ondia

Kubernetes Volumes

AGENDA

- Volumes
- Volume Types
- PersistentVolumes
- PersistentVolumeClaims
- The interaction between PVs and PVCs

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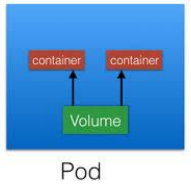
Volumes

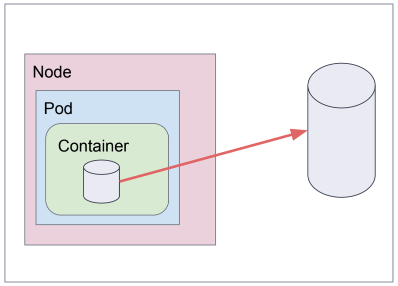


Volumes

- on-disk files in a Container are ephemeral.
- All data stored inside a container is deleted if the container crashes.
- When a Container crashes, kubelet will restart it, but the files will be lost which means that it will not have any of the old data.
- To overcome this problem, Kubernetes uses **Volumes**. A Volume is essentially a directory backed by a storage medium. The storage medium, content and access mode are determined by the Volume Type.

Volumes

A **volume** can be thought of as a directory which is accessible to the containers in a pod.



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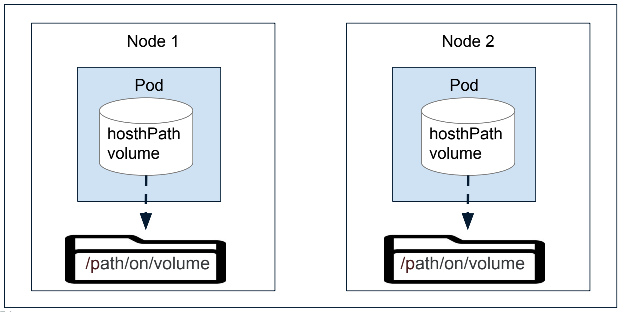
Volume Types

Volume Types

- **hostPath:** A hostPath volume mounts a file or directory from the host node's filesystem into your Pod.



Volume Types

- **emptyDir:** An emptyDir volume is first created when a Pod is assigned to a Node and exists as long as that Pod is running on that node.

  Note: A container crashing does *not* remove a Pod from a node. The data in an `emptyDir` volume is safe across container crashes.

Some uses for an emptyDir are:

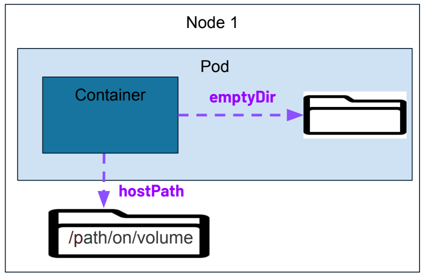
- checkpointing a long computation for recovery from crashes
- as a cache (holding files that a content-manager container fetches while a webserver container serves the data)

Volume Types

```yaml
apiVersion: v1
kind: Pod
metadata:
 name: test-pd
spec:
 containers:
 - image: k8s.gcr.io/test-webserver
   name: test-container
   volumeMounts:
   - mountPath: /cache
     name: cache-volume
 volumes:
 - name: cache-volume
   emptyDir: {}
```

Volume Types

- **hostPath vs emptyDir**



Volume Types

- **Secret:** A secret volume is used to pass sensitive information, such as passwords, to Pods.
- **configMap:** The configMap resource provides a way to inject configuration data, or shell commands and arguments into a Pod.
- **persistentVolumeClaim:** A persistentVolumeClaim volume is used to mount a persistentVolume into a Pod.

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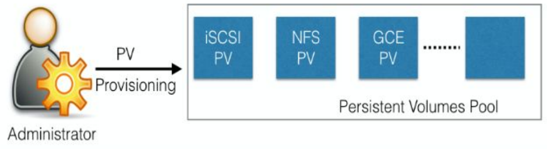
PersistentVolumes

PersistentVolumes

A **PersistentVolume (PV)** is a piece of storage in the cluster that has been provisioned by an administrator or dynamically provisioned using Storage Classes.



PersistentVolumes

Each PV gets its own set of **access modes** describing that specific PV's capabilities.There are four access modes:

- **ReadWriteOnce** (read-write by a single node)
- **ReadOnlyMany** (read-only by many nodes)
- **ReadWriteMany** (read-write by many nodes).
- **ReadWriteOncePod** (read-write only one pod in the cluster)

Once a suitable **PersistentVolume** is found, it is bound to a **PersistentVolumeClaim**.

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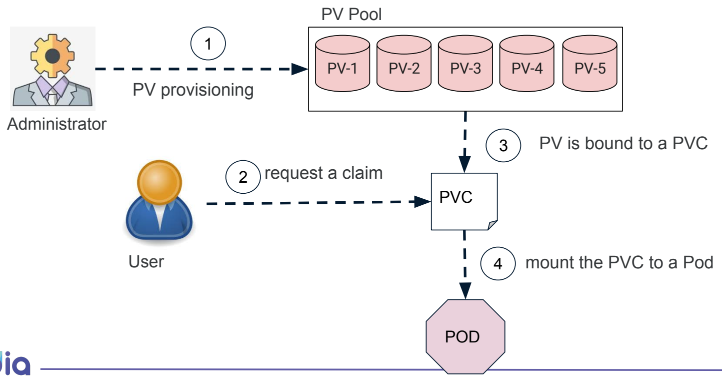
PersistentVolumeClaims

PersistentVolumeClaims

- A **PersistentVolumeClaim (PVC)** is a request for storage by a user.
- It is similar to a Pod. Pods consume node resources and **PVCs** consume **PV resources**.
- Pods can request specific levels of resources (CPU and Memory). Claims can request **specific size** and **access modes**.
- Once a suitable **PersistentVolume** is found, it is bound to a **PersistentVolumeClaim**.

PersistentVolumeClaims



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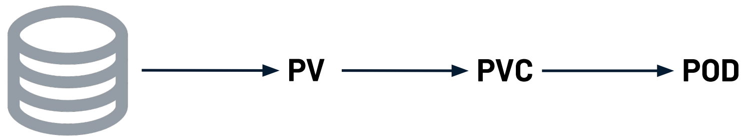
The interaction between PVs and PVCs

The interaction between PVs and PVCs



The interaction between PVs and PVCs

Provisioning

There are two ways PVs may be provisioned: statically or dynamically.

Static

A cluster administrator creates a number of PVs. They carry the details of the real storage, which is available for use by cluster users. They exist in the Kubernetes API and are available for consumption.

Dynamic

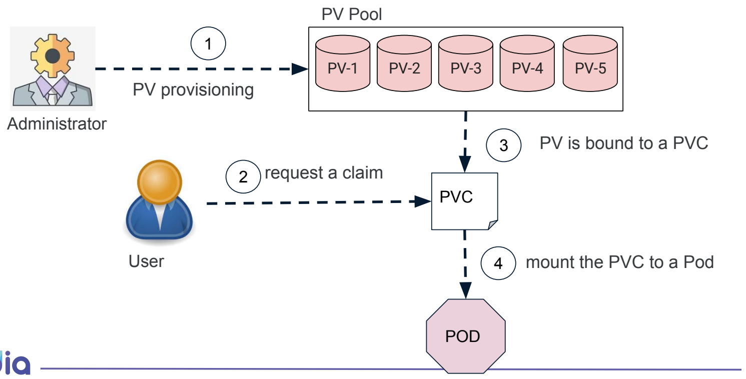
When none of the static PVs the administrator created match a user's PersistentVolumeClaim, the cluster may try to dynamically provision a volume specially for the PVC. This provisioning is based on **StorageClasses**.

The interaction between PVs and PVCs

Static

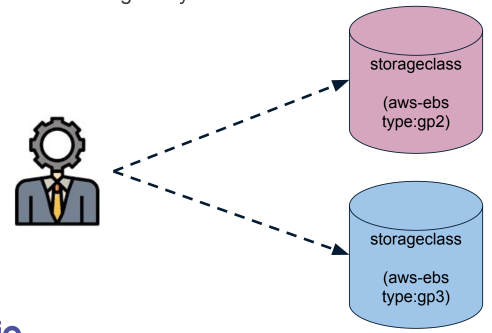
Dynamic

Static PV Provisioning

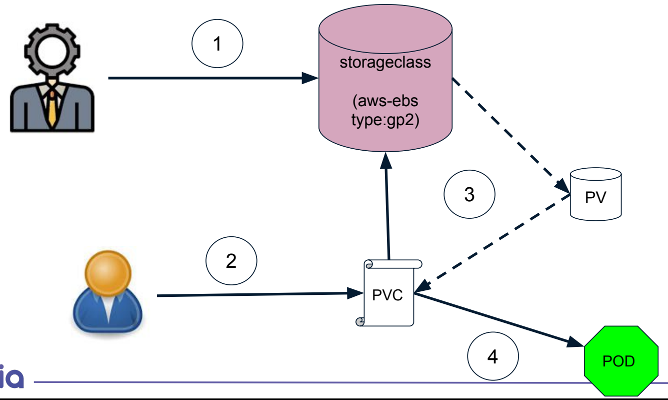


Dynamic PV Provisioning

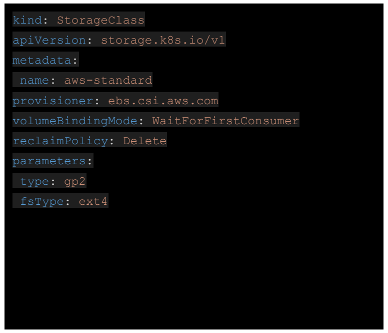
A **StorageClass** provides a way for administrators to describe the "classes" of storage they offer.



Dynamic PV Provisioning



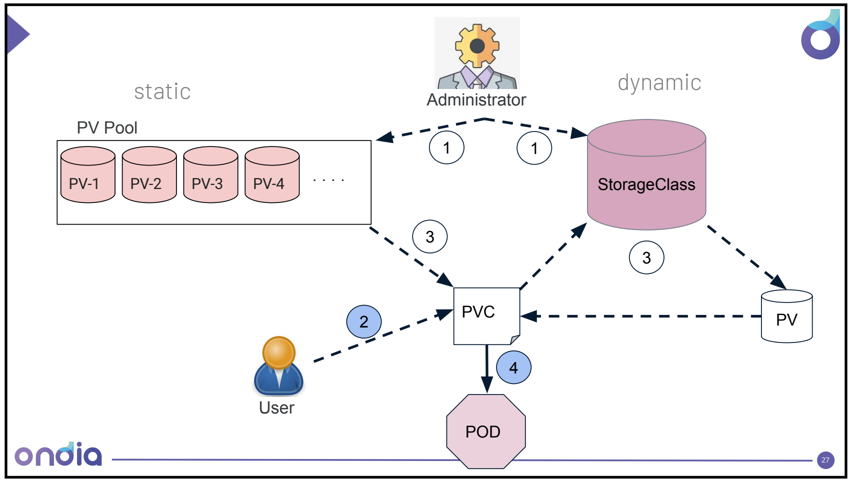
Storage Class



```
kind: StorageClass
apiVersion: storage.k8s.io/v1
metadata:
 name: aws-standard
provisioner: ebs.csi.aws.com
volumeBindingMode: WaitForFirstConsumer
reclaimPolicy: Delete
parameters:
 type: gp2
 fsType: ext4
```

Provisioner: Each StorageClass has a provisioner that determines what volume plugin is used for provisioning PVs.

Parameters: Storage Classes have parameters that describe volumes belonging to the storage class. Different parameters may be accepted depending on the provisioner



THANKS!

Any questions?