

DM - What's new from Dell Technologies: PowerMax and DLm updates

Robin Fromm

Dell EMC

November 7, 2019

Session **DM**

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DELL EMC PowerMax & VMAX All Flash Update for IBM Z

Robin Fromm – Global CTO Mainframe Solutions



DELL EMC

PowerMax/VMAX Unique Features

- Large Global Cache
 - Advanced Algorithms
 - Partitioning
 - FlashBoost Improving Response Time for Read Miss IO
- SRDF Is Single Program Product With 4 Operational Modes
 - SRDF Is A Mirror Enabling IO TO Serviced Through Replication Link Avoiding DASD Swap Or Site Failover Due To Local Device Or Raid Failure
 - Sync, Async, Adaptive & Active Active (FBA)
 - Dynamically Change Operation Modes
 - Async Automatically Pages To SRP To Ensure Stability
 - Dynamic Volume Expansion With Active Replication
- Virtual Storage Provisioning And Extreme Space Efficiency
 - Single Track Allocation 56K CKD, 128K FBA
 - 2:1 Or Better Data Compression For FBA Data
- TimeFinder SnapVX
 - Target Less Snapshots Requiring No Addresses
 - Flashcopy Compatibility
 - 256 Consistent PIT Copy Of A Volume
 - One Full Copy Of Storage Can Yield 256 Active Usable Copies Of Data
- Extreme Space Efficiency Enables New Cost Effective Possibilities
 - Parallel Application Development And Testing (DevOPS)
 - Multiple Data Recovery Points From Data Corruption Or Destruction Events

VMAX 950F All Flash

- ⇒ 1-8 Engines
- ⇒ 56Gb/s Infiniband Engine Interconnect
- ⇒ 72 Intel Broadwell 2.8GHz Cores/Engine
- ⇒ Up to 256 16Gb/s FICON ports
- ⇒ Up to 16TB cache (1TB, 2TB DDR4)
- ⇒ 120-drive DAE (1920 max)
- ⇒ Up to 1.7PBu

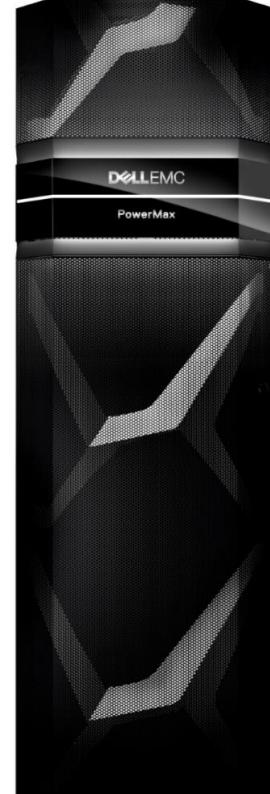
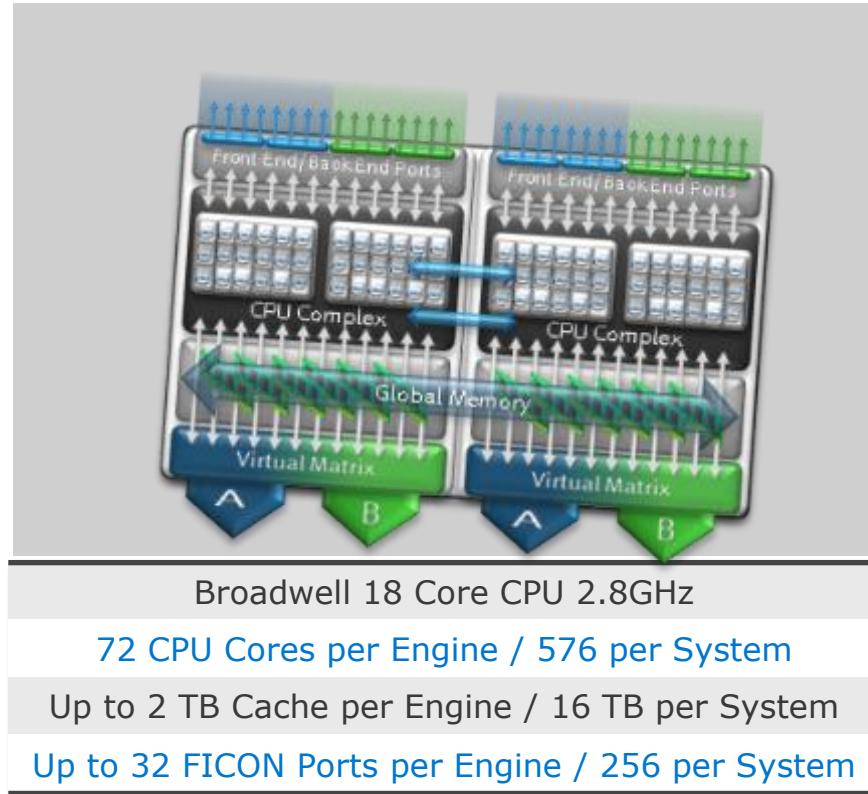


PowerMax 8000

- ⇒ 1-8 Engines
- ⇒ 56Gb/s Infiniband Engine Interconnect
- ⇒ 72 Intel Broadwell 2.8GHz Cores/Engine
- ⇒ Up to 256 16Gb/s FICON ports
- ⇒ Up to 16TB cache (1TB, 2TB DDR4)
- ⇒ NVMe Drives:
Storage Class Memory & NAND flash
- ⇒ 24-drive DAE (288 max)
- ⇒ Up to 1.7PBu

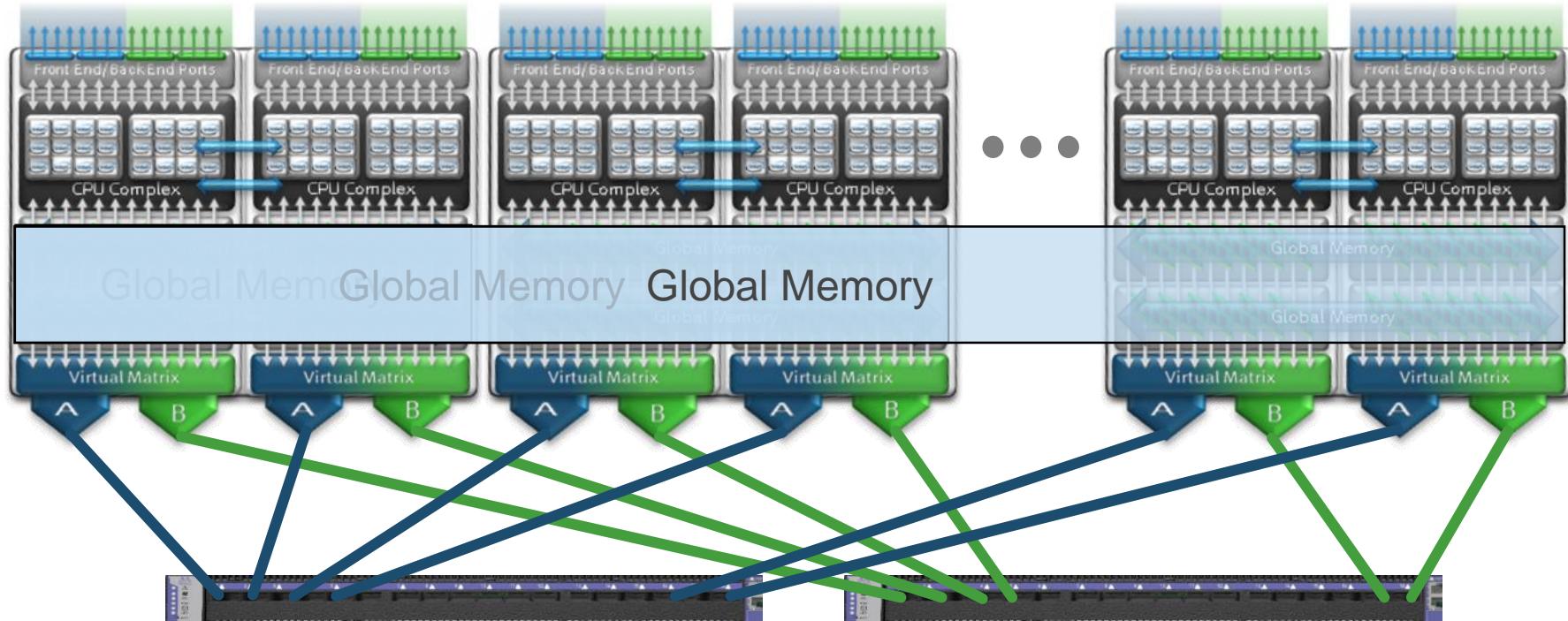


VMAX 950F & PowerMax 8000 All Flash Engines



Virtual Matrix enables global memory

Data cache and metadata striped across all directors



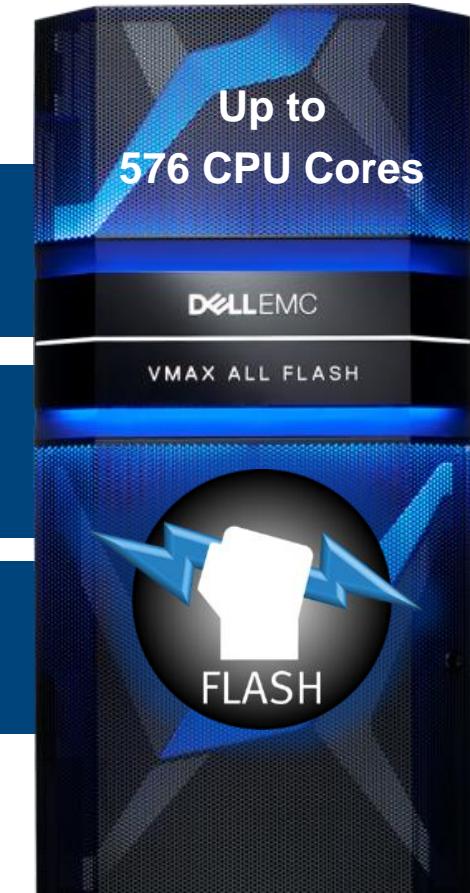
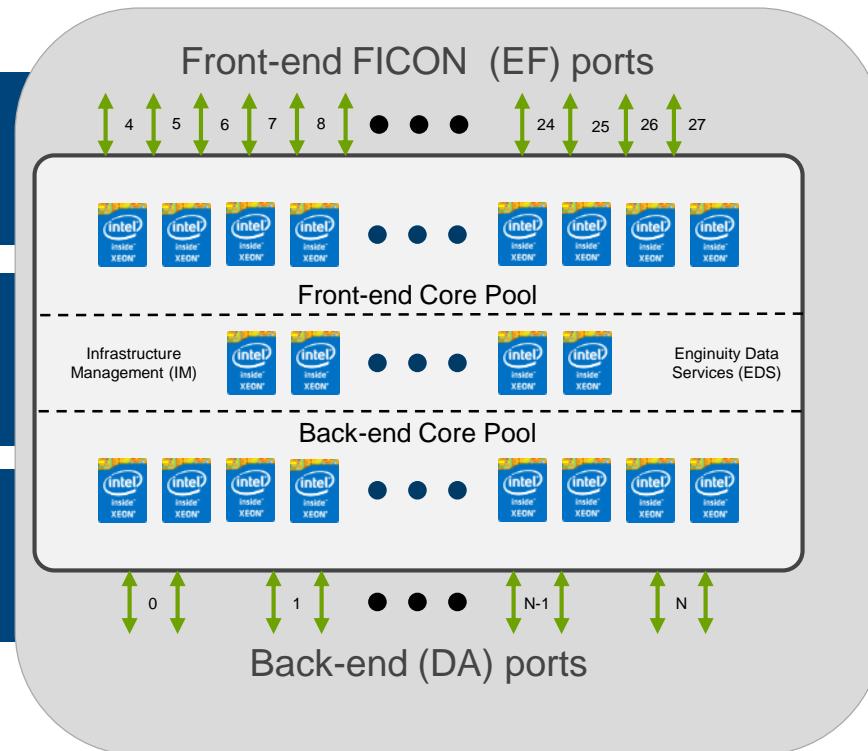
Architected for All Flash

zBricks & zPowerBricks (engine + capacity pack) optimized for multi-core CPUs

Massive increase in per-port performance

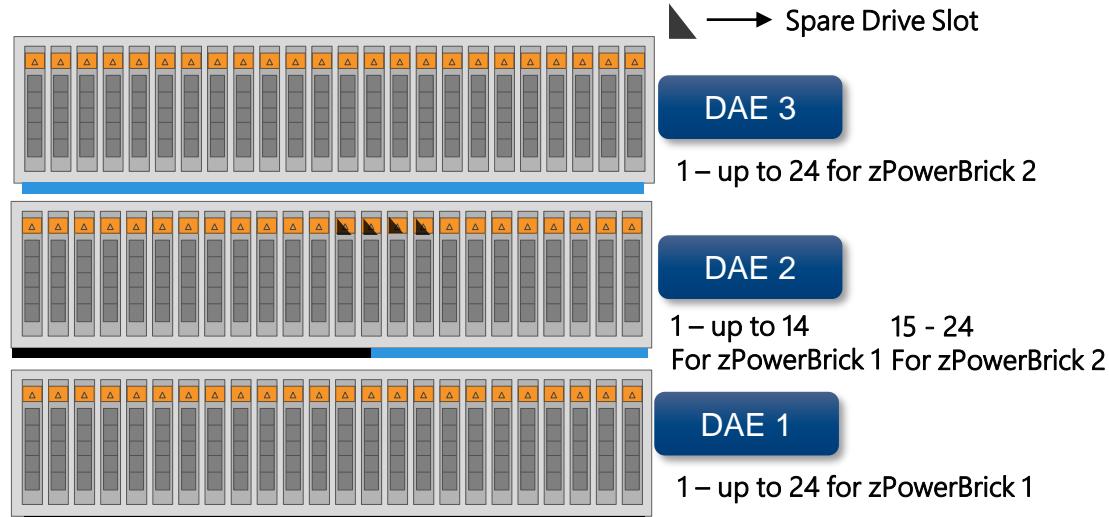
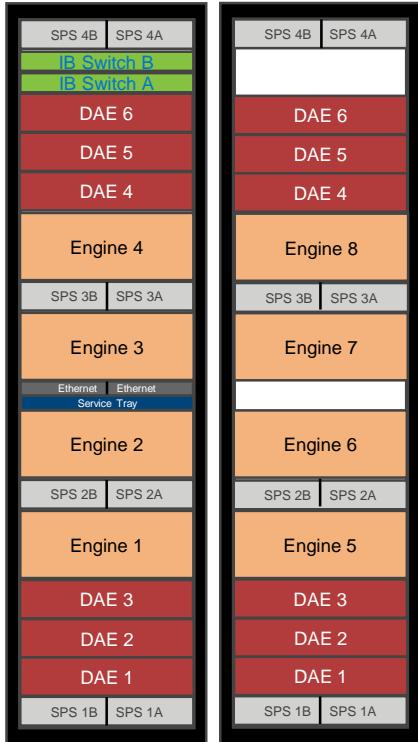
Balanced performance across CPU resources

Optimized for flash performance



PowerMax 8000 System Configuration Details

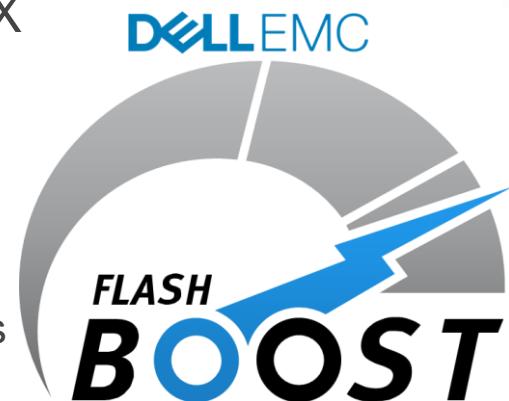
- Each engine starts with 2 DAEs
- Infiniband switch gets added with 2nd engine
- Each additional engine adds 3rd DAE
 - Each additional even numbered engine gets a 3rd DAE which is shared with the previous odd numbered engine



New! FLASHBOOST™ for Mainframe

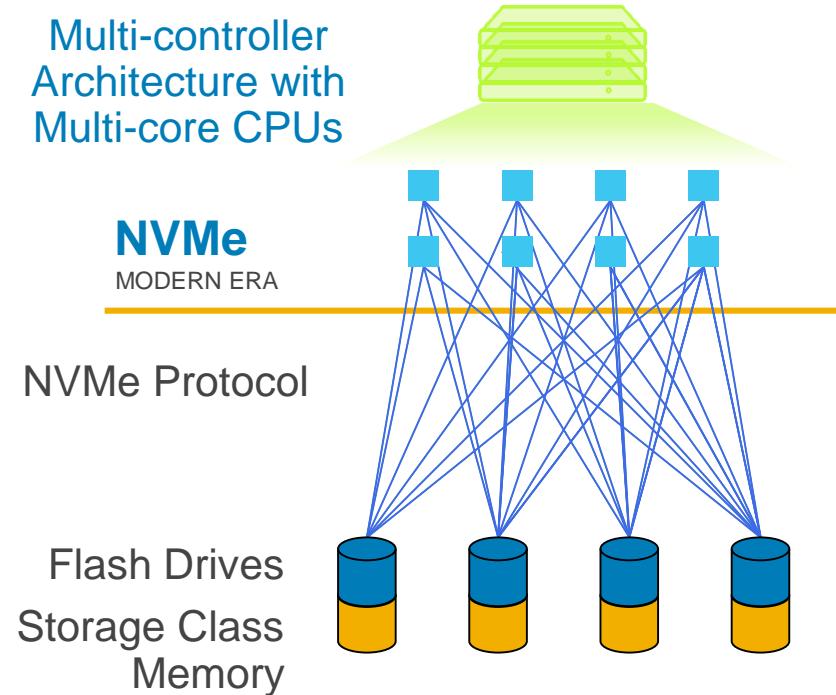
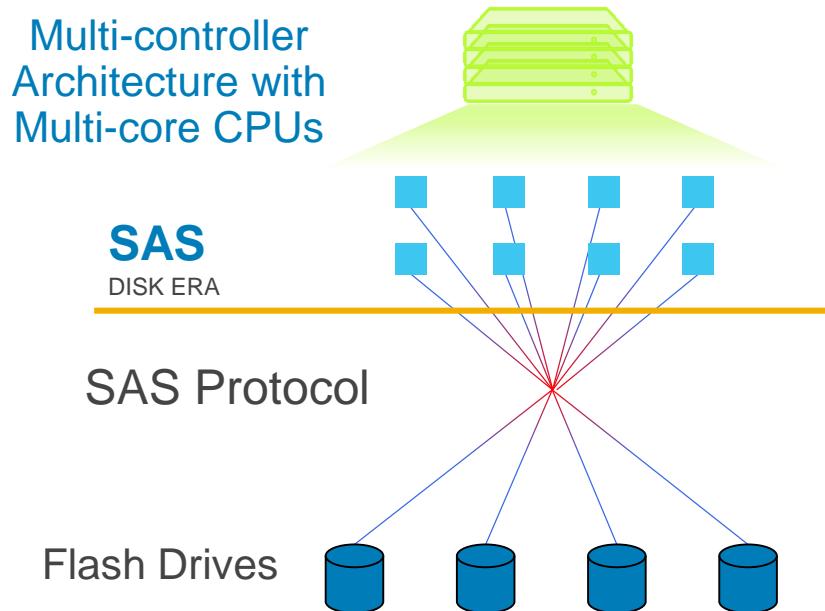


- Performance feature introduced with VMAX non-mainframe now reintroduced in PowerMax & VMAX All Flash
- Delivers performance acceleration for high demand read intensive workloads
 - VMAX will bypass its internal cache on read miss workloads
 - Cache loading overhead happens asynchronously
 - Performance improvements ~2X on Read Miss
 - Significant savings for All Flash disk response profile

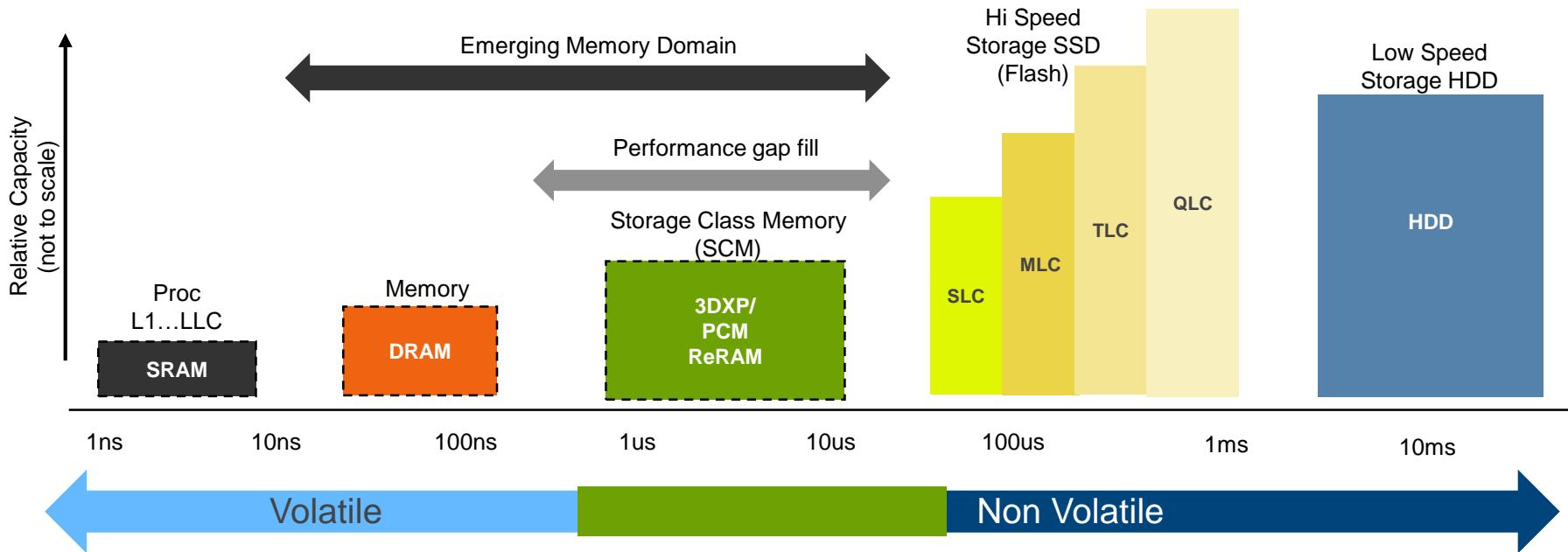


NVMe unlocks the power of next generation media

- Maximizing the performance of multi-controller architectures

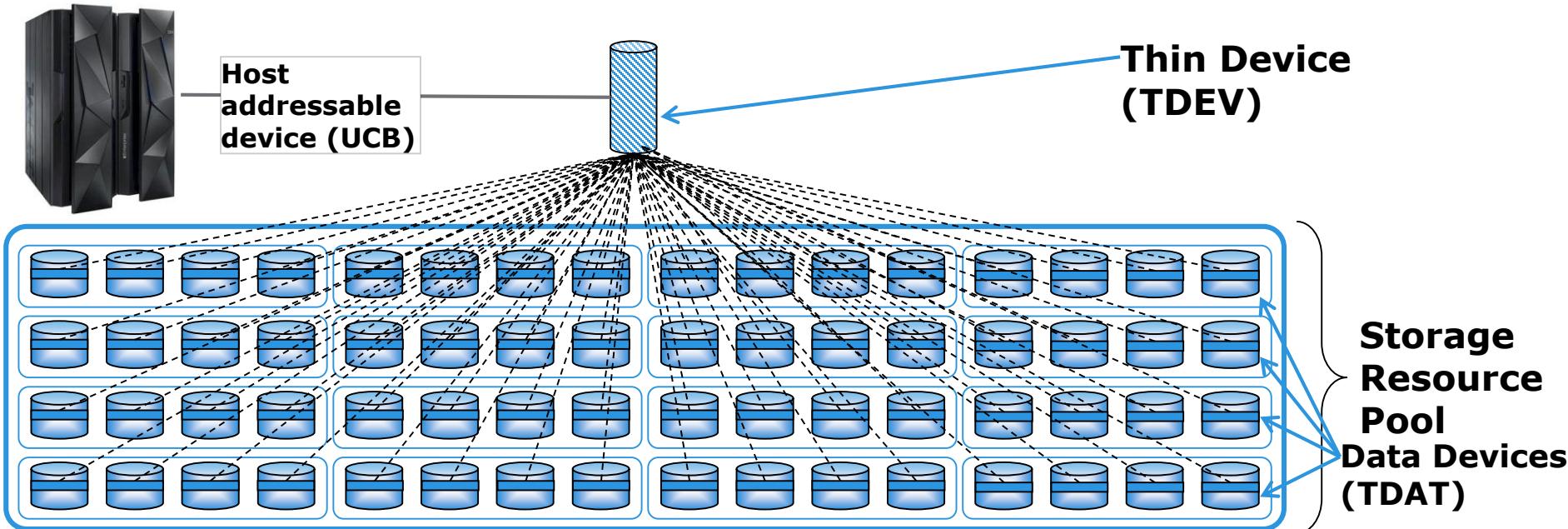


Storage Class Memory: Filling the latency gap



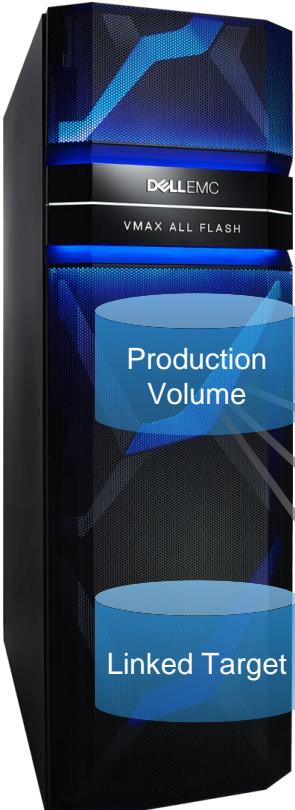
Virtual (thin) Provisioning Concept

- Storage capacity is structured in common data pools
- Thin devices are logical volumes that are provisioned to hosts
- Workload is spread across many disks



Incorporate snaps for data copies

New TimeFinder SnapVX™



REDUCED IMPACT

- Target-less Snapshots

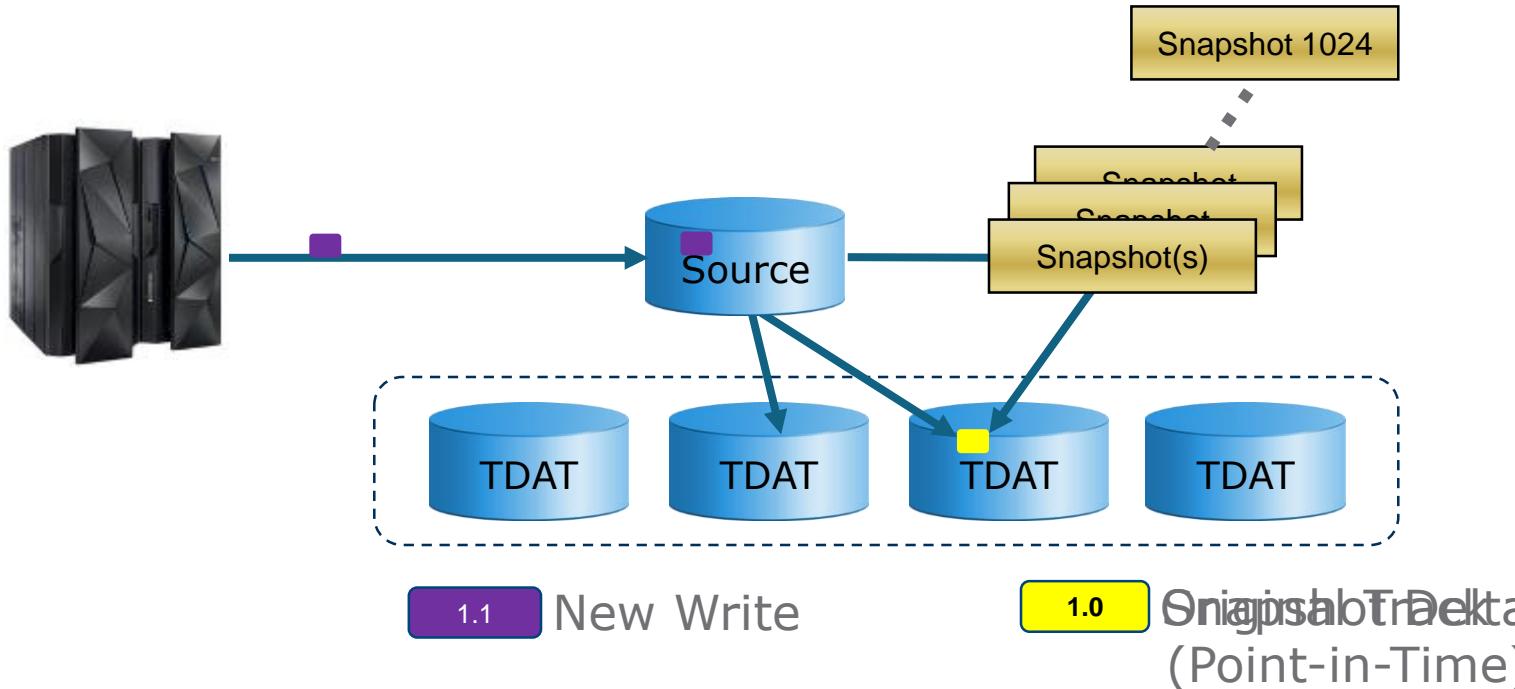
INCREASED AGILITY

- Up to 256 Snapshots per source
- zDP enables up to 1024 Snapshots per source
- Up to 1024 Linked Targets (snaps and/or clones) per source

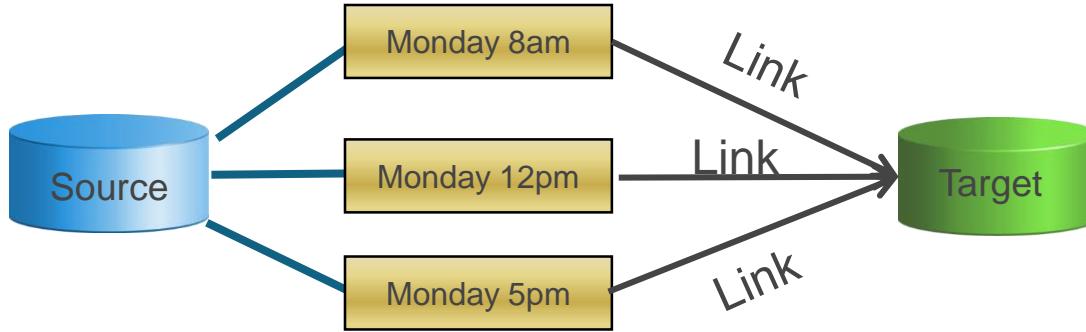
EASE OF USE

- User-defined name/version number
- Automatic expiration if desired
- Secure Snapshots

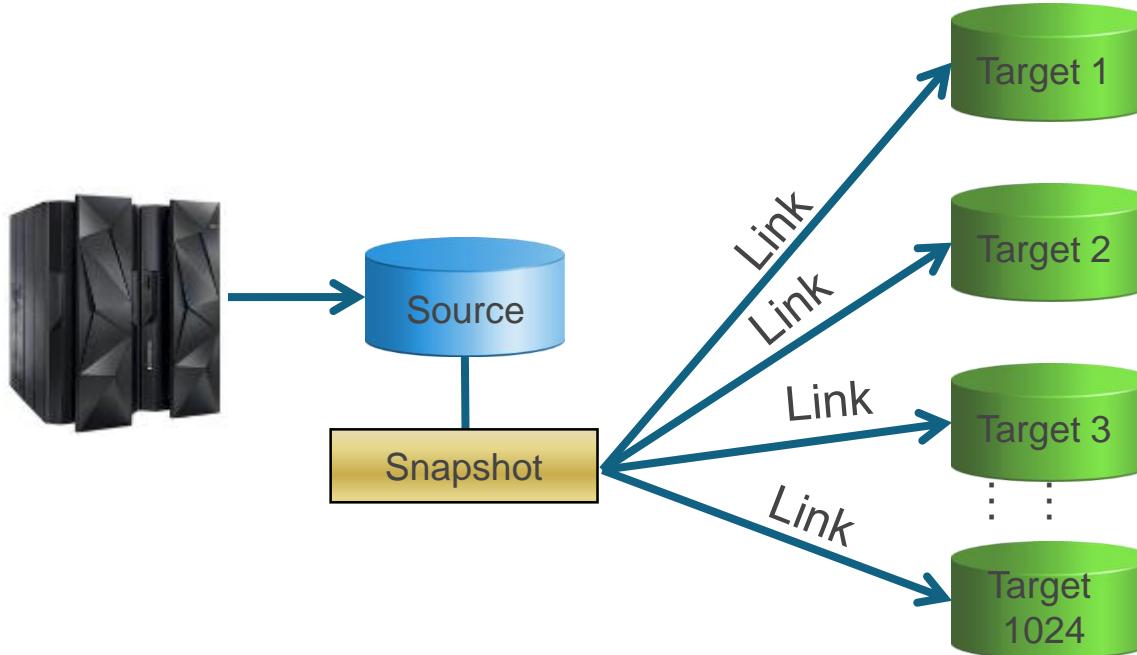
SNAPVX SPACE EFFICIENCY REDIRECT-ON-WRITE AND SNAPSHOT DELTAS



SNAPVX Link Command



SNAPVX Link Command



Which local replication solution would you choose?

NON-SNAPVX SOLUTION



256 full volume copies



25.6PB



SNAPVX SOLUTION



- * Based on the following observed avg's
• Snaps every 10 mins
• Observed change rate



99.9% LESS COPY SPACE USED WITH SNAPVX!!



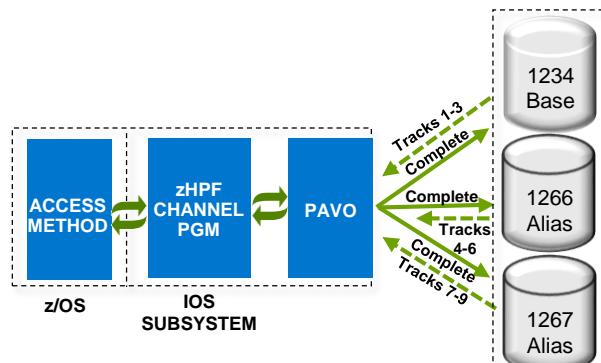
zHPF Optimizers for z/OS

Intercept zHPF I/O
and transform it to:

- Create multiple I/O requests
- Execute them parallel
- Reduce latency

PAV OPTIMIZER

UP TO **70%** FASTER RESPONSE TIME



MIRROR OPTIMIZER



Cuts replicated I/O response time in half

For any zHPF performance sensitive data

VMAX and PowerMax IBM Z synergy

- Multi-Incremental FlashCopy
- SuperPAV
- PPRC Event Aggregation
- Storage Controller Health Messages
- Enhanced zHPF support
 - List Prefetch
 - Format Writes
 - Bi-Directional transfers
 - BSAM/QSAM support
 - zHPF Extended Distance II
- Query Host Access
(ICKDSF VERIFY OFFLINE)
- FICON Enhancements:
 - FICON Dynamic Routing
 - 32K devices per FICON channel
 - Forward Error Correction Codes
 - Read Diagnostics Parameters
- zHyperWrite
- zFBA support
- PPRC SoftFence
- Non-disruptive state save
- 1 TB EAV
- Dynamic Volume Expansion
- D@RE external key manager support
 - IBM SKLM (Secure key Lifecycle Manager) & Gemalto



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Disk Library for mainframe DLm8500 release 5.1

Robin Fromm – Global Field CTO Mainframe Solutions



DLm8500 – What Matters - Unique Features

- Continuous Availability In A Single System
- Ability to Read/Write Test %100 of Data Without Disrupting Disaster Recovery
- Superior and Consistent Performance Over The Life Of The System (3X Competitive Offerings) Up to 12 GB/Sec!
- Deduplication Enables Extreme Space Efficiency (8:1 or more reduction)
- Leverage Cloud Object Storage (ECS) For Long Term Retention Of Data

What is Disk Library for mainframe?

- “Virtual” mainframe tape (tape on disk) for all tape use cases
- The first “all flash” virtual tape storage with powermax offering universal data consistency™ and truly synchronous tape (SRDF/S)
- IBM tape emulation, but significantly faster for IBM & unisys mainframes – 3480, 3490, 3590
- Up to 4096 virtual tape drives
- Transparent – looks just like IBM tape
- SAS, Flash & Cloud Object Storage Options
- Dell EMC invented 100% tape on disk
 - QA/tested by dell EMC
 - Developed & manufactured by dell EMC
 - Maintained by dell EMC
 - Professional services by dell EMC



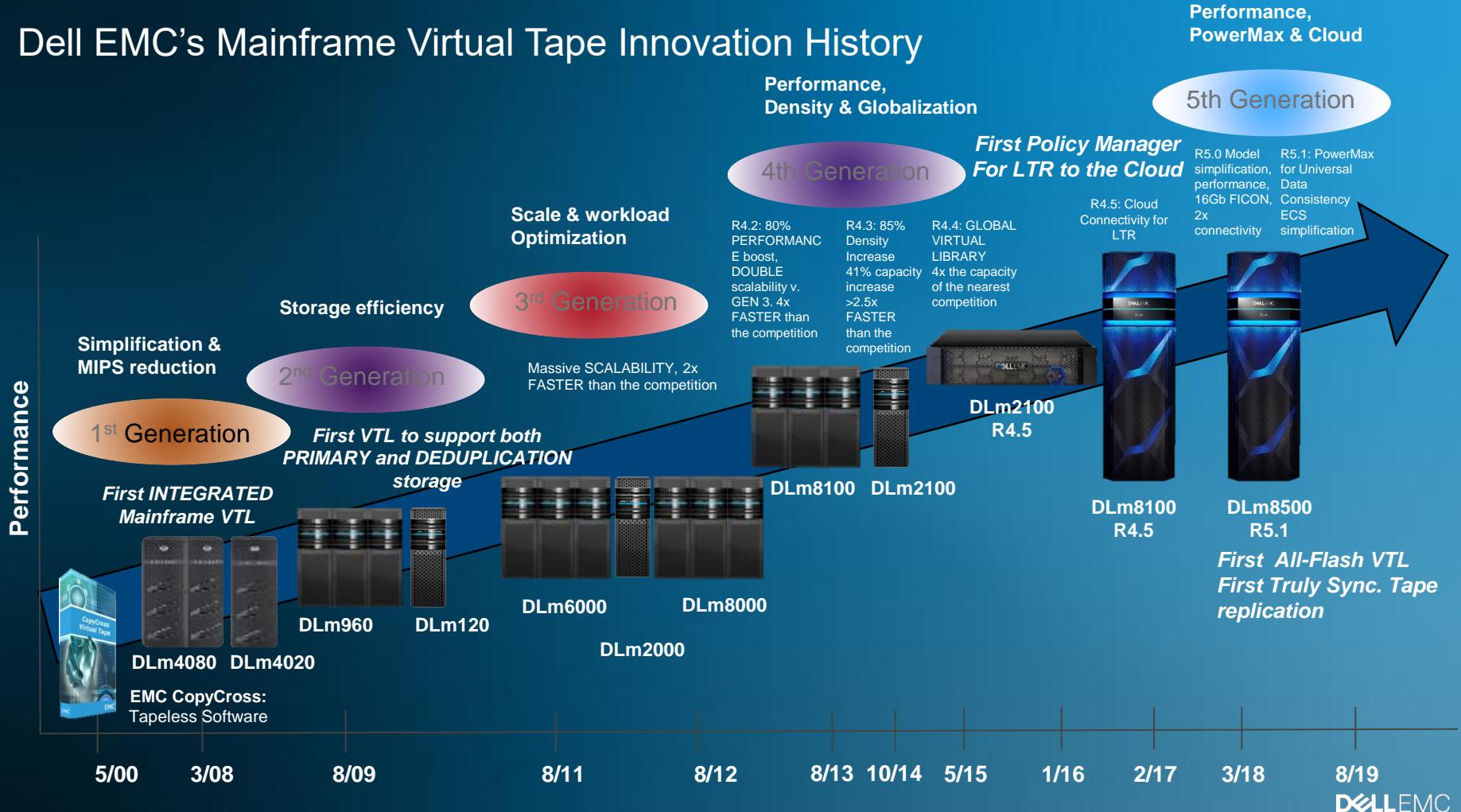
Single-cabinet configuration



Multi-cabinet configuration

DELL EMC

Dell EMC's Mainframe Virtual Tape Innovation History



DLm Starts With Dell EMC's Industry Leading Storage & Cloud Offerings

And allows you to leverage them all



New DLm8500 Release 5.1

Enhances DLm8500 release 5.0

Single-frame Solution

- 1-2 VTEs
- Up to 1024 Virtual Tape Drives
- Up to 3 GB/Sec Bandwidth
- 1-2 1Gb management switch
- 1-2 10Gb Data switch
- Deduplication Storage Options
 - DD6300
 - DD6800 (HA optional)
 - DD9300 (HA optional)
 - DD9800 (HA optional)
- Storage sharing with IBMi (iSeries), open systems
- Long-term tape retention cloud (ECS)



Multi-frame Scale out Solution

- 1-8 VTEs
- Up to 4096 Virtual Tape Drives
- Up to 12 GB/Sec Bandwidth
- 2 1Gb management switch
- 2 10Gb Data switch
- Deduplication Storage Options
 - DD6800-HA
 - DD9300-HA
 - DD9800-HA
- Long-term tape retention cloud (ECS)
- PowerMax8000 high performance DASD

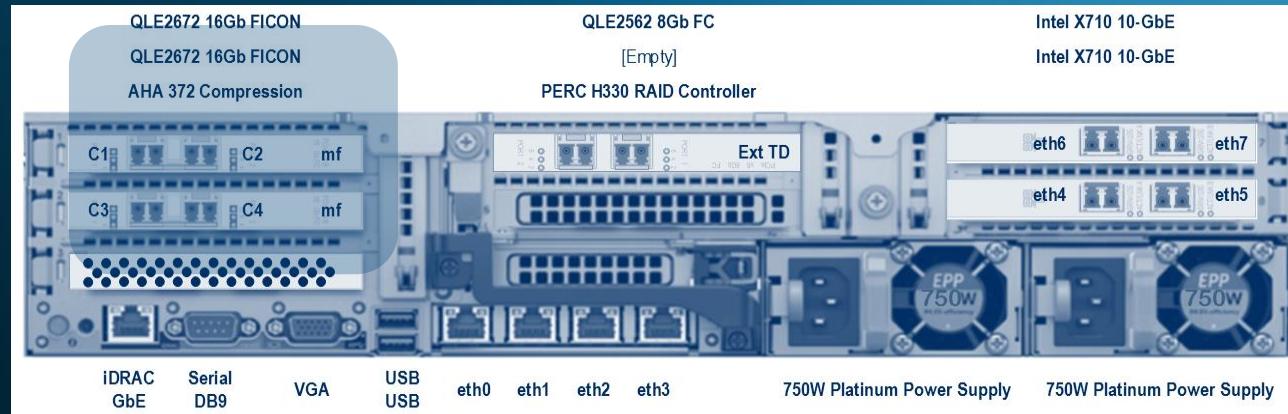


DLm 5.1 “under the covers”

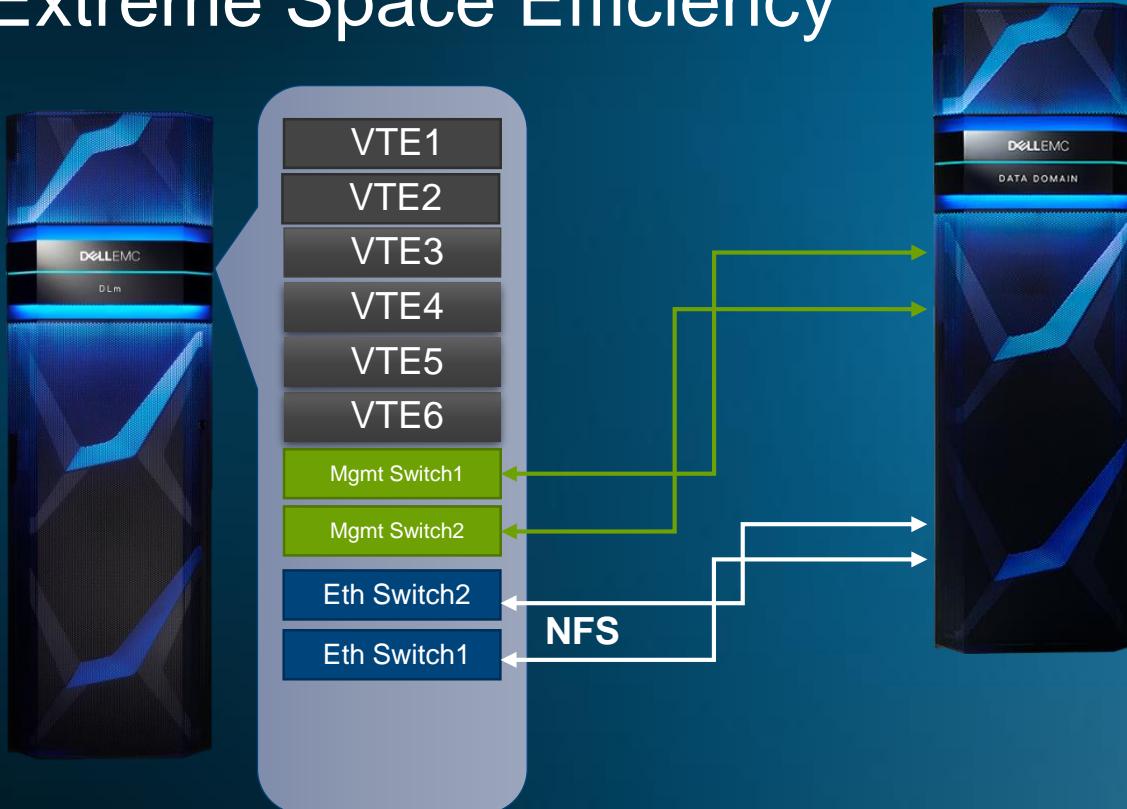


DLm8500 Virtual Tape Engine – 2x All Around

- 16Gb FICON ports into each VTE - Up to 32 per DLm Array – twice that of Gen 4
 - 4 port Virtual Tape Engine using Dell Servers
 - Up to 512 Virtual Tape Drives per VTE – twice that of Gen 4 VTEs
 - 1,500MB/Sec Performance Rating – twice the performance of Gen 4 VTEs
- New and faster Dell server for the DLm VTE Appliance



Data Domain Connectivity for High Performance Extreme Space Efficiency



- Data Domain
- High Availability Option
- Inline Deduplication 8:1 or More data reduction
- @DARE Encryption Option

Data Domain High Availability



- High availability of backup, archive, and recovery data on Data Domain ensures operational continuity to minimize downtime for users and processes.
- HA configurations are supported on DD6800, DD9300, DD9800 and the legacy DD9500
 - Delivering business continuity for both Large and Midsized Enterprises

Details of DLm 5.1 enhancements

PowerMax 8000 attachment

- Block Storage (supports mainframe and open environments)
- Universal Data Consistency™ (between PowerMax & DLm)
- Synchronous or asynchronous tape protection (SRDF/S, SRDF/A)

New Cloud capability and simplification

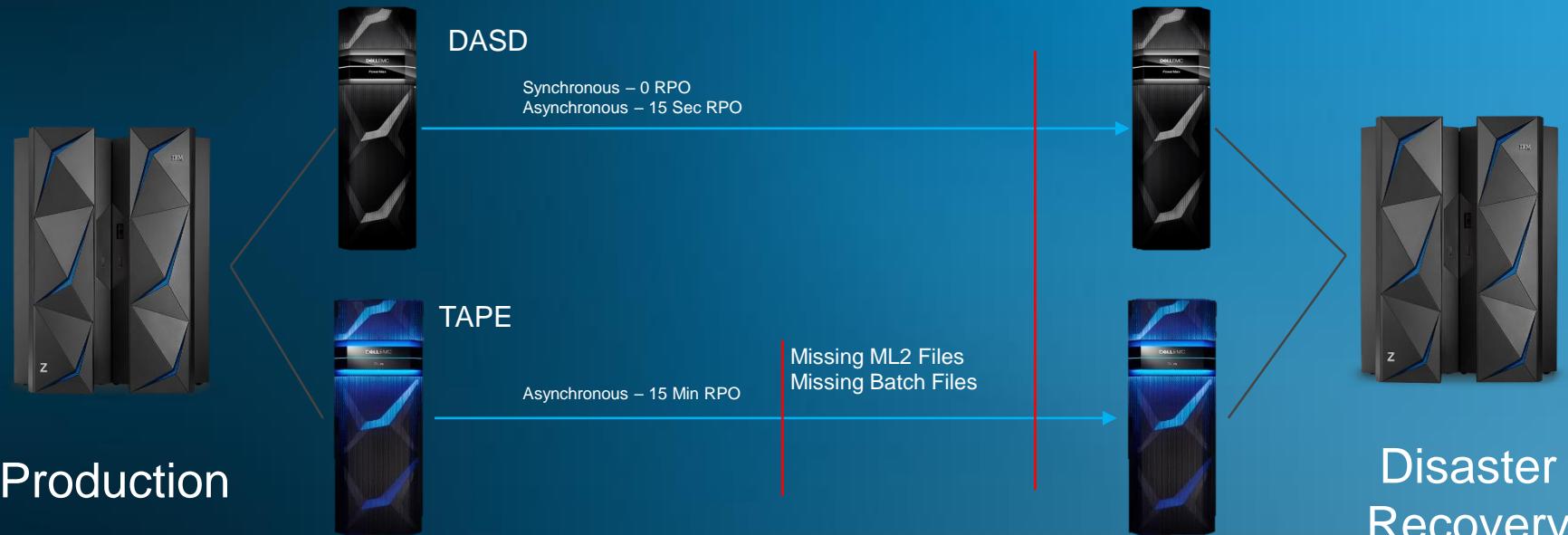
- Ability to move data on demand to the cloud tier
- Single, simple, “restore” command

Additional Enhancements

- SNMP V3 network security
- Additional installation options
 - Customer supplied rack
 - 3-Phase power available

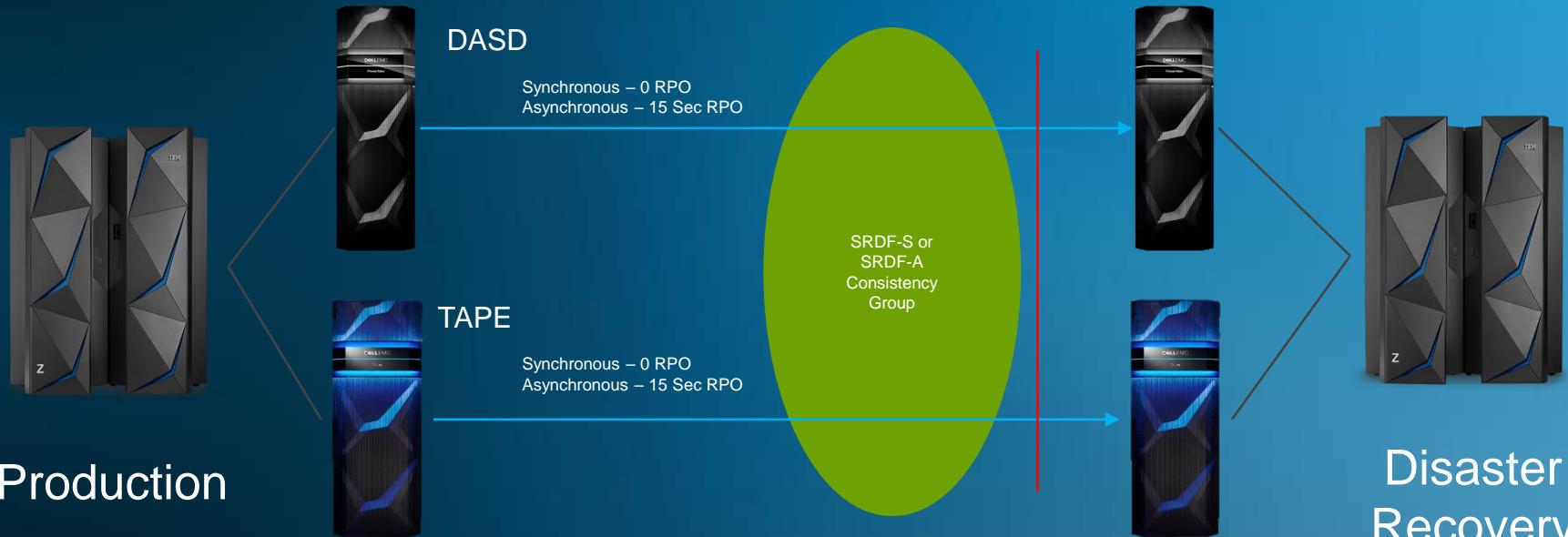


DASD and Tape Data Consistency Issue



- Missing Data
- DASD Files And System Catalogs Are Ahead Of TAPE Files

DASD and Tape Data Consistency Issue - Solved!



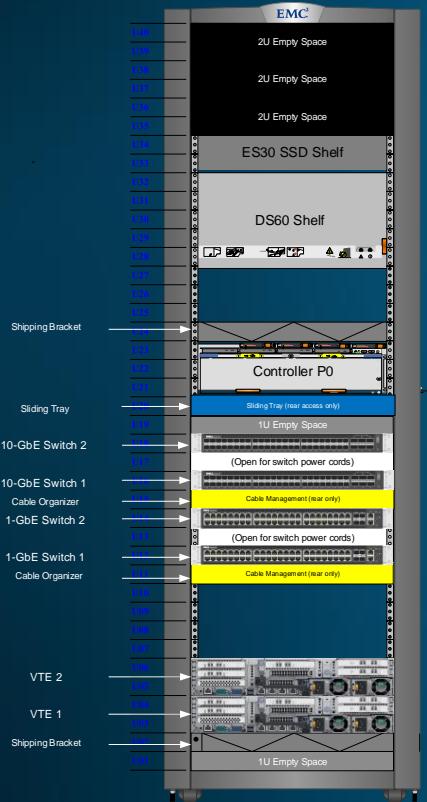
- DASD Files, Tape Files And System Catalogs Are Synchronized
- No Missing Tape Data
- No Performance Impact

Why use PowerMax 8000 with DLm?

- When Universal Data Consistency™ is needed to provide data consistency between PowerMax 8000 primary storage (DASD) & DLm (TAPE) on PowerMax for applications that demand it:
- Examples:
 - DFHSM ML2 Migration – DASD File is scratched and catalogs are updated before the TAPE file is replicated resulting in missing ML2 data at the DR location
 - Batch TAPE Files – Jobs or Job Steps terminate and catalogs are updated before the TAPE file is replicated – resulting in missing TAPE data at DR location
- SRDF Synchronous and Asynchronous replication is supported



DLm8500 Single Rack DD Storage Solution



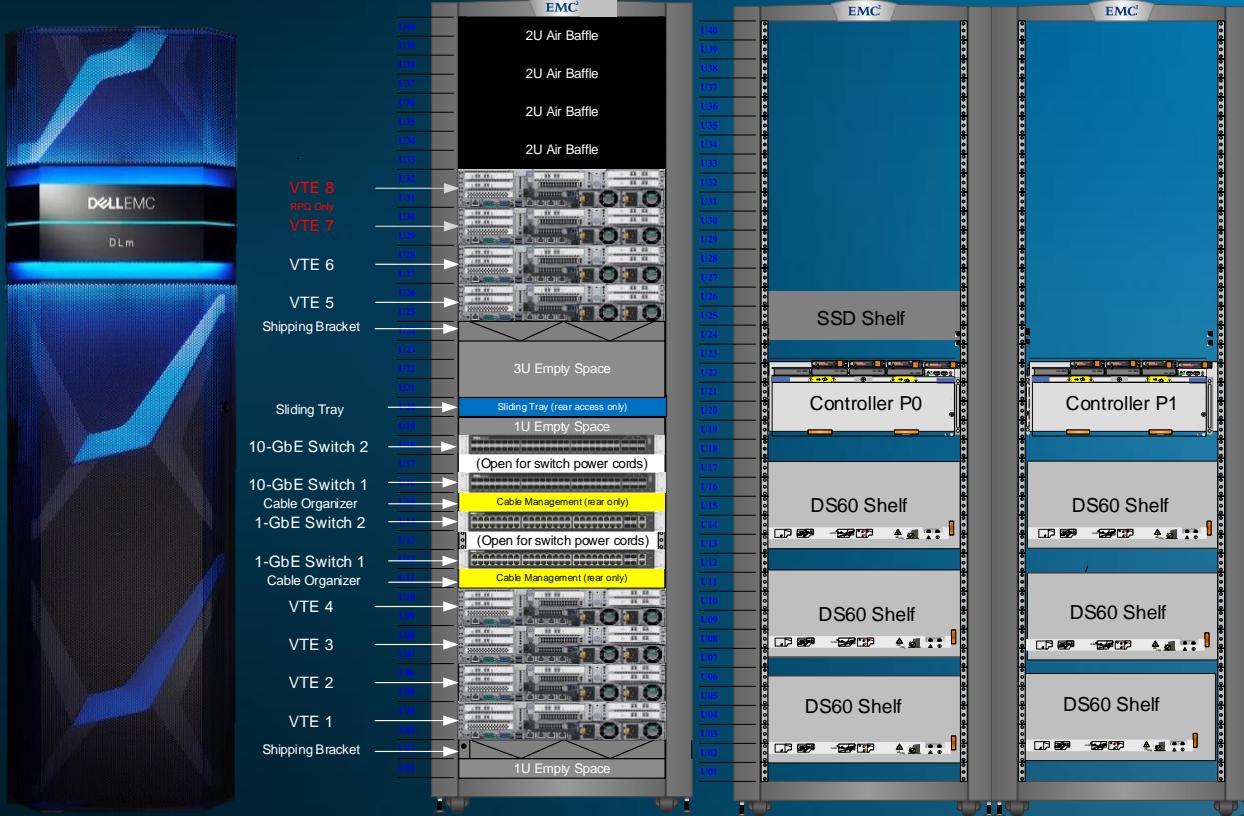
DLm8500

- 1 - 2 VTEs
 - Up to 4 FICONs per VTE
Total 8 FICONs
 - Up to 4 FICON Licenses per VTE
 - 512 – 1024 Tape Drive Support
 - Up to 3 GB/Sec

DD6300/DD6800

- Minimum useable capacity: 34 TB
 - 272 TB @ 6:1 Deduplication
- Maximum useable capacity: 420 TB
 - 3200 TB @ 8:1 Deduplication

DLm 8500 / DD9800 Scale Out



DLm8500

1 - 6 VTEs

- 1 – 24 FICON Channels
- 512 – 3072 Tape Drive Support
- ~750MBytes/sec single FICON
- ~1200MBytes/sec 32 FICONs

DD6800/DD9300/DD9800

High Availability Configuration

DD6800 Minimum useable capacity: 94TB

752TB @ 8:1 Deduplication

DD9800 Maximum capacity: 1PB

- 8000TB @ 8:1 Deduplication

Comprehensive PowerProtect DD Portfolio



**BACKUP
INGEST**
(with DD Boost)

Virtual Edition

Up to 11.2TB/hr
for 96TB

**LOGICAL
CAPACITY**
(with Cloud Tier)

Up to 14.8PB
for 96TB

**USABLE
CAPACITY**
(with Cloud Tier)

Up to 288TB
for 96TB

DD3300

Up to 7.0TB/hr

Up to 4.8PB

Up to 96TB

DD6900

Up to 33TB/hr

Up to 56.1PB

Up to 864TB

DD9400

Up to 57TB/hr

Up to 149.8PB

Up to 2.3PB

DD9900

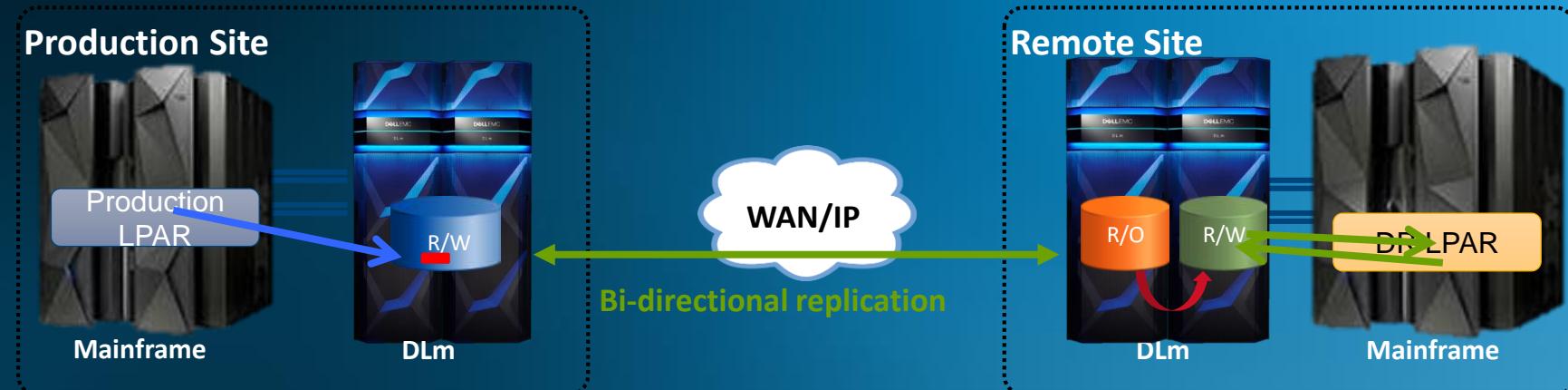
Up to 94TB/hr

Up to 211PB

Up to 3.25PB

Logical capacity based on up to 50x deduplication (DD3300) and up to 65x deduplication (DD6900, DD9400, DD9900) based on additional hardware-assisted data compression of up to 30%. Actual capacity and throughput depends on application workload, deduplication and other settings.

Typical Disaster Recovery testing with DLm



Read-only mounts

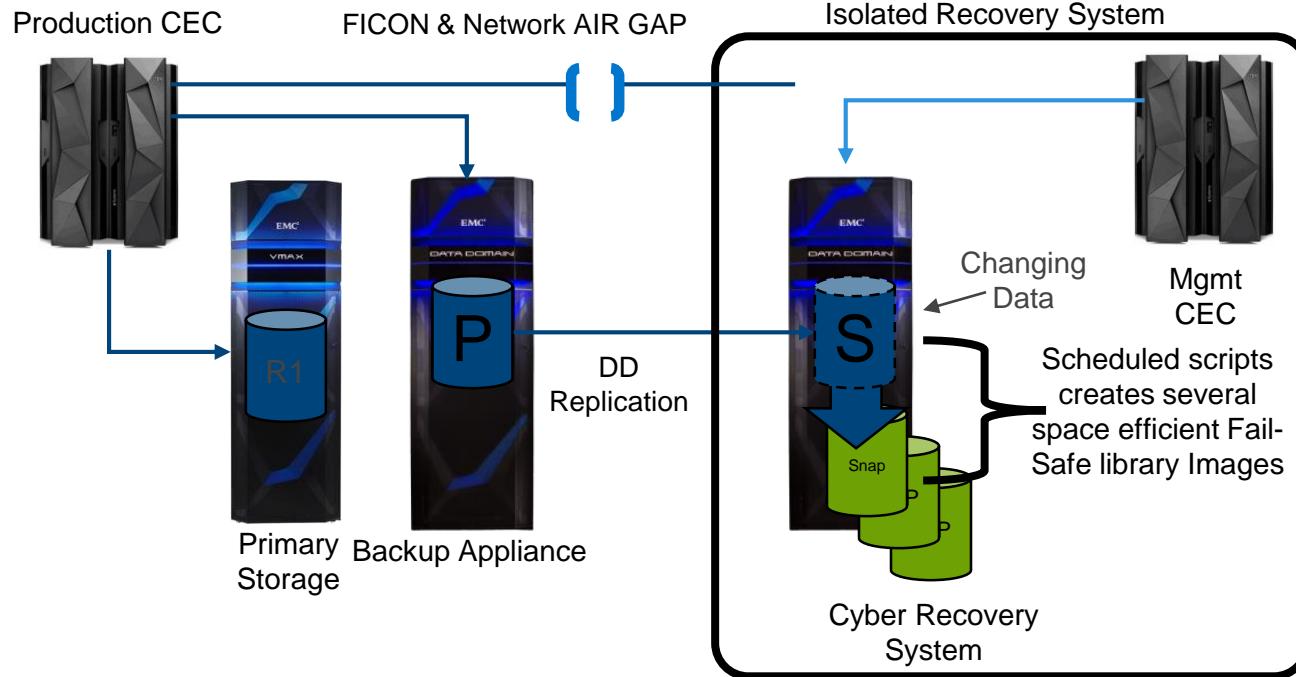
- Disk arrays allow instant “read-only” copies
- Confirm that tapes can be mounted and all required data can be accessed
- No incremental storage capacity required

Snapshots

- Disk arrays allow creation of “read-write” snapshots
- Confirm operation at the disaster recovery site
- Some incremental storage capacity required

Remote replication is uninterrupted during testing

DLM CYBER RECOVERY SOLUTION COMPONENTS



- Can co-exist with and enhance an existing BC/DR Solution
- Tape Data is periodically copied in to CRS environment
- File System Snapshot multiple space efficient Fail-Safe Library images
- Preferred that Management CEC is “hardwired” to CRS Solution
- Un-addressable Snapshot Copies allow multiple restore points
- Management CEC can be used used to periodically validate data

- P2P dedicated Ethernet replication ports
- All TCPIP Sockets Closed replication ports except Replicator
- Separate Dedicated Replication Network
- Coordinate TMC Catalog Backup with Restore Points
- Instant Access
- Retention Periods / WORM

- Cost Effective
- RPO = Hours to 1 Day*
- RTO = Hours to Days**

* Adjustable based on desired security window

** Depends on # of Volumes, Data etc.

CYBER RECOVERY EFFICIENCY

Filesys Compression

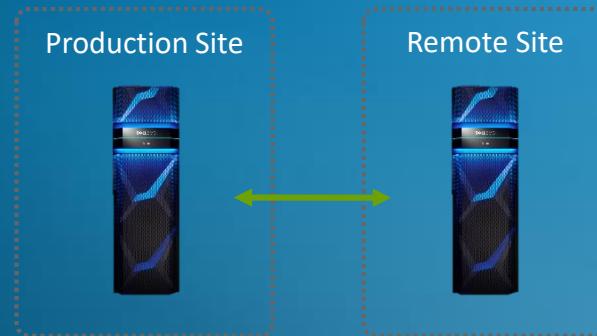
From: 2019-10-23 06:00 To: 2019-10-30 06:00

	Pre-Comp (GiB)	Post-Comp (GiB)	Global-Comp Factor	Local-Comp Factor	Total-Comp Factor (Reduction %)
Currently Used:*	30609529.7	643832.0	-	-	47.5x (97.9)
Written:					
Last 7 days	19662362.7	57548.9	100.4x	3.4x	341.7x (99.7)
Last 24 hrs	2461299.6	6592.0	107.4x	3.5x	373.4x (99.7)

Data Domain - Guaranteed Replication



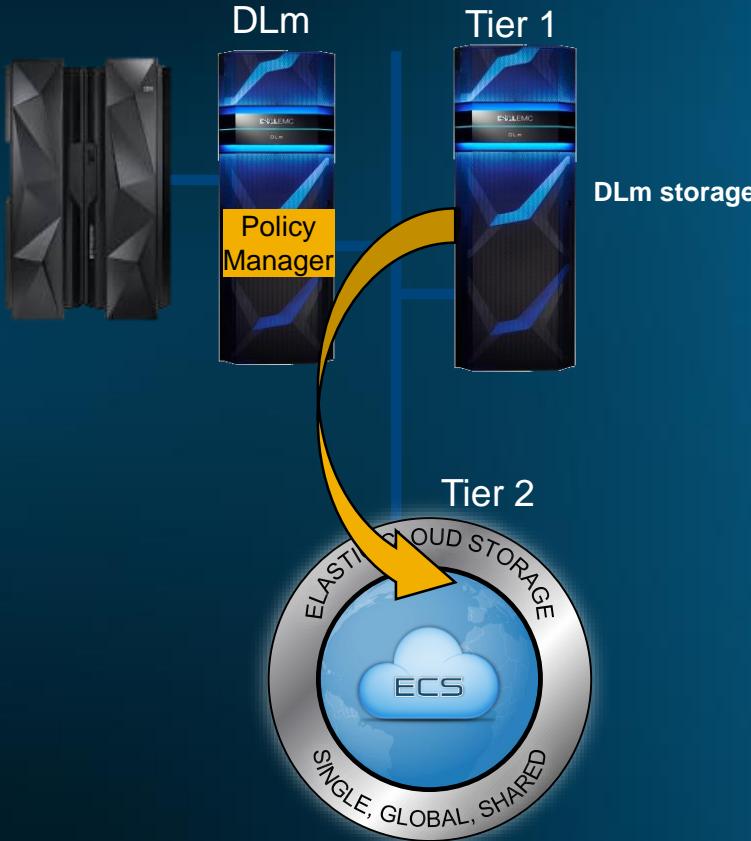
- Three Modes of Operation
 - **Guaranteed Replication** – Job Termination Waits Until Tape is Replicated
 - **RUN** – Final Tape Replication At Job Termination – NO Wait
 - **Sync Mode** – Replication and Wait On Tape Sync Command
- Active Replication Cycles During Job Execution Reduce Final Replication Delays
- Most Data Is replicated Prior to job Termination



Replacing Physical tape:

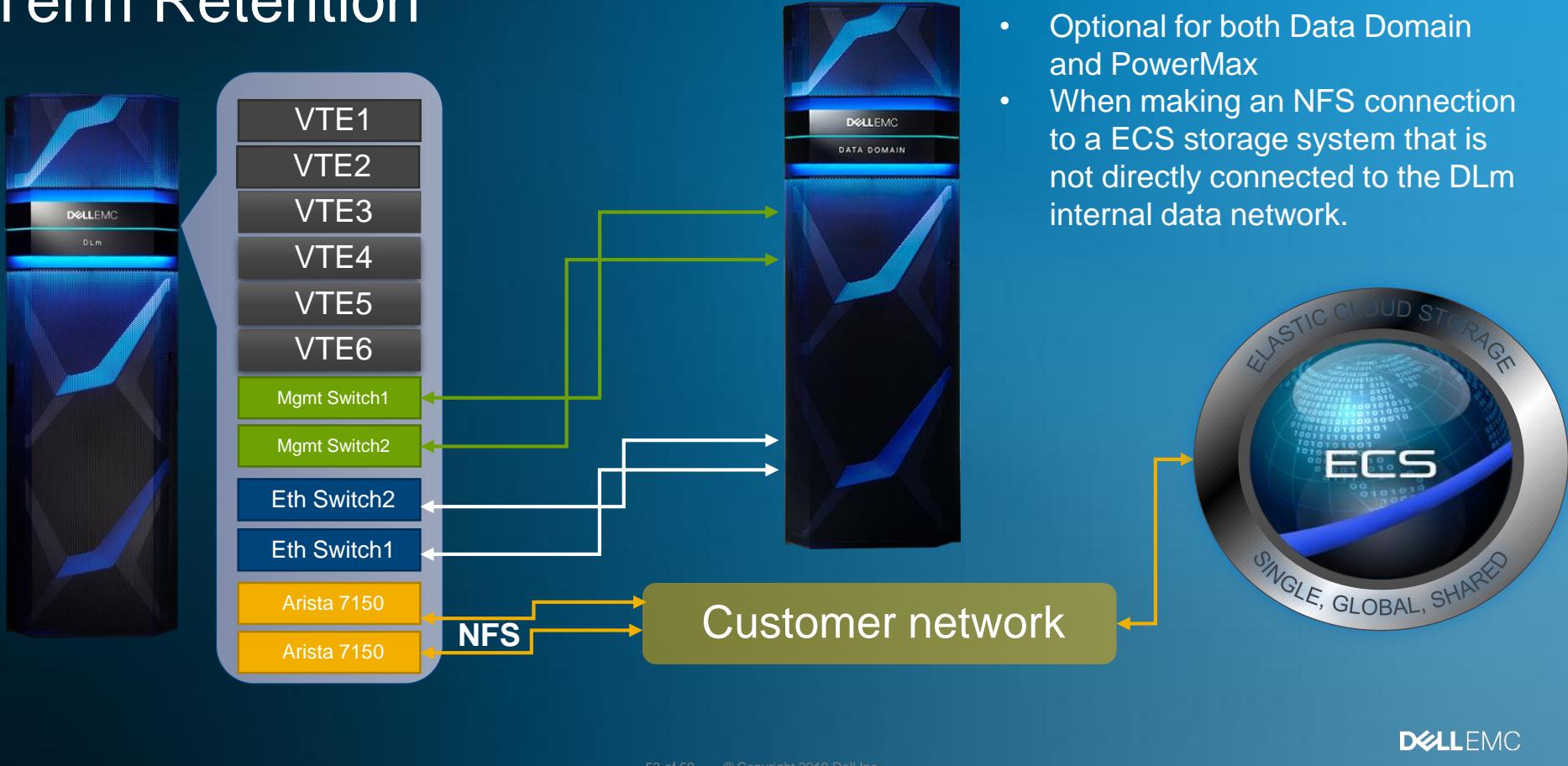
Cloud Object Storage and DLm5.1 Long-Term Retention

Benefits of DLm8500 + ECS For Long-Term Retention

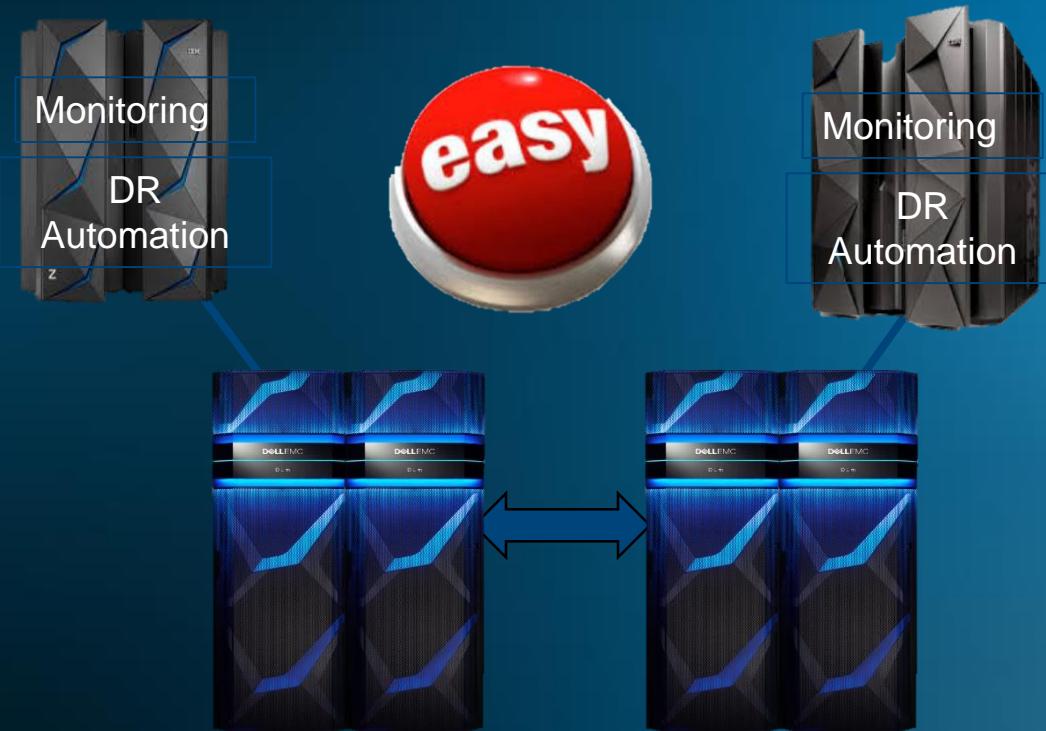


- 1. Reduce costs**
 - **Keep Only The “Working Set” Of Tape** Datasets On Primary Tier Of Storage
 - **Eliminate Physical Tape Media**
 - **Repurpose** all or a portion of an existing **ECS** environment
- 2. “Simplify & Quantify” DR**
 - Knowing what's on ECS vs. DLm creates more accurate accountability
- 3. Create a “Safety Valve” To** Accommodate Unexpected Increases In Tape Workload
- 4. Create “political capital” as mainframe** participates in the organization's cloud strategy.

Elastic Cloud Storage Connectivity (Object) for Long Term Retention



GDDR Tape: DLm DR & Test Automation



- Planned and unplanned outages
- Leverages Dell EMC GDDR Technology
- Automates DLm DR Test Setup and Tear Down
- Automates Switch Over / Failover / Failback
- Supporting DLm w/ VNX Data Domain & PowerMax

Summary of DLm 5.1 and ongoing advantages



Universal Data Consistency between disk & tape + tape Synchronous Copy via PowerMax 8000 SRDF/S & ability to r/w test 100% of data with no DR interruption



Extreme storage efficiency through deduplication combined with Superior and consistent performance



Additional enhancements include SNMP V3 network security, the ability to use a customer-supplied rack and 3-Phase power, configurable at installation



Lower Tape TCO, eliminate physical tape with DLm + Elastic Cloud Storage with simplified and expanded capabilities



Continuous, High Availability in a single frame to lower costs, via unique virtual tape engines & deduplication storage

DELL EMC