

Dell PowerProtect Data Domain

Build your cyber resilient foundation on the #1 backup appliance. Fast, efficient and secure. At a low cost to protect.

Why PowerProtect Data Domain

Fast

- Up to 38% faster backups²
- Up to 44% faster restores²
- Up to 58% faster replication²
- Instant access and instant restore of up to 118k IOPS for 64 concurrent VMs²

Efficient

- Typically up to 65:1 data reduction³
- Up to 11% less power consumed⁴
- 50% less floor space required⁵
- Less than 1¢ per GB/month to protect⁶

Secure

- Multiple layers of Zero Trust security to ensure data immutability and integrity
- Isolate critical data to cyber recovery vault

Broad portfolio and ecosystem

- Six products with 1 TB – 1.5 PB usable capacity in a single rack
- Up to 3 PB capacity for long-term retention
- Backup software agnostic and supports leading enterprise applications
- Seamless integration, faster performance with Dell PowerProtect Data Manager
- Native integration with Dell PowerStore & Dell PowerMax

The Data Domain Technology Difference

- CPU-centric architecture
- DD Boost
- Data Invulnerability Architecture (DIA)
- Data Domain Replicator for creating a secure and reliable offsite copy
- Transparent Snapshots for up to 5X faster VM backups⁷ and 6X faster restores⁸
- Cloud Tier for long-term retention to public, private or hybrid cloud
- Disaster recovery to the cloud with 3-click failover and 2-click failback
- Dell CloudIQ proactive insights, performance, and security analytics



Gain the confidence that you can recover from the unexpected.

Build your cyber resilient foundation on the #1 Purpose-Built Backup Appliance¹. Whether you are protecting data that is on-premises or across multicloud—for traditional or modern workloads—you can help ensure comprehensive cyber resilience wherever your data lives.

Data Domain target storage appliances are designed and optimized for data protection—resulting in performance, efficiency and security advantages that simplify operations, reduce risk and lower costs. And, its broad partner and backup software ecosystem means that it can seamlessly plug into your data protection environments.

Performance & Efficiency

Meet Service Level Agreements (SLAs) and minimize impact to production with shorter backup windows and faster recovery, while reducing Total Cost of Ownership (TCO).

The latest generation of Data Domain delivers up to 38% faster backups, up to 44% faster restores and up to 58% faster replication. It's also more efficient, delivering up to 65:1 data reduction and requiring up to 11% less power and 50% less floor space. All this equals a lower cost-to-protect.

Security

Data Domain helps advance your cyber resilience maturity with multiple layers of Zero Trust security. Features such as the Data Invulnerability Architecture (DIA), Hardware Root of Trust, Secure boot, encryption, retention lock, role-based access control, and multi-factor authentication help ensure the integrity and recoverability of your data. And, Data Domain appliances can be deployed in an isolated cyber recovery vault with independent management controls for tighter security.

The Data Domain Technology Difference

Data Domain has a long history as the industry's number-one backup appliance, and for good reason. Its technology has been proven and hardened for over a decade. And, Dell's data protection expertise continues to deliver innovations that matter to customers.

CPU-centric architecture accelerates performance

Data Domain appliances are built with a CPU-centric architecture. CPU and memory access is orders of magnitude faster than primary storage, including flash. A CPU-centric architecture enables advanced memory structures, predictive caching, and massively parallel high-speed streaming, that are not otherwise possible with general-purpose storage implementations.

Data Domain Operating System

The DD Operating System (DDOS) is the intelligence that powers Data Domain. It provides the agility, security and reliability that enables the appliances to deliver high-speed, scalable, and industry-leading multicloud protection storage for backup, archive, and disaster recovery. DDOS integrates seamlessly with existing infrastructures, enabling ease-of-use with leading backup and archiving applications, including Dell PowerProtect Data Manager. When purchasing a new Data Domain appliance, you can consume DDOS as a subscription providing flexibility for deployment while minimizing upfront costs.

DD Boost

DD Boost is a patented technology that allows deduplication to happen at the source—minimizing the amount of data that needs to be backed up. This reduces the impact to networks, clients, servers and to the Data Domain system. It delivers an advanced level of integration with backup applications and database utilities, enhancing performance and ease of use.

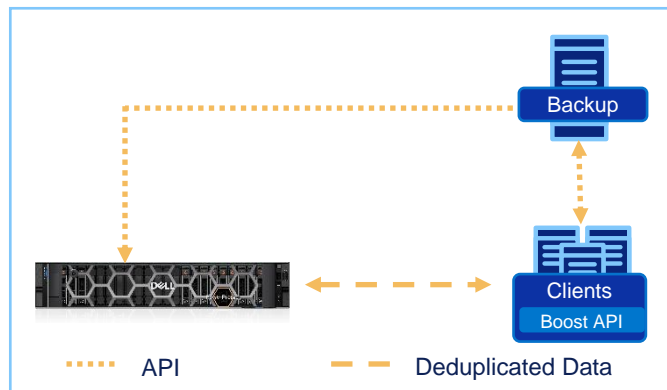


Figure 1. DD Boost reduces impact to networks.

Dell also provides a DD Boost File System Plug-In (BoostFS) with DD Boost for even greater application support, which enables all the benefits of DD Boost for applications that use NFS for data protection. Rather than sending all data to the system for deduplication processes, DD Boost enables the backup server or application client to send only unique data segments across the network to the system.

Data Domain is backup software agnostic. This gives you choice to decide which backup software is right for you

as well as the flexibility to seamlessly plug Data Domain into your existing on-premises environments.

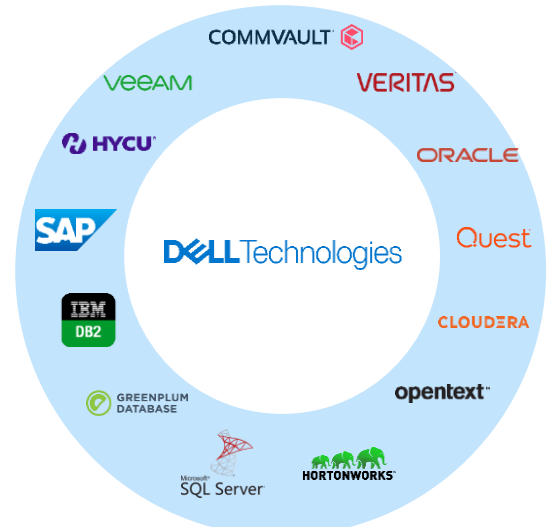


Figure 2. DD Boost delivers advanced integration with a broad ecosystem of backup software and applications.

Deduplication matters

Not all data deduplication is created equal. How it is implemented directly impacts backup and restore performance.

Industry-leading deduplication with Data Domain is done at the micro-level – delivering a more fine-tuned result. Segment sizes are small (8KB average), of variable length leveraging a sliding window in order to isolate changes, and is done inline and at high speed.

Because protection copies can represent up to 95% of an organization’s data, it is important to reduce their storage footprint to the greatest extent possible.



Figure 3. Data Domain typically delivers up to 65:1 data reduction, significantly shrinking storage requirements.

A 15% improvement in deduplication rate (for example from 80% to 95%) can reduce the physical capacity required by up to 4x. Data Domain typically delivers up to 65:1 data reduction—for a right-sized solution that shortens backup windows, delivers faster replication, increases retention, and reduces total cost of ownership.

Instant Access and Instant Restore

Instant Access and Instant Restore delivers high performance of VMs with up to 118K IOPS with the ability to instantly access up to 64 VMs simultaneously.

Instant Access and Instant Restore save time, minimizing mean time to repair (MTTR), by enabling instant access to data from the backup image on the included Data Domain SSD drives. It also saves primary storage space with the ability to manage data on the appliance itself and lowers cost by better utilizing the physical resources in both the data protection and production environments.

DD Replicator

DD Replicator provides automated, policy-based, network-efficient, and encrypted replication for disaster recovery and multi-site backup and archive consolidation. DD Replicator software asynchronously replicates only compressed, deduplicated data over the WAN. Cross-site deduplication further reduces bandwidth requirements when multiple sites are replicating to the same destination system.

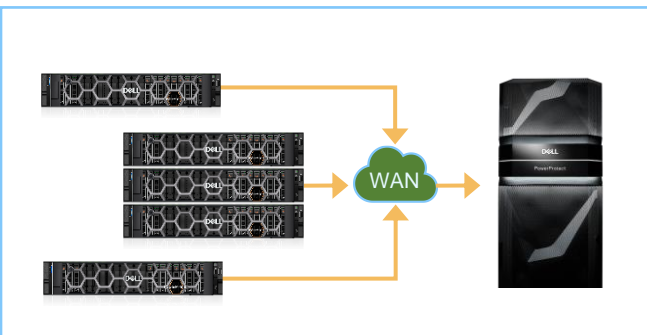


Figure 4. DD Replicator creates a secure and reliable offsite copy.

This improves network efficiency across all sites and reduces daily network bandwidth requirements making network-based replication fast, reliable and cost effective. To meet a broad set of DR requirements, DD Replicator provides flexible replication topologies, such as full system mirroring, bi-directional, many-to-one, one-to-many, and cascaded.

Seamless integration

Data Domain integrates easily with existing infrastructures, enabling ease-of-use with leading backup applications, and offers superior performance in conjunction with Data Manager.

Data Domain can simultaneously support multiple access methods including NFS, CIFS/SMB, VTL, NDMP and DD Boost. All applications and utilities can be supported in the same Data Domain appliance at the same time to enable greater protection storage consolidation. A system can present itself as a file server, offering NFS or CIFS access over Ethernet; as a virtual tape library (VTL) over Fibre Channel; as an NDMP tape server over

Ethernet; or as a disk target using application specific interfaces like DD Boost. DD VTL is qualified with leading open systems and IBMi enterprise backup applications.

With Storage Direct Protection, you can increase backup performance and efficiency for Dell storage, including Dell PowerStore and Dell PowerMax.

Comprehensive cyber resilience

Data Domain delivers powerful built-in security features for cyber resilience wherever your data lives—with multiple layers of Zero Trust security.



Hardware Root of Trust and Secure boot protects the boot process and establishes trustworthiness. Retention lock prevents deletion or changes to your data for a configurable set time period. Role-based access control allows different levels of access via assigned user roles for various levels of expertise within the organization. Multi-factor authentication grants users access only after successfully authenticating the user with multiple methods. Plus, Data Domain offers inline encryption of data at rest as well as encryption of in-flight data.

Data Domain can be deployed in an isolated cyber recovery vault with independent management controls for tighter security. Over 2,100 PowerProtect Cyber Recovery customers (and counting) use PowerProtect appliances in their cyber recovery vault⁹.

The vault is not an additional data center, but rather a secure storage environment located at the production or corporate data center, public cloud, or with a third-party solution provider. Intelligence through AI-based machine learning and analytics with CyberSense enables recoverability.

Data Invulnerability Architecture

Data Domain appliances are designed as the storage of last resort—providing you with the confidence that you can always reliably recover your data. The Data Invulnerability Architecture is built into DDOS and Data Domain appliances to provide the industry's best defense against data loss. Inline write and read verification protects against and automatically recovers from data integrity issues during data ingest and retrieval while RAID-6 and hot spares protect against disk failure.

Capturing and correcting I/O errors inline during the backup process eliminates the need to repeat backup jobs, ensuring backups complete on time and satisfy service-level agreements (SLAs). In addition, unlike other

enterprise arrays or file systems, continuous fault detection and self-healing ensures data remains recoverable throughout its lifecycle on Data Domain.

Transparent Snapshots

Available with Dell PowerProtect Data Manager, Transparent Snapshots delivers unique VMware VM protection and ensures availability of all your VMs at scale, without business disruption. Transparent Snapshots simplifies and automates VM image-level backups and enables backing up VMs without the need to pause the VM during the backup process. The result is significantly reduced impact on VMs, especially large, high-change-rate VMs.

Long-term retention in cloud

Data Domain can tier deduplicated data to any supported object storage provider for long-term retention using Cloud Tier. Cloud Tier supports an extensive ecosystem of cloud and on-premises object storage solutions, including AWS S3, Azure, Google Cloud Platform, Alibaba Cloud, Wasabi, Dell ECS, and others to deliver long term retention of backup data at reduced costs.

Cloud disaster recovery

Data Domain, in conjunction with supported PowerProtect Data Manager software, provides orchestrated and automated cloud disaster recovery. Cloud Disaster Recovery integrates with AWS and Azure native cloud operating environments, along with their associated VMware and Government Cloud offerings.

Data Domain as a virtual appliance

Leverage the power of DDOS to deliver software-defined protection storage on-premises using PowerProtect DD Virtual Edition (DDVE), and in-cloud with Dell APEX Protection Storage. Both are fast and simple to download, deploy and configure – and can be up and running in minutes.

DDVE can be deployed on-premises on any standard hardware, converged or hyper-converged, and runs in VMware vSphere, Microsoft Hyper-V, and KVM. DDVE is also certified with VxRail and Dell PowerEdge servers. An assessment tool can be run during deployment to check the underlying infrastructure and ensure it meets recommended requirements. A single DDVE instance can scale up to 96TB.

APEX Protection Storage is a virtual appliance with Data Domain DNA. It increases transactional and operational efficiencies and provides significant cost savings by providing the ability to write data or backup into the cloud object storage directly.

APEX Protection Storage delivers massive data protection efficiencies by backing up only unique data segments. As data is ingested, the stream is

deduplicated, compressed, and encrypted, which enables rapid and secure data transfers. APEX Protection Storage provides automated, policy-based, network-efficient, and encrypted replication for disaster recovery and multi-site backup and archive consolidation.

APEX Protection Storage provides up to 256TB per instance and offers the same experience in-cloud and on premises. Easily download APEX Protection Storage from public cloud marketplaces to protect applications running in any supported cloud environment, including AWS, Microsoft Azure, Google Cloud, AWS GovCloud, Microsoft Azure Government Cloud, Alibaba Cloud, and VMware Cloud.

Within DDVE and APEX Protection Storage, capacity can easily be distributed between virtual systems and/or locations and can scale in increments of 1TB allowing you to grow capacity as the business demands. DDVE and APEX Protection Storage maintain the core DDOS features and include DD Boost, DD Encryption and DD Replicator. DDVE and APEX Protection Storage can be configured and managed using DD System Manager and centrally manage multiple instances, through PowerProtect DD Management Center.

Operational simplicity

Data Domain is very simple to install and manage resulting in lower administrative and operational costs. Administrators can access DDOS through command line over SSH or through DD System Manager, a browser-based graphical user interface.

Multiple Data Domain appliances can be managed and monitored through a single interface, PowerProtect DD Management Center, or DDMC. Customizable dashboards provide visibility into aggregate status, status by geo, and the ability to drill-down to system-level details.

DDMC can provide insights into current and projected capacities at the system level for Data Domain systems allowing for enhanced forecasting and capacity management. Simple programmability as well as SNMP monitoring provides additional management flexibility. DDMC offers a pre-check option before scheduling a DDOS upgrade to make sure your environment is compatible with the update. Once the pre check is complete you can schedule a one-to-many upgrade allowing you to schedule multiple DDOS upgrades as opposed to one-to-one updates.

Configuring multiple Data Domain appliances is simple with DDMC by allowing you to create and apply configuration templates to your appliances.

With cyber attacks and threats on the rise, DDMC can provide compliance alerts when a system's configuration is out of compliance. In the event of a DDOS upgrade failure the appliance will automatically default back to the

previous OS release minimizing system downtime and allowing for continuous backup operations.

In addition, Data Domain has an automatic call-home system reporting called auto-support, which provides email notification of complete system status to Dell support and a selected list of administrators. This non-intrusive alerting and data collection capability enables proactive support and service without administrator intervention, further simplifying ongoing management.

Data Domain is integrated with Dell CloudIQ. CloudIQ provides proactive insights and performance analytics across supported storage, data protection, and hyper-converged products through one UI.

Subscribe to Data Domain appliances with greater convenience

Dell APEX subscriptions provide the ultimate choice and consistency for building a foundation for cyber resiliency and multicloud data protection. Tailor capabilities and services according to your needs. We deliver exactly

what you want, available as-a-Service and on your schedule. Simply pay for what you use each month – all on your terms. Gain the confidence that you can recover from the unexpected, and experience unparalleled simplicity, agility, and control with Dell APEX.

Future-Proof Program



Data Domain participates in the Future-Proof Program. The program gives our customers additional peace of mind with guaranteed satisfaction and investment protection through a comprehensive set of world class technology capabilities and programs for future technology changes.

Backed by the power of Dell Technologies

Dell offers one-stop convenience to Data Domain customers, with leading end-to-end solutions and ecosystem partners, global services and secure supply chain and a strong channel and direct salesforce.

Comprehensive PowerProtect Data Domain portfolio

	DDVE - 96TB	DD3300	DD6400	DD6900	DD9410	DD9910
Backup Ingest (w/DD Boost)	Up to 11.2TB/hr	Up to 7.0TB/hr	Up to 27.7 TB/hr	Up to 33TB/hr	Up to 75TB/hr	Up to 130TB/hr
Logical Capacity ¹⁰ (w/Active Tier)	Up to 4.8PB	Up to 1.6PB	Up to 11.2PB	Up to 18.7PB	Up to 49.9PB	Up to 97.5PB
Usable Capacity ¹¹ (w/Active Tier)	1 TB - 96 TB	4 TB - 32 TB 3.5 TiB - 28.4 TiB	8 TB - 172 TB 7.1 TiB - 152.5 TiB	24 TB - 288 TB 21.3 TiB - 255 TiB	192 TB - 768 TB 170 TiB - 681 TiB	576 TB - 1.5 PB 511 TiB - 1.33 PiB

Software-defined protection storage on-premises: PowerProtect Data Domain Virtual Edition scales up to 96 TB

In-cloud protection storage: Dell APEX Protection Storage scales up to 256 TB

¹Based on revenue from the IDC 4Q23 Purpose-Built Backup Appliance (PBBA) Tracker

²Based on Dell internal testing comparing a Dell PowerProtect DD9910 appliance vs. a PowerProtect DD9900 appliance, February 2024. Actual results may vary.

³Based on Dell internal testing and field telemetry data, February 2024. Actual results may vary.

⁴Based on Dell analysis comparing a Dell PowerProtect DD9910 appliance vs. a PowerProtect DD9900 appliance both configured at maximum capacity (1.5PBu). Savings in US dollars calculated using power consumption and thermal rating for appliances with expansion shelves and an average electricity price of \$.168 per KWH. For estimation purposes only. Actual costs will vary.

⁵Based on Dell internal testing comparing a Dell PowerProtect DD9910 appliance using an optional deep rack vs. a PowerProtect DD9900 appliance, March 2024.

⁶Based on ESG review commissioned by Dell, "Analyzing the Economic and Operational Benefits of the Dell Data Protection Portfolio", November 2022. Actual results will vary.

⁷When comparing PowerProtect Data Manager 19.13 with Transparent Snapshots backup performance to PowerProtect Data Manager with VADP backup performance. Based on Dell internal testing, June 2023.

⁸When comparing PowerProtect Data Manager 19.13 with Transparent Snapshots restore performance to PowerProtect Data Manager with VADP VM latency performance. Based on Dell internal testing, June 2023.

⁹Based on Dell Technologies analysis, February 2024.

¹⁰Logical capacity based on up to 50x deduplication (DD3300) and up to 65x deduplication (DD6400, DD6900, DD9410, DD9910). Actual capacity & throughput depends on application workload, deduplication, and other settings.

¹¹TiB/PiB values adjusted for estimated DDOS overhead. DDOS overhead can vary depending on metadata required for customer workload



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