# Dell EMC All-Flash Strategy
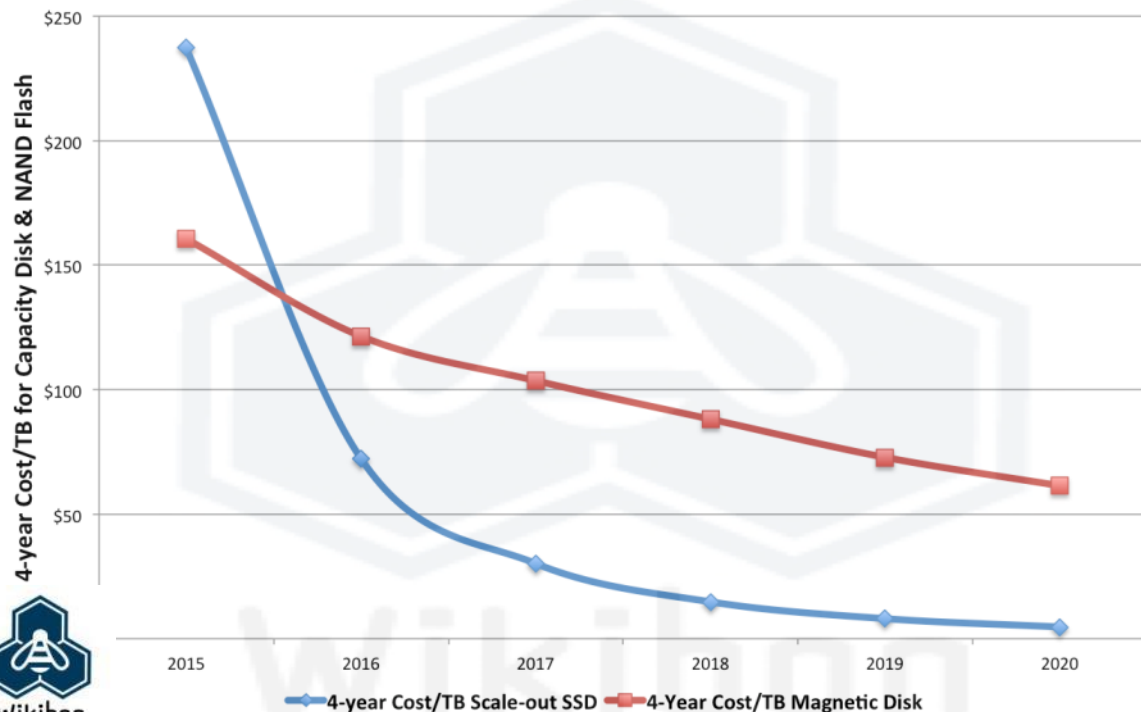
**Operate your business in real time**

**Aleksandr Shvadtshenko**

**Sr System Engineer, Nordics**

**DELL**EMC

# Evolution of all-flash storage architectures



Projection 2015-2020 of Capacity Disk & Scale-out Capacity NAND Flash

Source: Wikibon 2014. 4-Year Cost/TB Magnetic Disk includes Power, Maintenance, Space & Disk Data Reduction. 4-year Cost/TB SSD includes Power, Maintenance, Space, SSD Data Reduction & Data Sharing.

This research shows that flash will become the **lowest cost media** for almost all storage from 2016 and beyond, and that a **shared data philosophy** is required to maximize the potential from both storage cost and application functionality perspectives.

http://wikibon.org/wiki/v/Evolution_of_All-Flash_Array_Architectures

# Modernize your data center
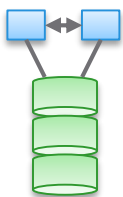
## DELL EMC STORAGE PORTFOLIO

# Storage Architecture matters

**Scale Up** | TYPE 1

- Dual Controller
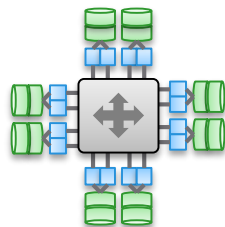- Shared Meta-Data
- Mid-Tier Architecture

**Tightly Coupled Scale-Out** | TYPE 2

- Multi-Controller Grid
- Shared Meta-Data
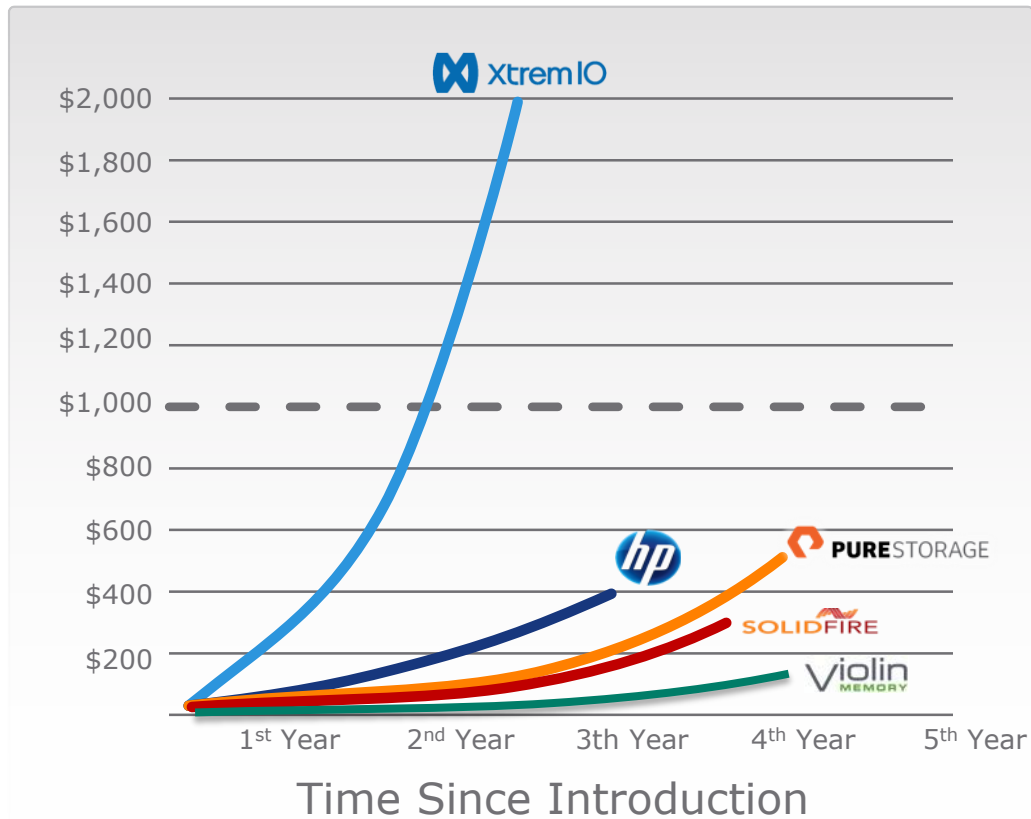- Enterprise Architecture

## Why Scale-Out?

- Controllers are the Bottleneck
  - No front-end relief in Scale Up
  - Limited CPU for Data Services

- Linear Scaling – Iops & Latency

- 7+ Year Asset Lifecycle
  - No performance tech refreshes
  - Xpect More Program

- Superior Resiliency & Performance
  - N-Way Active/Active Architecture

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# Unprecedented growth story



Fastest growth

5x nearest array

Groundbreaking

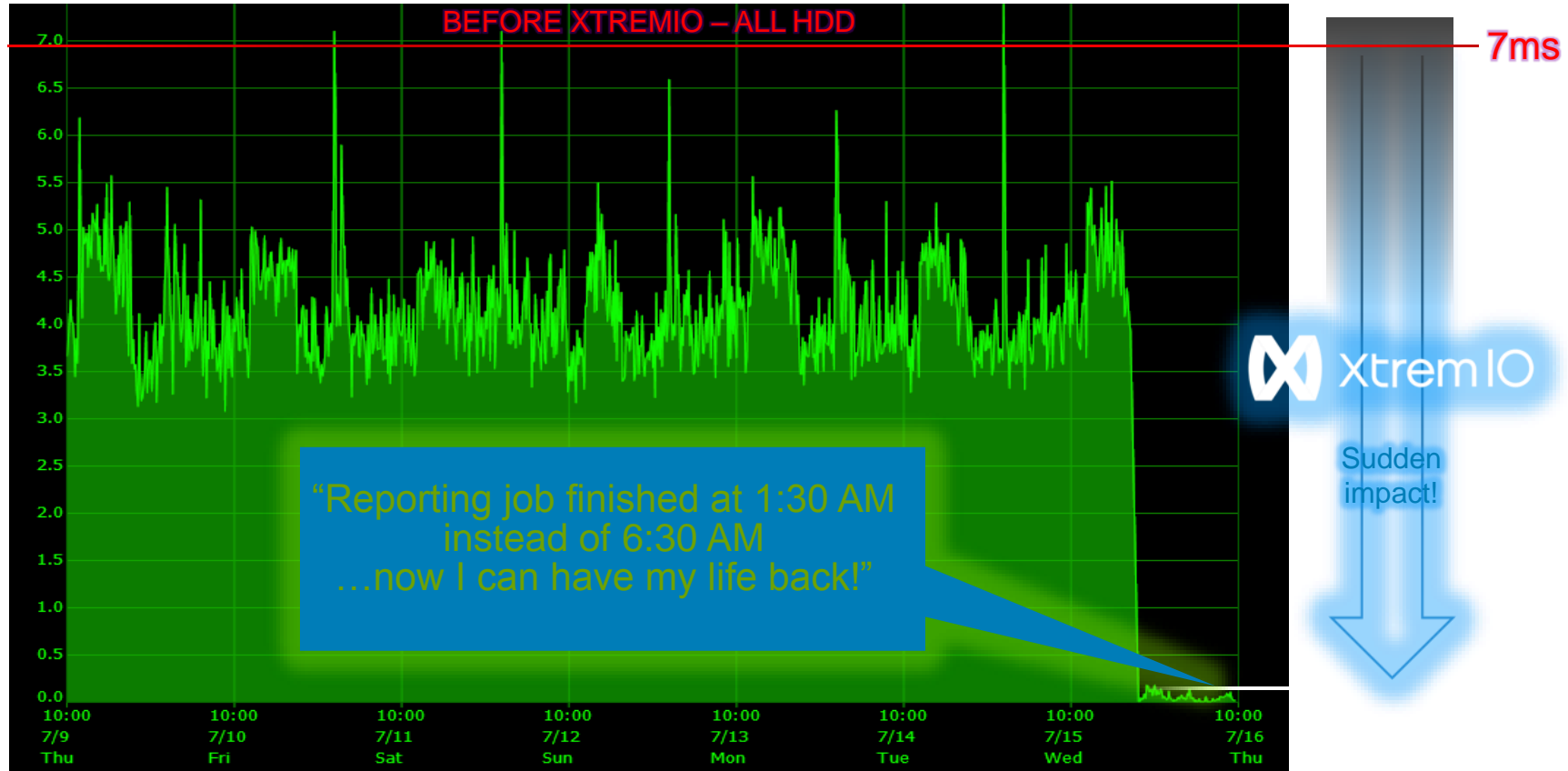DELL EMC

# Consistent predictable performance

Performance

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# Speed is a competitive advantage



BEFORE XTREMIO – ALL HDD

7ms

XtremIO

Sudden impact!

"Reporting job finished at 1:30 AM instead of 6:30 AM …now I can have my life back!"
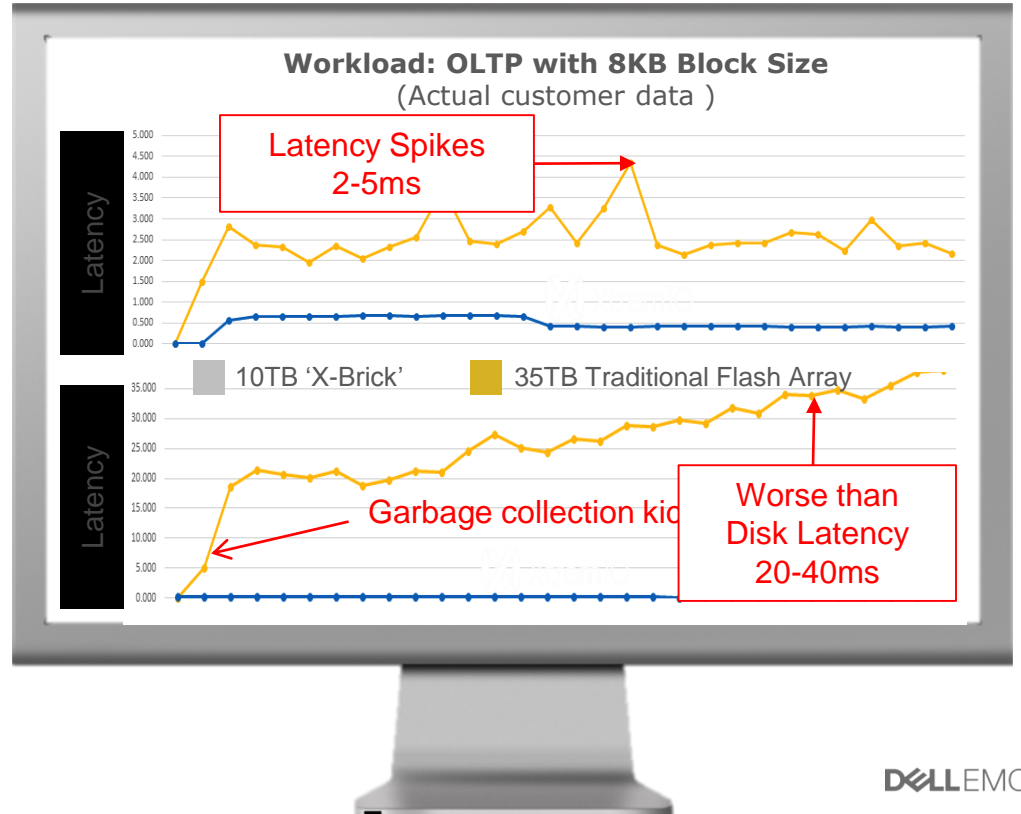
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# Performance matters

**XtremIO consistently outperforms traditional AFAs**

- **Consistent low latency** at all times with no system level garbage collection

- **Predictable, scalable IOPs** whether the array is new or has been fully overwritten.

- **Predictable performance** with Always-on, Inline **Data Services**



**Workload: OLTP with 8KB Block Size**
(Actual customer data )

Latency Spikes 2-5ms

10TB 'X-Brick'    35TB Traditional Flash Array

Garbage collection kio

Worse than Disk Latency 20-40ms

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# XTREMIO – NO SYSTEM LEVEL TAX

XtremIO Controller
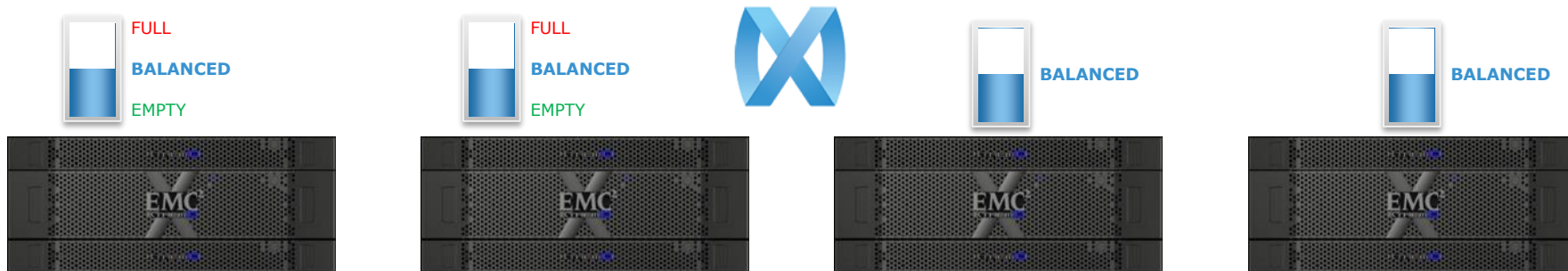
No Garbage Collection

Performed by Each SSD Controller ASIC

- SSD controllers have ideal knowledge of the NAND
- **Zero** back-end I/O initiated by the array controllers
- **No** tax on array controllers

Dell - Internal Use - Confidential

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# XTREMIO REBALANCING



## IOPS & Capacity (4x)

- **Zero Downtime,** on-demand scaling and non-disruptive upgrades

- **Predictable, Linear Growth** for performance and capacity

- **Auto-Balancing** reduces operational complexity/costs

- **Simplified,** single-cluster management for workload consolidation

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# XtremIO X-Brick

- Cluster building block



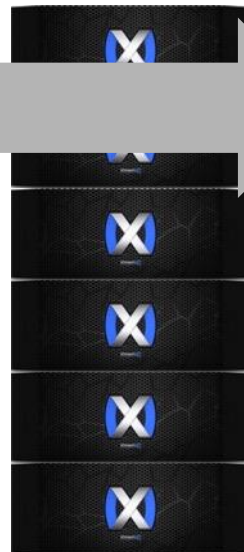**Dell - Internal Use - Confidential**

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# XtremIO Family Portrait

150K mixed IOPS
250K read IOPS
<1ms Latency

**From 2 – 16 N-way Active Controllers**

1.2M mixed IOPS
2M read IOPS
<1ms Latency

Starter
5TB

**5TB – Over 1PB Usable Capacity**

SCALE-OUT     <1ms LATENCY     RICH DATA SERVICES     NO TUNING

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# XtremIO simplicity & automation



**Management Impact:**
- Zero Planning & Tuning
- No storage skills
- No GUI certifications
- Provision in seconds!

**Integration:**
- VMware vCenter
- EMC ViPR, ESA, ESI, SRM
- Microsoft Hyper-V
- App Consoles: Oracle, SAP, System Center, etc
- REST API & CLI

# Complexity is no longer Needed

**HISTORIC COMPLEXITIES**

Disk Type Selection

RAID Protection Selection

RAID Group or Storage Pool

Striped or Concatenated Meta Devices

Auto Tiering

Array Caching

Thick or Thin LUNs

**XTREMIO**

DONE!

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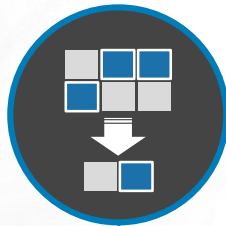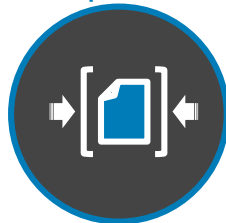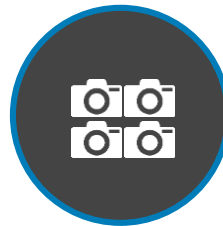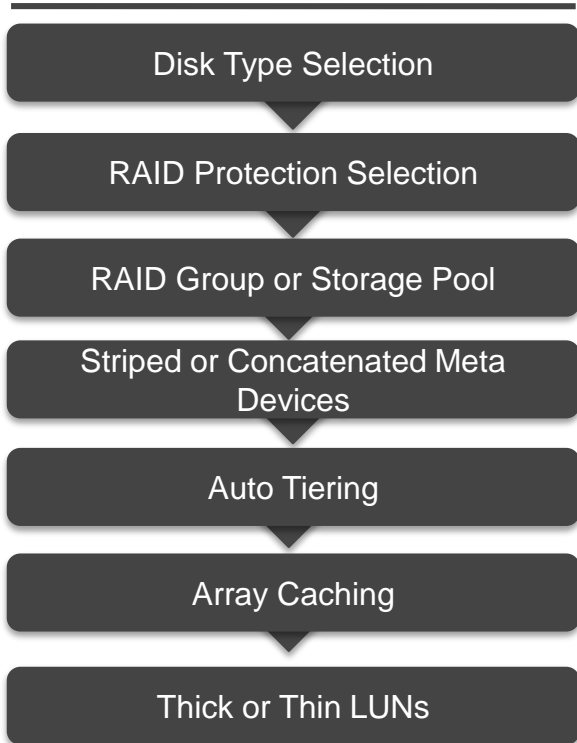
# XtremIO Data Protection

- Designed for SSD

- No legacy RAID baggage

- Highly efficient- only 8% overhead

- Lowest write amplification

- SSDs may fail in place

- No configuration

- No hot spares

- Adapts to failures

Good Capacity
Utilization
RAID 5

XDP

High
Performance
RAID 1

Superior
Protection
RAID 6

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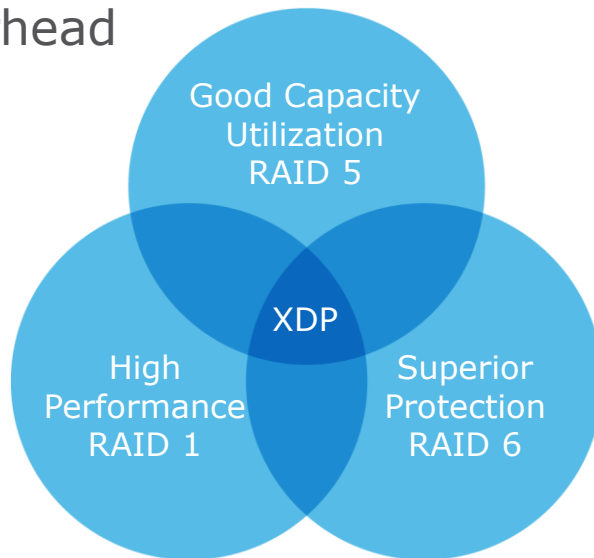
# Business Agility

# ICDM: What If You Could Simultaneously…
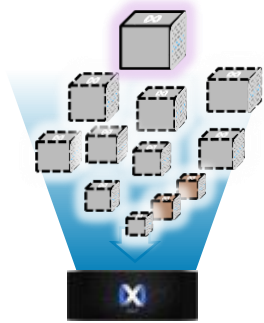
Consolidate **everything**: production, dev, test, analytics

Meet all performance & availability **SLAs**

Transform **Business process** workflow agility

**Simplify** operations and **self-service**

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# The Copy Data Management Problem

**IDC: >60% data from copies**

### Development

Test/Dev

Continuous- Integration

QA

Training

### Operations

Sandbox

Patch management

Optimizations & tuning

Pre-prod simulation

**Production**

### Data Analytics

Reporting

BI

Analytics

### Data Protection

Backup

DR copies

Logical corruption

protection

**Dell - Internal Use - Confidential**

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# Traditional data copies process challenges

## Challenge: Slow copies

### Making copies is slow

- Restore from backup takes hours
- Virtual data center copy operations take a long time

### Using copies is slow

- Snapshots are sloooow (metadata on disk)
- Test environments usually have tier2 performance

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# XTREMIO VIRTUAL COPIES

**100% IN-MEMORY**
Any topology
Instant creation
Instant deletion

**100% PERFORMANCE**
Identical read IOPS
Identical write IOPS
Identical latency

**INCREDIBLE SCALE**
Instant application clones
to petabyte scale

**100% SPACE EFFICIENT**
No space reservations
No metadata bloat

**100% OPTIMIZED**
Identical data services
Always on, always inline

**UNMATCHED**
Use XtremIO where all-flash arrays were never before viable

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# LET'S SEE HOW THIS WORKS
## A SNAPSHOT IS CREATED INSTANTLY
IT ONLY INVOLVES ALLOCATION TO A SMALL CONTAINER



IN-MEMORY
METADATA

Product MD
Shared MD

SSD DATA
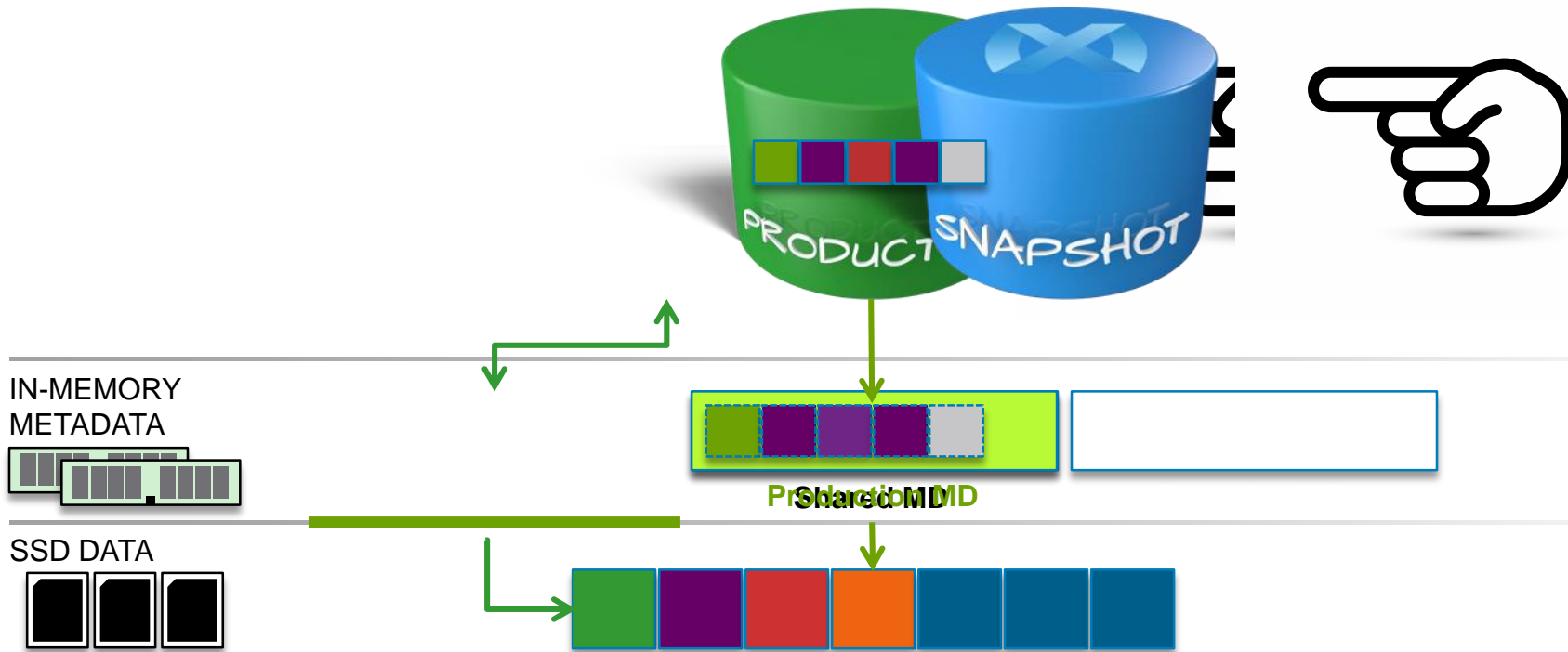
# METADATA MANAGEMENT IS EFFICIENT
ENABLING THOUSANDS OF SPACE EFFICIENT COPIES



IN-MEMORY
METADATA

Production MD

Shared MD

SSD DATA

**Dell - Internal Use - Confidential**

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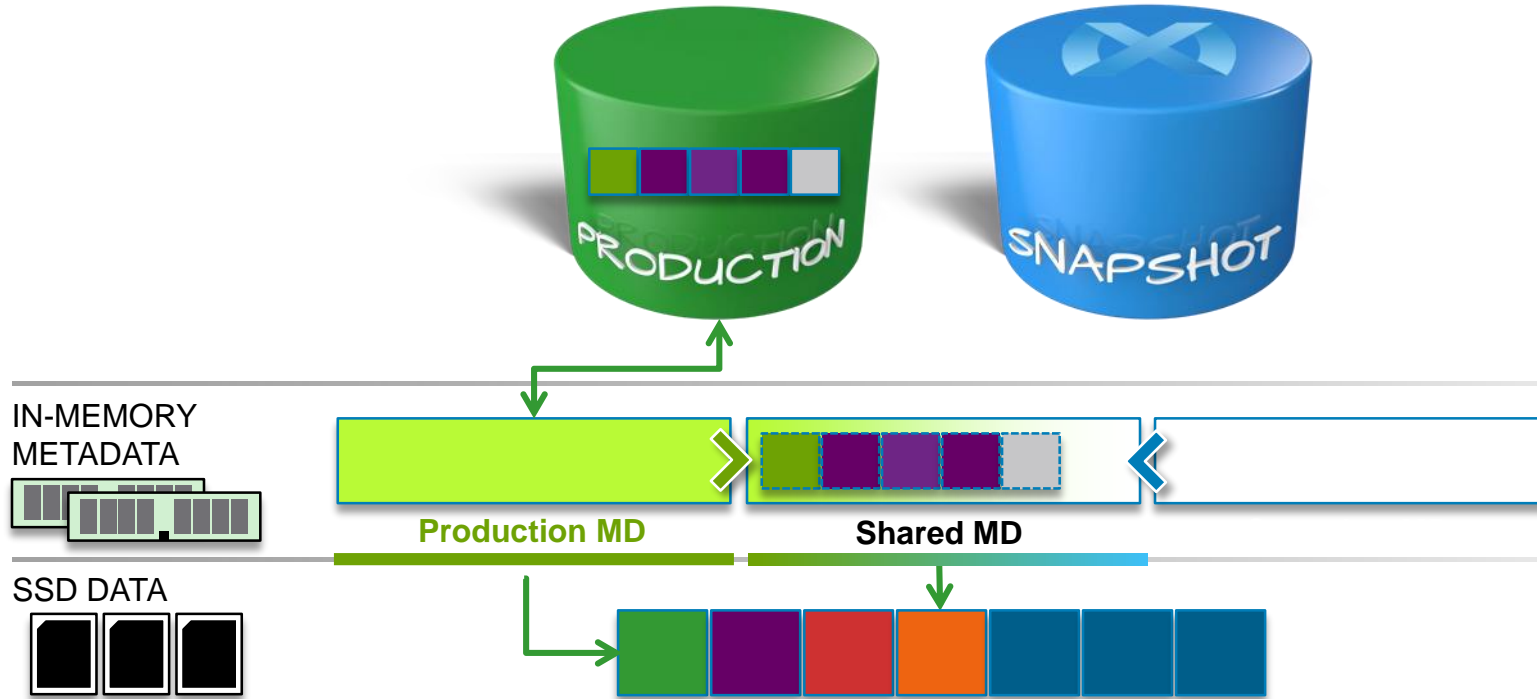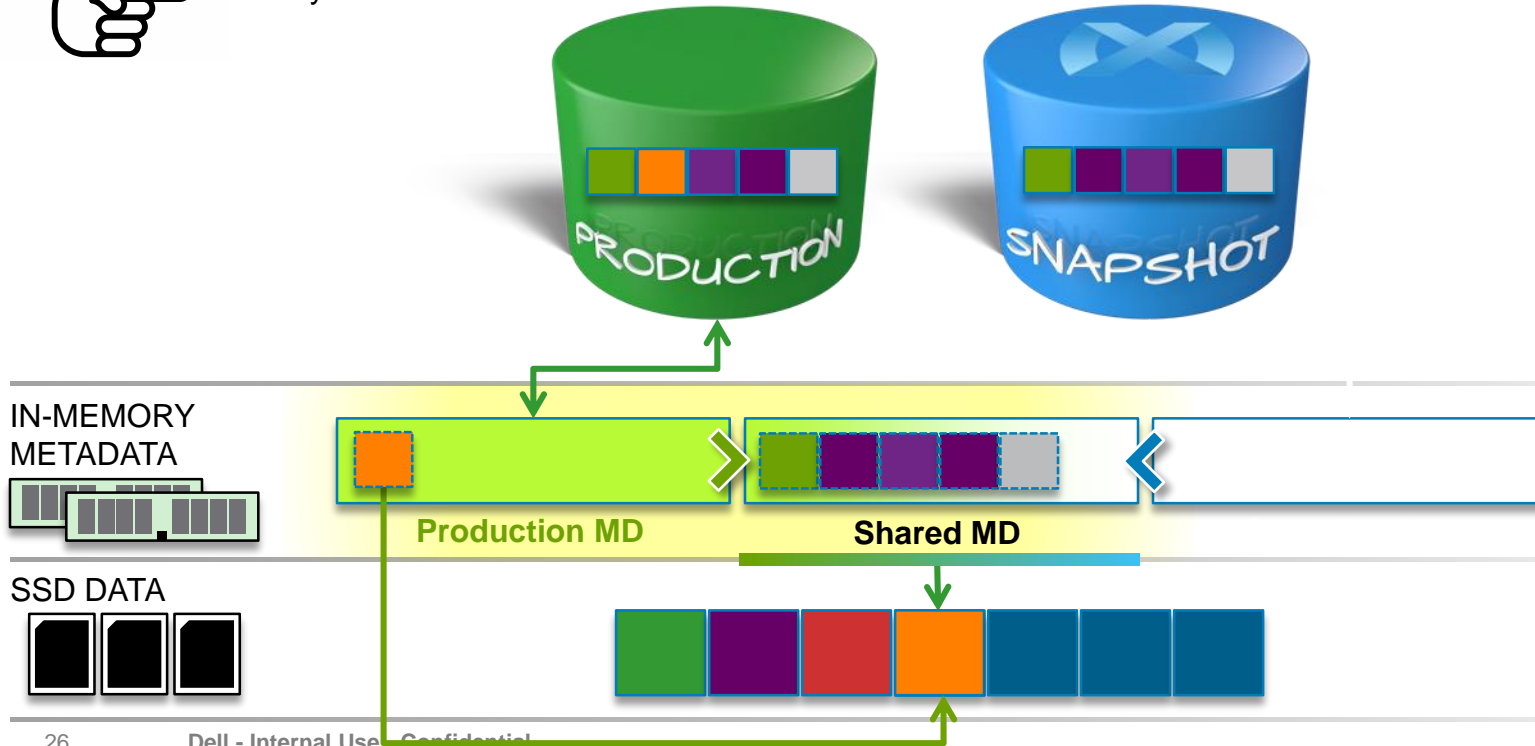
# METADATA MANAGEMENT IS EFFICIENT

## THE METADATA IS SHARED AND IN-MEMORY SPACE EFFICIENT



Modify Data **B** @ Block 1

IN-MEMORY
METADATA

Production MD

Shared MD

SSD DATA

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# SNAPSHOT PERFORMANCE IS EQUAL

## IT'S EXACTLY LIKE WRITING DATA TO THE PRODUCTION VOLUME

Modify Data **D** @ Block 4

IN-MEMORY
METADATA

Production MD

Shared MD

Snapshot MD

SSD DATA

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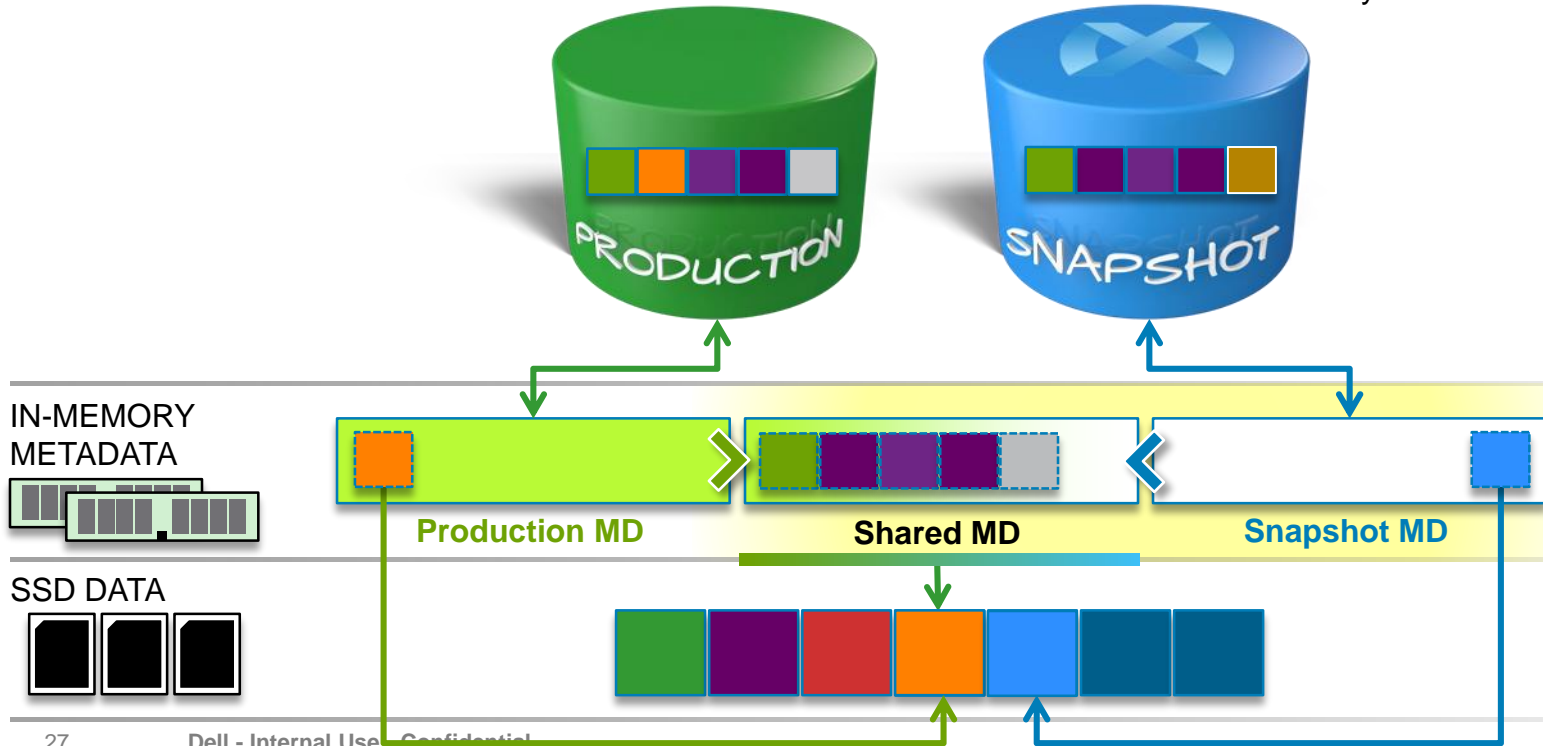
# Virtual data copies at no cost

Flash innovation will make **fast & free** copies

An XtremIO writable snaphots

1. Have same performance as a regular volume

- Metadata allways kept in memory

- No hops between  metadata tables

= **IT'S FAST**

2. Do not (at creation) consume any

- SSD capacity

- Metadata space

= **IT'S FREE**

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# XVC vs. traditional snapshots

**XtremIO Vs. Vendor "A" DB Volumes, Steady State, IOPS Over Time**



**70K IOPS**
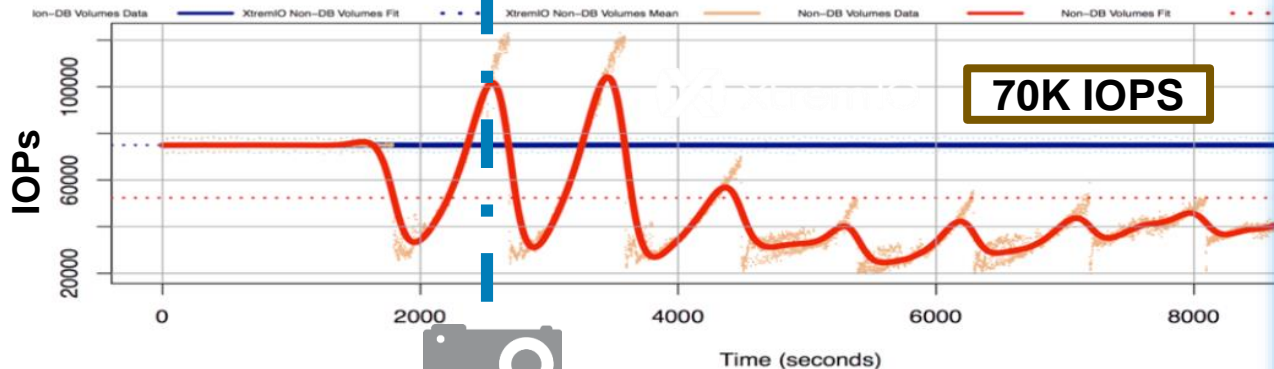
**XtremIO Vs. Vendor "A" DB Volumes, Steady State, Latency Over Time**



**1ms latency**

## XtremIO
- **No impact** on copy creation
- **Consistent** performance on prod and copy

## Vendor A
- **IOPs** drop by 50% to **35K**
- Spikes to **20ms latency**

# Traditional infrastructure architecture

**Complex, costly, silo'd & slow**



## Test & Dev 'Starved'

QA Instance

Stress Test

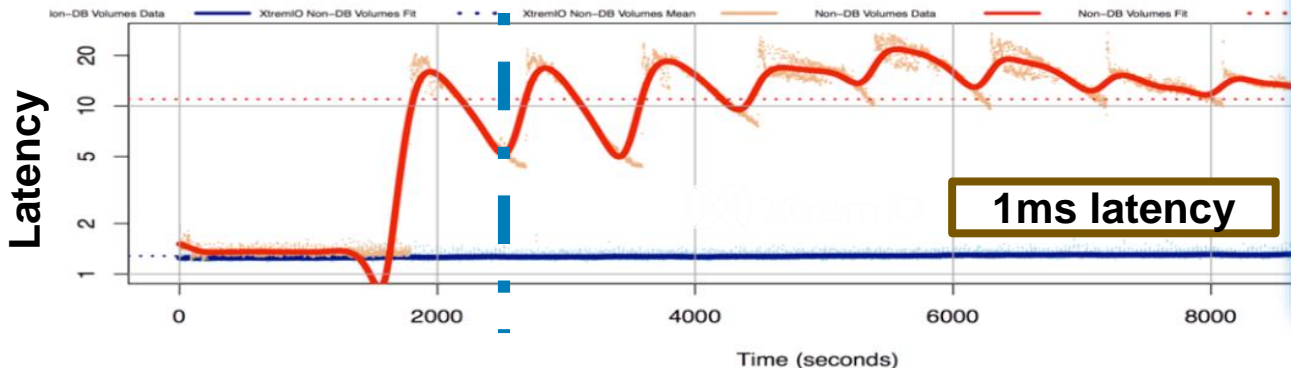Training

3 copies for 30 engineers, 30TB, ~50k+ IOPS

## Production 'Underperforming'

10TB for 2TB DB, 150K+ IOPS

## Over-Provisioned

Reports

Finance Copies

Analytics

Marketing Copies

Trends

Sales Copies

10+ DB copies, 150K+ IOPS
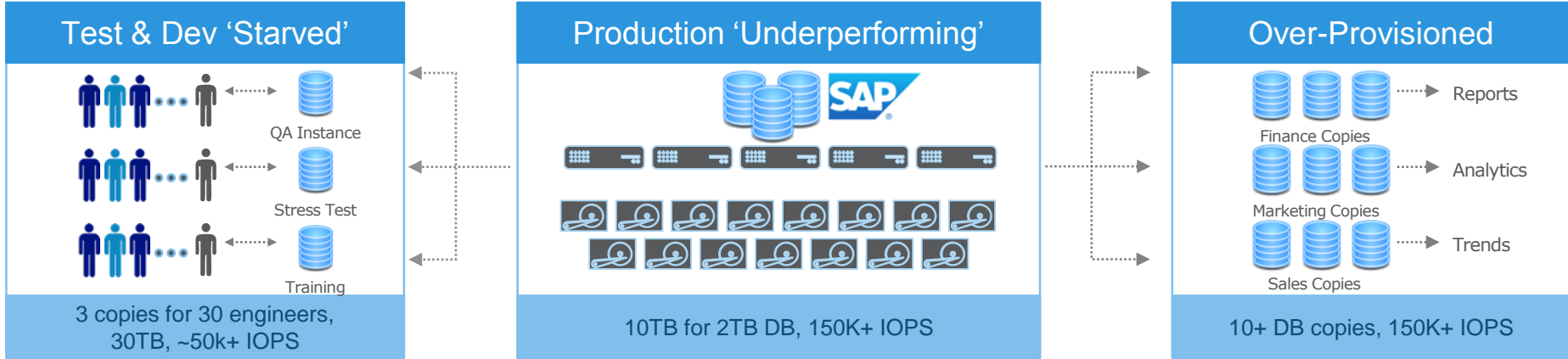
13+ DB copies to manage, 130TB+ of storage, 2TB of production application data

SAP Applications deployed on multiple, dedicated & inefficient storage silos

# Consolidate with ONE platform

**Efficient, faster & simpler**



**Test & Dev**

Every engineer gets a full DB copy, All data, full IOPs

**Production**

10TB for 2TB DB, 150K+ IOPS

**Mktg, Fin, Sales**

Every team gets a full DB, All data, Flash speeds
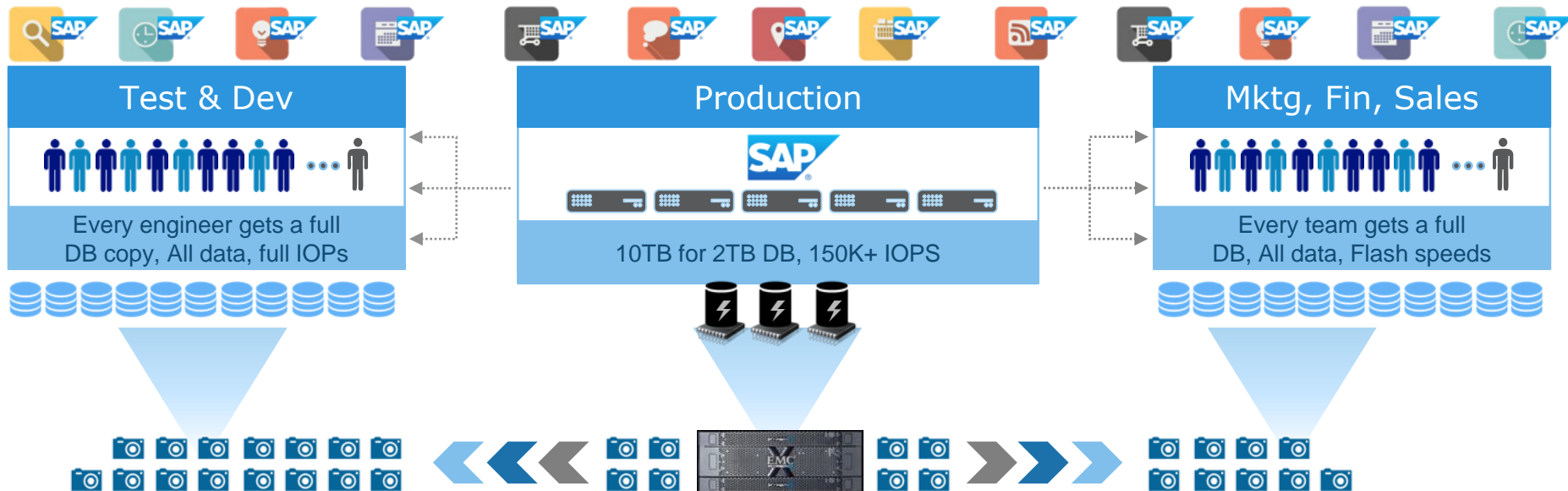
- One single all-flash array
- Faster than silos of storage
- Simpler to manage

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# Advantages of Flash Storage in the Data Center

Result: You'll build better quality software faster

Faster Development Copies - > Faster development

More Testing Copies-> More testing

More & Faster Develoment Resources- > Better code, less bugs, FASTER TTM

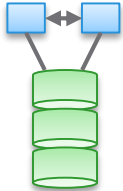Happier Users

Happier Developers

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# Storage Architecture matters

## Scale Up | TYPE 1

- Dual Controller
- Shared Meta-Data

- Mid-Tier Architecture



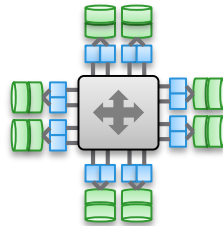## Tightly Coupled Scale-Out | TYPE 2

- Multi-Controller Grid
- Shared Meta-Data

- Enterprise Architecture



## Why Scale-Out?

- Controllers are the Bottleneck
  - No front-end relief in Scale Up
  - Limited CPU for Data Services

- Linear Scaling – Iops & Latency

- 7+ Year Asset Lifecycle
  - No performance tech refreshes

- Superior Resiliency & Performance
  - N-Way Active/Active Architecture

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# Dell EMC Midrange Storage Portfolio

## SC Series

## Unity



**Modern, reliable solutions for virtualized environments**

**All-flash | Hybrid | Unified – any midrange budget or workload**

*Note VNX, VNXe, PS Series (EqualLogic) and MD Series (PowerVault) continue to be available)*

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# UNITY

**Modernize and simplify with Unity**



### SIMPLE
SLICK UX • ALL INCLUSIVE SW
CLOUDIQ™ • PROACTIVE ASSIST

### FLEXIBLE
VIRTUAL • PURPOSE-BUILT • CONVERGED
UNIFIED (NAS & SAN & VVOLs) • 16PBe
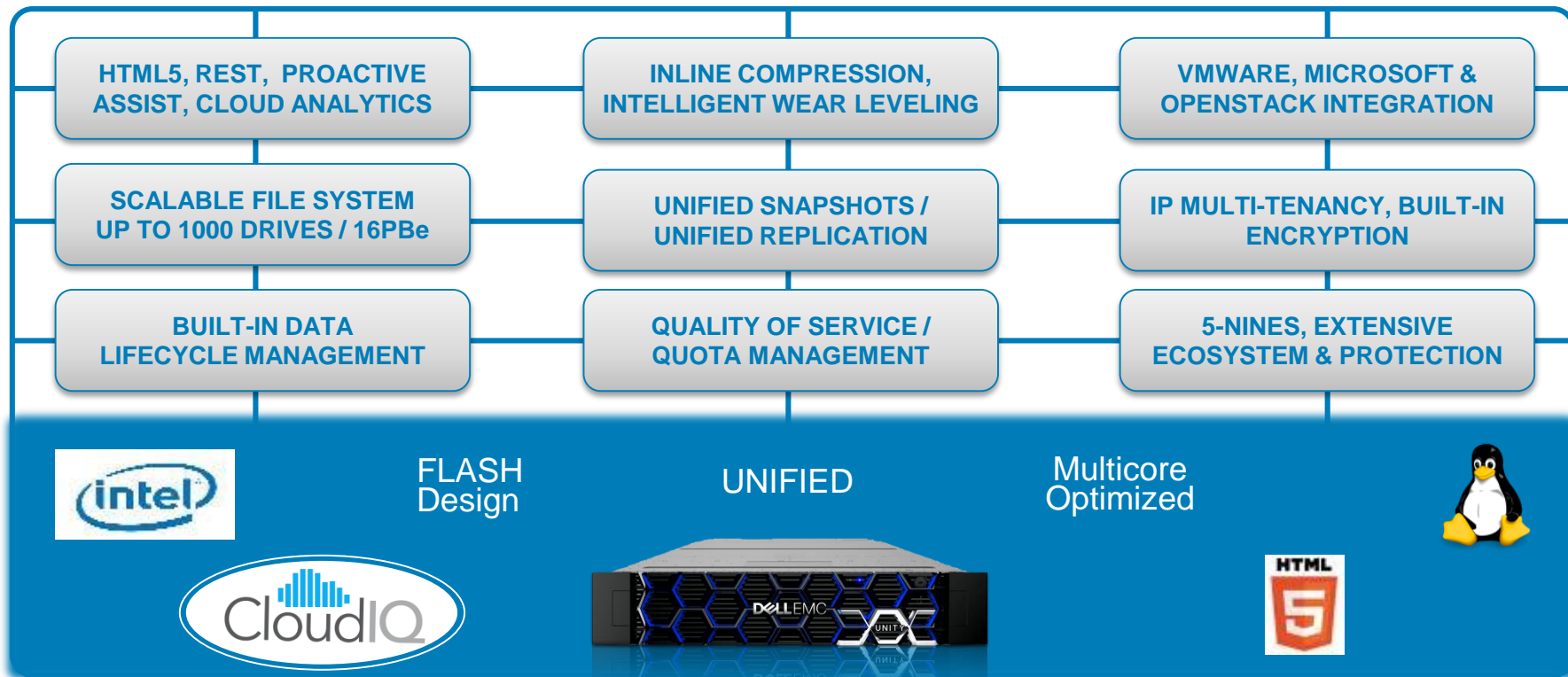
### MODERN
ALL-FLASH DESIGN WITH INLINE
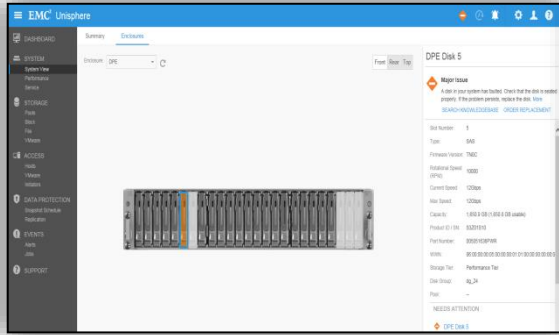EFFICIENCIES & TIERING TO A CLOUD

### AFFORDABLE
ALL-FLASH STARTING UNDER $18K
EARLY ADOPTER PROMO • XPECT MORE

**DELL**EMC

Note: Early Adopter Promo & Xpect More are specific to Unity All-Flash

# Rich enterprise data services

| | | |
|---|---|---|
| **HTML5, REST, PROACTIVE ASSIST, CLOUD ANALYTICS** | **INLINE COMPRESSION, INTELLIGENT WEAR LEVELING** | **VMWARE, MICROSOFT & OPENSTACK INTEGRATION** |
| **SCALABLE FILE SYSTEM UP TO 1000 DRIVES / 16PBe** | **UNIFIED SNAPSHOTS / UNIFIED REPLICATION** | **IP MULTI-TENANCY, BUILT-IN ENCRYPTION** |
| **BUILT-IN DATA LIFECYCLE MANAGEMENT** | **QUALITY OF SERVICE / QUOTA MANAGEMENT** | **5-NINES, EXTENSIVE ECOSYSTEM & PROTECTION** |

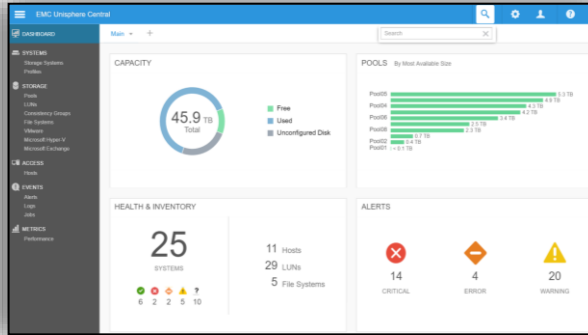FLASH Design       UNIFIED       Multicore Optimized

DELL EMC

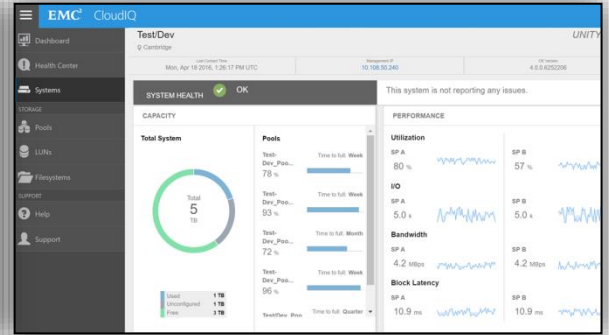# Proactive management and support

**Get connected and resolve problems faster**
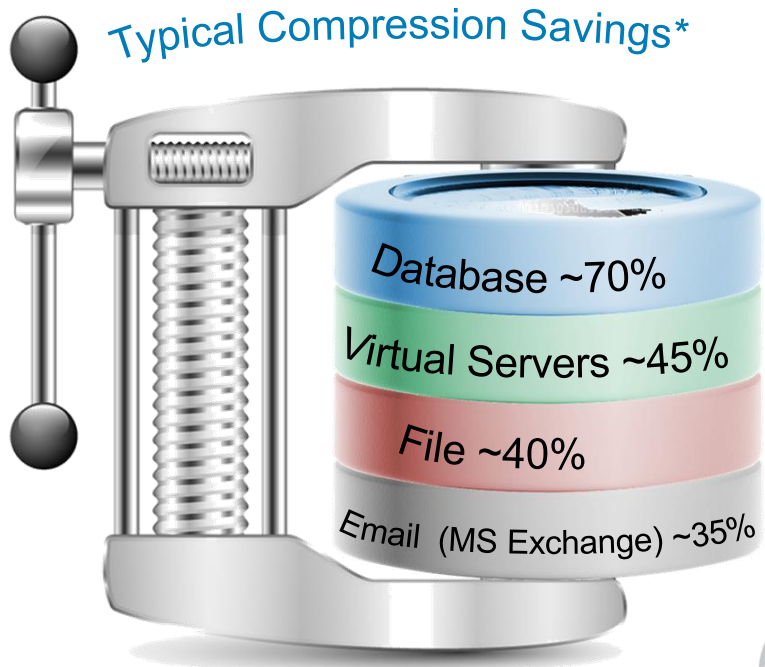


**PROACTIVE ASSIST**
SELF SERVICE PORTAL

**UNISPHERE CENTRAL**
CENTRALIZED MANAGEMENT

**CLOUD IQ** DASHBOARD
& MANAGEMENT PLATFORM

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# Unity inline compression

Typical Compression Savings*



Database ~70%

Virtual Servers ~45%

File ~40%

Email (MS Exchange) ~35%

MITREND
Compression
Estimator

Now Available

## INTELLIGENT INLINE COMPRESSION

- Enabled through Unisphere or CLI
- Non-disruptive
- Compress existing data
- LUN Level (all-flash pools / block)
- Supports all data services
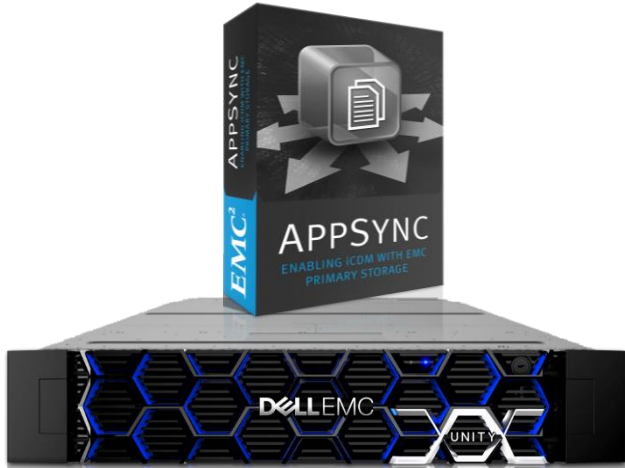- Only compresses where there will be sufficient savings

**2:1** Expected Savings

Unity can now support
~16PBe capacity

* Milege will vary

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# AppSync on Unity

**SIMPLE:** Easy to use GUI to automate copy lifecycle management. No more custom scripts

**SMART:** One place for application owners to manage copies across applications, EMC arrays and mounting hosts

**FRICTIONLESS:** Applications owners and storage admins are on the same page with a transparent copy workflow

**Integrated Snapshots**
(Multiple Mount Points)

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# What's new in Unity

## ALL FLASH OPTIMIZATIONS

- **Inline Compression**
  - Intelligent wear-leveling
  - Included in MiTrend Tool
- **High-density 15.36TB SSD**
  - Up to 16PBe
  - Up to 600TBe in 2U
- **Higher System Capacity**
  - Unity 500: up to 500 drives
  - Unity 600: up to 1000 drives

## CLOUD MANAGEMENT

- **CloudIQ**
  - Predictive storage analytics
  - Proactive Health Score
  - Best practices remediation
- **File Tiering to Cloud**
  - Automated, policy-based
  - Virtustream (60% savings)
  - Amazon S3 & Microsoft Azure
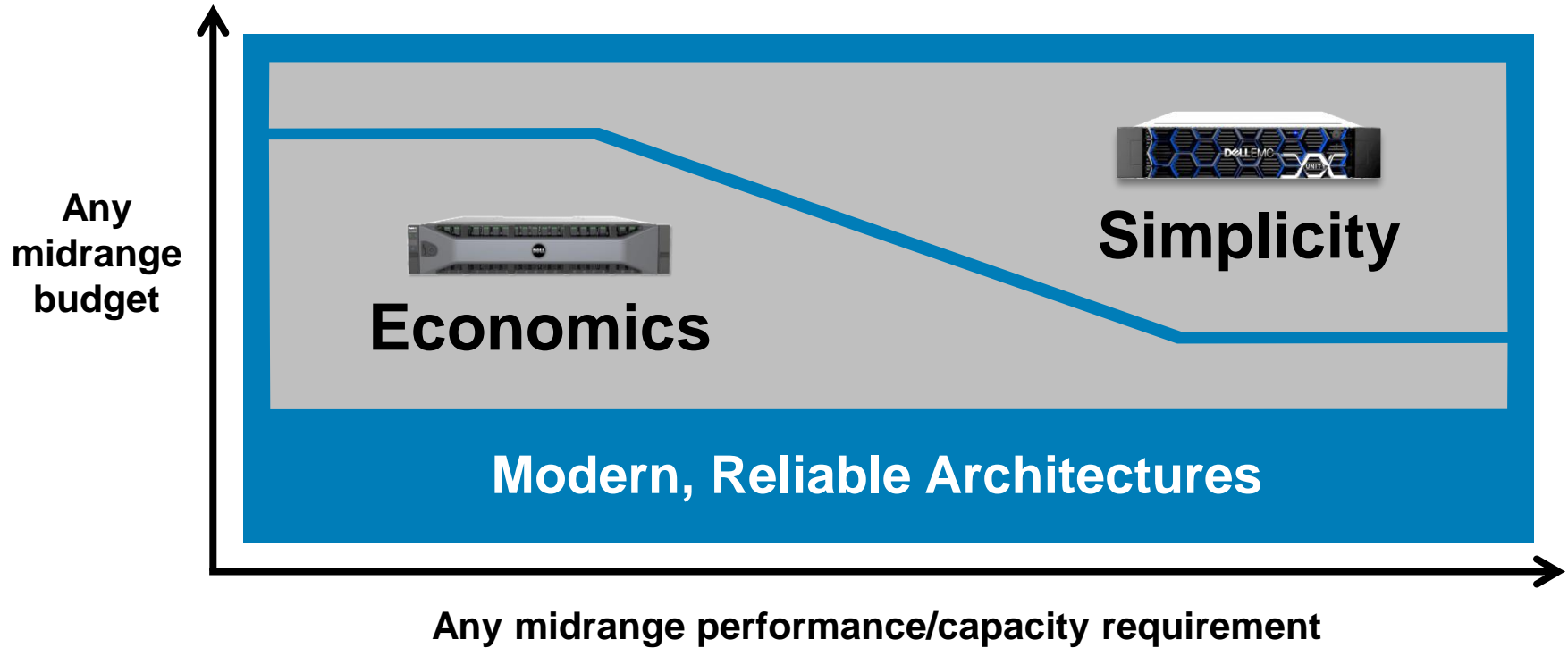  - Physical, Virtual, & HA

## ADVANCED DATA MOBILITY

- **Unified Migration**
  - Built-into Unisphere
  - VNX1 & VNX2 to Unity
  - File systems (NFS only)
  - Block LUNs (CG, Meta LUNs)
- **Data-in-place Conversion**
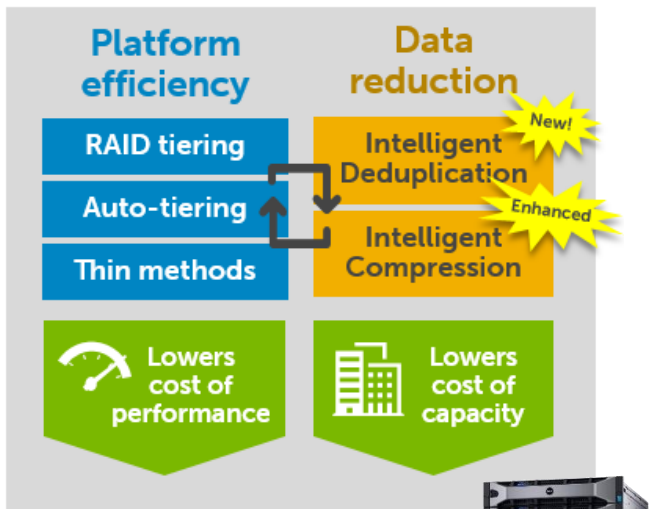  - Cost effectively convert to higher Unity models

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# Complete Midrange solution coverage



**Any midrange budget**

**Economics**

**Simplicity**

**Modern, Reliable Architectures**

**Any midrange performance/capacity requirement**

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# The Power of SC Series: transforming economics

## Intelligent, self-optimizing arrays



**Platform efficiency**
- RAID tiering
- Auto-tiering
- Thin methods

**Data reduction**
- Intelligent Deduplication — *New!*
- Intelligent Compression — *Enhanced*

Lowers cost of performance

Lowers cost of capacity

**Flash under $0.45/GB** *

✓ SSD, HDD, hybrid solutions
✓ Perpetual software licensing

## Efficient, resilient data centers

**Optimize storage at the data center level** – Data movement between arrays does NOT affect workloads

Storage hypervisor

**Federated cluster**

LUN
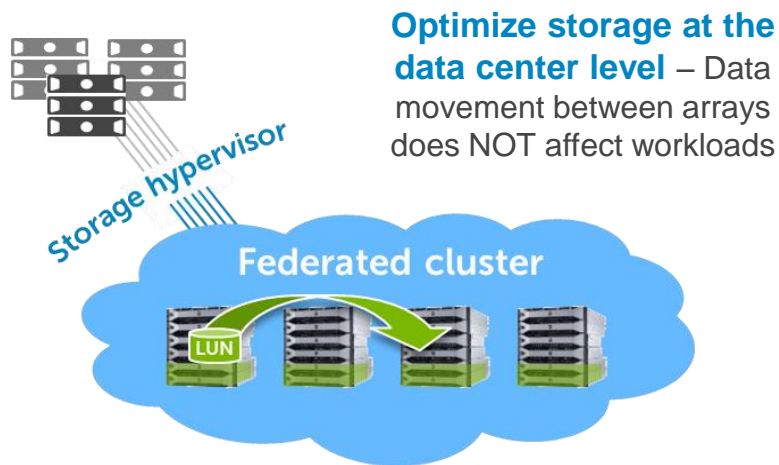
**Live Migrate**

Move volumes anywhere **without remapping hosts**

**Volume Advisor**

Monitors cluster, recommends ideal **load balancing**

**Live Volume**

Optional auto-failover for **always available storage**

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# Why you should Xpect More from Dell EMC

**Lower cost. Faster time to insights. Avoids data center expansions.**

**Performance**

**Efficiency**

**Simplicity**

**Protection**

**Lifetime\***
maintenance price protection

**3-year**
money-back warranty

**3YRS**

**Lifetime\***
flash endurance protection

*\*Lifetime equates to the support life of the system*

**intel XEON inside**

Powered by Intel®
Xeon® Processors

**D∕ELL**EMC

# Summary: choosing right All-flash storage system



**Unity**

**SC Series**

## Choose XtremIO when:

- Sub 1ms consistent latency
- Over 100K IOPS
- RPO / RTO is less than one hour
- DB development require a lot of data copies
- Oracle licensing optimization

## Choose Unity when:

- No sub ms latency / IOPS SLA's
- Limited use of data copies
- Rich data services are required
- Simplicity

## Choose SC when:

- Economics is primary factor
- $/GB

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