Redefining the Economics of Enterprise Storage

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Customer Questions about Flash

- How can I accelerate my applications without adding headcount?

- How do I achieve the lowest possible $/GB or $/IOPS?

- Once data is written, it's barely used so why am I forced to store it on expensive SSD drives?

- How much longer will 7K RPM HDD provide the lowest $/GB?

- How do I know which SSD drive type, SLC, MLC or TLC, has the right endurance without overpaying?

- There's a lot of new SSD drives and arrays entering the market daily, how do I future proof my enterprise?
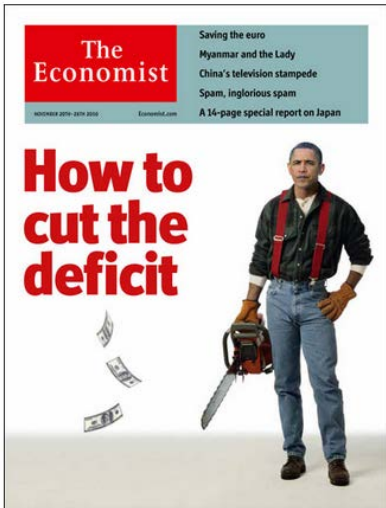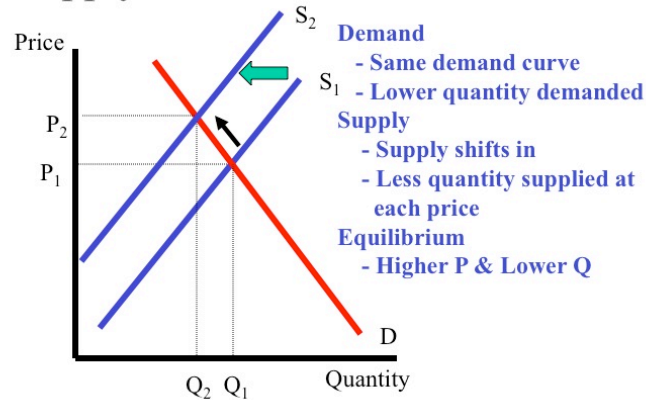
Today's Outline

- Market data

- Why tiering works addresses economic, new technology innovation, and data value

- TLC overview

- Tiering can protect less endurant drives

- Cost / GB comparison

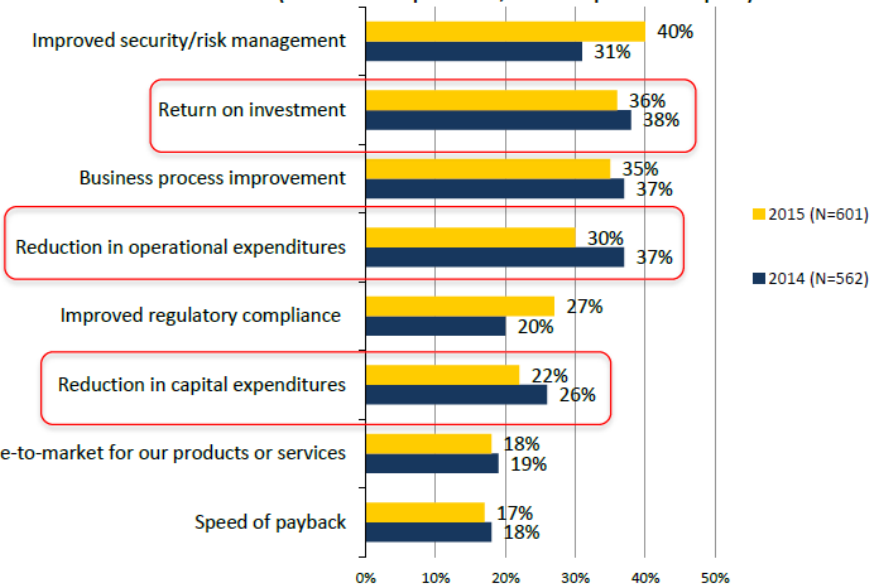- Case study

Redefining the Economics of Enterprise Storage

Supply Shifts Left

Price

S_2

S_1

P_2

P_1

D

Q_2 Q_1 Quantity

Demand
  - **Same demand curve**
  - **Lower quantity demanded**

Supply
  - **Supply shifts in**
  - **Less quantity supplied at each price**

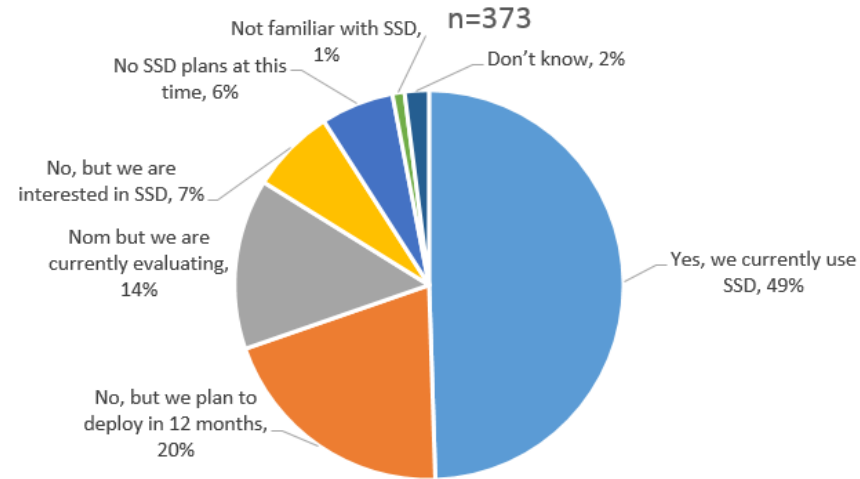**Equilibrium**
  - **Higher P & Lower Q**

Cost is the No. 1 driver for flash adoption

Which of the following considerations do you believe will be most important in justifying IT investments to your organization's business management team over the next 12 months? (Percent of respondents, three responses accepted)

Consideration	2015 (N=601)	2014 (N=562)
Improved security/risk management	40%	31%
Return on investment	36%	38%
Business process improvement	35%	37%
Reduction in operational expenditures	30%	37%
Improved regulatory compliance	27%	20%
Reduction in capital expenditures	22%	26%
Reduced time-to-market for our products or services	18%	19%
Speed of payback	17%	18%

Source: Enterprise Strategy Group, 2015.

Use of SSD in servers or storage

n=373

- Not familiar with SSD, 1%
- Don't know, 2%
- No SSD plans at this time, 6%
- No, but we are interested in SSD, 7%
- Nom but we are currently evaluating, 14%
- No, but we plan to deploy in 12 months, 20%
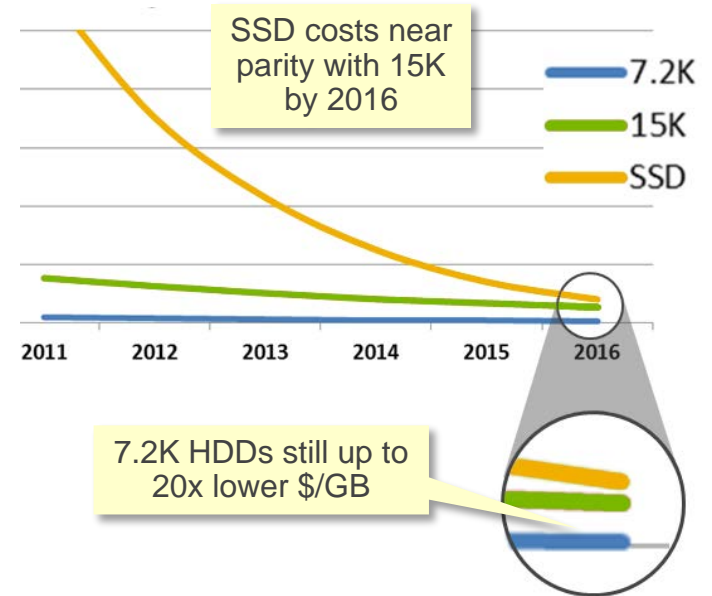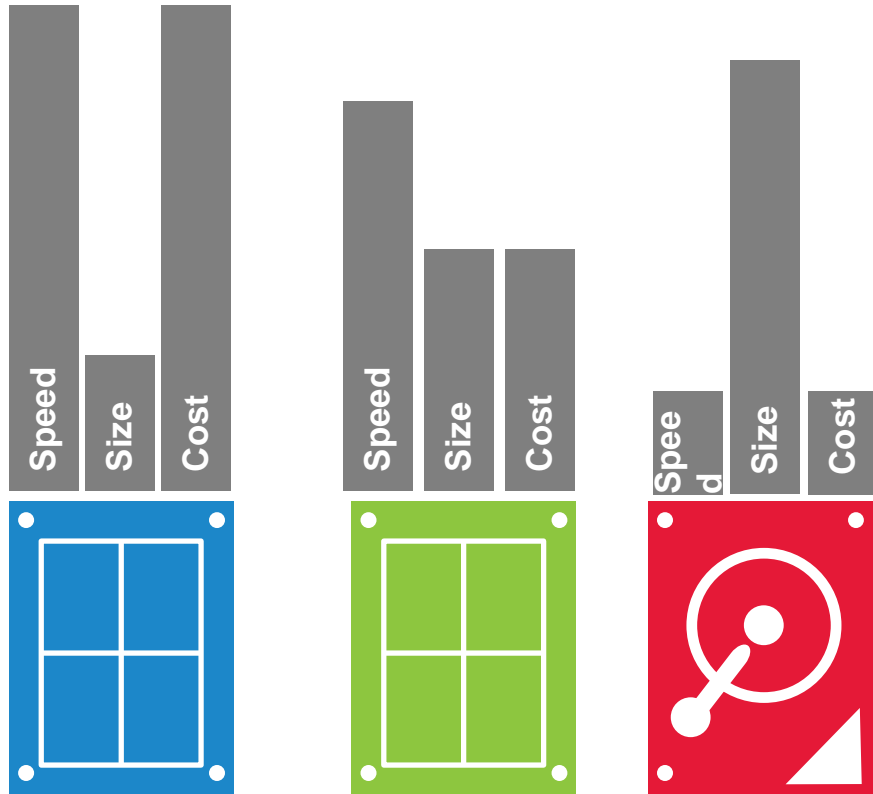- Yes, we currently use SSD, 49%

5

High Cost of Inactive Data

"**Enterprises consistently report that only 20-25% of their data is primary while rest is secondary.**"

"85% of production data is inactive – 68% not accessed on 90 days "
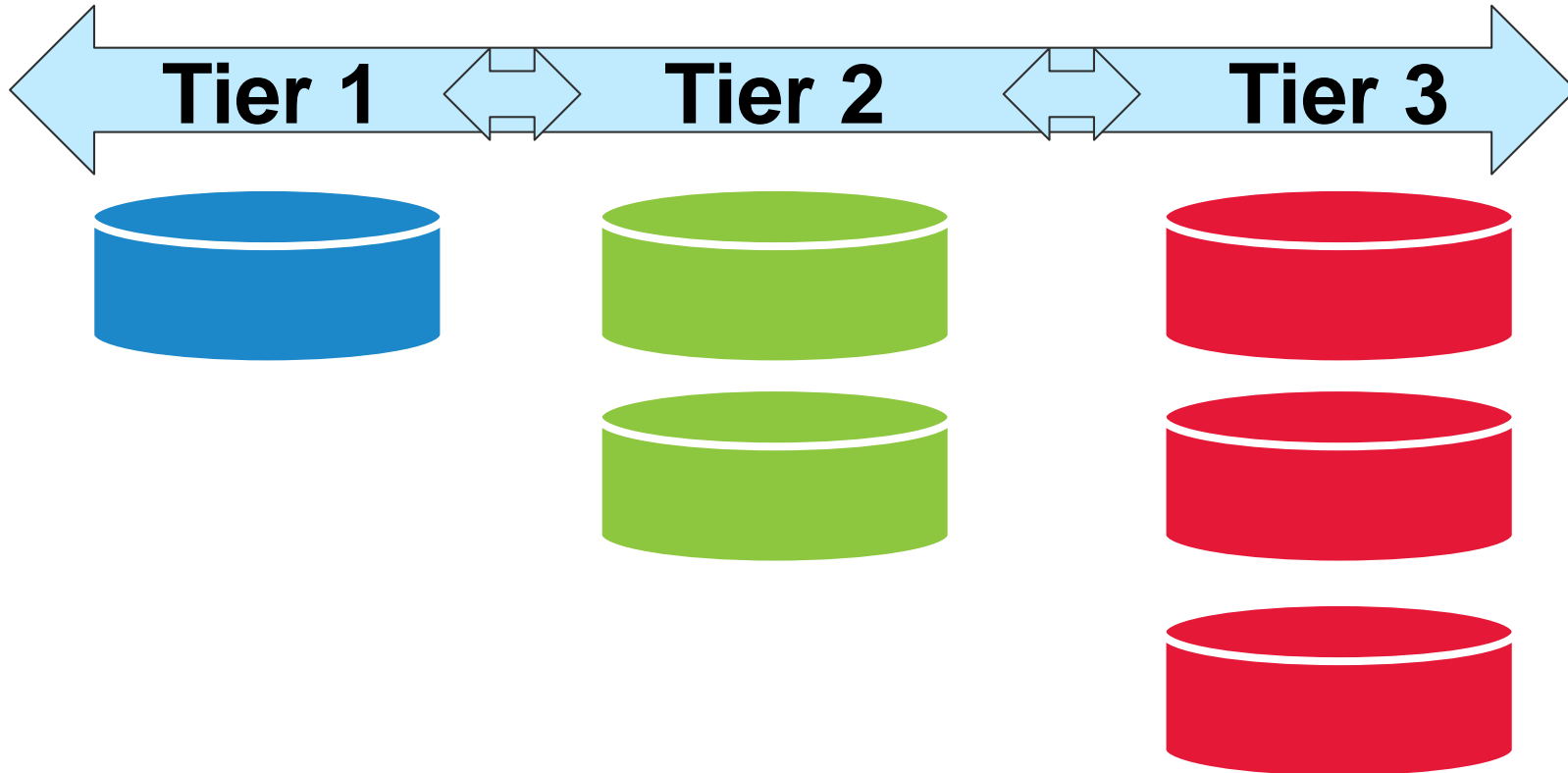
Different Cost and Performance Options

SLC/MLC SSD **TLC SSD** **7.2K HDD**

SSD costs near parity with 15K by 2016

7.2K HDDs still up to 20x lower $/GB
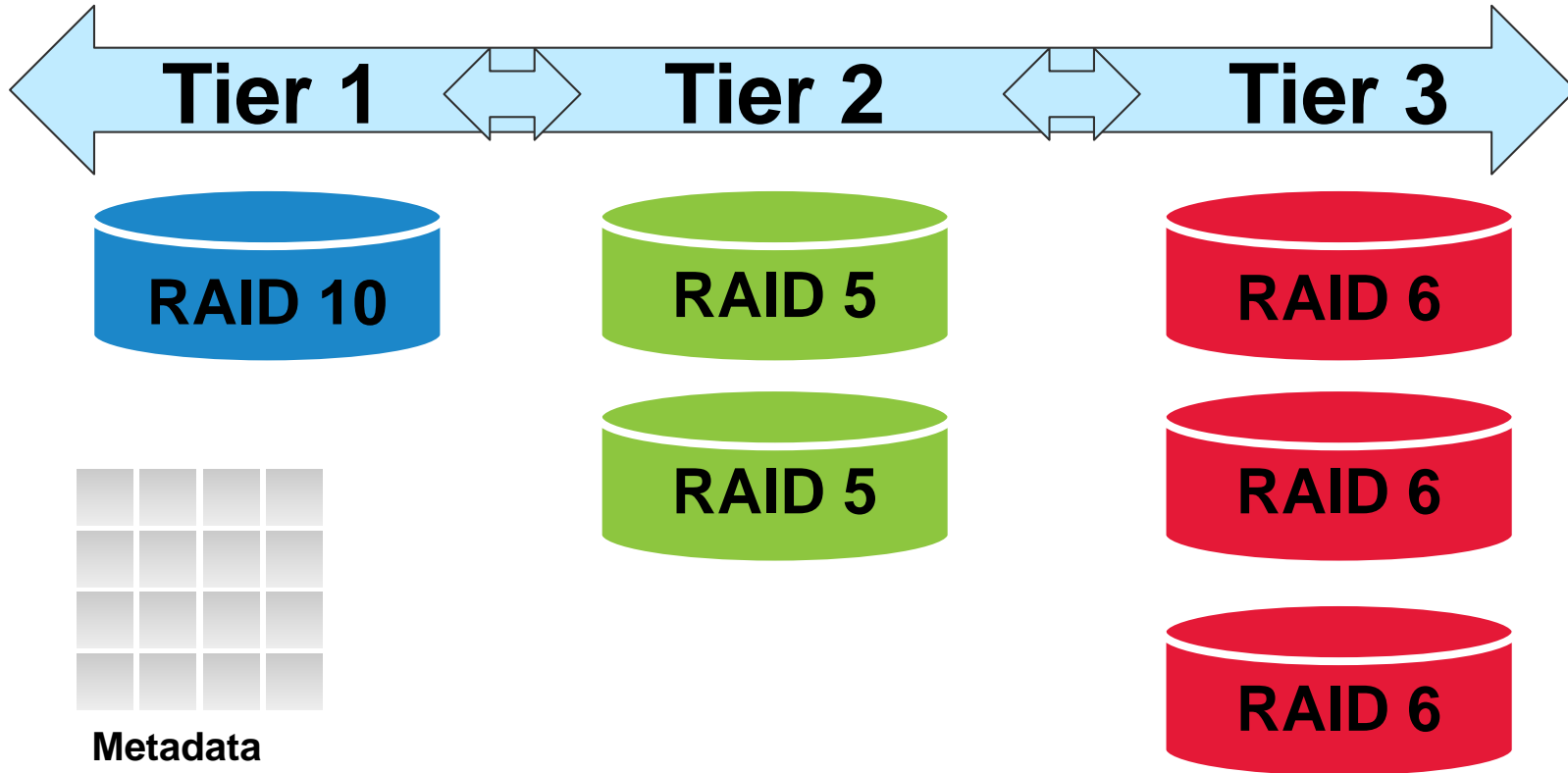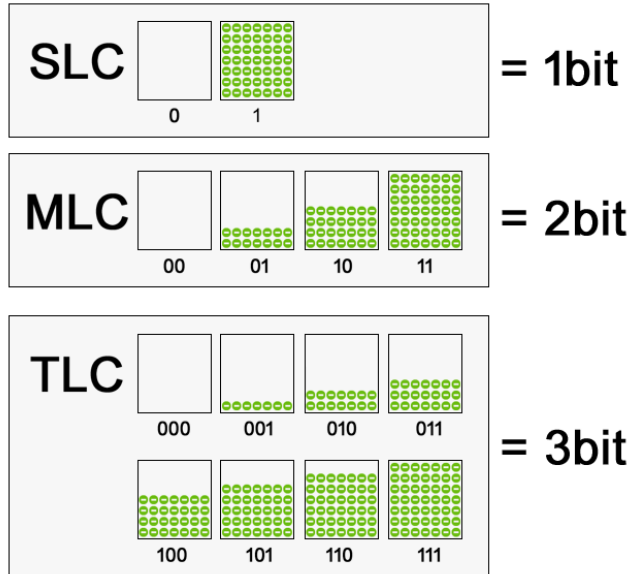
7.2K
15K
SSD

2011 2012 2013 2014 2015 2016

Tiered Storage Architecture Addresses Problem

Tiered Storage Architecture Addresses Problem

Overview and Use of TLC Technology

	Endurance	Cost	Common Use
SLC	High	High	Enterprise
MLC	Med	Med	Mixed
TLC	Low	Low	Consumer

Tiered Storage Architecture Solves Problem

Writes from Application

Directed to Tier 1
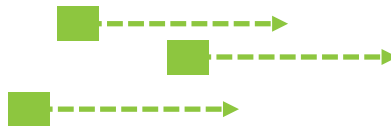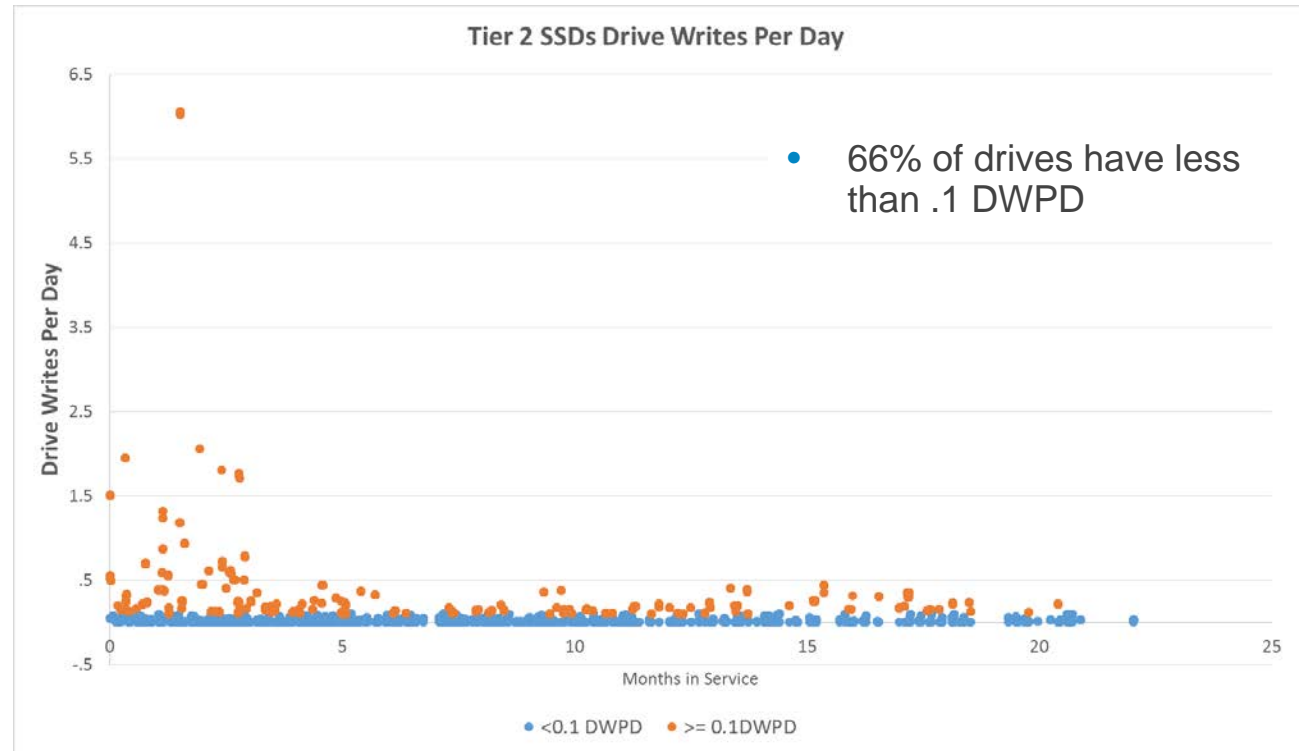
Virtualized Volume
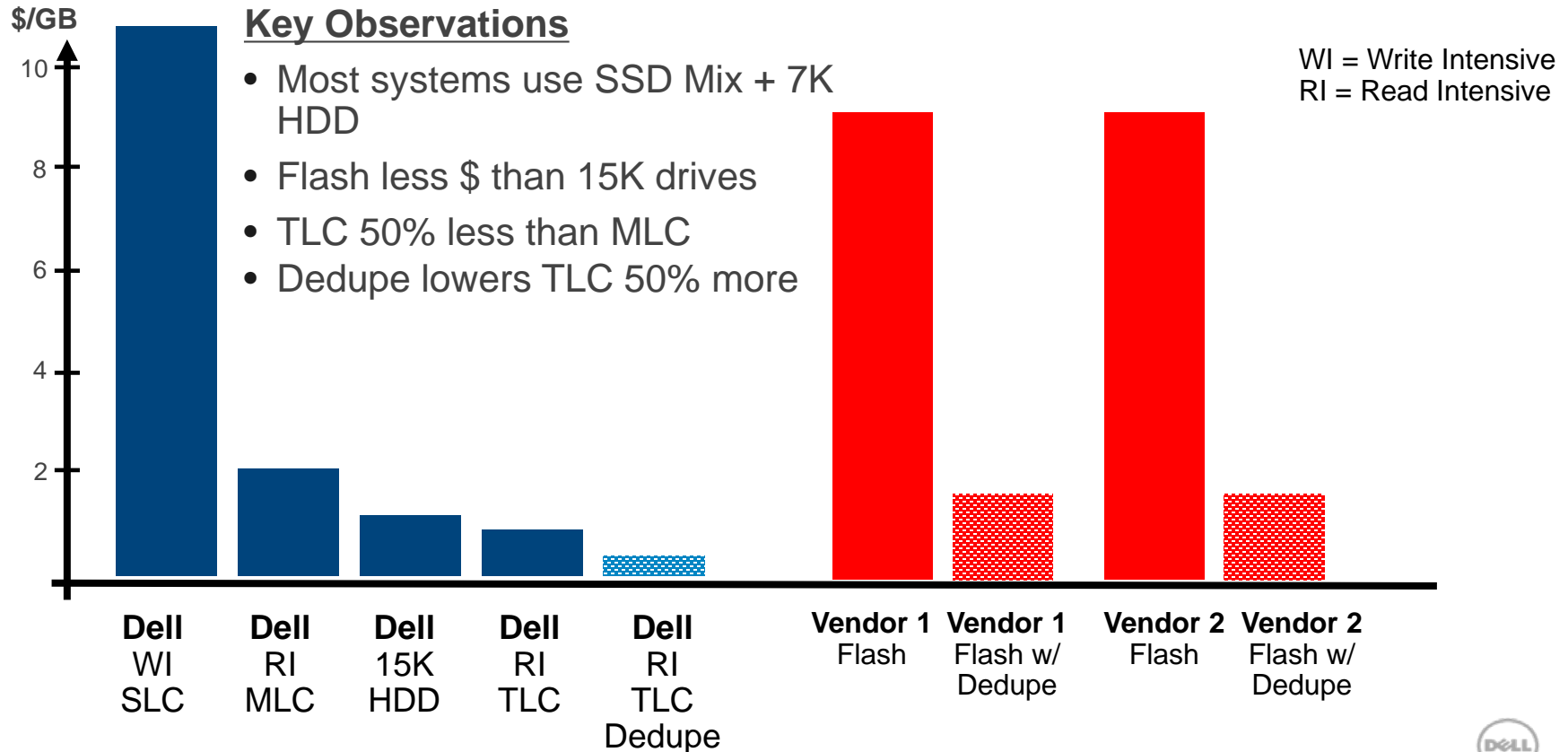
Tier 2

Tier 3

Tiering Protects Less Endurant Drives

- All incoming writes steered to Tier 1, data moved only as needed

- Tier 2 drives spec at 1 write full write per day

- No drive in service longer than a year average more than 1 DWPD

Tier 2 SSDs Drive Writes Per Day

- 66% of drives have less than .1 DWPD

● <0.1 DWPD   ● >= 0.1DWPD

Price Comparison

$/GB

Key Observations

- Most systems use SSD Mix + 7K HDD
- Flash less $ than 15K drives
- TLC 50% less than MLC
- Dedupe lowers TLC 50% more

WI = Write Intensive
RI = Read Intensive

Dell WI SLC	**Dell** RI MLC	**Dell** 15K HDD	**Dell** RI TLC	**Dell** RI TLC Dedupe	**Vendor 1** Flash	**Vendor 1** Flash w/ Dedupe	**Vendor 2** Flash	**Vendor 2** Flash w/ Dedupe

Speed storage performance at a lower cost

Opportunity:
West Virginia's Wheeling Hospital needed flexible, cost-effective storage and networking to support the latest version of its critical clinical-information system.

Solution:
The hospital deployed Dell Compellent SC8000 hybrid flash storage arrays, Dell PowerEdge servers and Dell Networking switches to boost system performance and support new initiatives.

Results:
Upgrade to latest version of clinical-information **system in less than one month**

50 percent **reduced backup times** and **database performance increase** of 40 percent

Flexible 60TB **hybrid** flash and spinning-disk **storage at one-third the cost of competitor solutions**

> "We're a small community hospital that doesn't have a huge budget to buy a full flash solution. With Compellent, we get the benefit of having multiple tiers, with affordable spinning-disk storage at lower tiers and high-performance flash at the higher tiers. "
> — Sean Loy, Director of Clinical Informatics at Wheeling Hospital
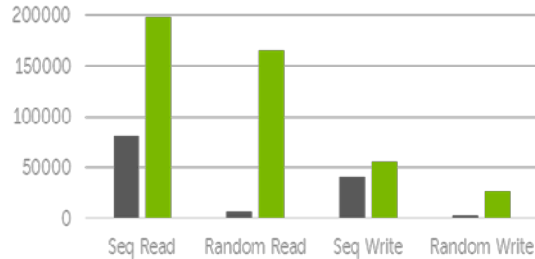
Conclusion

Tiering technology

- Redefines the Economics of Enterprise Storage
- Leverages the right amount of high performance / high capacity drives
- Protects less endurant SSD drives
- Drives wider adoption of flash

TLC Technology

- Ideal for enterprise apps when used properly
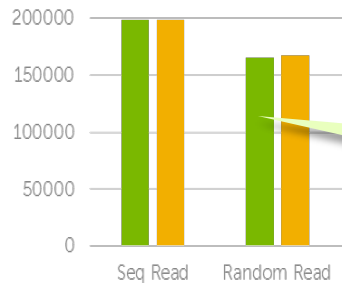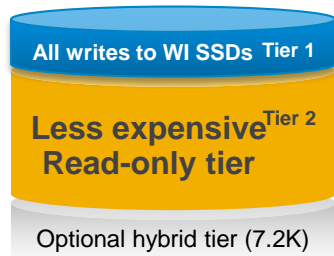
TLC Provides 50% lower $/GB than current SSD options

Displace 15K HDD and crank up the speed of <u>general-purpose</u> arrays

15K HDD replacement

Optional hybrid tier (7.2K)

Up to 24x more IOPs @ same cost

✓ Lower latency
✓ Lower power/ cooling
✓ Smaller footprint

Reduce the cost of <u>premium performance</u> "flash-optimized" arrays

All writes to WI SSDs **Tier 1**

Less expensive Tier 2
Read-only tier

Optional hybrid tier (7.2K)

50% lower $/GB

No read performance reduction vs. other RI SSDs

| ■ 15K HDD | ■ Mainstream RI SSD | ■ Premium RI SSD | ■ WI SSD |