Alegerea arhitecturii de stocare potrivite

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Radu Isaia – Storage Platforms & Solutions Sales

DELLTechnologies

Dell Storage portfolio classification

HETEROGENEOUS & DEMANDING WORKLOADS

Multi-Controller Storage: Mission Critical
Use Cases: Advanced Connectivity, Replication, Consolidation, Specialist OS
Unique Advantages: Tightly Coupled Scale Out, Always on Updates

Bare Metal & Agnostic Cloud/VMs
Use Cases: Kubernetes DevOps, Virtual/Physical Consolidation, DBaaService, Exadata
Unique Advantages: Heterogenous Disaggregated, High Performance

PowerMax

PowerFlex

Unstructured Data

PowerScale, ECS & ObjectScale

PowerStore Unity XT

VxRail & Azure Stack APEX Cloud Platforms

Does not share memory

Can be managed as one

Dynamic Nodes

VxRail Deployment Flexibility
DELLTechnologies

Dual Controller Storage: Business Critical
Use Cases: General Mixed Workload Consolidation
Unique Advantages: Loosely Coupled Scale Out, Anytime Upgrades, AppsOn

VMware, Microsoft, Red Hat Specific
Use Cases: Private/Multi Cloud, Azure/VMWare Consolidation
Unique Advantages: End-toEnd VMW/Azure Vertical Stack Integrated System

MOSTLY VIRTUALISED WORKLOADS

Storage Array Topology

Node Based Topology

TOPOLOGY & OPERATING MODEL
Classic and Trusted
(3 Layer/CI: SVR, SAN, STR)
(Discrete Teams / Refresh Cycles / Scaling Models)
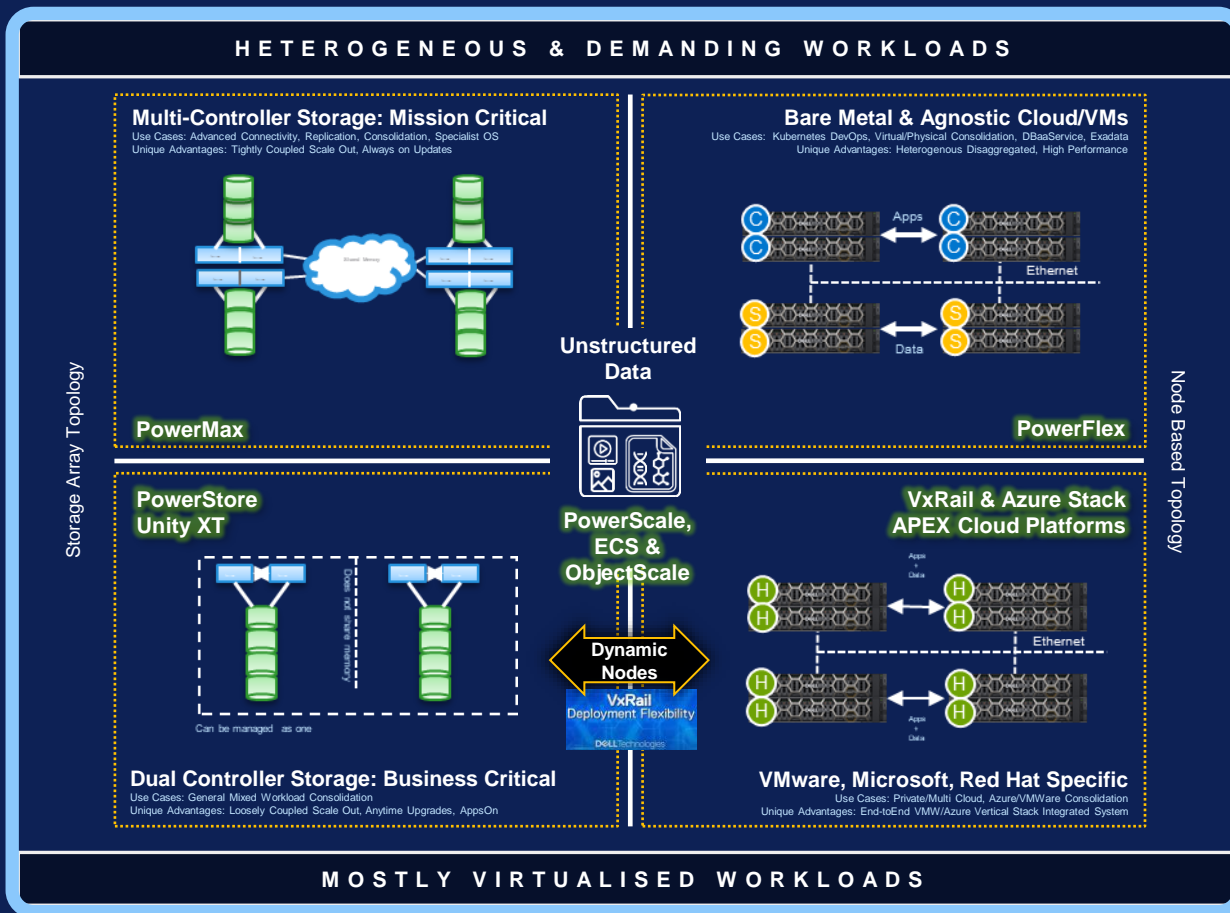
TOPOLOGY & OPERATING MODEL
Redefined and Outcome Focused
(2 Layer (SVR/STR) or HCI)
(Accelerated TTM, Integrated M&O&A, Turnkey LCM)

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PowerStore

Continuously modern storage

Flexible architecture and program advantages help you adapt to any future
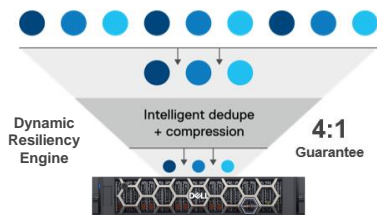
Container-based design

Modular microservices OS
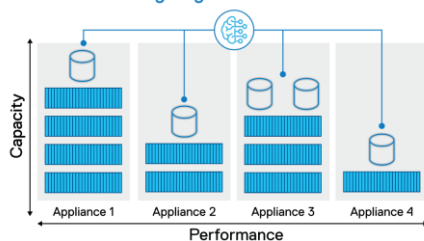
Enables rapid delivery of new features

Self-optimizing architecture

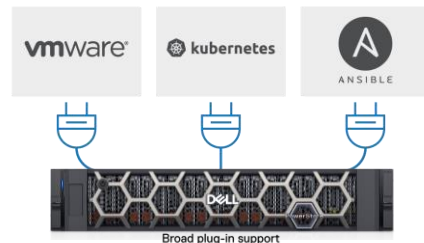Eliminate effort, boost performance & efficiency

Dynamic Resiliency Engine

Intelligent dedupe + compression

4:1 Guarantee

Intelligent scale-up and out

Machine learning engine

Capacity

Appliance 1　Appliance 2　Appliance 3　Appliance 4

Performance

Programmable infrastructure

Automated, end-to-end workflows

vmware   kubernetes   ANSIBLE

Broad plug-in support

Anytime Upgrade

All-inclusive software subscription | Non-disruptive hardware upgrades

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PowerStore momentum continues

Industry validation

TechTarget

Storage Product of the Year
3ʳᵈ consecutive year!

"This is a major leap upgrade, not just window dressing" – Products of the Year judge, TechTarget

IDC

Independent 3rd party Business Value Assessment
468% 3-year ROI

"Pays back investment in 11 months"

Customer adoption

Deployed in over 90% of Fortune 500 sectors

Aerospace & Defense	Food, Beverage & Tobacco	Media
Apparel	Healthcare	Motor Vehicles & Parts
Business Services	Hotels, Restaurants & Leisure	Retailing
Chemicals		Technology
Energy	Household Products	Telecommunications
Engineering & Construction	Industrials	Transportation
Financials	Materials	Wholesalers

90+ countries shipped

150M+ Run hours clocked

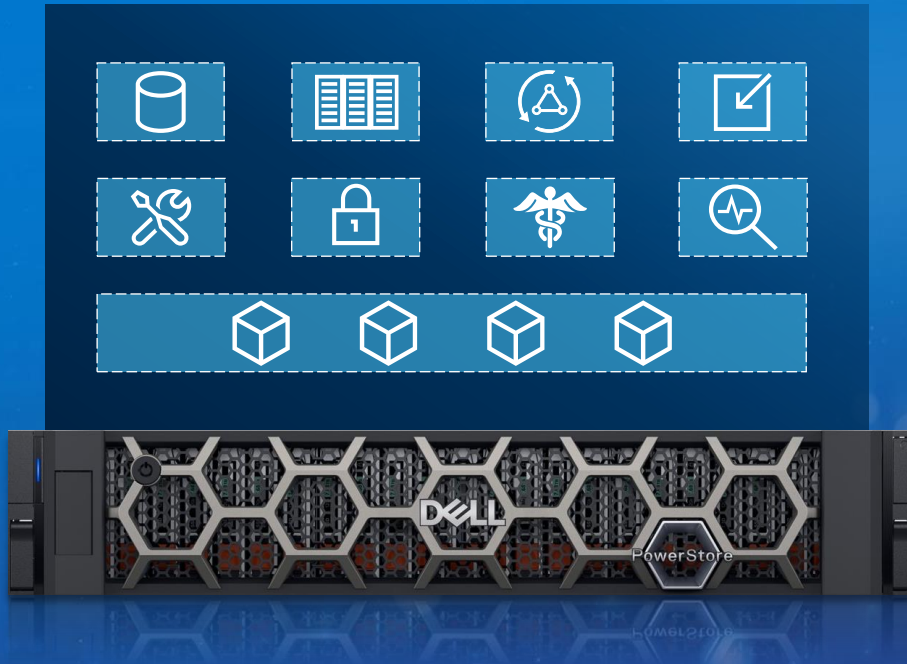**4+ EBe** capacity shipped

24% customers new to Dell Storage

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Any workload

Traditional and modern workloads

Relational Databases	ERP	Electronic medical records	Cloud native	Content repositories	Home directories

FC | iSCSI   **NVMe FC | TCP**   **NFS | SMB**

LUN

Apps and databases   **Containers**   FS FS FS **File**

D∕ELL Technologies
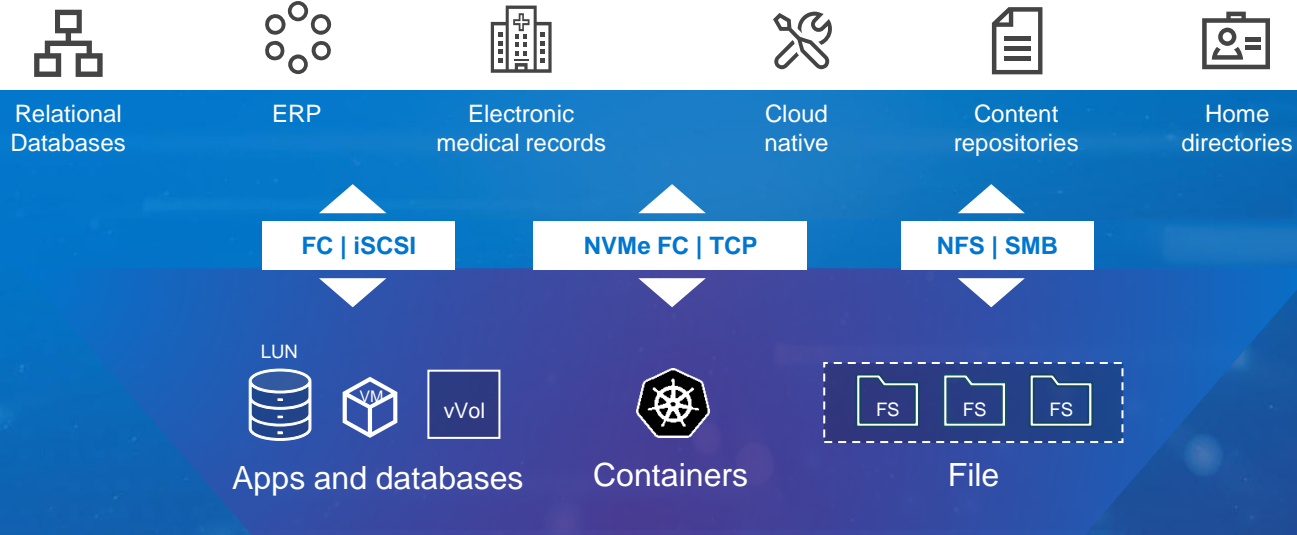
Modular, container-based OS

PowerStoreOS

Continuously modern design

Microservices architecture helps PowerStore *itself* evolve faster.

Shared capabilities across platforms

Future deployment models

D∈LL Technologies

Performance-optimized platform

Expandable appliance

Start with base chassis

Node 1 **PowerStoreOS**   Node 2 **PowerStoreOS**

25 NVMe drives

Scale up to 3 expansion enclosures per appliance

24 NVMe drives

24 NVMe drives

24 NVMe drives

- End-to-end NVMe

- Dual active/active nodes

- High core counts, large system memory configurations

- 4.7 PBe per appliance

- Self-optimizing efficiency

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Scale out with multi-appliance clusters

Scale UP
to 4.7 PBe per appliance*

Scale OUT (4 appliances, 8 nodes)
to >18 PBe per cluster*

CAPACITY

Node 1   Node 2   Node 1   Node 2   Node 1   Node 2   Node 1   Node 2

PERFORMANCE
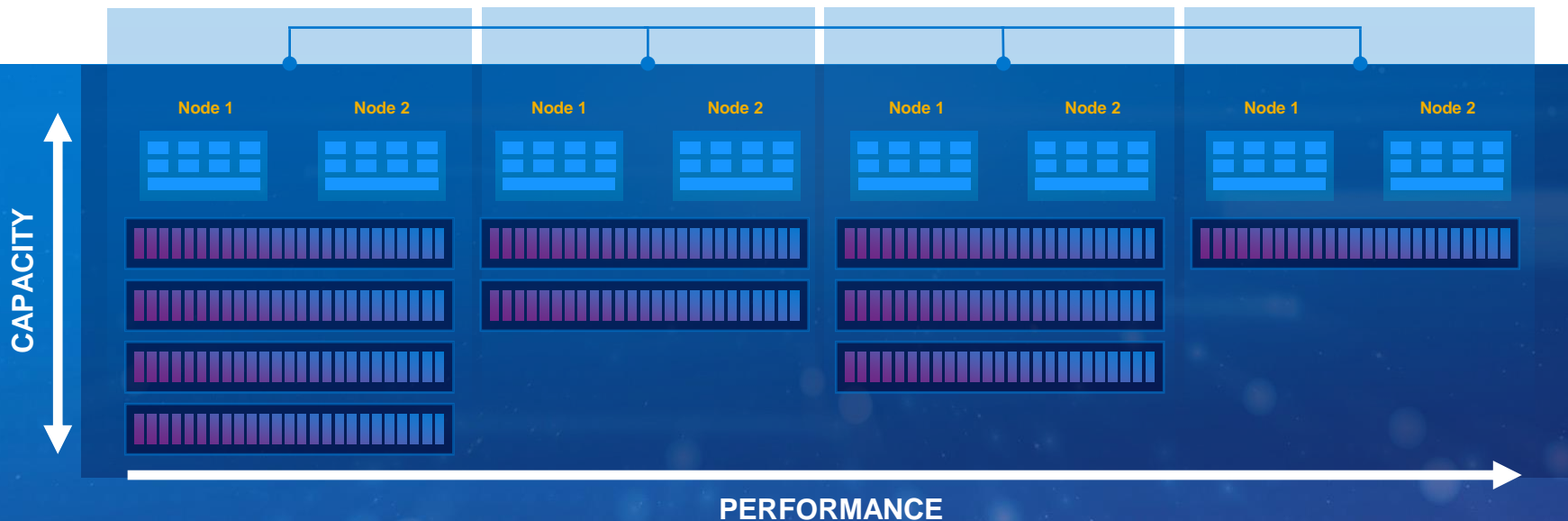
Expand compute and storage independently

D∕∕LL Technologies

Mixed clusters target specific workload needs

Flexible performance & application segregation

Oracle	VMware	High Capacity	Ultra-high performance
Efficiency, consolidation	*Rich data services*	*Low entry, scalable*	*SCM media*

PowerStore 5200 | **PowerStore 3000** | **PowerStore 1000** | **PowerStore 9200**

CAPACITY

PERFORMANCE

Performance varies by model

Same software features, <u>same max capacity</u>

DELLTechnologies

Copyright © Dell Inc. All Rights Reserved.

Autonomous appliance

Easy cluster expansion and management

Machine learning engine

CAPACITY

| Node 1 | Node 2 | Node 1 | Node... | Node 1 | Node 2 | Node 1 | Node 2 |

DATA PLACEMENT RECOMMENDATION

NEW RESOURCE AUTOMATICALLY DISCOVERED

CONTINUOUS MONITORING OPTIMIZES EFFICIENCY

PERFORMANCE
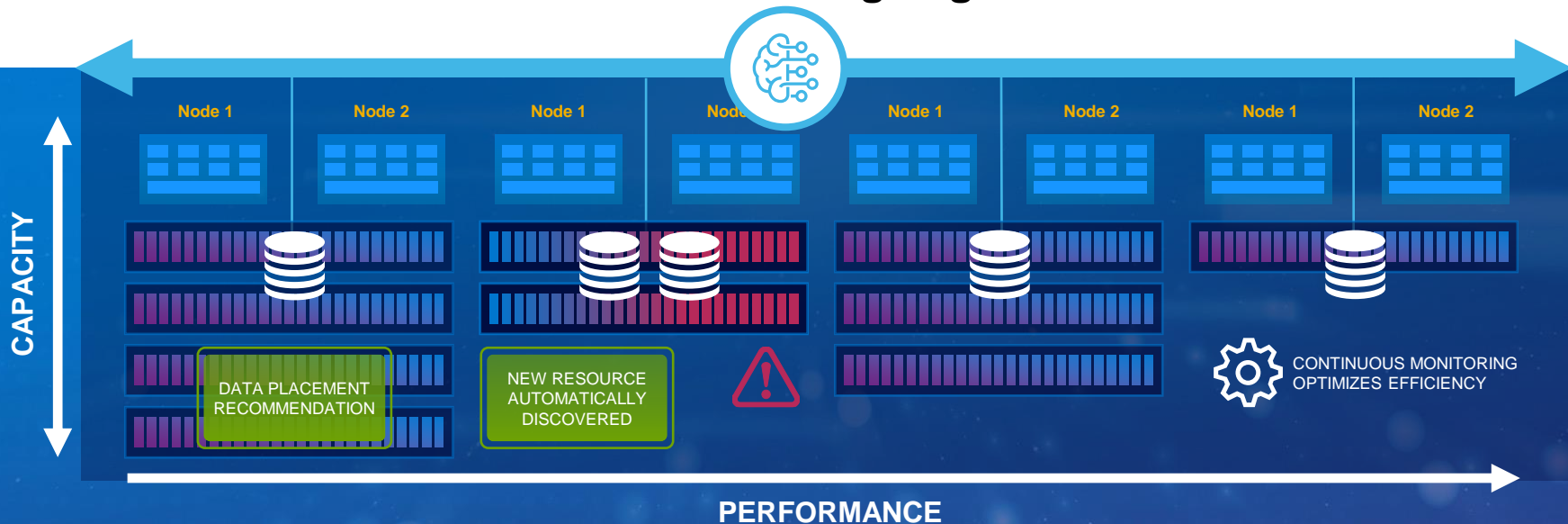
99% less staff time to rebalance volumes

D❮LL Technologies

Always-on data reduction minimizes cost

Intelligent dedupe + compression

No management required

FUTURE-PROOF

4:1

data reduction
GUARANTEED

Up to 20:1

Consistent storage efficiency **without compromise.**

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End-to-end NVMe ecosystem

Treat your workloads to improved IOPS performance, throughput and reduced latency

All-NVMe storage

NVMe

NVMe

NVMe

NVMe Eth or FC

Begin your NVMe network transition
More efficient, parallel, scalable than SCSI

- Easy software-only upgrade, using existing hardware.[1]
- Run standard SCSI/iSCSI and NVMe over same network.

NVMe   *Switch*   NVMe   *NIC / HBA*   *Server*

Eth or FC

ALL PowerStore models
now support NVMe
expansion enclosures.

100/25Gb NVMe/TCP
High-performance IP alternative to FC
Easy deployment w/ SmartFabric software!

32Gb NVMe/FC
Lower latency for block
and/or vVols workloads

1 Assumes compatible 25Gb, 32Gb or 100Gb switches and HBAs.
  See notes for required firmware levels.

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Resiliency and data protection

D&LL Technologies

Trust your data to PowerStore enterprise storage

Dual-controller architecture, software-driven data protection

Non-disruptive	**Resilient**	**Protected**
Active-Active data path	Redundant components	Dynamic Resiliency Engine
Data / Application migrations	Dual-ported NVMe drives	Native replication
Capacity expansions	Fast rebuilds	Local protection
HW and SW upgrades	Cluster high availability	Dell Data Protection

Designed for **99.9999% availability**

D&ll**Technologies

Dynamic Resiliency Engine

Multiple technology advantages working together

Redundancy extents
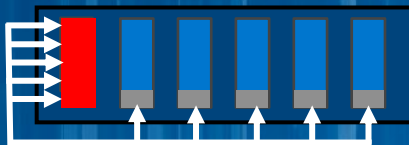
Distributed sparing

Single- and mixed-drive expansion
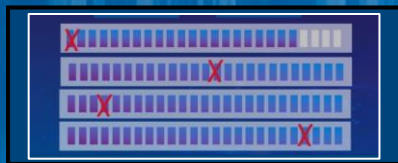
Resiliency sets

Virtualized parity domains *not* tied to physical drive groups

Start with as few as 6 drives, expand non-disruptively, one drive at a time. Automatically assimilates drives.

Distributed spare capacity reduces risk by enabling faster rebuilds

Improves performance, all drives house data, contribute IO

Multiple fault domains dynamically expand as more drives are added

In event of a drive failure, DRE restores original protection levels without manual intervention, *before drive replacement.*

D∅**LL**Technologies

Secure and immutable snapshots

New security option for volume and volume group snapshots
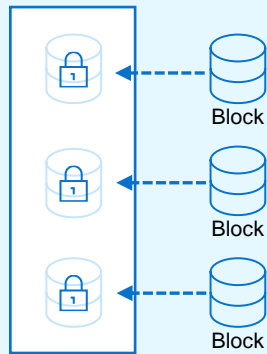
CANNOT be modified or deleted prior to expiration date – *even by an administrator*

Virtual Vault protection against…

- Ransomware attacks
- Accidental or malicious deletion by admin
- Point in time overwrites
- Prevents deletions even when out of capacity
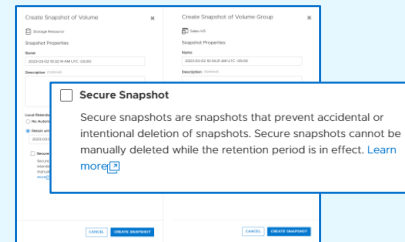
Easy to manage

- Schedule / automate by policy
- PowerStore Manager, CLI, REST API
- Changes only affect future creation -- previously locked snaps *stay* locked

DELLTechnologies

PowerStoreOS 3.x data mobility options

Support more solutions, innovate without limits.

Block   vVols   File

Seamless import	Replication	Metro area replication

Seamless import

Native block
- SC, PS, XIO, VNX, Unity
- VMax AF **– NEW**
- NetApp **– NEW**
- iSCSI or FC connect **– NEW**

Native file – NEW
- VNX

File via Datadobi – NEW
(Software now included)
- NetApp
- Unity

Replication

RP4VM
- Block *(sync, async)*
- vVols *(sync, async)*

Native
- Block async
- File async **– NEW**
- vVols async **– NEW**

Metro area replication

Metro node
- Block sync metro *(active/active)*
- Heterogeneous arrays

Native – NEW
- Block sync metro *(active/active)*

Now protect any workload

Import

Replicate

Distance

D≪**LL**Technologies

Native Metro Volume synchronous block replication

Create a high availability storage environment across VMware sites.

Active/Active

ESXi hosts write to PowerStore on either side. Data remains 100% in sync, *zero RPO/RTO*.

Built-in data service

Supports Gen 1 and Gen 2 hardware platforms with PowerStoreOS 3.0.

Easy to set up

No additional software or licenses needed to enable, configure in 6 clicks!

Data protection, load balancing, migration

Site A   60 miles
                (100 km)   Site B

Stretched Metro Volume
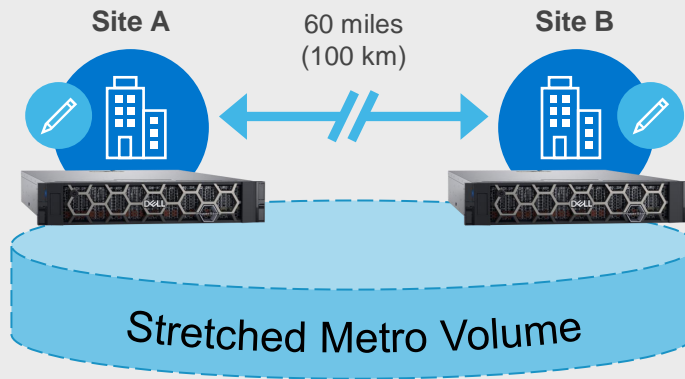
Resilient

Integrated with VMware HA to optimize and balance uniform and non-uniform clusters.

Flexible

Enables transparent load balancing and VM migrations between sites/arrays.

Supports heterogeneous PowerStore appliances – including PowerStore 500 and Gen 1 models!*

Now deploy **1PBe capacity + native metro sync** in a single, scalable 2U appliance.

* Currently available on PowerStore T models only

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Native metro volume: Third site witness

Fully-automated HA for mission-critical VMware workloads

Separate fault domain

Install on physical server, VM, or cloud

Metro Witness

60 miles (100 km)

Stretched Metro Volume
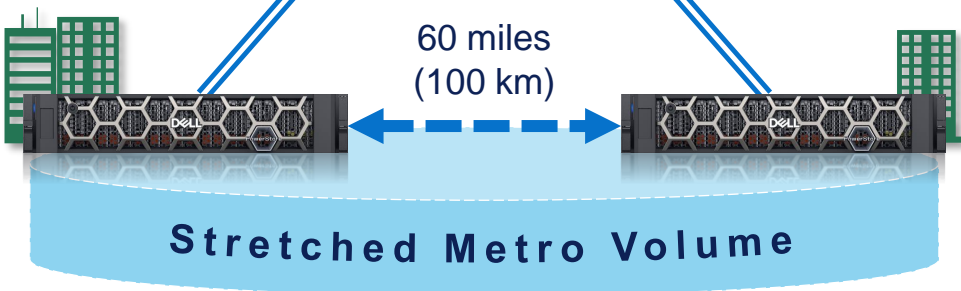
Native SW-only solution for Zero RTO/RPO needs
Active/Active: read/write to either side, 100% in sync

Third site witness option

- Automates recovery from either array *without manual intervention!*

- Prevents split-brain scenarios

- Easy to deploy in just minutes

- Single witness works with multiple PowerStore clusters and/or metro volumes

- No license or purchase required!

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PowerStore metro node

Active-active

Multi-site constant dual access
Immediate failback
Witness for automatic site recovery

Heterogeneous platforms

Multi-platform support
Workload granularity
Replicate to any array

Total array offload

Zero performance overhead
No capacity on the array
No additional host software

32Gb FC | 2U Cluster | Built-in Management Server
Simplistic installation
DevOps Automation Enabled with Ansible

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Comprehensive data protection and mobility

Ultimate flexibility to secure and backup your data

Local	Remote	Cloud
Secure Immutable Snapshots	Async Replication Block, file, vVol	Integrated Backup to Dell APEX Protection Storage for Public Cloud
File Locking (FLR)	Native Metro with Witness	Dell APEX Data Storage Services Block at Equinix
Dynamic Resiliency Engine	Integrated backup to PowerProtect DD	

Designed for **99.9999% availability**

D¢LL Technologies

Native backup integration

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Direct backup to PowerProtect DD

Experience the resiliency and cost advantages of the industry's #1 data protection appliance

Create PowerStore remote snapshots *directly* on cloud or on-prem PPDD targets

Production data	Temporary point-in-time copy		Inline dedupe	Backup images
4:1	**Changes only**	150TB/day	**65:1**	
Dedupe index		Incremental backups	Deduplication Index	

PowerStore → Changes only → PowerProtect DD (physical or software-defined)
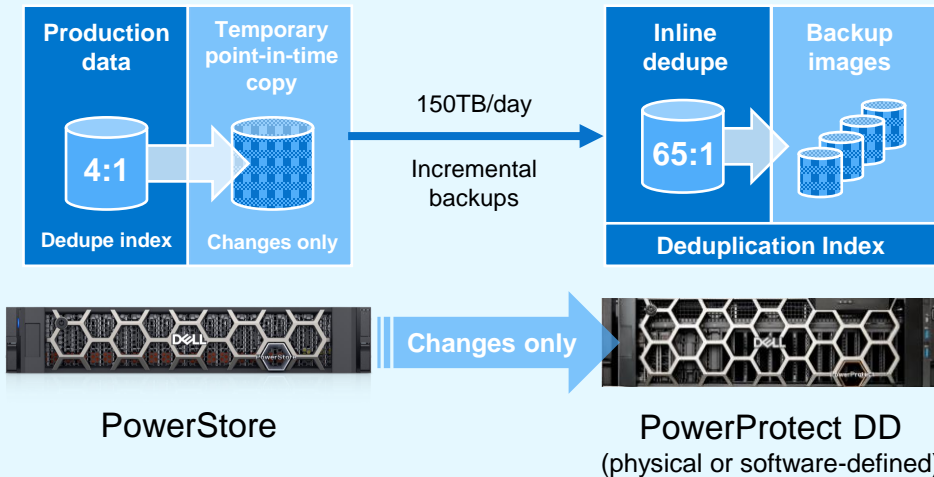
No dedicated backup server required

Zero impact to application hosts

Reduced network traffic

Up to 65:1 data reduction[1]

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Control backups directly from PowerStore Manager

Native PowerProtect DD integration empowers data owners with self-service backup and recovery

Any PowerProtect DD target

Physical appliance

DDVE on-prem

DDVE in cloud[2]

aws

Set up in
90 secs![1]

Up to
65:1 DRR[3]
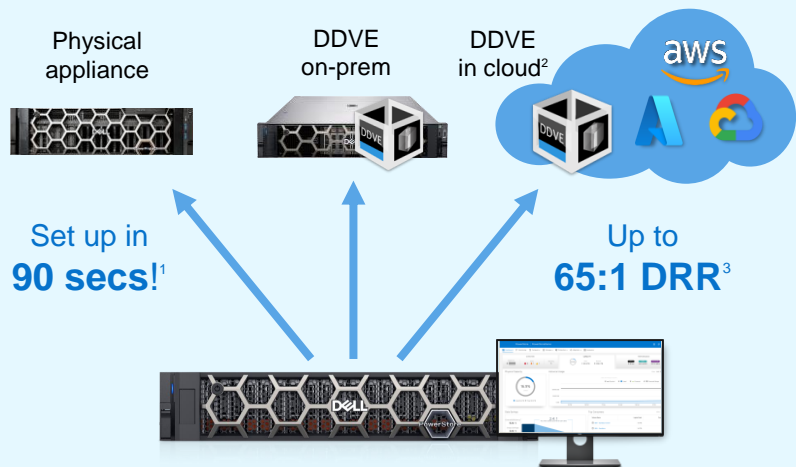
Easy, granular data recovery

Restore to same or different PowerStore

Instant Access[4]
- ✓ Inspect snapshots in place
- ✓ Mount temporarily
- ✓ Recover only data you need
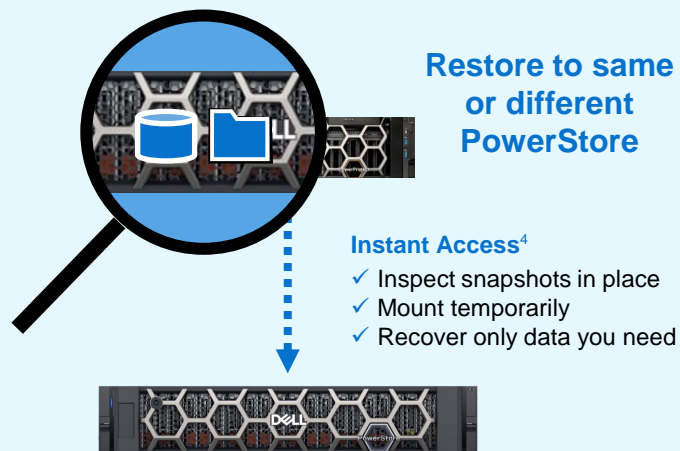
Initiate manually or via new Remote Protection rule. Schedule, Backup, Discover, Retrieve

1 – Based on Dell analysis, March 2023.   2 – Qualified with AWS, Azure and Google Cloud qual pending. DDVE available now on AWS, Azure and Google.
3 – Logical capacity based on up to 50x deduplication (DD3300) and typically deduplication (DD6400, DD6900, DD9400, DD9900) based on additional hardware-assisted data compression of typically 30% more logical capacity per TB.
4– Instant Access is not currently supported for VMFS datastores. VMFS support planned for 2H 2023. In current release VMFS datastores can still perform retrieves using PowerStore Manager.

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Cybersecurity

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PowerStore accelerates Zero Trust adoption

Modern, intelligent security stays ahead of today's threats

Data at Rest Encryption

Native solution
External key manager support
Self-encrypting media

Cyber Security Resiliency

Secure & Immutable Snapshots
File Level Retention (FLR)
Operational air gap (PowerProtect CR)

Trusted Admin Access Control

Multi-Factor Authentication (RSA SecurID)
Role-Based Access Control (RBAC)
LDAP support

Built in Hardware Security

Immutable HW Root of Trust
Secure Boot Chain of Trust
Digitally signed FW updates

Advanced Threat Detection

Security configuration deviation
Secure syslog events and exports
CEPA / CAVA (antivirus & event publishing)

Security Certifications

STIG/APL, USGv6-R1
FIPS 140-2 certified
Common Criteria*
DoDIN APL

Cloud IQ Cybersecurity – AIOps for intelligent IT infrastructure insights

Cybersecurity Assessment | System risk health check to detect configuration drift | Real-time alerting

* Certification in process

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Anomaly Detection with CloudIQ

System Risk Health
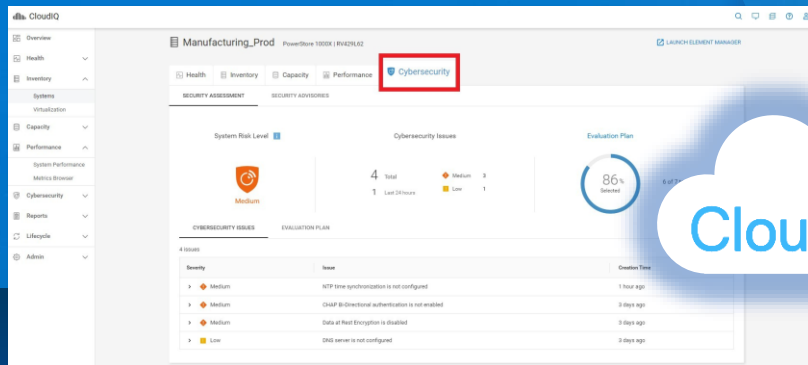
Real Time Alerting
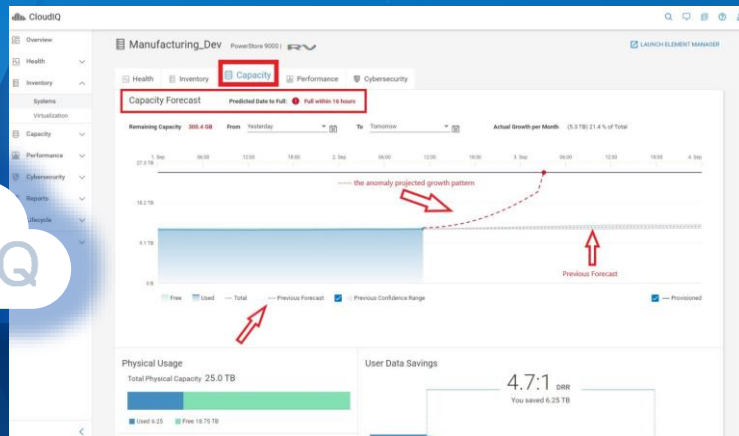
Anomaly Detection leverages CloudIQ telemetry to monitor and analyze growth pattern changes.

Admins have visibility into anomalies that could lead to identification of attempts to maliciously encrypt workloads

Health risk reporting and early detection minimizes ransomware exposure and speeds application recovery.

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STIG Compliance

PowerStore is hardened to accommodate the security requirements of the US Federal Government
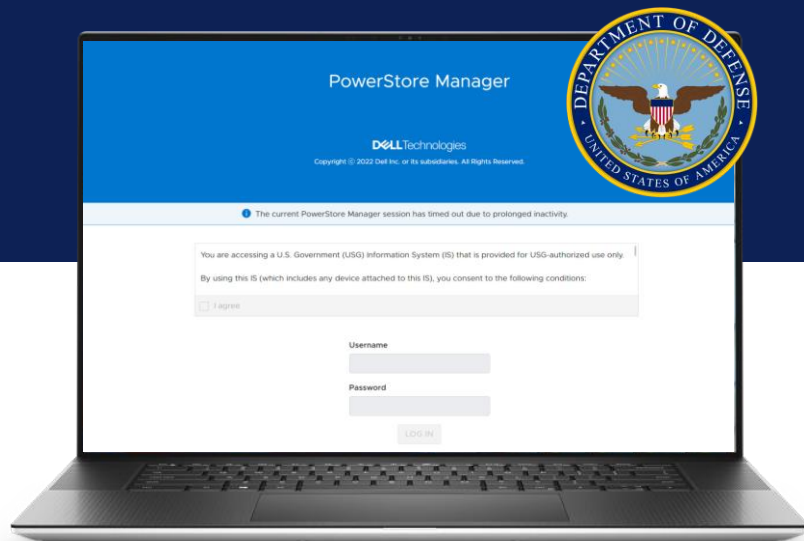
DoD IT security compliance configurations

✓ Custom DoD login banner

✓ Password complexity requirements and rules

✓ Periodic intrusion detections and alerts

✓ User lockout policies

DoD Approved Product List (APL) certification !
https://aplits.disa.mil/processAPList.action

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Multi-Factor Authentication

Highly secure – yet simple and familiar to users

Enter password in PowerStore Manager

Upon acceptance, enter temporary RSA token

Both password and token must be validated for authentication
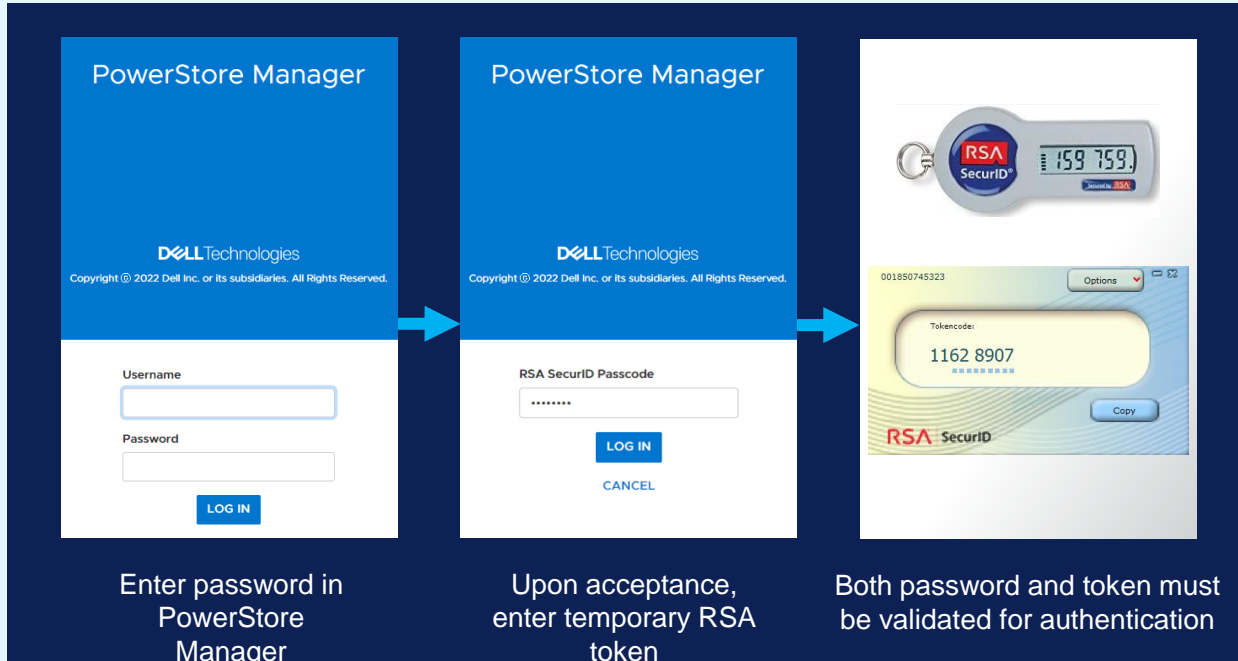
Safeguard access to PowerStore admin tools

- Protect against hackers
- Mitigate poor password practices
- Enable regulatory compliance

Enable for PowerStore Manager or REST API

- Local or LDAP user accounts

Security requirement for both Federal sales and non-FED customers

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Unified / File solutions

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PowerStore file solutions

Consolidate file, vVols and block on a single platform.

Build your NAS breakthrough – *without the learning curve*

Traditional NAS

Home directories, file sharing/collaboration, file-based applications

VM Applications

Transactional workloads, SQL, Oracle, SAP HANA, etc.

Containers / DevOps

Workflow automation, on-demand infrastructure, cloud-native apps

Unified platform experience

Block   **File**   **vVols**

- ✓ No extra hardware or software required
- ✓ Intuitive UI toolset for block, file, vVols
- ✓ Common replication, snapshot, DR, load balancing
- ✓ Common metrics, alerts, analytics/forecasting

DELLTechnologies

PowerStore file solutions

Consolidate file, vVols and block on a single platform.

All the enterprise file capabilities you need to innovate

Traditional NAS	**VM Applications**	**Containers / DevOps**
Home directories, file sharing/collaboration, file-based applications	Transactional workloads, SQL, Oracle, SAP HANA, etc.	Workflow automation, on-demand infrastructure, cloud-native apps

Traditional NAS
- Scalability (4PBe, 32B files)
- Multi-protocol *(SMB, NFS, FTP, SFTP)*
- Multi-tenancy (VLAN)
- Quotas, FS shrink / extend
- Security, ransomware protection

VM Applications
- VMware / Hyper-V integrations
- VMware datastores (NFS)
- VSI / VASA / VAAI integrations
- Orchestration (vRO / vRA)
- vVols support and replication

Containers / DevOps
- Kubernetes: Tanzu, EKS, etc.
- Workflow orchestration (Ansible)
- Container Storage Modules
- Clones, snapshots, replication
- Topology support, health monitor

D&LL Technologies

PowerStore file solutions

Enterprise NAS capabilities …on an intelligent, **unified** platform

Scalable

- 4PBe per appliance
- 256TB per namespace
  10M subdirectories, 32B files
- Multi-tenancy support
  VLAN, 500 file systems/appliance
- File system shrink/extend
  Up to 4x more scalable!

Flexible

- Multi-protocol
- General file systems
- VMware file systems
- Kubernetes, CSI/CSM
- vRO, VSI, VAAI, VASA

Simple to use

- Unified interface
- Wizard-based deployment
- Provision your way
  vSphere, REST, CLI, Ansible
- Cloud-based analytics, alerts
- Included migration tools

High performance

- NVMe, dual-socket CPUs
- 100GbE networking
- File on all Ethernet ports
- Link aggregation
- 64-bit file systems

Efficient

- Thin provisioning/clones
- Always-on data reduction
  4K, global dedupe, compression
- Quotas (user, tree)
- File system shrink/extend

Highly available

- File replication
- Easy DR testing
- Dynamic Resiliency Engine (DRE)
- NAS server auto-failover
- NDMP backups (3-way)
- **Fail-Safe Networks**

Secure

- Access / permissions control (Kerberos, LDAP, LDAPS)
- Anti-virus (multi-engine support)
- In-flight data encryption (SMB3)
- File locking (FLR)
  FLR-E, FLR-C
- **Manage SMB share permissions from PowerStore**
- File monitoring, ransomware prevention
  Supports 3rd-party monitoring apps: Varonis, Stealthbits, DefendX.

Ecosystem Integrations and Intelligence

Programmable infrastructure

Enabling automation and DevOps.

Automated end-to-end workflows
Self service catalog

DevOps

VMware

Kubernetes

Ansible

REST API
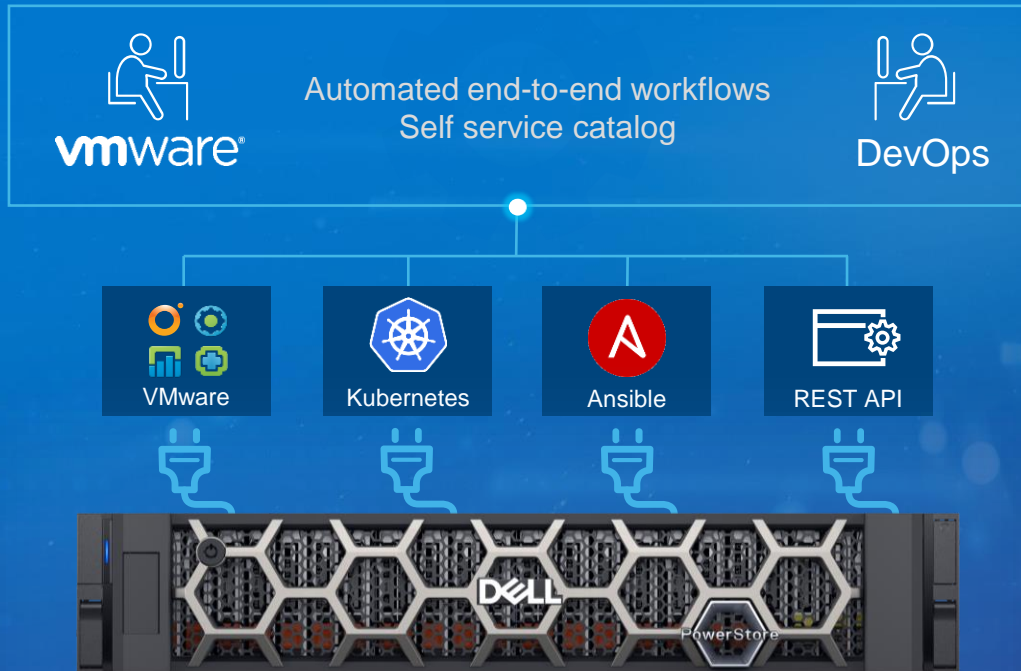
Automate storage
provisioning processes.

Deploy new resources
in **seconds** vs days*.

Eliminate manual steps
to reduce risk.

*Assumes multiple teams and manual approval process

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VMware integration

Enabling consistent operations
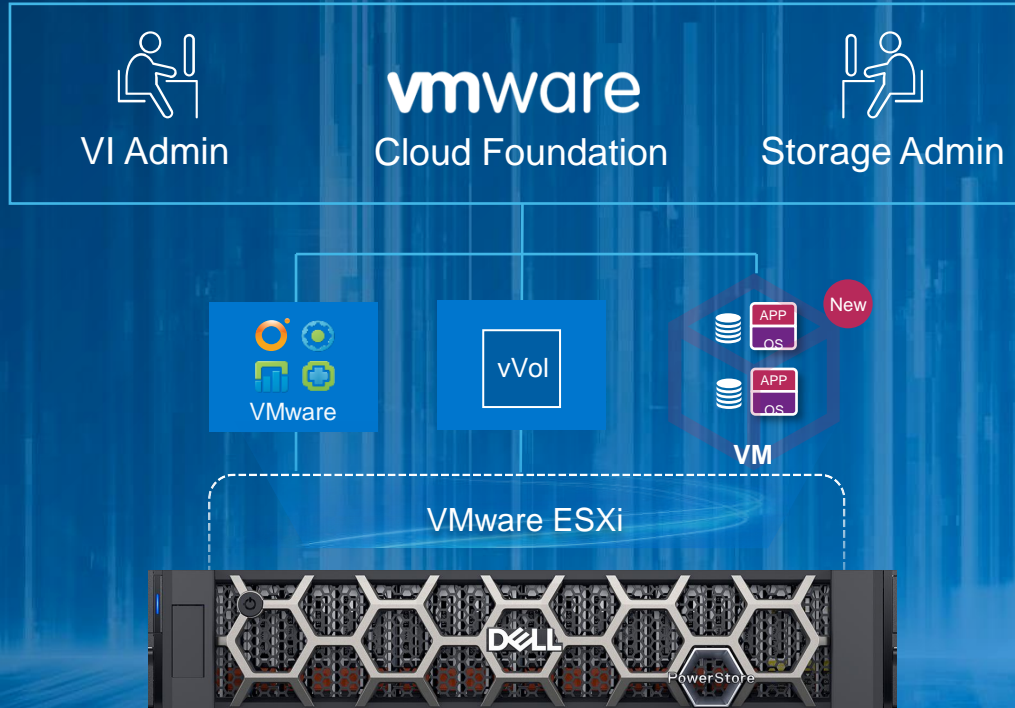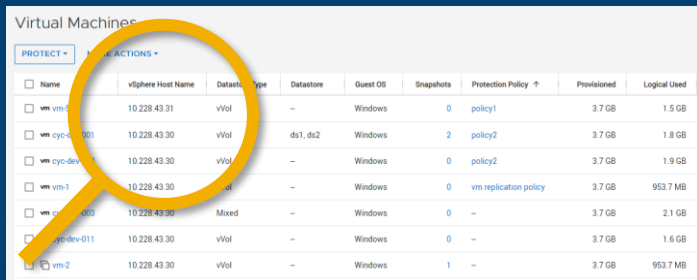
VMware Integration points:

- ESXi (VAAI & VASA)

- vVols

- vRO/vRA

- VMware Cloud Foundation

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Build your VMware breakthrough

PowerStoreOS gives PowerStore even more VMware affinity.

End-to-end VMware visibility through PowerStore Manager

View relationship between VMware and PowerStore objects

- Reduced effort
- Fewer errors
- Performance and utilization insights

Provision PowerStore services directly from vSphere

Create datastores	Apply storage policies to VMs	Automate operations

Snapshots, replication, performance

- Empowers application owners
- Quicker time to solution

Flexible datastores

VMFS | vVols | NFS

Protect any workload

- Native vVols async replication
- Native metro sync block replication
- Native block and file async replication

Fast VMware solutions

- vVols-over-NVMe/FC *and TCP* *New!*
- 10x faster XCOPY
- 100Gb NVMe/TCP

Plus…

Scale VxRail storage with Dynamic AppsOn

D&LL Technologies

Boost VMware vVols performance

Easily transform and future-proof your storage using industry-first[3] technology with NVMe/TCP

NVMe/TCP for vVols

Why vVols?

Policy-based VM Storage Management

Granular Control

Efficient Operations

Cloud Ready

Boost performance for vVols workloads

Up to **50%** more IOPS than iSCSI[1]

Cost-effective ethernet networking

Up to **78%** lower cost per port![2]

Why NVMe/TCP?

Modern Storage Network Technology

High-Performance

Cost-Effective

Simple & Scalable

25 or 100GbE

Combine the advantages of today's most advanced datacenter technologies

DELLTechnologies

VMware ecosystem advantage

Powerful integrations and modern architecture streamline your IT operations

End-to-end visibility

View VMware objects within PowerStore Manager

✓ Reduced effort

✓ Fewer errors

✓ Performance and utilization insights

Streamlined management

Provision PowerStore services from vSphere

✓ Empowers application owners

✓ Quicker time to solution

✓ Native protection for any workload

Performance / Scalability

Support demanding VMware workloads

✓ Scale up & out to 18 PBe[1] of all-NVMe

✓ vVols over NVMe (FC & TCP)

✓ Up to 100Gb NVMe/TCP

Dynamic AppsON

Independently scale VxRail capacity with advanced data services and solution-level lifecycle management

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Dynamic AppsON

Combines the advantages of VxRail and PowerStore to meet needs of diverse workloads
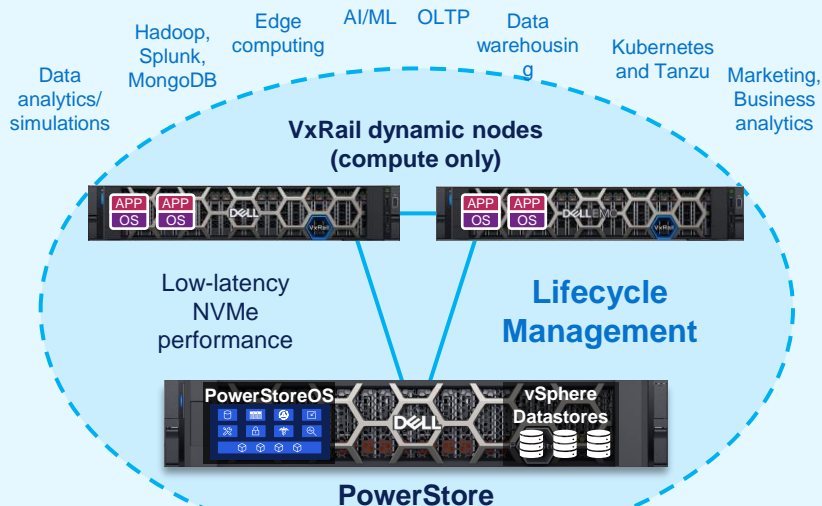
Scale compute or storage independently

Flexible integration

- Easy to purchase and deploy
- Seamless data and application mobility
- Advanced PowerStore storage services

End-to-end VMware management

- Provision VxRail *and* PowerStore services directly from vSphere
- Eliminate operational silos!

Solution-level lifecycle management

- Eliminate complexity and risk
- Ensures solution is always optimized, always up-to-date

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CloudIQ

Cloud-based monitoring and predictive analytics for storage, SAN & data protection
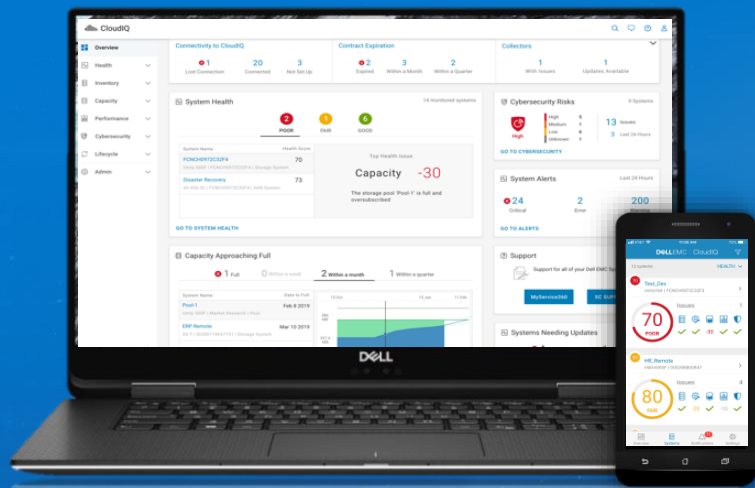
Reduce risk
Identify **performance** and **capacity** anomalies, **cybersecurity** vulnerabilities. Speed time to resolution.

Plan ahead
Anticipate business needs, avoid outages with capacity forecasting.

Improve productivity
Monitor on-prem, co-location infrastructure and cloud data protection in one view.

Average **3X faster** time to resolution[1] | Up to **10X faster** to predict capacity approaching full[2]

D&LL Technologies

Anytime Upgrade

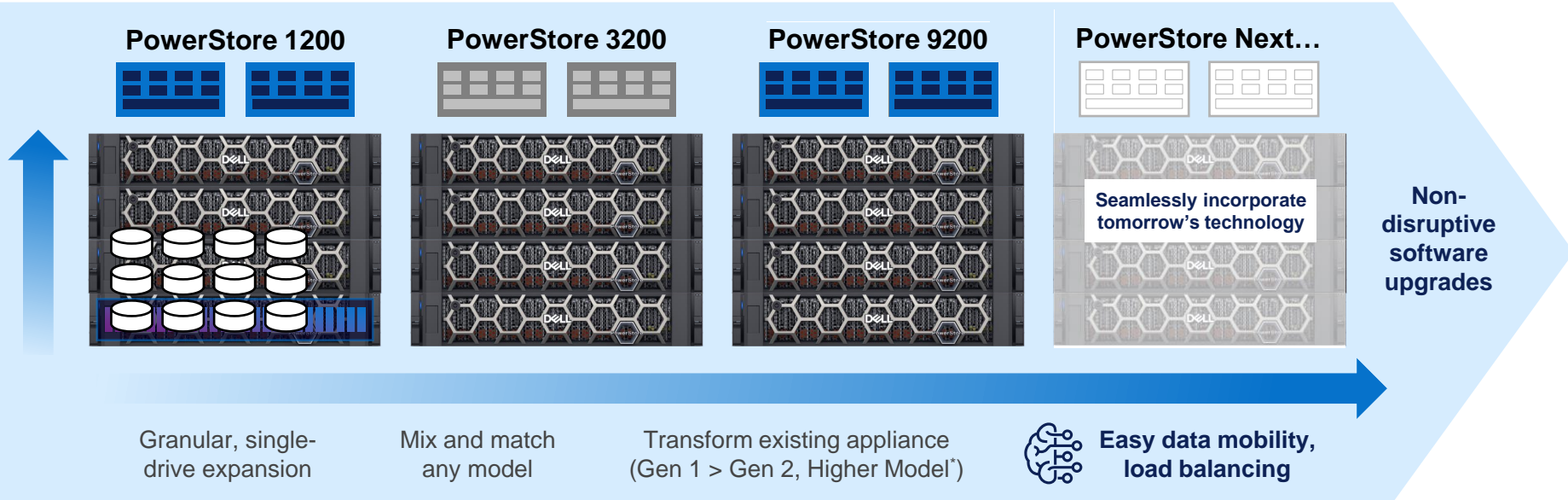**DELL**Technologies

Ready for any future

PowerStore offers multiple ways to extend ROI by modernizing your solution over time

Scale-UP and scale-OUT   **DIP node upgrades**   **Multi-generational clusters**

PowerStore 1200   **PowerStore 3200**   **PowerStore 9200**   **PowerStore Next…**

Seamlessly incorporate
tomorrow's technology

Non-disruptive software upgrades

Granular, single-drive expansion

Mix and match any model

Transform existing appliance
(Gen 1 > Gen 2, Higher Model*)

Easy data mobility, load balancing

* Higher model upgrades for Gen 2 customers available in future release.

D∕ELL Technologies

Anytime Upgrade

Industry's most flexible controller upgrade program:[1] Makes on-prem storage feel like cloud!

**Storage confidence
for an uncertain world**

Easiest way to ensure your workloads will *always* be running on the newest technology

- Reduce effort during modernization
- Simplify planning/forecasting
- Extend ROI and solution longevity
- Lock in long-term cost savings

Enroll at point of sale

Easy to purchase, easy to redeem!

Redeem anytime in contract[2]

Choose from 3 upgrades…[3]

| **Higher model upgrade** | **Scale-out discount** | **Next Gen appliance** |

Renewal decision *(after upgrade)*

Renewal NOT required to receive upgrade

DELLTechnologies

Anytime Upgrade program

Simplified *single* offer gives you access to multiple redemption options – modernize your way!

Boost performance today	Grow your cluster at any time	Integrate cutting-edge technology
Higher model upgrade	**Scale-out discount**	**Next Gen appliance**

Higher model upgrade

In-family N+1 node swap
(3200 > 5200, etc.)

- Non-disruptive, data-in-place – keep existing drives/enclosures
- Deployment services included
- Boost performance without waiting for Next Gen release!

Scale-out discount

Easy-to-apply discount on any PowerStore model

- Expand your cluster
- In-family models *(N, N+1, N+2, etc.)*
- Get value from your Anytime Upgrade investment, even between generations

Next Gen appliance

Premier access to tomorrow's PowerStore

- Includes Next Gen base enclosure, nodes, IO modules[1]
- Cluster with existing appliances – no trade-in required!
- Deployment services included

1 - Requires new ProSupport contract and minimum drive purchase.

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Seamless migration

XTREMIO UNITY SC SERIES VNX SERIES PS SERIES

Native tools included **Cross-platform solutions**

Migrate from existing platforms in less than **10 clicks.***

D&LL Technologies

PowerStore

Enterprise storage made simple

#1 in ease of use

Adaptable

End-to-end NVMe
Headroom for evolving performance needs. NVMe/FC, NVMe/TCP with SmartFabric

Scale-up/Scale-out
Add performance or capacity independently, single-drive expansion, mixed clusters, all models scale to same capacity

Built-in data protection
Dynamic Resiliency Engine, policy-based replication services, secure snapshots, multi-cloud backup integration (PPDD)

Intelligent

Automated efficiency
Self-optimizing design eliminates effort. Guaranteed 4:1 DRR, ML-based load balancing

Advanced Cybersecurity
Accelerate Zero Trust adoption with MFA, HWRoT, D@RE, file security, ransomware protection, STIG and more

CloudIQ AIOps application
Cross-platform monitoring & alerts, predictive analytics. Improves productivity, reduces risk.

Continuously Modern

All-inclusive software
Container-based design enables rapid innovation, delivered non-disruptively at no cost to existing customers

Programmable architecture
VMware, DevOps integrations. Provision PowerStore from your platform of choice.

Anytime Upgrade
Flexible, non-disruptive hardware upgrades makes on-prem infrastructure feel like cloud!

60% more energy efficient

61% more TB/U

Superior density across entire PowerStore family

Energy Star certifications

DELLTechnologies

The **PowerStore** Experience

Welcome to continuously modern

PowerFlex

What are some of the most important attributes that customers value…

Based on ESG Research Report: The State of DataOps…

Reliable

Flexible

Performant

Scalable

An ideal solution solves the infrastructure problem with these attributes

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What does the ideal solution look like...

IT Operations

- Manage **diverse environments**
- **Scale flexibly**
- Maintain **uniform operations**

Business Vision

- **Adapts** to growth and change
- **Supports diverse workloads**
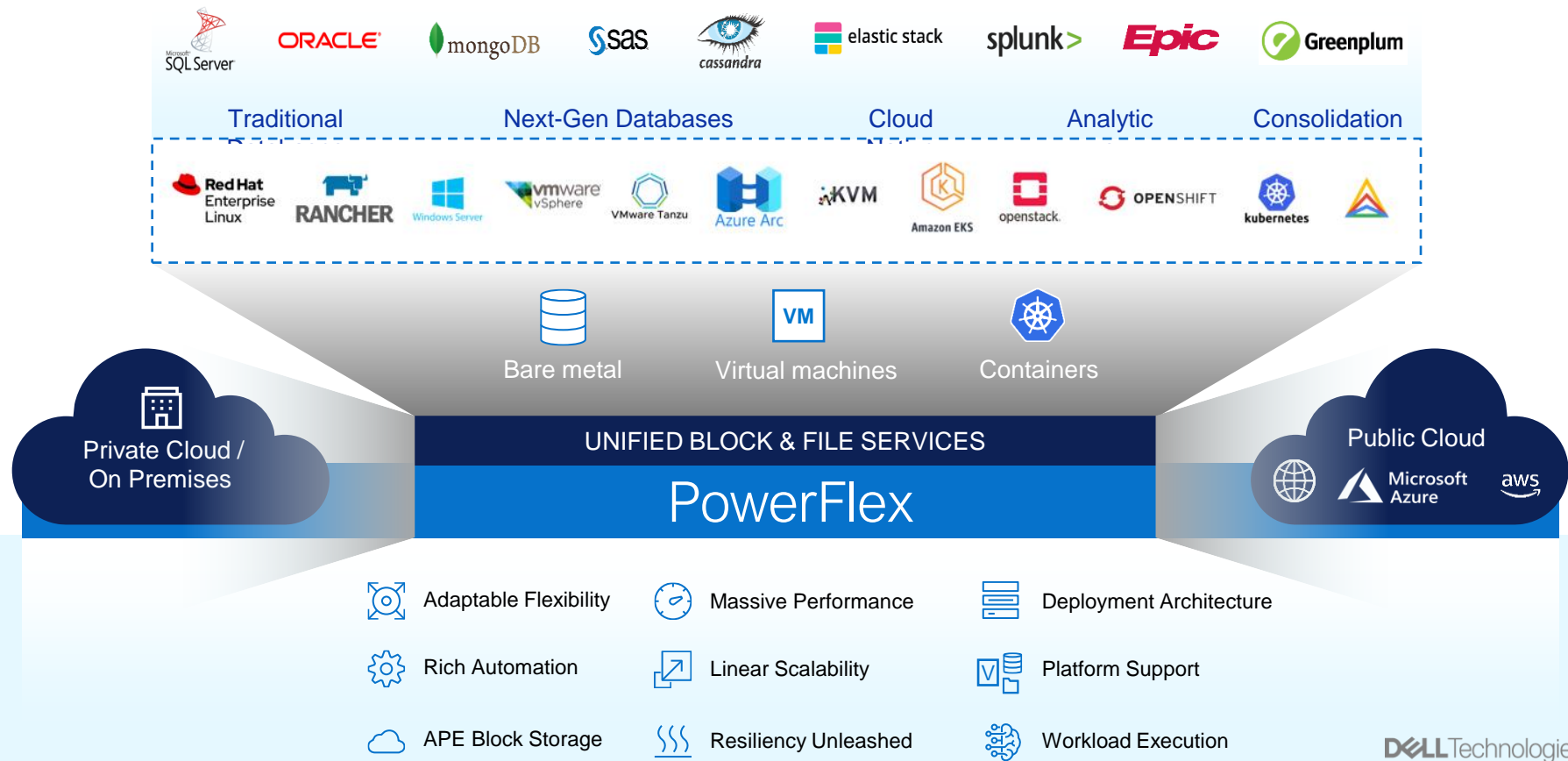- Allows for **seamless evolution** of ecosystems

Workloads

The solution runs…

- **mission-critical** databases
- **varied workloads**
- seamless **third-party integration**
- **modernized containerized applications**.

D≪LL Technologies

PowerFlex is the ultimate software-defined infrastructure

Microsoft SQL Server | ORACLE | mongoDB | SAS | cassandra | elastic stack | splunk> | Epic | Greenplum

| Traditional | Next-Gen Databases | Cloud | Analytic | Consolidation |

Red Hat Enterprise Linux | RANCHER | Windows Server | vmware vSphere | VMware Tanzu | Azure Arc | KVM | Amazon EKS | openstack | OPENSHIFT | kubernetes

Bare metal | **VM Virtual machines** | **Containers**

Private Cloud / On Premises

UNIFIED BLOCK & FILE SERVICES

PowerFlex

Public Cloud
Microsoft Azure | aws

Adaptable Flexibility	Massive Performance	Deployment Architecture
Rich Automation	Linear Scalability	Platform Support
APE Block Storage	Resiliency Unleashed	Workload Execution

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DELLTechnologies

PowerFlex

Unbounded software-defined infrastructure

Modernize without limits

- Heterogenous environments
- Unified file and block services
- Flexible scaling

Automate for agility

- LCM automation
- Rich APIs & tools
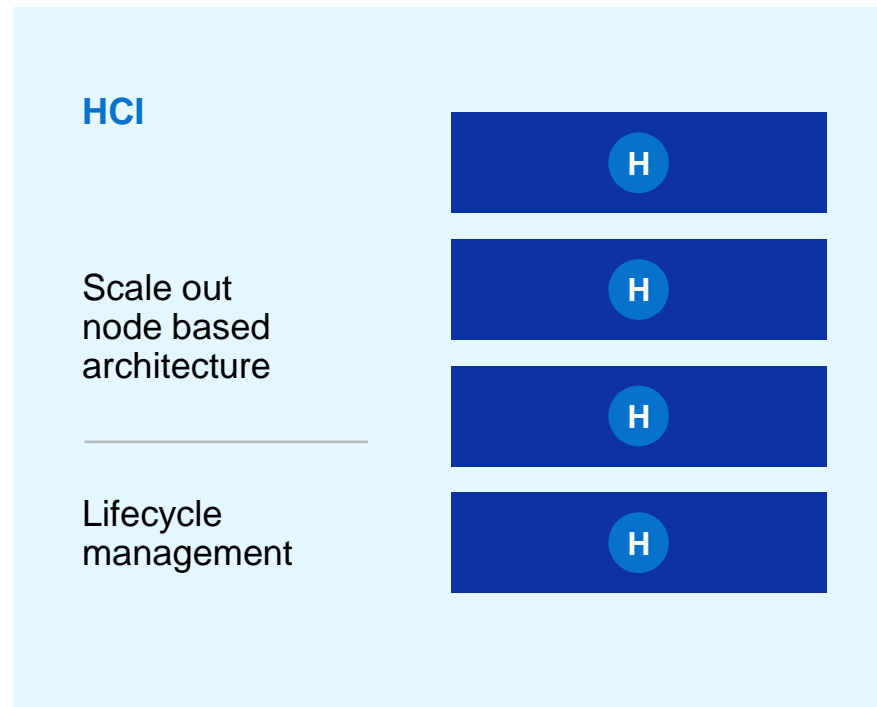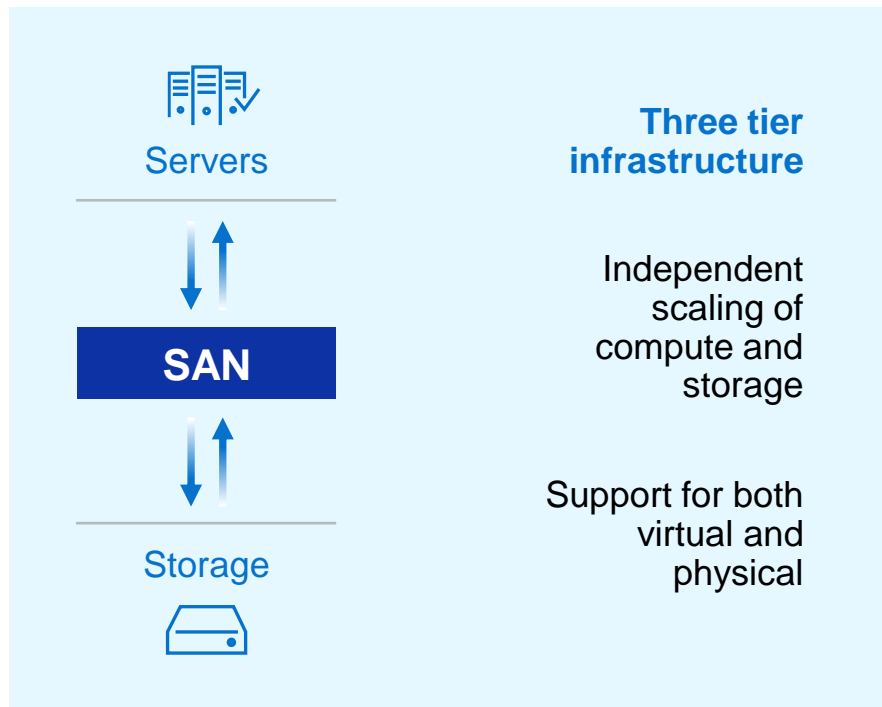- AIOps with CloudIQ

Optimize your outcomes

- Massive performance
- Unmatched linear scalability
- Extreme resilience

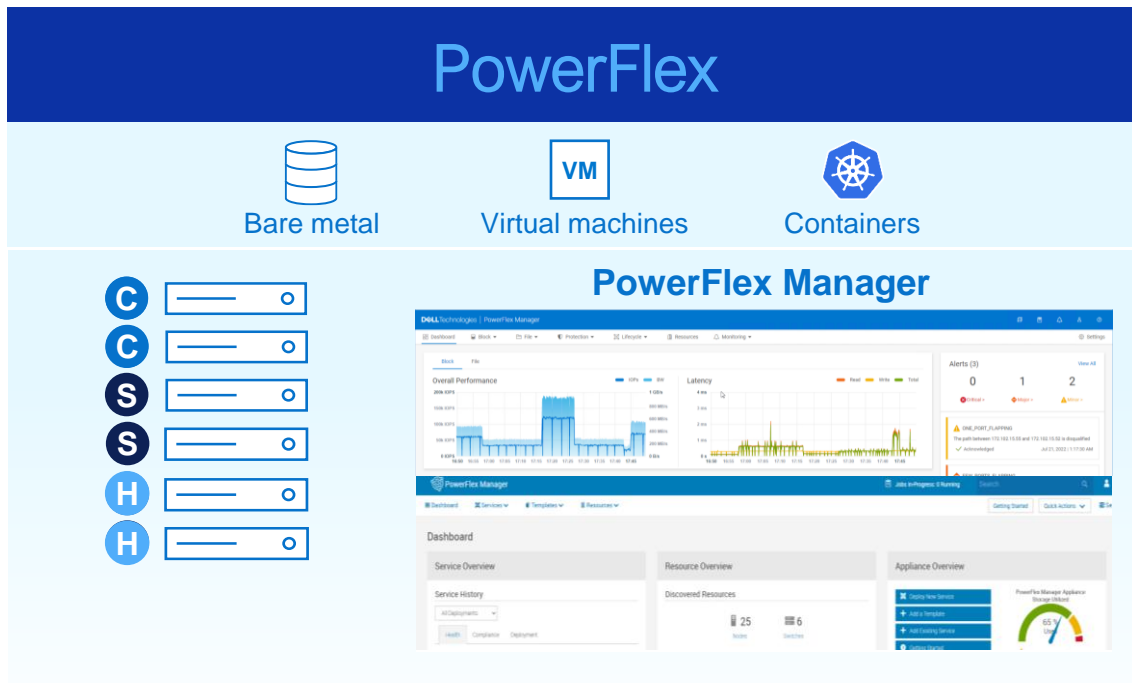# The ultimate software-defined infrastructure

Three tier infrastructure

Servers

SAN

Storage

Independent scaling of compute and storage

Support for both virtual and physical

HCI

Scale out node based architecture

Lifecycle management

H

H

H

H

DELLTechnologies

The ultimate software-defined infrastructure

Three tier infrastructure

Independent scaling of compute and storage

Support for both virtual and physical

PowerFlex

Bare metal

VM — Virtual machines

Containers

PowerFlex Manager

HCI

Scale out node based architecture

Lifecycle management

BENEFITS OF BOTH

DELLTechnologies

The PowerFlex family

PowerFlex software

Software-defined block and file storage services that enable scale-out storage infrastructure using x86 nodes and TCP/IP networking.

```
01010000 01101111 01110111
01100101 01110010 01000110
01                  111000
```

PowerFlex rack

Fully engineered system with integrated networking

Accelerate time-to-value

PowerFlex appliance

High-performance infrastructure with flexible networking options

Small starting point with massive scale potential

APEX Block Storage

Block storage for high performance, scalability, and resilience in the cloud

PowerFlex Manager

Full-stack Lifecycle Management of hardware, software and networking. Unified UI for administration of all storage operations.

aws

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PowerFlex software-defined infrastructure

Software-first architecture

- Start with a bunch of x86 nodes (and networking)

- A few bits of software to make it work
  - A storage supplier
  - A storage consumer
  - And a manager to supervise

Networking

SDS
Storage Data Server
Installed on servers contributing local disks to the storage cluster

SDC
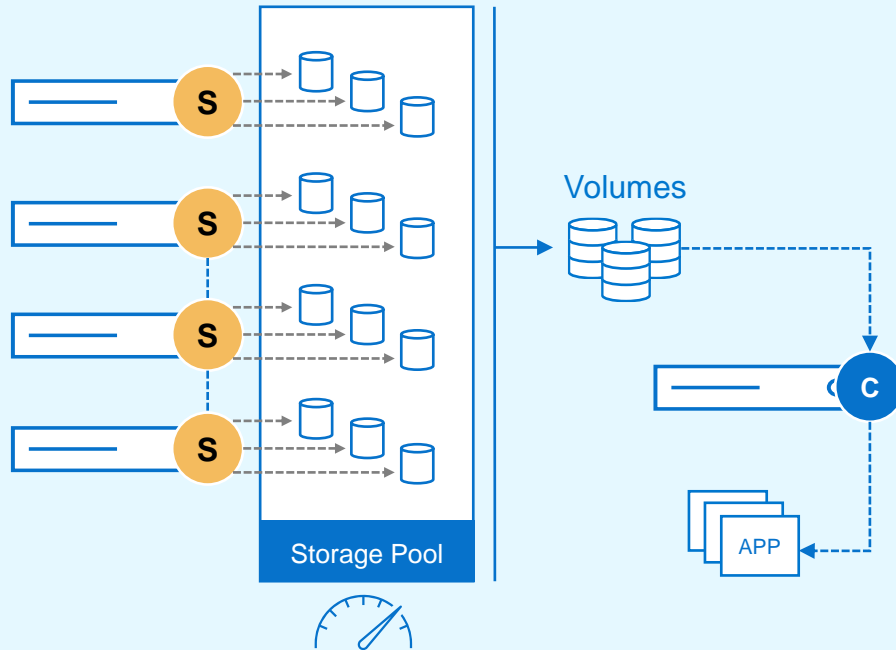**Storage Data Client**
Installed on servers consuming storage

MDM
Metadata Manager
Oversees cluster configurations, monitoring, rebalances, and rebuilds

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PowerFlex architecture basics

High-performance, scalable, highly resilient storage

DELLTechnologies

PowerFlex architecture basics

Distributed data layout – native multipathing and massively parallel performance
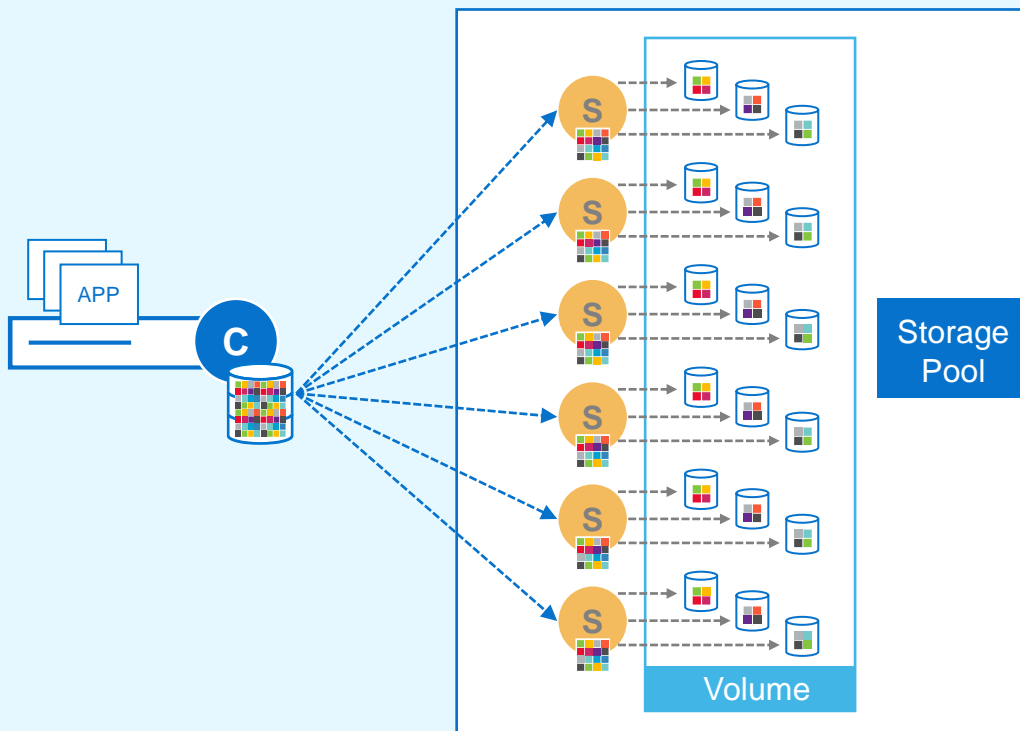
PowerFlex software-defined infrastructure
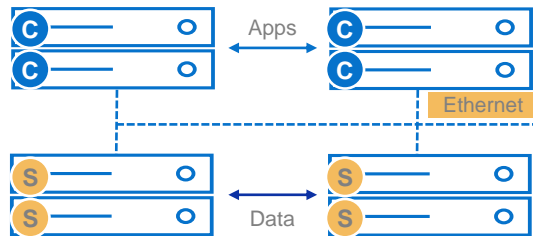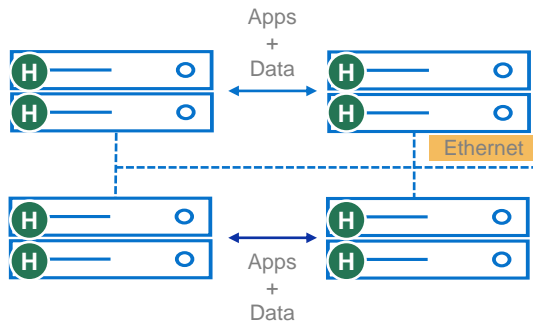
Software-first architecture

Storage

Compute

Networking

HCI

Install SDS to create a storage node

Install SDC to create a compute/consumption node

Install both to make a hyperconverged node

DELLTechnologies
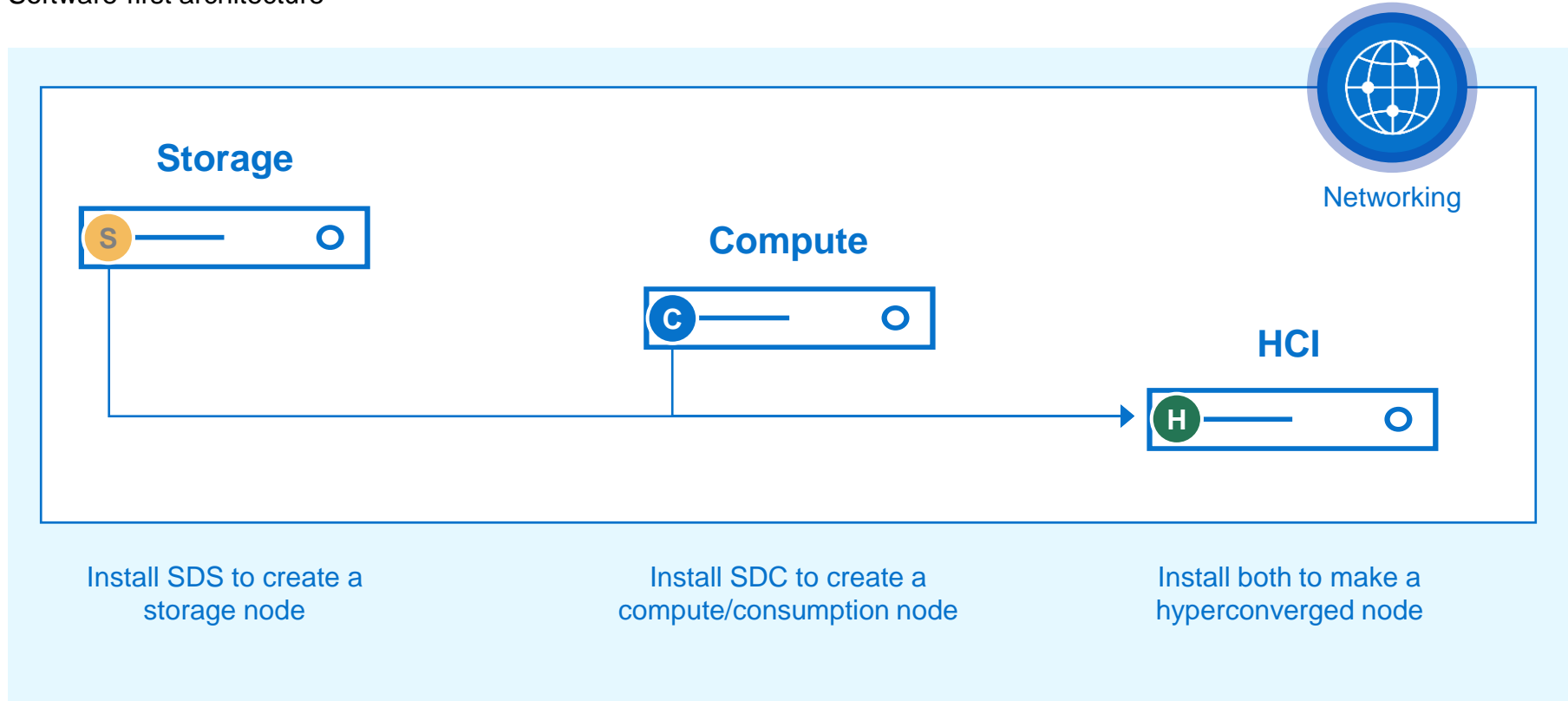
Dynamic infrastructure

Evolve your data center as you wish

Independent
Compute and storage

Separate compute and storage
for independent scaling

Hyperconverged
Compute and storage
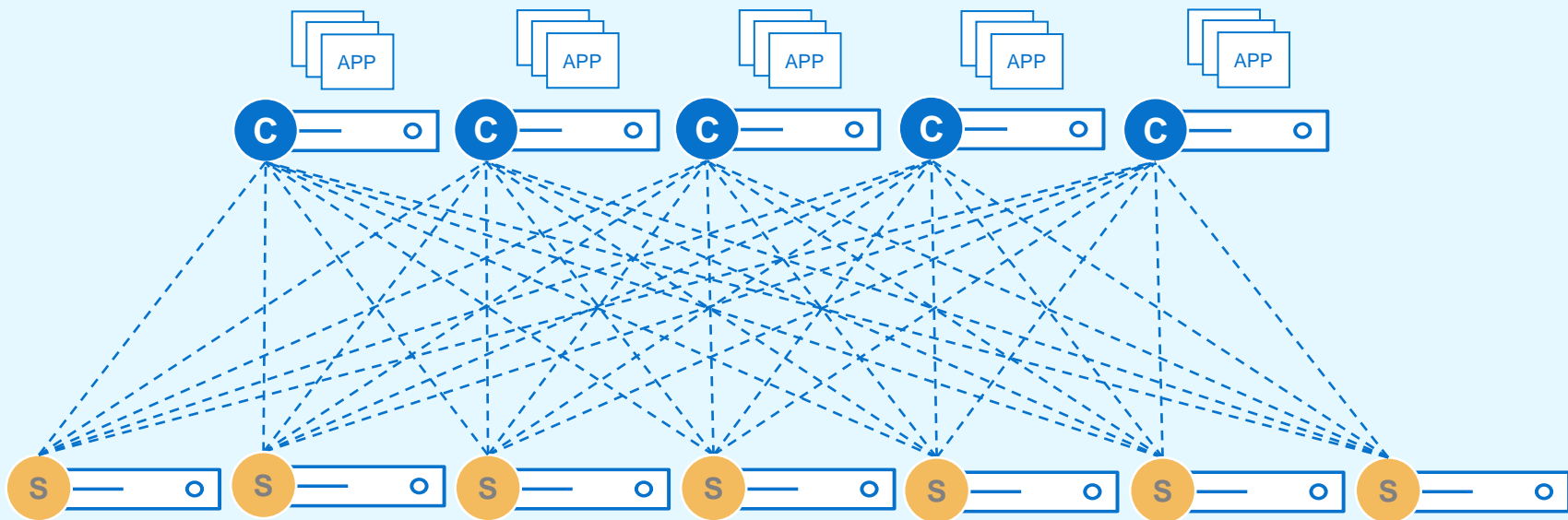
Consolidate as single building
block for dense scaling
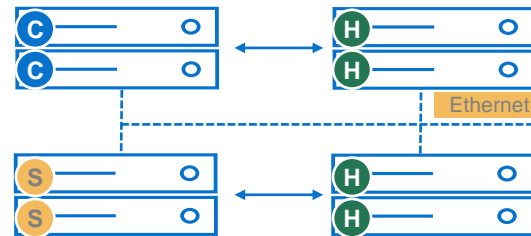
Mixed
architectures

Flexibility to mix architectures
as needs evolve

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PowerFlex software-defined infrastructure

Client – server mesh

DELL Technologies

Native Asynchronous Replication

- PowerFlex asynchronous replication is enabled by the Storage Data Replicator (SDR) software component

  - Implements Journal-based replication

  - RPOs down to 15 seconds

  - Scalable & elastic, just like the other components

- Supports from one to four peer systems

- I/O for replicated volumes passes through SDR

 - Writes are split for local SDS commit & journal shipping to remote SDS

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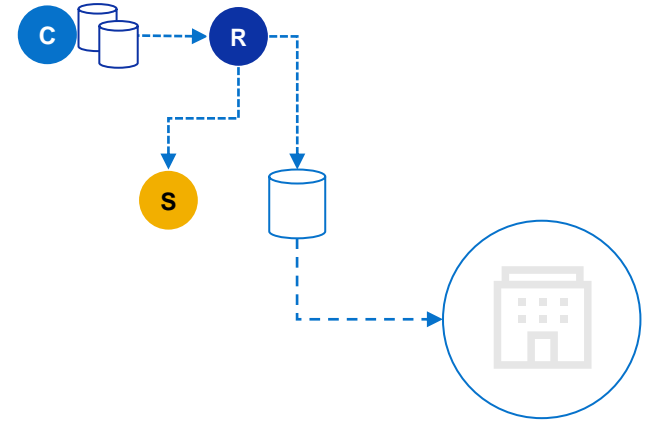
PowerFlex SRA for VMware SRM

Storage Replication Adapter (SRA) for VMware Site Recovery Manager (SRM)

- Enables the use of PowerFlex native asynchronous replication as the replication engine for protecting VMs on vSphere datastores

- PowerFlex SRA for use with Site Recovery Manager 8.2*, 8.3*, 8.4, 8.5, 8.6, 8.7, and 8.8**

- PowerFlex replication must be configured and working
  - The SRA is compatible with PowerFlex 3.5.1, 3.6.x, 4.0.x, and 4.5

- At least one Replication Consistency Group containing volumes that are:
  - Mapped to ESXi hosts
  - Used to create the datastores hosting the VMs that SRM will protect

SRM Protected Site

SRA

Gateway

REST API

M

S1
S1
S1

DELLTechnologies
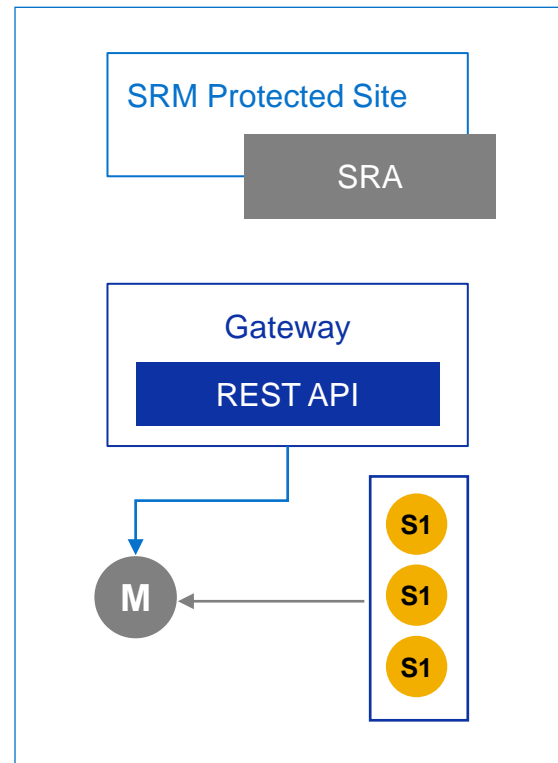
Extreme performance in a small footprint…

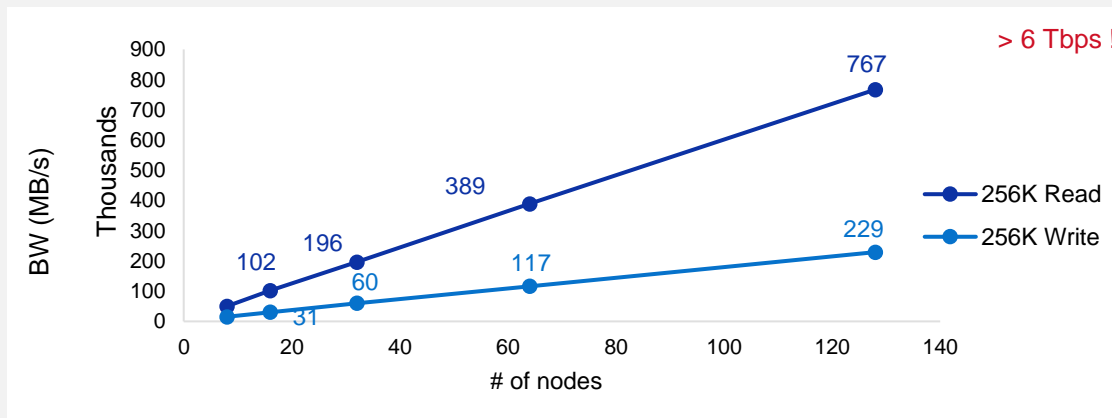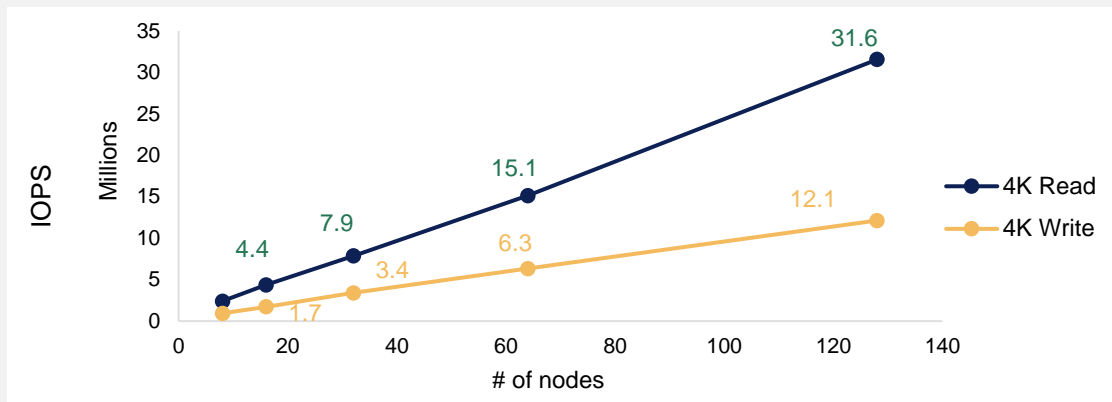| 10M	7M	1B	2.2M	325K
Transactions per minute	Transactions per minute	Indexing events	Operations per second	Operations per second
In 5U rack space	In 8U rack space	In only 3 hours	On Kubernetes	In 8U rack space
ORACLE RAC	Microsoft SQL Server	elastic stack	mongoDB	cassandra

*Based on Dell testing. Results may vary based on configurations.

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PowerFlex performance

Scale out by adding more nodes

Scaling adds both capacity and performance

Near-linear predictable improvement with scale

IOPS chart (Millions vs # of nodes):
- 4K Read: 4.4, 7.9, 15.1, 31.6
- 4K Write: 1.7, 3.4, 6.3, 12.1

> 6 Tbps !

BW (MB/s) chart (Thousands vs # of nodes):
- 256K Read: 102, 196, 389, 767
- 256K Write: 31, 60, 117, 229

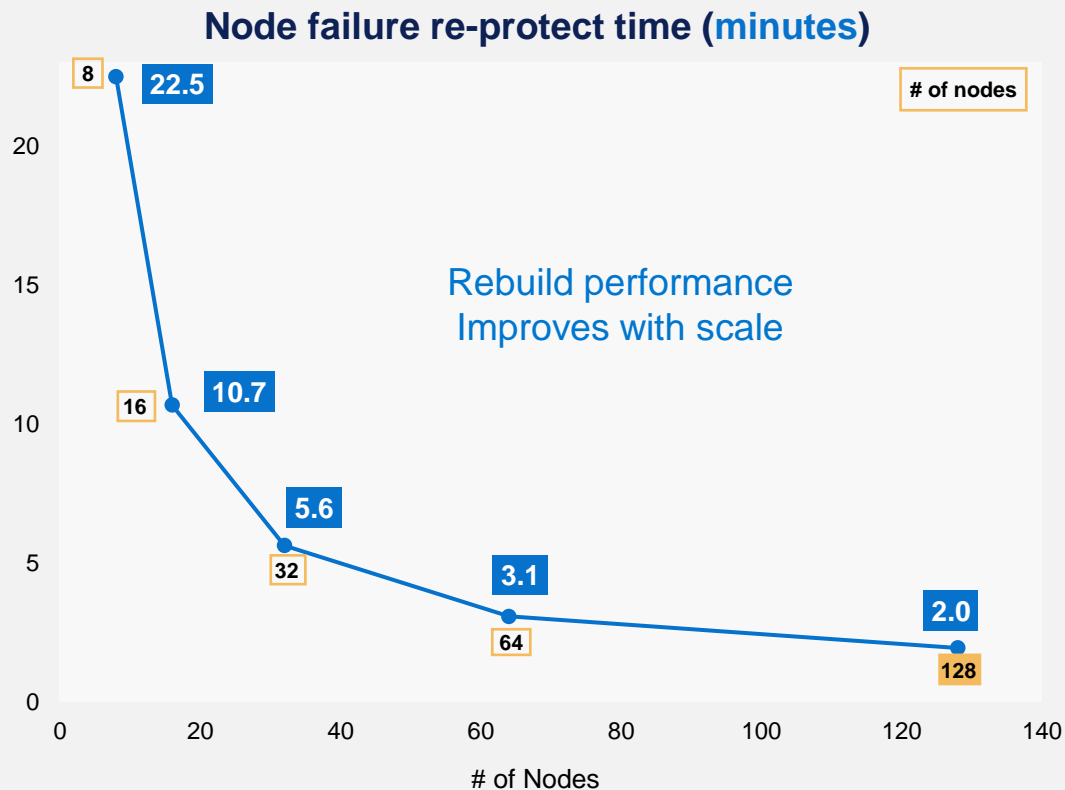DELLTechnologies

Fast data reprotection

Self healing / self balancing

Rebuild data, not drives

Seconds and minutes, not hours and days

Bend but do not break

99.9999% availability by design

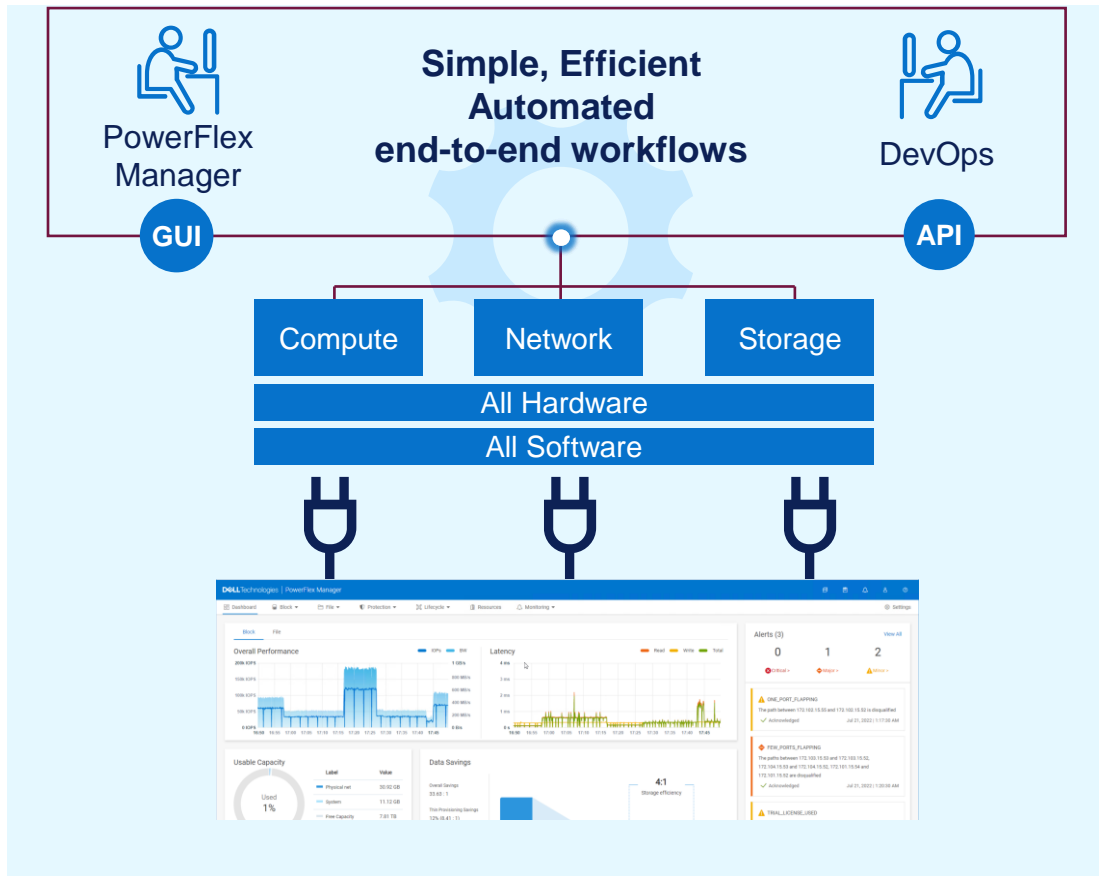## Node failure re-protect time (minutes)

Rebuild performance
Improves with scale

# of nodes

8	22.5
16	10.7
32	5.6
64	3.1
128	2.0

# of Nodes

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Life Cycle Management

PowerFlex Manager

Automated infrastructure operations

Eliminate errors and admin time

Integrate with open REST APIs
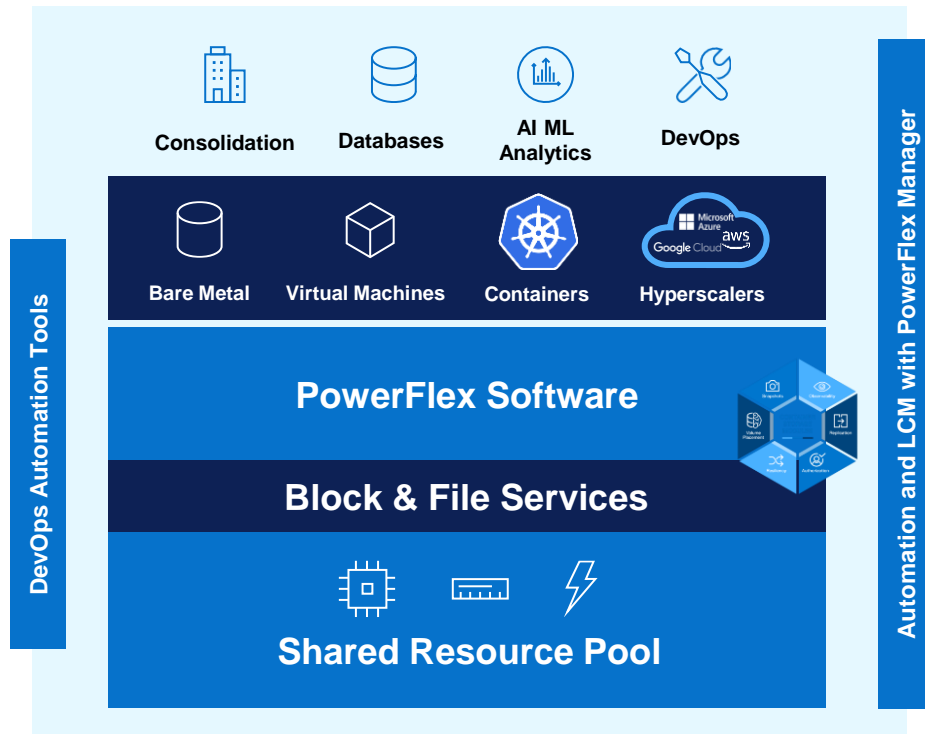
Alignment with operational roles through full RBAC

Admin Time — 95%

Fewer Steps — 77%

PowerFlex Manager **GUI**

Simple, Efficient Automated end-to-end workflows

DevOps **API**

Compute | Network | Storage

All Hardware

All Software

DØLLTechnologies

A comprehensive DevOps platform

ANSIBLE Terraform CloudIQ

DevOps Automation Tools

Consolidation	Databases	AI ML Analytics	DevOps

Bare Metal	Virtual Machines	Containers	Hyperscalers

PowerFlex Software

Block & File Services

Shared Resource Pool

Automation and LCM with PowerFlex Manager

Rich automation and orchestration ecosystem

Deep application expertise and integrations

Integrated security, compliance, protection and CDM

D❤LL Technologies

Dell PowerFlex Security Advantages

Comprehensive security by design

Data Encryption - D@RE
FIPS-compliant Data-At-Rest Encryption and Key Management

KMIP-compliant Key Management
KMIP Sever and KMS. Client on vSphere KMIP server

Network Segmentation
vLAN management and configuration

Secure Admin Access
SSO, Certificate-based access

Secure Physical Access
Advanced cabinet access controls with programable sensors and locks

Secure Development
Dell maturity model and Secure Development SDL practices

Availability
High Availability, Data Protection, System Recovery, and Monitoring. Dell Cyber Recovery air-gapped secure-vault solution.

System & Storage Integrity
Storage Checksum. Software digital signature validation. SBOM. Hardening to STIG & NIST Guidelines.

Dell Enhanced SupportAssist Enterprise
Secure remote support service

D∉LL Technologies

On-premise experience to the public cloud with:
APEX Block Storage

300%
More performance
per dollar [2]

Extreme performance & scale   Seamless data mobility

Flexible storage options   Multi-AZ durability

Use cases

ON PREM/ COLO

ENTERPRISE BLOCK STORAGE

Multi-year Leader
in Gartner Magic Quadrant [1]

Databases   Containers   Analytics   General compute   Consolidation

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The power of the Dell portfolio

Ecosystem Partners Frameworks

Compute

AI/ ML
PowerEdge XE

General Purpose
PowerEdge R & MX

Edge
PowerEdge XR

Networking
PowerSwitch | SONiC

Storage

Block & Unified
PowerMax | PowerStore | Unity XT | PowerVault

File & Object
PowerScale | ObjectScale | ECS

HCI / SDS
VxRail | PowerFlex | Azure

Data Protection

PowerProtect Data Manager | PowerProtect DataDomain | PowerProtect DM 5500

Cyber Recovery

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3 Tier Architectures

Ecosystem Partners Frameworks

Plug-ins/ Redfish

Compute

K8s backup

VAAI/ CSI/ Plug-ins/

General Purpose
PowerEdge R & MX

Networking
PowerSwitch | SONiC

Storage

Block & Unified
PowerMax | PowerStore | Unity XT | PowerVault

File & Object
PowerScale | ObjectScale | ECS

Tiering

Dynamic NAS backup

Storage Direct Backup

Data Protection

PowerProtect Data Manager | PowerProtect DataDomain | PowerProtect DM 5500

Cyber Recovery

Long term retention

Air Gap Replication

HCI/ Turnkey solutions

Ecosystem Partners Frameworks			

Ecosystem Partners Frameworks

RED HAT OPENSHIFT · Azure · vmware®

Compute

Apex Cloud Platform for RH OpenShift

Apex Cloud Platform for Azure

VxRail

General Purpose
PowerEdge R

Edge
PowerEdge XR

Networking
PowerSwitch | SONiC

Storage

File & Object
PowerScale | ObjectScale | ECS

NAS

S3

HCI / SDS
VxRail | PowerFlex | Azure

Data Protection

PowerProtect Data Manager | PowerProtect DataDomain | PowerProtect DM 5500

Cyber Recovery

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AI Validated Designs

| **Ecosystem Partners Frameworks** | NVIDIA | AMD INSTINCT MI300X | intel GPU | RED HAT OPENSHIFT | | Starburst | | |

Compute

AI/ ML
PowerEdge XE

General Purpose
PowerEdge R

Networking
PowerSwitch | SONiC

Storage

Dell Data Lake House

File & Object
PowerScale | ObjectScale | ECS

HCI / SDS
VxRail | PowerFlex

Dell Validated Designs
(AI, Analytics, HPC, VDI)

Data Protection

PowerProtect Data Manager | PowerProtect DataDomain | PowerProtect DM 5500

Cyber Recovery

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The power of the Dell storage portfolio

Recognized as a **leader** in Gartner's Magic Quadrant for Primary Storage	**$7.9B+** investments in R&D	**>28,000** patents	**85%+** of ISG engineering staff are software developers

Smart	Flexible	Resilient
Accelerate innovation with intelligent & efficient systems.	Power any workload across the edge, data center & public cloud.	Deliver comprehensive data protection everywhere.

Block & Unified
PowerMax | PowerStore | Unity XT | PowerVault

File & Object
PowerScale | ObjectScale | ECS

Hyperconverged
VxRail | PowerFlex | Azure Stack HCI

Software-defined
PowerFlex | ACPs

Data Protection
PowerProtect

CloudIQ & 3rd Party Automation Integration

Multi-Cloud Solutions

Thank you !

D&LL Technologies