DELL Technologies

Solution Brief

Dell Container Storage Modules

Empower your developers with a simple, consistent, integrated, and automated experience for enterprise storage and cloud native stateful applications.

Benefits of Dell CSM

Extend enterprise storage to Kubernetes

Accelerate adoption of cloud native workloads with proven enterprise storage

Empower developers through automation

Reduce development cycles by integrating enterprise storage with existing Kubernetes toolsets

Safely and seamlessly consume storage

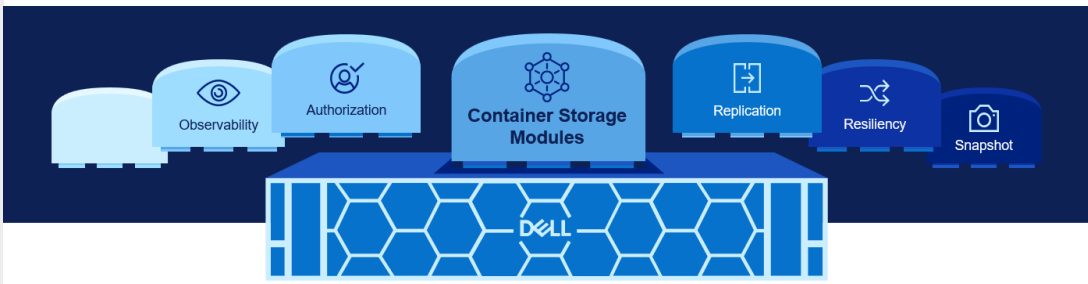
Monitor and secure operations across enterprise storage and DevOps environments

Production use of Kubernetes is accelerating, as more than 95% of global organizations are expected to run containerized applications in production by 2029, a significanct increase from less than 50% in 2023.[1] However, as production use grows, enteprises are utilizing multiple clouds for their Kubernetes deployments, which can lead to unexpected challenges. For Kubernetes admins and developers, this means lack of visibility and monitoring, difficulty meeting security and compliance demands, and inconsistent multicloud strategies.

Dell's DevOps solutions help organizations prepare for these challenges, enabling them meet data persistence, storage, and protection requirements for their preferred Kubernetes distribution by building on top of industry standard Container Storage Interface drivers with Dell Container Storage Modules.

Dell Container Storage Modules

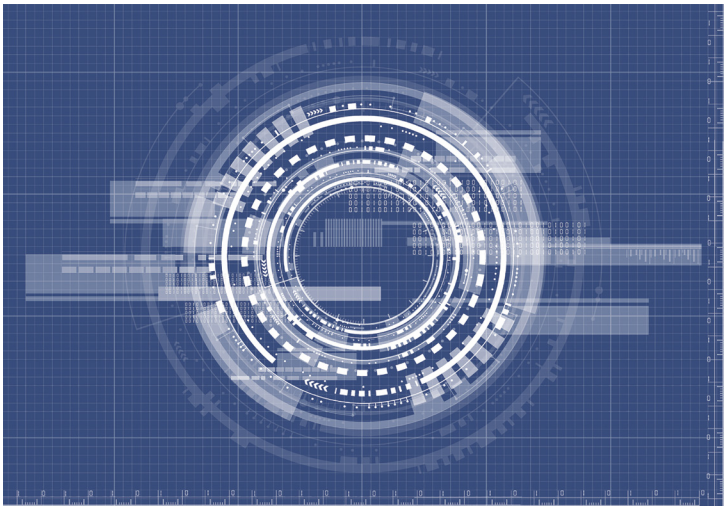
Dell Container Storage Modules (CSM) bring powerful enterprise storage features and functionality to your Kubernetes running in Dell primary storage arrays, providing easier adoption of cloud native workloads, improved productivity, and scalable operations.



- **Authorization:** Apply quota and RBAC rules that instantly and automatically restrict cluster tenants' usage of storage resources, built on a stateless architecture.
- **Replication:** Easily extend data protection and DR planning to Kubernetes workloads with consistent policy enforcement and user experience.
- **Resiliency:** Improve application up-time with automatic detection and recovery of node failures.
- **Observability:** Create a single pane management experience for developers and K8 admins by integrating tools such as Prometheus and Grafana.
- **Snapshot:** Build on CSI's point-in-time recovery with additional capabilities for volume snapshots with referential integrity.

Authorization Module

CSM Authorization, built on a stateless architecture enables storage administrators to limit and control storage consumption in Kubernetes environments. With this module, storage administrators can apply quota and Role-Based Access Control (RBAC) rules that instantly and automatically restrict cluster tenants' usage of storage resources. The module does this by deploying a proxy between the CSI driver and the storage system to enforce RBAC and usage rules. The access is granted with a token that can be revoked at any point in time, and quotas can be changed on the fly to limit or increase storage consumption from the different tenants.



Replication Module

CSM Replication helps to implement a high availability architecture for business critical applications, a key component of any disaster recovery plan. As such, Kubernetes users can decide that their StatefulApp will use a volume that is replicated on another site. Behind the scenes the replication module is in charge of creating the replicated volume, checking the replication process and mounting the volumes to the workload. In case of a failover / failback, the data replicator will take care or reconfiguring the replication group and remounting the volumes.

CSM Replication supports both a stretched Kubernetes cluster (one cluster with nodes on the different sites) or replicated Kubernetes cluster (separate clusters on the different sites). This allows you to choose the right disaster recovery plan for your workloads.

Resiliency Module

CSM Resiliency is designed to make Kubernetes applications that utilize persistent storage more resilient to failures. CSM Resiliency uses a pod monitor that is specifically designed to protect stateful applications from various failures. It is not a standalone application, but deployed as a sidecar to Dell's CSI drivers in both the driver's controller pods and the driver's node pods.

Deploying CSM Resiliency as a sidecar allows it to make direct requests to the driver through the Unix domain socket that Kubernetes sidecars use to make CSI requests. The module detects node failures (power failure), Kubernetes control plane network failures, and array I/O network failures, in addition to moving the protected pods to properly functioning hardware.

Observability Module

CSM Observability delivers a high-level view of storage capacity and performance usage via Grafana dashboards to the Kubernetes users. Kubernetes administrators have insight into CSI Driver persistent storage topology, usage, and performance. Metrics data is collected at a fast rate (<1minute), pushed to the OpenTelemetry Collector, and exported in a format consumable by Prometheus. Topology data related to containerized volumes that are provisioned by a CSI Driver is also captured.

Other capabilities include:

- Storage pool consumption by CSI Driver
- Storage system I/O performance by Kubernetes node
- CSI Driver positioned volume I/O performance
- CSI Driver provisioned volume topology

Snapshot Module

Snapshot capabilities are part of the CSI plugins for each Dell array and take advantage of state-of-the-art snapshot technology to protect and re-purpose data. In addition to point-in-time recovery, these snapshots are writable and can be mounted for test/dev and analytics use cases without impacting production. Through CSM, a Volumesnapshot group feature is added to the CSI snap shots, delivering additional capabilities such as referential integrity.

Learn more about Dell's Container Storage Module

Contact a Dell Technologies Expert

Read CSM Documentation
Download CSM Software

Join the conversation with #CSM

[1]Gartner, The CTO's Guide to Containers and Kubernetes: Top 10 FAQs, Arun Chandrasekaran and Wataru Katsurashima, 22 January 2024.

DELL Technologies