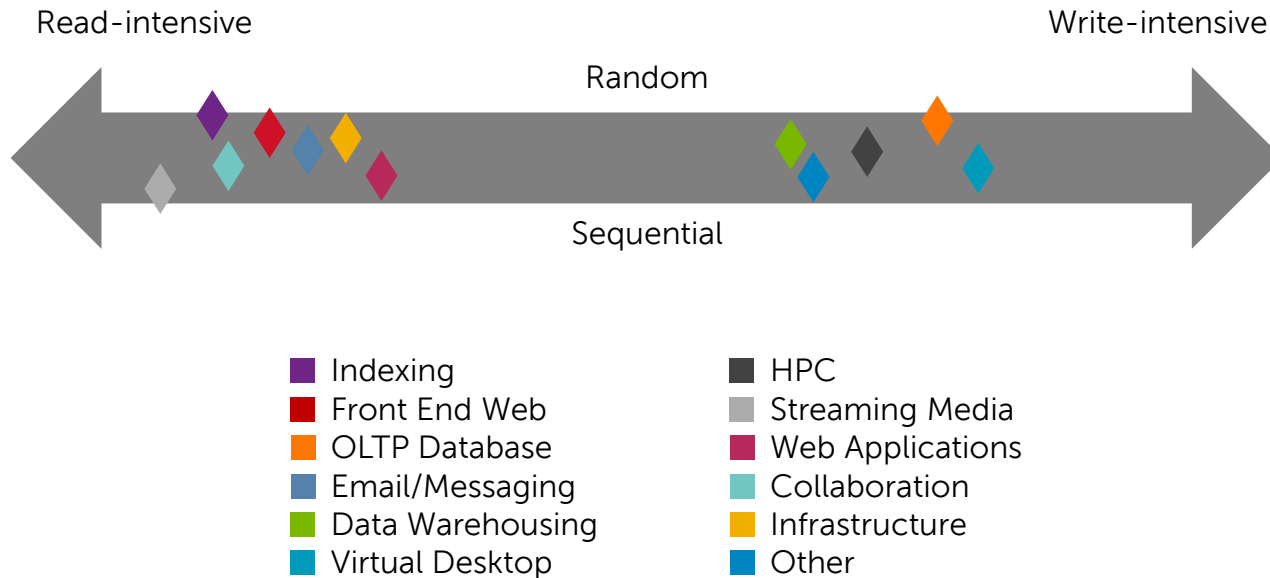
IDC

Highlights

- Gain financial advantages over legacy storage with Dell consolidation, standardization and automation capabilities

- Manage storage infrastructure more efficiently on a unified platform with common tools

- Optimize workloads with flash price/performance efficiency

- Simplify and de-risk storage acquisition with open standards solutions based on software-defined storage

"Dell's automated data management, extended product life span, remote management services and approach to storage licensing charges combine to form a uniquely differentiated proposition."

Source: Redefining the economics of storage,, *IDC White Paper*, August 2014. See full report: http://dell.to/1u0iVdg

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Data centers need to handle **many types of diverse application workloads**

Read-intensive

Write-intensive

Random

Sequential

■ Indexing	■ HPC
■ Front End Web	■ Streaming Media
■ OLTP Database	■ Web Applications
■ Email/Messaging	■ Collaboration
■ Data Warehousing	■ Infrastructure
■ Virtual Desktop	■ Other

- Applications are getting more dependent on higher I/O performance

- Traditional storage systems are optimized for the middle of the spectrum

- Data stored, backed up and archived is growing exponentially

- SLAs are becoming more rigorous

- IT budgets are often staying flat

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What characterizes **your workloads**?
Traditional "one size fits all" data storage strategy is inefficient

Performance
- Hot data that needs to be retrieved extremely fast without latency
- IOPS vs. throughput

Access patterns and frequency
- Data accessed frequently vs. cold, rarely accessed data
- Heavily read vs heavily written data
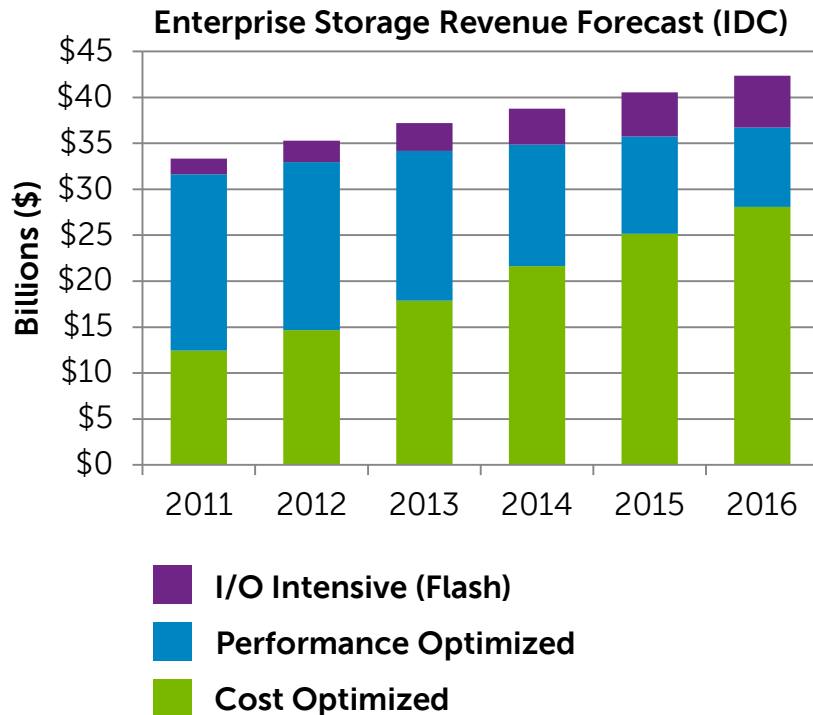- Data optimized for tiering vs caching

I/O patterns
- Read and write percentages
- Transfer sizes
- Sustained vs. bursty I/O patterns

Business value
- Data that is highly valuable to the business and can be used for deriving business intelligence, financial analysis, etc.

Each type of data needs to be treated differently to align the application performance with capacity and cost requirements

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Reliance on **I/O-intensive solutions** for critical applications is growing

Enterprise Storage Revenue Forecast (IDC)

Billions ($)

	2011	2012	2013	2014	2015	2016

Legend:
- **I/O Intensive (Flash)**
- **Performance Optimized**
- **Cost Optimized**

Hot/ Active Data → I/O intensive solutions growing at 57% CAGR as SSD prices are reduced

Cold/ Static Data → Cost/capacity optimized 19% CAGR growth is driven by the explosion of unstructured data

IT Managers are looking for storage solutions that can span both, hot and cold data, optimizing for performance and value

IDC,, Worldwide Enterprise Storage Systems 2013–2017 Forecast, May 2013; Doc #241033

Storage

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Flash adoption is accelerating

Pent-up demand for improving application performance at the right price point

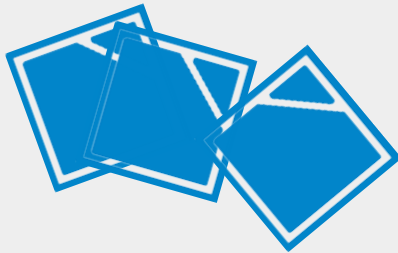## Flash prices falling faster than HDDs but still considerably higher than 15K HDDs

$/GB

15K HDD

Flash SSD

7.2K HDD
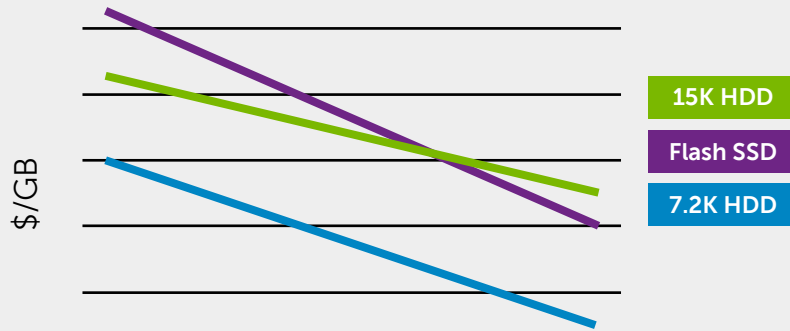
New form factors: PCIe cards, appliances, shared storage
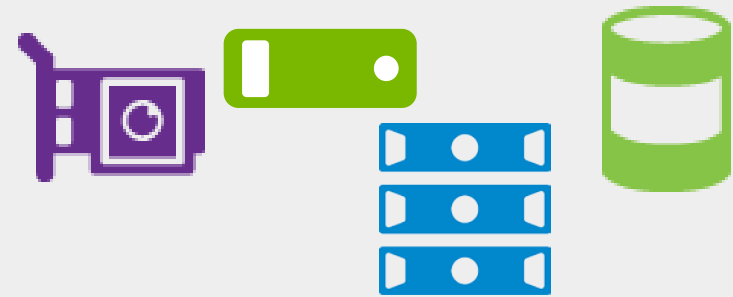
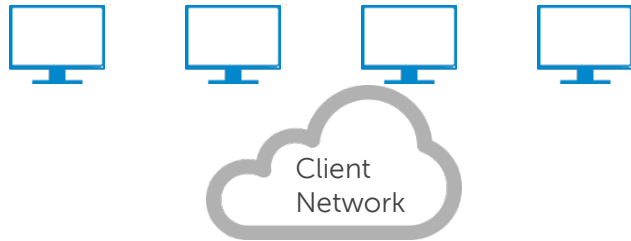## Multi-core processors drive up processor utilization and demand for more I/O per server

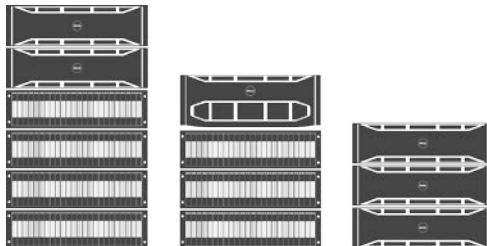## Virtualization is increasing the demand for random I/O with the "mixer effect"

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Flash storage can be deployed at **various layers** to accelerate application performance

Client Network

Dell Fluid Cache on PowerEdge

Storage Network

Dell Compellent All-Flash or Hybrid-Flash Array

Server-based cache (Tier-0)

- Flash drives placed directly on high speed PCI bus in application servers
- Caching software enables server to leverage flash storage as an extension of memory cache
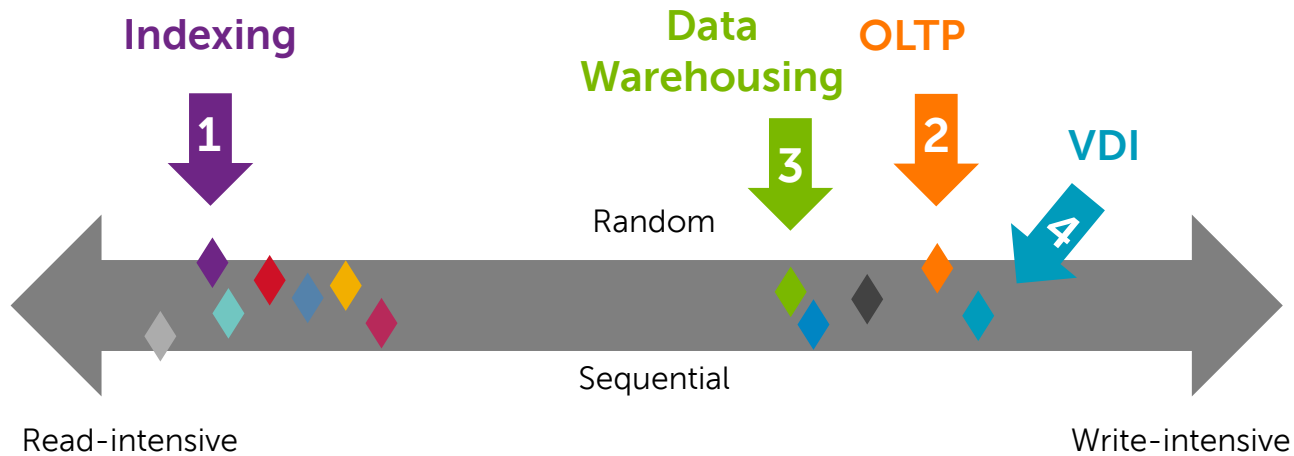
SSD tiering in shared storage

- A few SSDs can be added to the array to dramatically increase performance for targeted workloads

OR

- An entire storage tier can be deployed on SSDs so that complete volumes and datasets can be fit in flash

Fluid Cache for SAN

- Benefits of Fluid Cache extended to the entire SAN for maximum performance and reliability

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Best use of flash storage: **transactional, IOPS-intensive workloads**

Indexing

1

Data Warehousing

3

OLTP

2

VDI

4

Random

Sequential

Read-intensive

Write-intensive

Indexing
- Maintains indexes to allow quicker access to data
- Runs on databases to accelerate locating a block of data in queries

Data Warehousing
- Stored data used to create reports or derive Business Intelligence
- Used for data mining, analysis, hypothesis testing, modeling

OLTP
- Manage transaction-oriented applications, i.e. retail, banking
- Business can be hurt if data not accessible,slow
- During peak usage, customer experience can be effected

VDI
- Hosting desktop OS within a VM on a centralized server
- Facilitate a quick retrieval of gold images
- Boot storms, write allocations and latency are issues

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What can flash storage do in **your data center**?

A way to accelerate business results and improve operational efficiency

Accelerate business

- New revenue streams through reduction in latency and increase in IOPS
- Quicker business insights
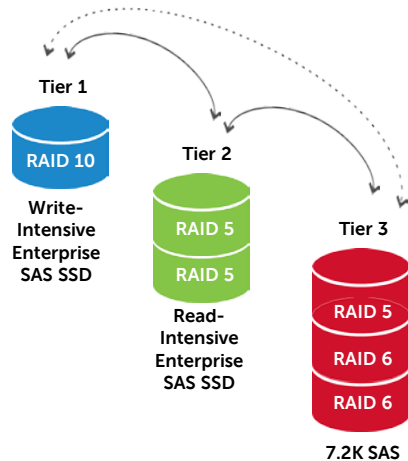- Faster user access
- Better customer experience

Increase operational efficiency

- Minimized datacenter footprint
- Lower power consumption
- Lower cost of software licenses
- Simplified management

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Compellent introduces **flash innovations** that **change the economics of flash storage**

Storage Center 6.4

- Extends tiering to multiple flash types
- Data progression enhancements
- Best performance at the lowest possible cost

Tier 1
RAID 10
Write-Intensive Enterprise SAS SSD

Tier 2
RAID 5
RAID 5
Read-Intensive Enterprise SAS SSD

Tier 3
RAID 5
RAID 6
RAID 6
7.2K SAS

Flash enclosure

- 80% lower cost than most all-flash solutions
- Industry's first MLC & SLC SSD intelligent flash tiering
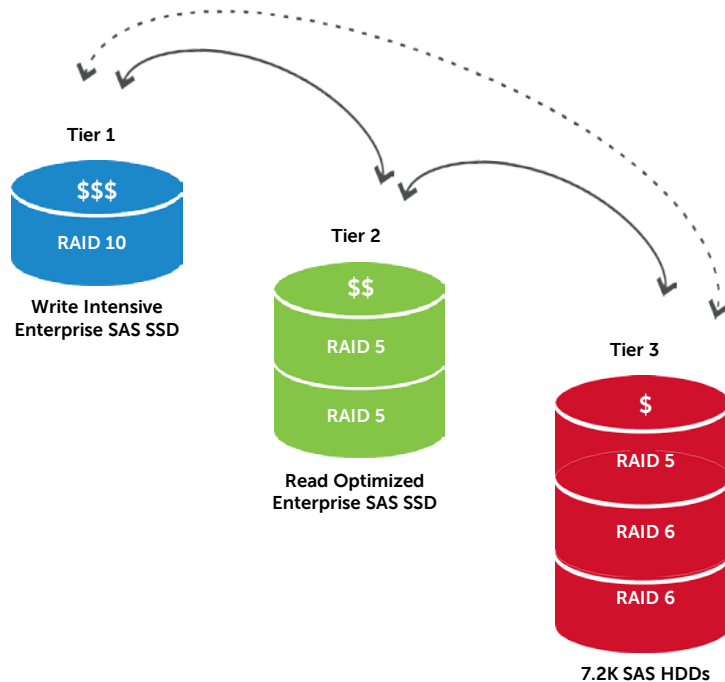- Introduces new 1.6TB MLC SSDs

Dense enclosure

- Densest solution of any major vendor with 336TB in 5U
- Designed for cost/capacity optimized data growth
- Ideal as Tier 3 in hybrid arrays

SC 6.4 combined with flash enclosures delivers high-performance flash storage at a fraction of the cost compared to other storage solutions.

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Secret sauce behind the flash optimized Compellent: **tiering with Data progression**

Tier 1

$$$

RAID 10

Write Intensive Enterprise SAS SSD

Tier 2

$$

RAID 5

RAID 5

Read Optimized Enterprise SAS SSD

Tier 3

$

RAID 5

RAID 6

RAID 6

7.2K SAS HDDs

Flash-optimized Data Progression leverages the endurance of write-intensive SSDs and the value of read-intensive SSDs.

SearchServerVirtualization.com
BEST OF vmworld 2010
FINALIST AWARD
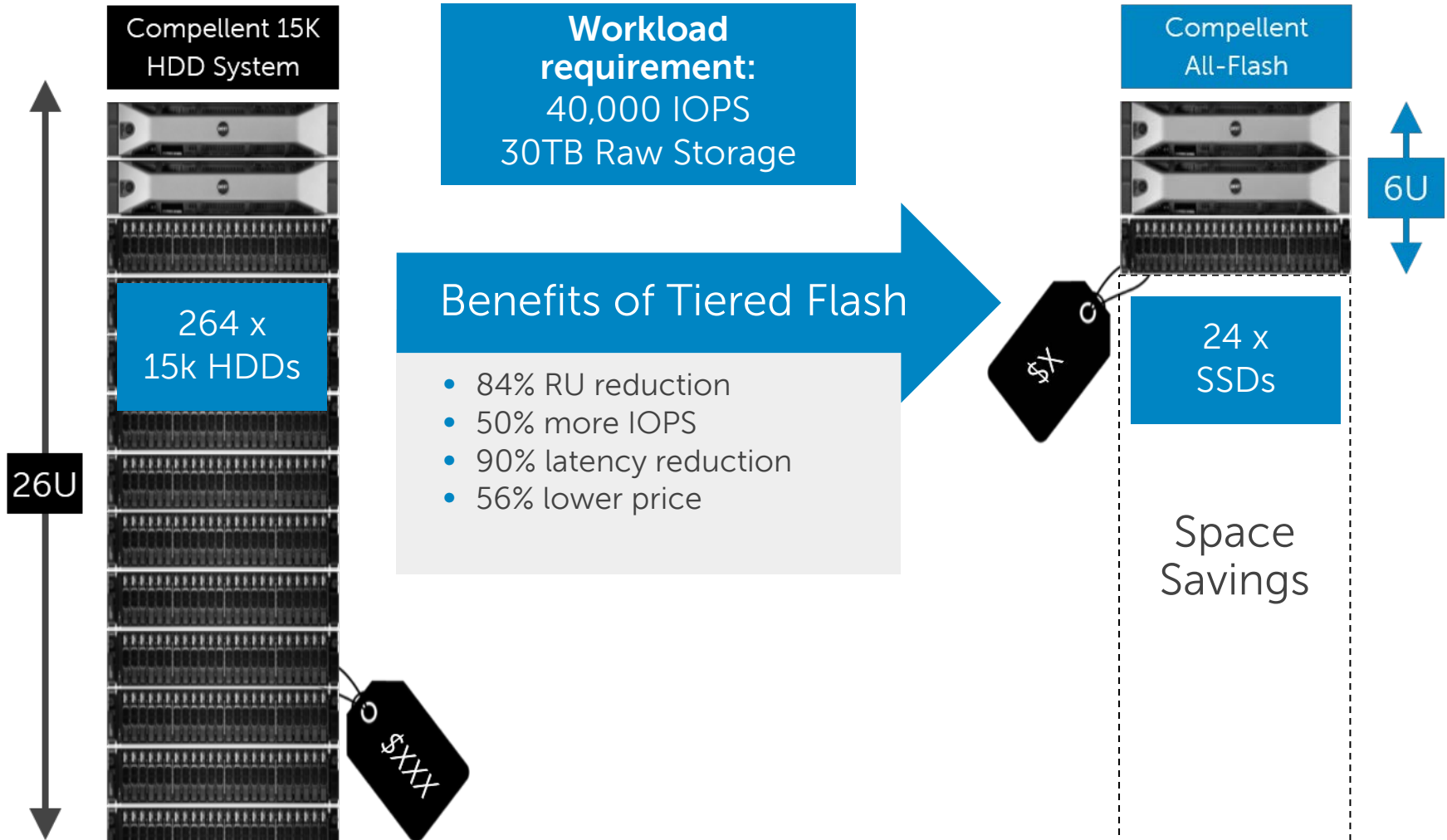HARDWARE FOR VIRTUALIZATION

Advanced software tiering seamlessly manages data

- Incoming writes are written to the write intensive SSDs for fast access

- Read intensive data is automatically moved to less expensive read optimized SSDs keeping Tier 1 free for new incoming writes

- Cold and non-performance data is migrated to lower tier, less expensive rotating disk

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New economies of flash: tiering innovations allow Compellent to offer **flash at the price of disk**

Compellent 15K HDD System

264 x 15k HDDs

26U

$XXX

Workload requirement:
40,000 IOPS
30TB Raw Storage

Benefits of Tiered Flash

- 84% RU reduction
- 50% more IOPS
- 90% latency reduction
- 56% lower price

Compellent All-Flash

6U

24 x SSDs

$X

Space Savings

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New economies of flash with Compellent :
1/5th the price vs. competitive all-flash solutions

Compellent

With Flash Tiering

Other Vendors
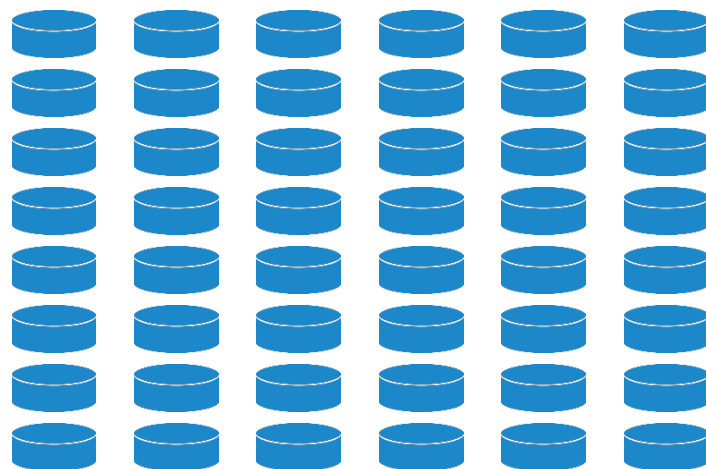
Single SSD type (SLC or eMLC) only
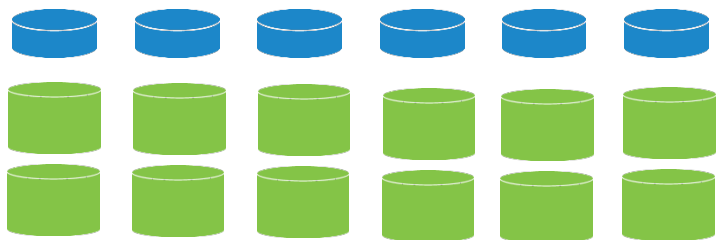
Write Intensive (SLC)

Read Intensive (MLC)

80%
Lower costs

Higher costs

Hardware ▲

Power / Cooling ▲

Software ▲

Support ▲

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Slash costs with **more efficient use of every disk**

Instant Deployment of New Technologies

Thin Provisioning

Automated Tiered Storage
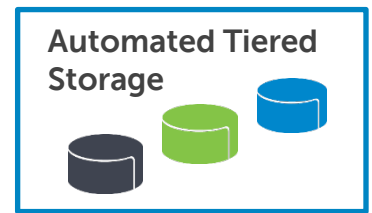
Block-Level Intelligence

Unified Block and File

Thin Replication

Perpetual Licensing Model

Fast Track

Space efficient snapshots

Compellent can reduce total storage software costs up to 96% and hardware costs up to 44% over a 10 year period.

- No pre-allocation required with Thin provisioning

- Buy fewer and less expensive drives with Automated tiered storage

- Cost-effective Disaster Recovery with Thin Replication

- Single solution for unified block and file

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Designed to address **multiple performance levels**
Compellent helps align storage performance with workload requirements

All-flash for business critical workloads

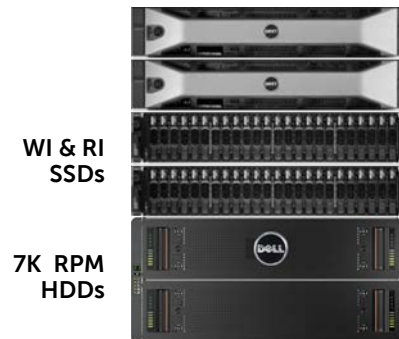**Large capacity flash with low latency and scalability**

- Tier 1 applications
- OLTP Oracle database
- VDI gold images and logs
- Big data analytics

WI & RI SSDs

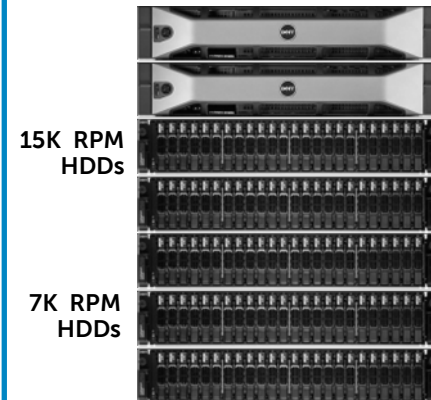### Hybrid for general workloads

Capacity with mainstream application performance

- Better performance with limited flash capacity
- General workloads

WI & RI SSDs

7K RPM HDDs

Cost optimized HDD-based for lowest $/GB

Large capacity, lowest $/GB

- When large datasets are required
- Data that is not performance sensitive
- Backup and archive

15K RPM HDDs

7K RPM HDDs
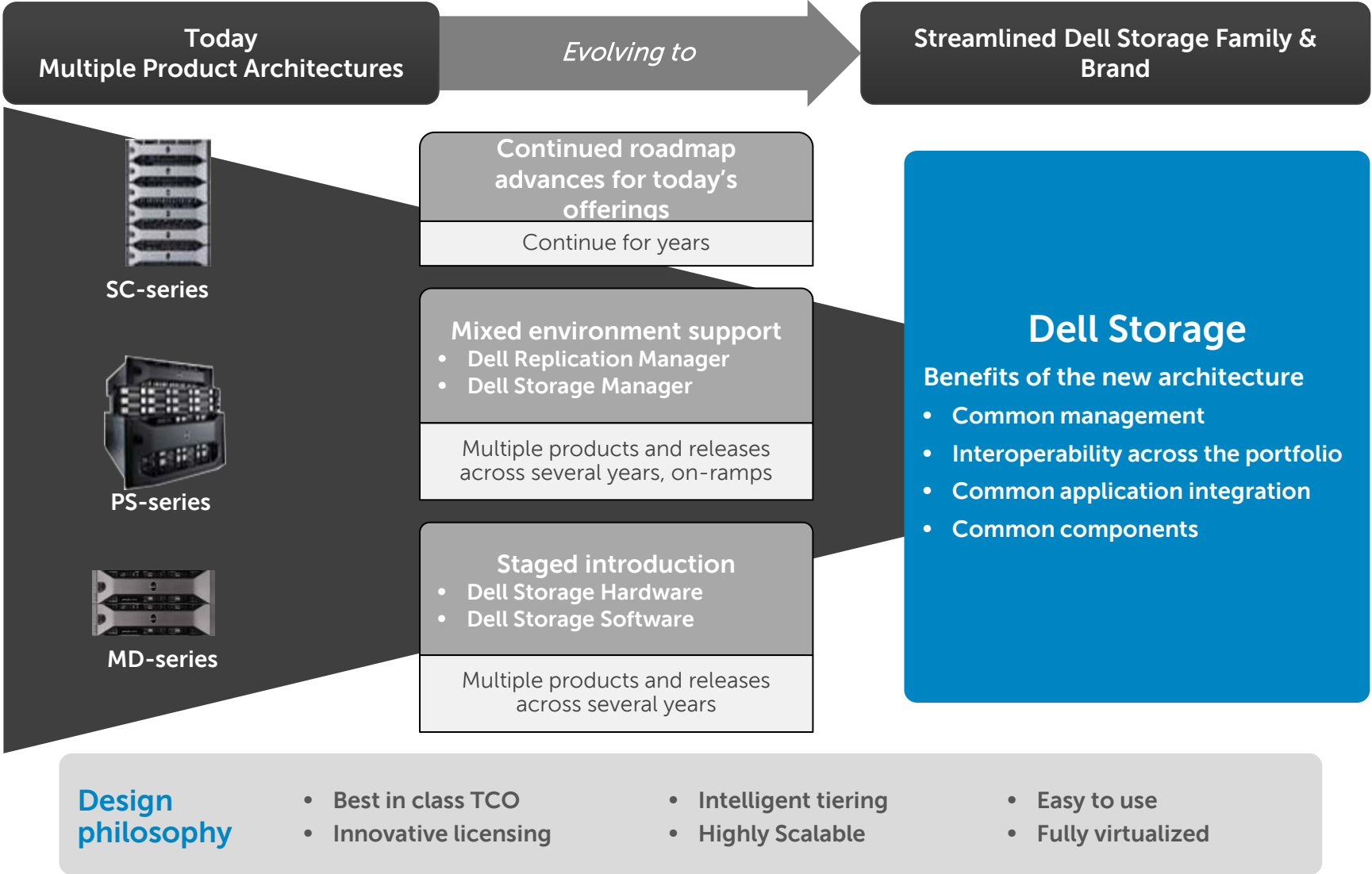
DELL Storage

The Direction of Dell Storage

Storage

Dell is the No. 1 worldwide storage vendor in total terabytes sold.

No company ships more storage capacity than Dell, more than 4 exabytes in the first half of 2014.

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Continuing to Redefine the Economics of Enterprise Storage

Today Multiple Product Architectures	*Evolving to*	Streamlined Dell Storage Family & Brand

SC-series

PS-series

MD-series

Continued roadmap advances for today's offerings
Continue for years

Mixed environment support
- **Dell Replication Manager**
- **Dell Storage Manager**

Multiple products and releases across several years, on-ramps

Staged introduction
- **Dell Storage Hardware**
- **Dell Storage Software**

Multiple products and releases across several years

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Benefits of the new architecture

- **Common management**
- **Interoperability across the portfolio**
- **Common application integration**
- **Common components**

Design philosophy	• Best in class TCO • Innovative licensing	• Intelligent tiering • Highly Scalable	• Easy to use • Fully virtualized

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Investment Protection – Today and Tomorrow

EqualLogic 5-year TCO savings 41% or higher depending on configuration

Compellent Flash-optimized solutions cost an average of up to 59% less per GB than comparable solutions

Evolve with technologies and timing to meet your needs

Path to the Future	Roadmaps: Short & Long Term	EqualLogic & Compellent Together
• **EqualLogic** plans include data mobility and common management with the Dell Storage Architecture family providing investment protection now and in the future	• **EqualLogic** roadmap continues for both software and hardware	• Increasingly common
• **Compellent** software upgrade plans include Dell Storage Architecture capabilities	• **Compellent** roadmap continues for both software and hardware	• **Cross platform replication** for data mobility
	• **Joint roadmap** – planning for EqualLogic, Compellent and the Dell Storage Architecture is done jointly	• **Common management** for ease of administration
		• **Tested Configurations & Best Practices** reduces risks
		• **Designed in** as a routine part of all roadmaps in future

The Dell Storage Journey

SC Family

Dell Storage Architecture

Dell Storage Manager

Cross Platform Replication

Unified Management

PS Family

Today

Next Year

Future

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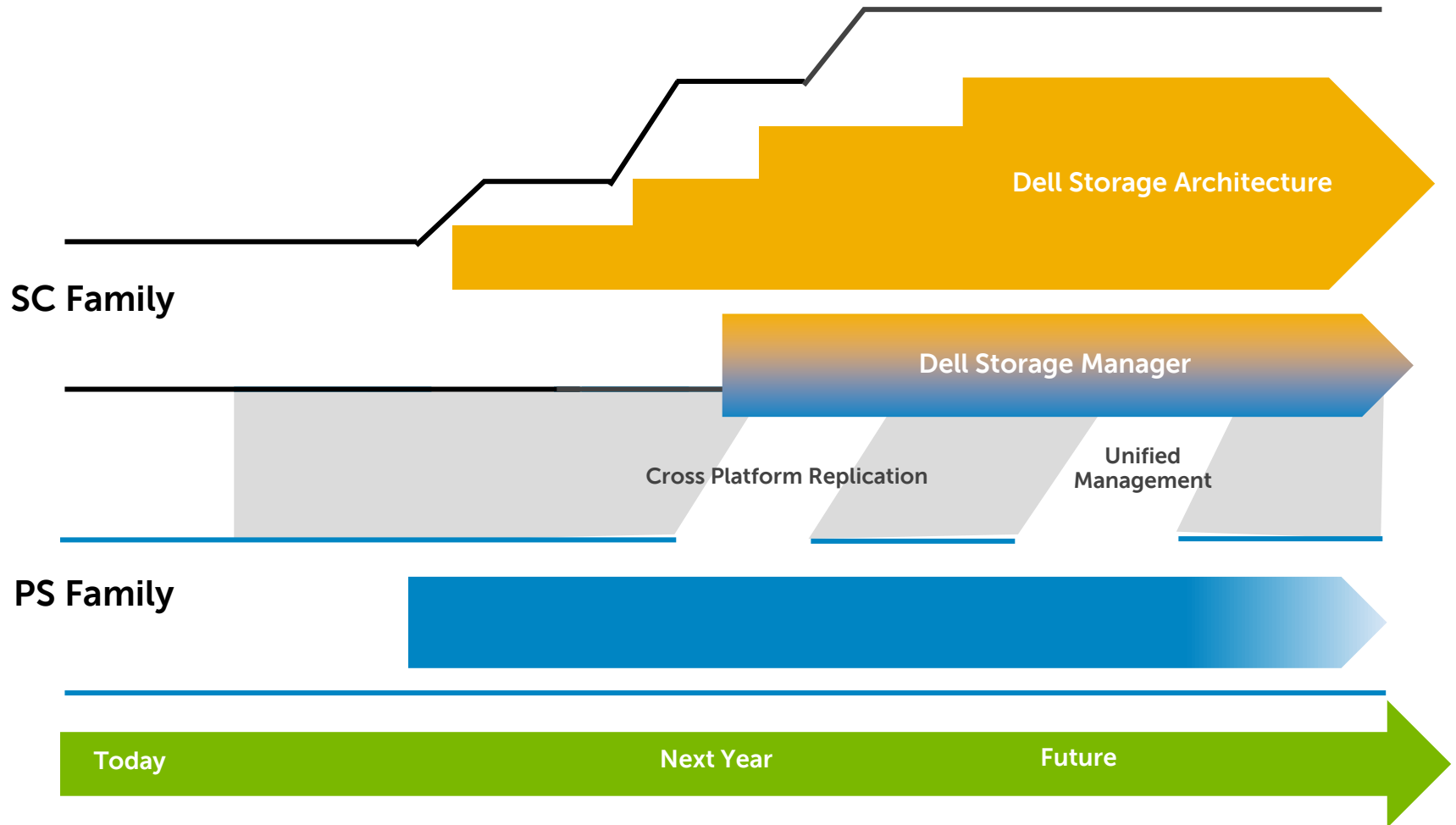
Compute solutions from office scale to hyperscale
Dell Servers

#1 in **Americas** in **x86 server** units

#2 in **EMEA** in **x86 server** units

#2 in **APJ** in **x86 server** units[1]

2014 Server of the **Year**[2]
Dell PowerEdge
VRTX
1st integrated solution for **ROBO** & **SMB**

World's **most**
power-efficient
blade server[3]

2x
density of any other
blade system[4]
1st quarter-height blade for dense computing

99% reduction in **server** configuration time[5]

Industry firsts[6]
⚡ **Express Flash PCIe SSD**
🖥 **Comprehensive agent-free management**
🔌 **Titanium power efficiency**

[1]IDC Worldwide Quarterly Server Tracker, Q2 2014.

[2]http://www.infoworld.com/slideshow/135876/infoworlds-2014-technology-of-the-year-award-winners-234225#slide26

[3]SPEC and the benchmark name SPECpower_ssj are trademarks of the Standard Performance Evaluation Corporation. Based on benchmark results based on best SPECpower_ssj2008 results published as of July 2014. For the latest SPECpower_ssj2008 benchmark results, visit http://www.spec.org/power_ssj2008/results/power ssj2008.html. Actual performance will vary based on configuration, usage and manufacturing variability.

[4]PowerEdge M420 quarter-height server compared to half-height servers.

[5]Based on Principled Technologies report "Simplifying systems management with Dell OpenManage on 13G Dell PowerEdge servers," commissioned by Dell, testing Dell 13th generation R730 with Enterprise-level Dell systems management.

[6]AD#G12000810.

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Dell Software Defined Storage offerings

Software Defined Storage

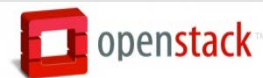| Storage Spaces	OpenStorage	Virtual SAN	Storage Server	Unified & Distributed
DELL	DELL	DELL	DELL	DELL
Microsoft	nexenta — Enterprise class storage for everyone	vmware	redhat	ceph

Big Data	Object Storage	OpenStack	EVO: RAIL	Web-Scale Converged
DELL	DELL	DELL	DELL	DELL
hadoop	caringo	openstack	vmware	NUTANIX

Dell XC-Series Appliances

DPACK

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What characterizes **your workloads**?

Performance
- Hot data that needs to be retrieved extremely fast without latency
- IOPS vs. throughput

Access patterns and frequency
- Data accessed frequently vs. cold, rarely accessed data
- Heavily read vs heavily written data
- Data optimized for tiering vs caching

I/O patterns
- Read and write percentages
- Transfer sizes
- Sustained vs. bursty I/O patterns

Business value
- Data that is highly valuable to the business and can be used for deriving business intelligence, financial analysis, etc.

Use DPACK to unveil

DELL Storage

DPACK Results review

Co-Branding

Report Summary – Aggregation of both IOPS, memory, and MB/s. This summary takes into account the time of performance peak across server workloads.

This provides a highly accurate simulation of what the combined workload will look like on a virtual storage array.

A 95 percentile is an industry standard that IO demands, but excludes anomalies that can be handled at an acceptable rate by a systems cache.