# Dell Container Storage Interface (CSI) Drivers

Enable your DevOps and IT teams to extend their existing infrastructure and storage footprint, reducing the cycles required to rapidly deploy modern microservice based applications

Why Dell CSI

Expedites the shift from a monolith to a microservices based architecture

Simplifies container deployment in a Kubernetes environment
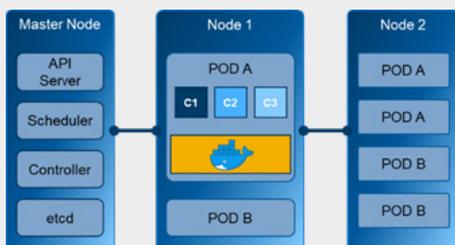
### Shift in Software Architectures and Development Processes

Software architectures are rapidly shifting from a monolith of tightly coupled modules to microservices based ones, where small, selfcontained and independent pieces of functionality can be built and deployed with much greater agility, at scale and with higher availability. Microservices are deployed as one or more containers, which are light weight packages of the microservice bundled together with all the dependencies. Containers are created so that a complete Operating System image is not required to run these services.

Docker, Kubernetes, and CSI Plugin Specifications

Docker is the container engine that is used to extract container images of applications and run the container image, with Kubernetes being the most popular container deployment and orchestration platform. The Container Storage Interface (CSI) standard is rapidly evolving as the de-facto standard to provision and manage the shared storage of these containerized workloads. As such, Dell has developed our own CSI plugins to ensure customers can support their containerized workloads requirements on all of our industry leading storage arrays, including PowerMax, PowerStore, PowerScale, Power-Flex, and Unity XT.

Dell's CSI Plugins

The CSI plugin is the interface between the logical volumes in the Kubernetes environment called persistent volumes and the storage volumes (or LUNs). Storage classes specify a set of parameters for the different characteristics unique to the underlying storage arrays. In a static provisioning workflow, a storage admin can create Persistent Volumes (PVs) using specific storage classes available for a Kubernetes cluster. In dynamic provisioning the pod manifest can specify a persistent volume claim (PVC) of a particular storage class be provisioned dynamically.
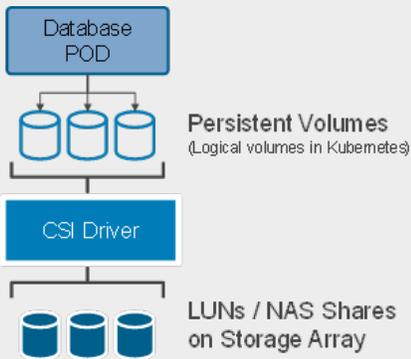
Pairing Dell CSI with Dell's Container Storage Modules (CSM)

Dell CSM delivers a set of modules that builds on top of the CSI foundation to deliver unique, powerful storage and enterprise capabilities. This includes modules for:

- **Replication:** Easily extend data protection and DR planning to Kubernetes workloads with consistent policy enforcement and user experience.
- **Observability:** Create a single pane management experience for your developers and K8 admins by integrating tools such as Prometheus and Grafana.
- **Resiliency:** Improve application up-time with
- automatic detection and recovery of node failures.
- **Authorization:** Apply quota and RBAC rules that instantly and automatically restrict a cluster tenant's usage of storage resources.
- **Secure:** Transparently add host side encryption to a volume, allowing for encryption both at rest and in motion (using familiar external key managers such as HashiCorp Vault).
- **Snapshot:** Build on CSI's point-in-time recovery with additional capabilities such as group/crash consistent snapshots with referential integrity.
- **App Mobility:** Clone stateful application workloads and application data to other Kubernetes clusters (either on-premises or in the cloud) using a single command.

How Does it Work?

Let us take an example to understand how this works. Consider a simple eCommerce application. Database services are required to store and retrieve information from records like product catalog, pricing database, customer information, etc. Depending on the design this may require multiple database workloads, both relational databases as well as NoSQL databases. These database services are deployed as PODs in a Kubernetes environment. To provision storage to these services, logical volumes called Persistent Volumes are used. The CSI Plugin for Dell's storage arrays presents the backend LUNs of the required size and performance characteristics (defined in a Storage Class) and maps them to the Persistent Volumes.
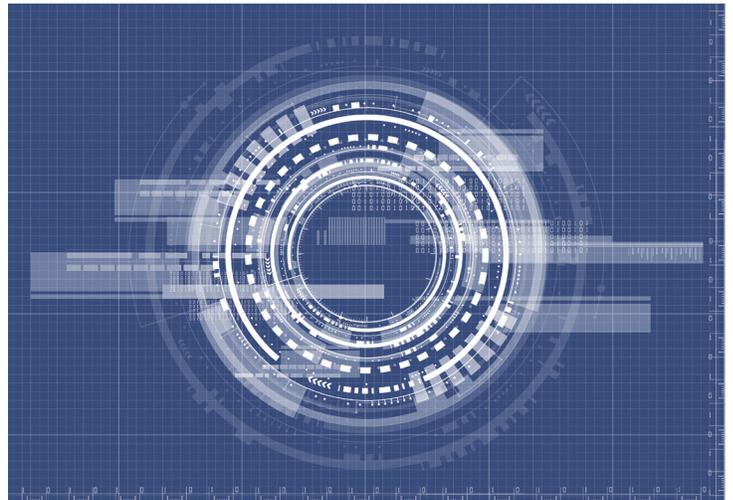
Get Started with CSI and CSM

Download the drivers and software for both CSI and CSM from Dell's single location GitHub repository. For CSI, this includes the following:
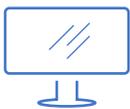
PowerMax CSI Plugin   PowerFlex CSI Plugin

PowerScale CSI Plugin   Unity XT CSI Plugin

PowerStore CSI Plugin   PowerVault ME4 CSI Plugin (Community Maintained)

Learn more about Dell's Container Storage Interface Plugins

Contact a Dell Technologies Expert

Read CSI Documentation
Learn More about Dell CSM

Join the conversation with #CSI

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