

OpenShift API Data Protection (OADP) with Ceph CSI

OpenShift Commons Briefing

Annette Clewett

Dylan Murray

Raghavendra Manjunath

OpenShift Backup & Restore Plan

Key goals

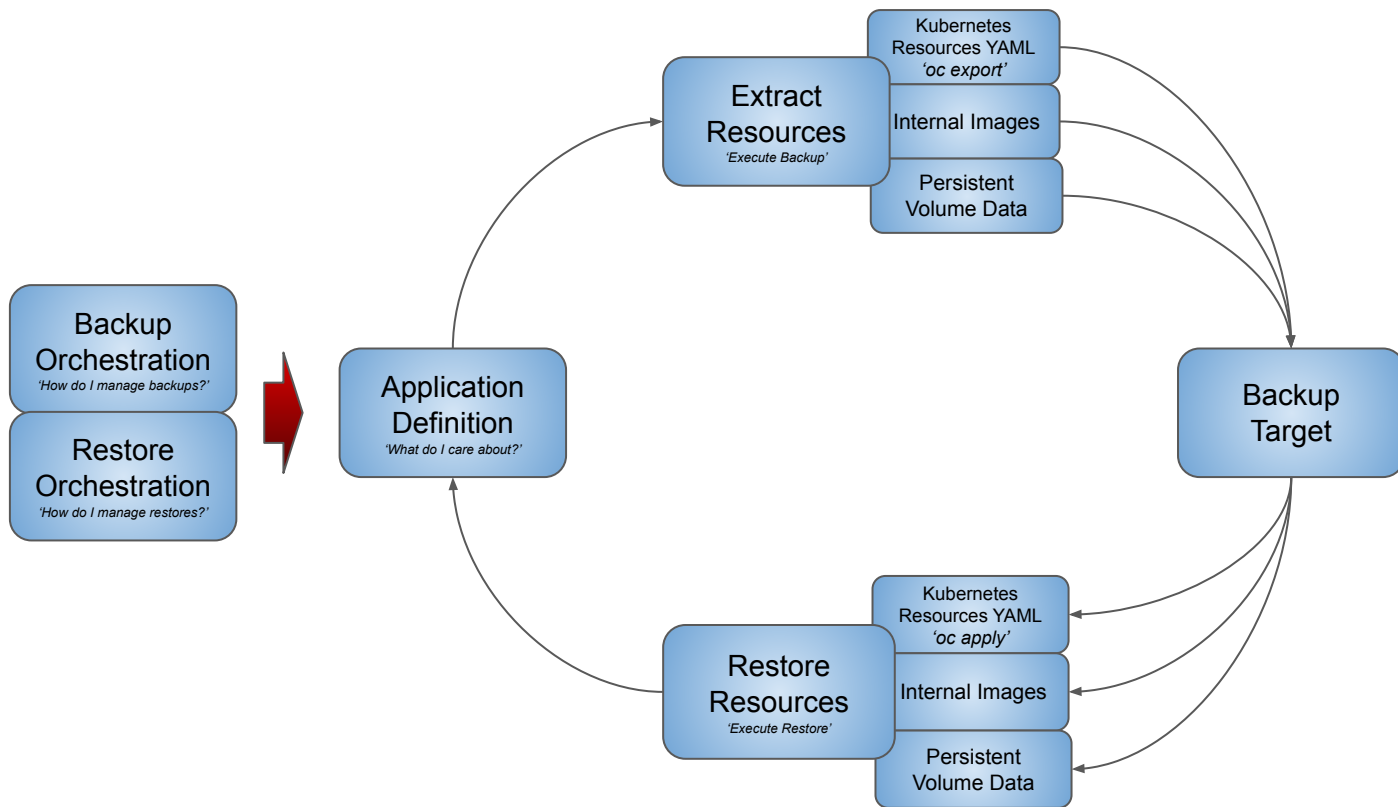
- Provide application granular backups that covers cluster metadata and Application persistent data.
- Enable a wide range of backup solutions with Backup ISV partnerships.

Strategy

- Provide Backup APIs that are built on Open Standards, applicable to wide range of external backup applications (i.e. Trillio).
- Solution uses OpenShift, Velero, Rook-Ceph, and CSI upstream projects.
- Red Hat Operator OCS (OpenShift Container Storage) incorporates Rook-Ceph & Ceph-CSI.
- Community Operator OADP (OpenShift API Data Protection) incorporates Velero APIs.

Backup and Restore Workflow

What does the problem look like?





OADP Solution Overview

OADP API – Red Hat Value

Leverages our Cluster knowledge



Cluster Consistent Backups

OADP provides for Backup application a cluster consistent backup image

- Cluster Resources +
- Persistent Volume Data



Application Portability

Platform maintains and delivers a series of plugins focused on enabling portability for core resources

- Across Clusters & Cluster versions
- Across Cloud Storage Providers



Red Hat Ecosystem Support

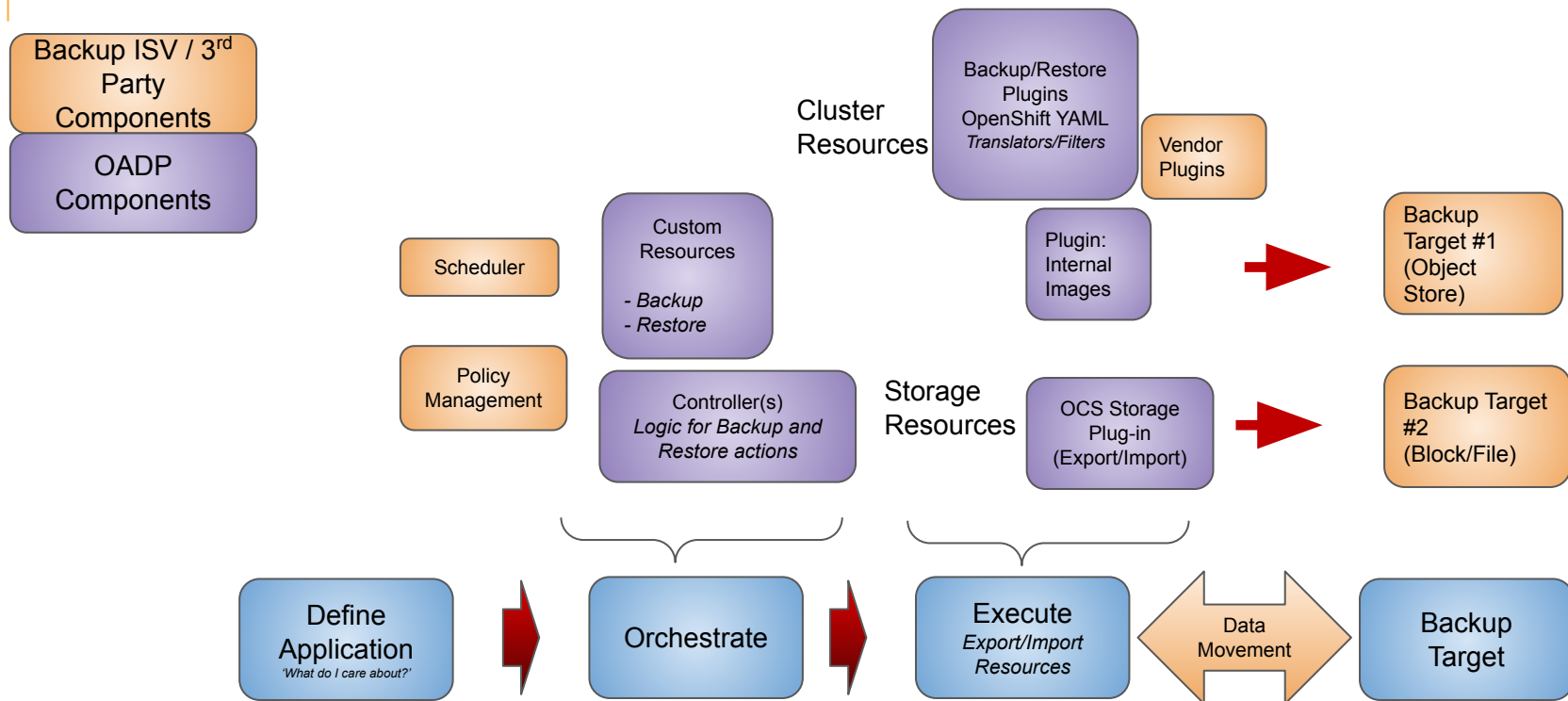
Red Hat integration, testing and support of the backup API speeds up partner solution development

- Available in Operator Hub
- Keeps up with future version compatibilities



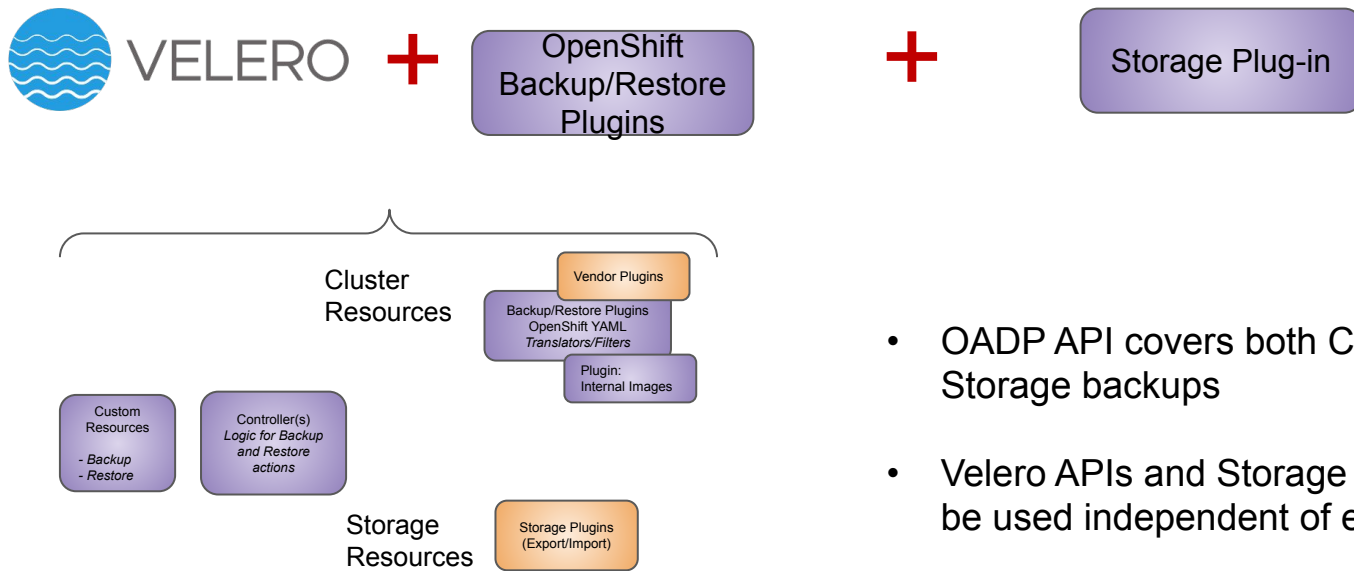
OpenShift Backup/Restore

Integration Points



Defined by App Developers or future community projects. Currently Supported as:

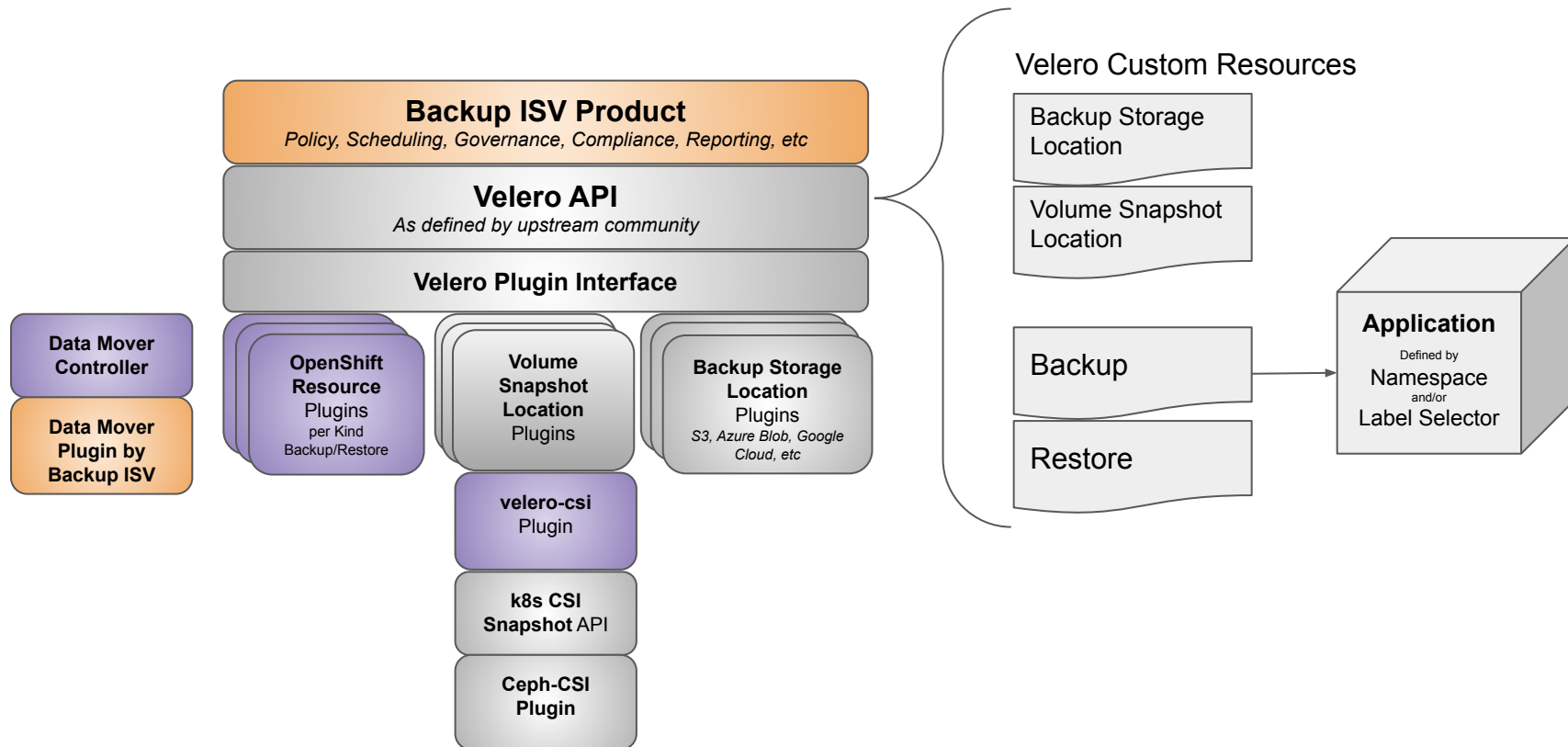
- Namespace(s)
- Label(s)
- Helm Chart(s)
- Operator Customer Resource(s)



- OADP API covers both Cluster and Storage backups
- Velero APIs and Storage Plug-ins can be used independent of each other

OpenShift API Data Protection (OADP)

Architecture





Velero API

[vmware-tanzu/velero:](https://vmware-tanzu.github.io/velero/pkg/apis/velero/v1)
[pkg/apis/velero/v1](https://vmware-tanzu.github.io/velero/pkg/apis/velero/v1)

Velero API Resources: User Perspective

Custom Resources extending Kubernetes

Backup

- Name: String
- Include/Exclude Namespaces: String[]
- Include/Exclude Resources: String[]
- Include Cluster Resources: Bool
- Label Selector: String
- SnapshotVolumes: Bool
- StorageLocation: String
- VolumeSnapshotLocations: String[]
- TTL: Duration
- Hooks

Restore

- BackupName: String
- Include/Exclude Namespaces: String[]
- Include/Exclude Resources: String[]
- LabelSelector: String
- IncludeClusterResources: Bool
- RestorePVs: Bool
- NamespaceMapping: String[][]

BackupStorageLocation

- Provider
- Coordinates/Credentials

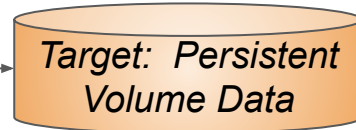
Where to store Kubernetes Resource YAML



VolumeSnapshotLocation

- Provider
- Coordinates/Credentials

Configuration for PV Snapshots



Schedule

- Template (*Same data as in Backup Resource*)
- Schedule

Velero API Resources: Backup Resource

Custom Resources extending Kubernetes

Backup

- Name: String
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- TTL: Duration
- Hooks

How to define your 'application'

- Include/exclude of
 - Namespaces
 - Resources
- Label selector

How to quiesce

- Hooks

Retention:

- TTL specifies how long to keep Backup in the Target

Restore

- BackupName: String
- Include/Exclude Namespaces: String[]
- Include/Exclude Resources: String[]:
- LabelSelector: String
- IncludeClusterResources: Bool
- RestorePVs: Bool
- NamespaceMapping: String[][]

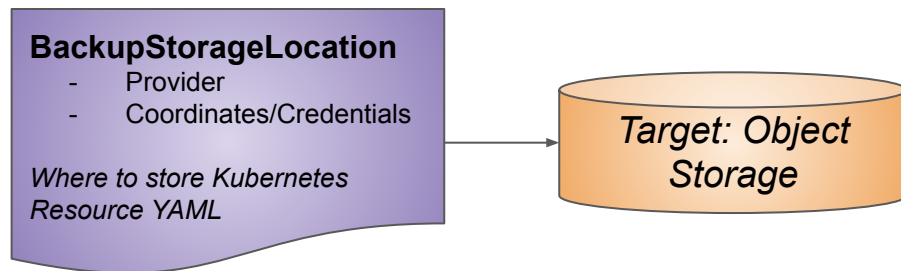
- Restore **requires** a Backup resource
- For Restoring to different clusters
 - Velero will watch the 'Backup Storage Locations' for creation of backup data and will auto create matching 'Backup' resources
 - This allows workflow of
 - Assume Cluster-A and Cluster-B are configured to use same Object Storage
 - Cluster-A: Creates a 'Backup'
 - Cluster-B: Velero sees the backup data in Object Storage and creates a matching 'Backup' resource
- Able to:
 - Change namespace mapping of where to restore
 - Select what to restore from the backup

Velero API Resources: User Perspective

Custom Resources extending Kubernetes

BackupStorageLocation (BSL)

- Configuration data for Object Storage target
- Object Storage
 - Velero stores:
 - Backup Metadata
 - Kubernetes YAML
 - Restic PV Data
 - CSI Snapshot metadata
- Plugins exist for:
 - Amazon S3:
 - NooBaa, Minio, etc
 - Azure Blob Storage
 - Google Cloud Storage

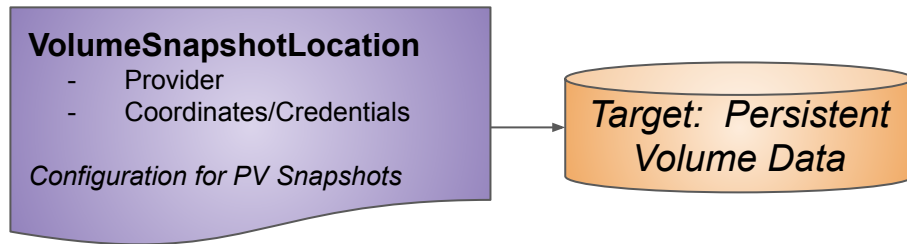


Velero API Resources: User Perspective

Custom Resources extending Kubernetes

VolumeSnapshotLocation (VSL)

- Configuration for snapshots
- Specifies plugin that will handle PV snapshots for this type of PV
- VolumeSnapshot Plugin interface allows Velero to be extended to support CSI snapshots



Schedule

Supports a CronJob like syntax for specifying when to run a Backup

Intent is platform exposes this since it's part of Velero, yet no investment is planned by Red Hat to expand capabilities in scheduling.

Advanced scheduling needs will be satisfied via Vendor solutions

Schedule

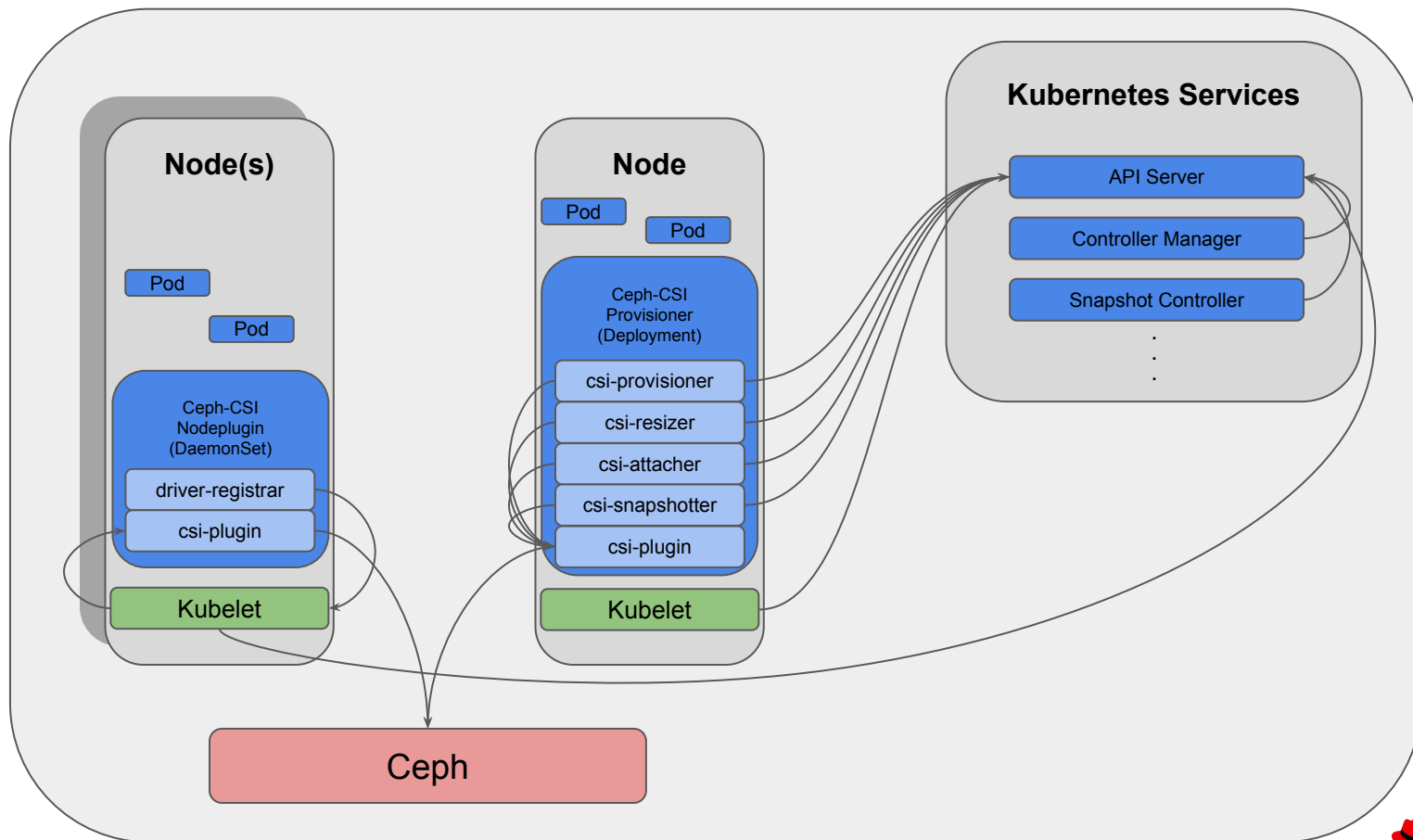
- Template (*Same data as in Backup Resource*)
- Schedule

Velero API Resources: Deeper Dive into Specifics

Reference Links

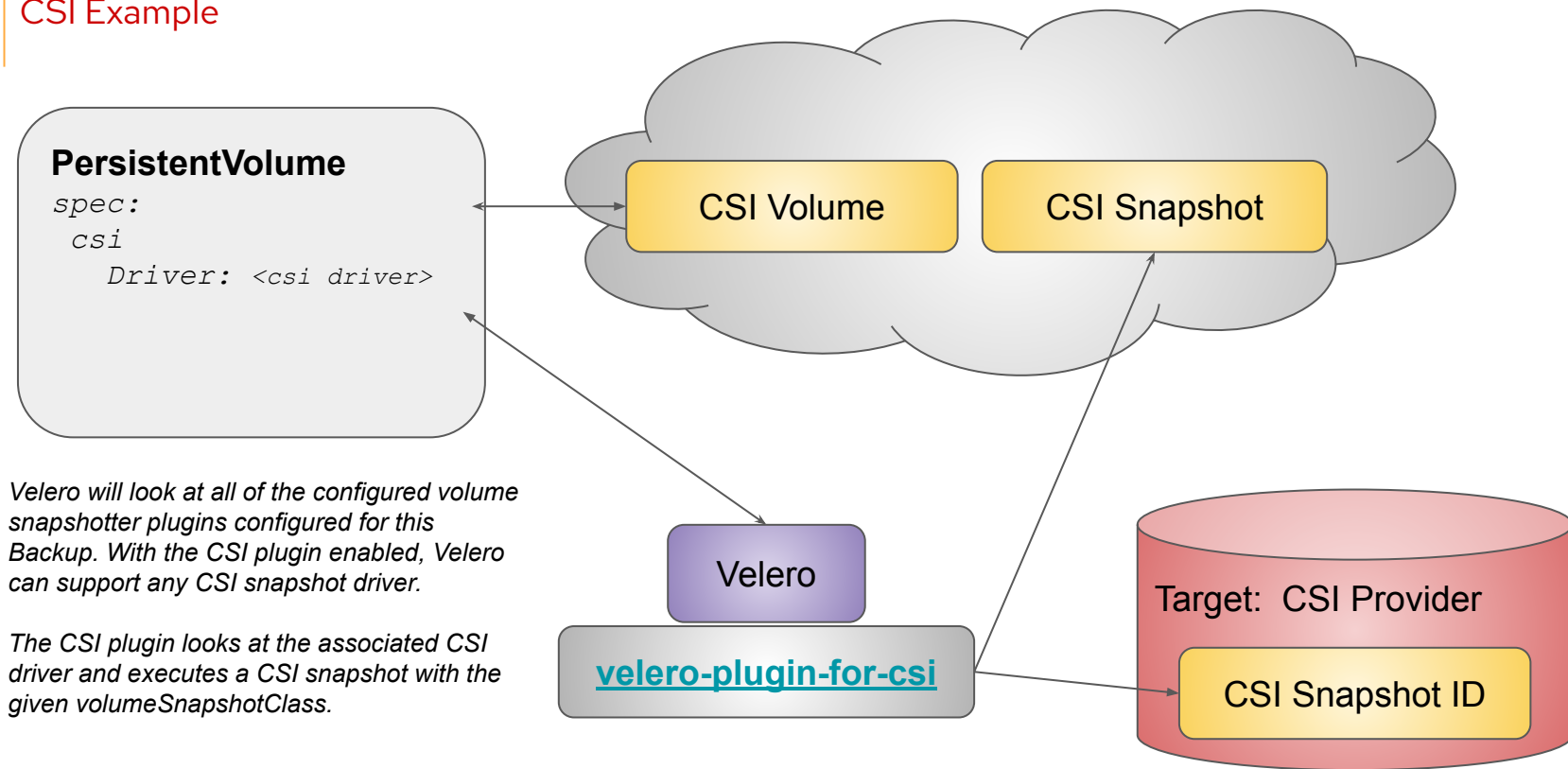
- Velero source code: github.com/vmware-tanzu/velero/
 - API Resource definitions: [pkg/apis/velero/v1](https://github.com/vmware-tanzu/velero/blob/master/pkg/apis/velero/v1)
 - Configuration Resources
 - BackupStorageLocation: [apis/velero/v1/backup_storage_location.go](https://github.com/vmware-tanzu/velero/blob/master/pkg/apis/velero/v1/backup_storage_location.go)
 - Docs: <https://velero.io/docs/master/api-types/backupstoragelocation/>
 - VolumeSnapshotLocation: [apis/velero/v1/volume_snapshot_location.go](https://github.com/vmware-tanzu/velero/blob/master/pkg/apis/velero/v1/volume_snapshot_location.go)
 - Docs: <https://velero.io/docs/master/api-types/volumesnapshotlocation/>
 - Actions
 - Backup: [apis/velero/v1/backup.go](https://github.com/vmware-tanzu/velero/blob/master/pkg/apis/velero/v1/backup.go)
 - Docs: <https://velero.io/docs/master/api-types/backup/>
 - Restore: [apis/velero/v1/restore.go](https://github.com/vmware-tanzu/velero/blob/master/pkg/apis/velero/v1/restore.go)
 - Docs: <https://velero.io/docs/master/api-types/restore/>
 - Schedule: [apis/velero/v1/schedule.go](https://github.com/vmware-tanzu/velero/blob/master/pkg/apis/velero/v1/schedule.go)
 - Docs: <https://velero.io/docs/master/api-types/schedule/>

Controllers and Ceph-CSI Interactions

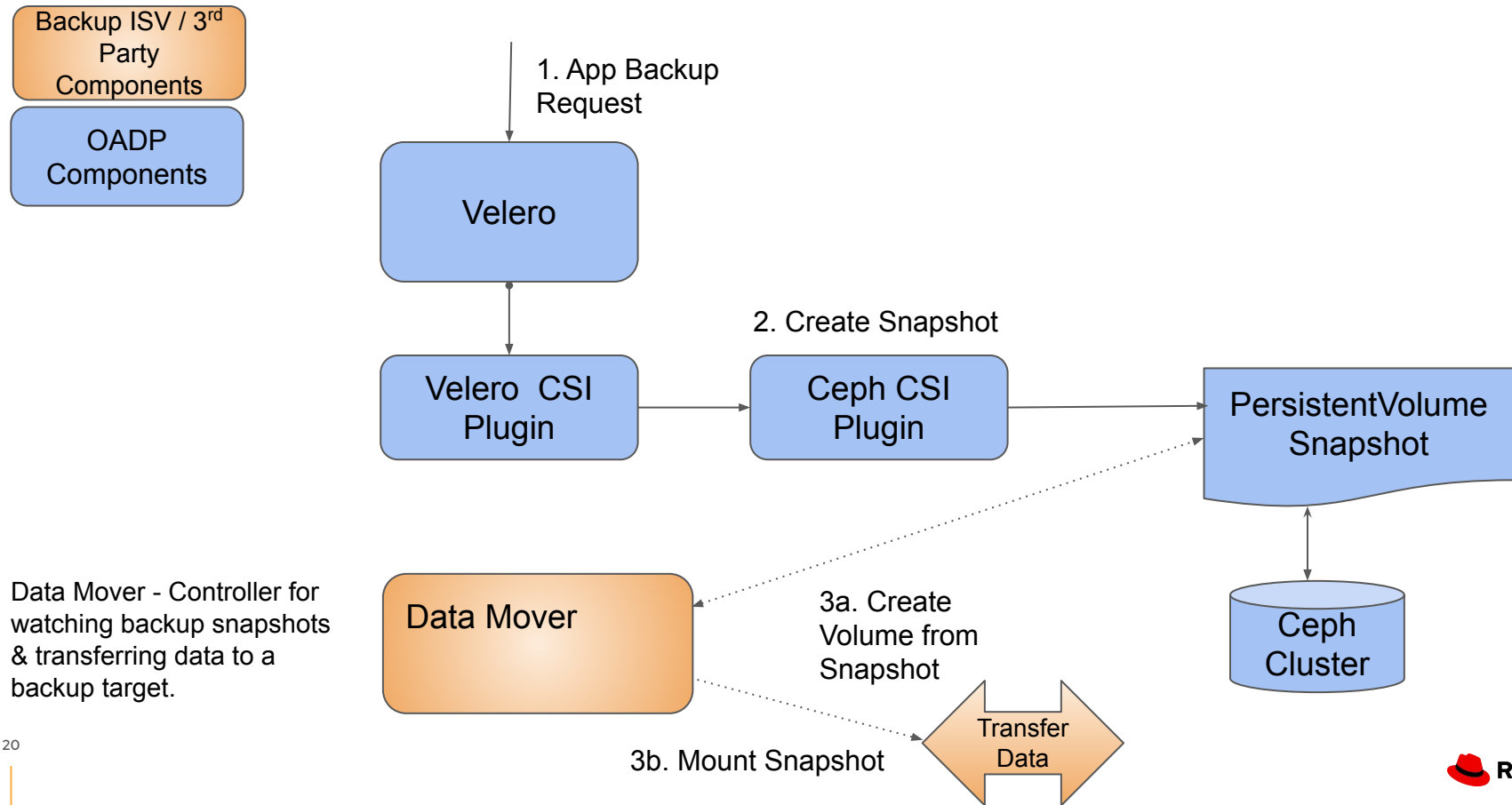


Velero: How a Snapshot Provider is determined

CSI Example



OADP - Storage Plug-in





OADP Operator

[konveyor/oadp-operator](https://github.com/konveyor/oadp-operator)



Administrator

Home

Operators

OperatorHub

Installed Operators

Workloads

Networking

Storage

Builds

Monitoring

Compute

User Management

Administration

You are logged in as a temporary administrative user. Update the [cluster OAuth configuration](#) to allow others to log in.

Project: all projects

OperatorHub

Discover Operators from the Kubernetes community and Red Hat partners, curated by Red Hat. You can purchase commercial software through [Red Hat Marketplace](#). You can install Operators on your clusters to provide optional add-ons and shared services to your developers. After installation, the Operator capabilities will appear in the [Developer Catalog](#) providing a self-service experience.

All Items

All Items

oadp

1 items

AI/Machine Learning

Application Runtime

Big Data

Cloud Provider

Database

Developer Tools

Integration & Delivery

Logging & Tracing

Monitoring

Networking

OpenShift Optional

Security

Storage

Streaming & Messaging

Install State

☐ Installed (0)

☐ Not Installed (1)

Provider Type

☐ Red Hat (0)



Community

OADP Operator
provided by Redhat

OADP is OpenShift Application
Data Protection operator. This
operator sets up and installs...



⚙️ Administrator ▾

Home ▸

Operators ▾

OperatorHub

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User Management ▸

Administration ▸

You are logged in as a temporary administrator

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oadp



OADP Operator
provided by Redhat

OADP is OpenShift Application Data Protection operator. This operator sets up and installs...

Community



OADP Operator

0.1.0 provided by Redhat

Install

Operator Version

0.1.0

Capability Level

- ☒ Basic Install
- ☒ Seamless Upgrades
- ☐ Full Lifecycle
- ☐ Deep Insights
- ☐ Auto Pilot

Provider Type

Community

Provider

Redhat

Repository

<https://github.com/konveyor/oadp-operator>

Container Image

quay.io/konveyor/oadp-operator:latest

Created At

2020-09-08T12:21:00Z

Support

Red Hat

Community Operator

This is a community provided operator. These are operators which have not been vetted or verified by Red Hat. Community Operators should be used with caution because their stability is unknown. Red Hat provides no support for Community Operators.

[Learn more about Red Hat's third party software support policy](#)

OADP is OpenShift Application Data Protection operator. This operator sets up and installs Velero on the OpenShift platform.



Administrator

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OperatorHub > Operator Subscription

Create Operator Subscription

Install your Operator by subscribing to one of the update channels to keep the Operator up to date. The strategy determines either manual or automatic updates.

Installation Mode *

- ☐ All namespaces on the cluster (default)
This mode is not supported by this Operator
- ☒ A specific namespace on the cluster
Operator will be available in a single namespace only.

Installed Namespace *

☒ Operator recommended namespace: **PR** oadp-operator



Namespace creation

Namespace **oadp-operator** does not exist and will be created.

☐ Pick an existing namespace

Update Channel *

☒ alpha

Approval Strategy *

☒ Automatic

☐ Manual

Subscribe

Cancel



OADP Operator
provided by Redhat

Provided APIs

V Velero

Velero is a tool to safely backup and restore, perform disaster recovery and migrate Kubernetes cluster resources and persistent volumes.

BSL BackupStorageLocation

BackupStorageLocation represents an object storage location (Such as Amazon S3 Bucket) where Velero stores backup objects.

B Backup

Backup is a Velero resource that represents the capture of Kubernetes cluster state at a point in time (API objects and associated volume state).

DBR DeleteBackupRequest

DeleteBackupRequest is a request to delete one or more backups.

DR DownloadRequest

DownloadRequest is a request to download an artifact from object storage such as a backup log file.

PVB PodVolumeBackup

A velero pod volume backup is a restic backup of persistent volumes attached to a running pod.



Demo

Thank you

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services make Red Hat a trusted adviser to the
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