



# KPLABS Course

Certified Kubernetes Administrator

## Storage

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# Module 1: Overview of Docker Volumes

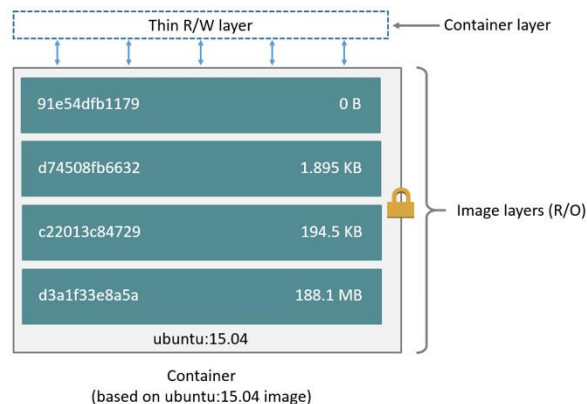
## 1.1 Challenges with files in Container Writable Layer

By default, all files created inside a container are stored on a writable container layer. This means that:

The data doesn't persist when that container no longer exists, and it can be difficult to get the data out of the container if another process needs it.

Writing into a container's writable layer requires a storage driver to manage the filesystem. The storage driver provides a union filesystem, using the Linux kernel.

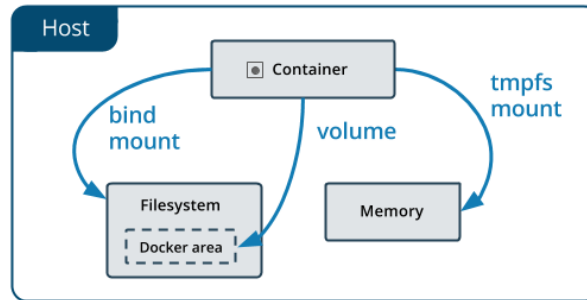
This extra abstraction reduces performance as compared to using data volumes, which write directly to the host filesystem.



## 1.2 Ideal Approach for Persistent Data

Docker has two options for containers to store files in the host machine, so that the files are persisted even after the container stops: volumes, and bind mounts.

If you're running Docker on Linux you can also use a tmpfs mount.



### 1.3 Important Pointers to Remember:

A given volume can be mounted into multiple containers simultaneously.

When no running container is using a volume, the volume is still available to Docker and is not removed automatically.

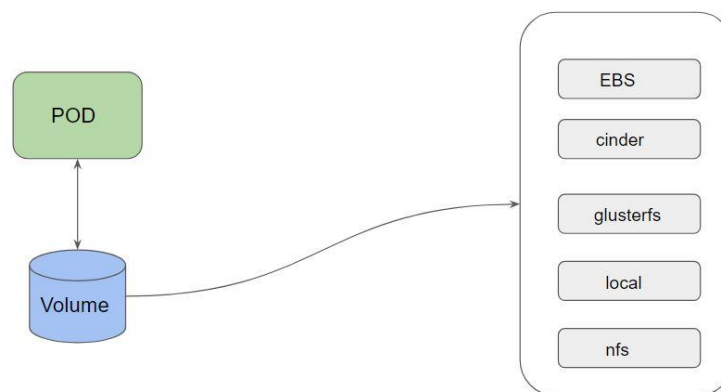
When you mount a volume, it may be named or anonymous. Anonymous volumes are not given an explicit name when they are first mounted into a container, so Docker gives them a random name that is guaranteed to be unique within a given Docker host.

## Module 2: Volume in Kubernetes

On-disk files in a Container are ephemeral.

When there are multiple containers that want to share the same data, it becomes a challenge.

One of the benefits of Kubernetes is that it supports multiple types of volumes.



# Module 3: PersistentVolume and PersistentVolumeClaim

## 9.1 PersistentVolume (PV)

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

Every Volume which is created can be of a different types.

This can be taken care of by the Storage Administrator / Ops Team



## 9.2 PersistentVolumeClaim (PVC)

A PersistentVolumeClaim is a request for the storage by a user.

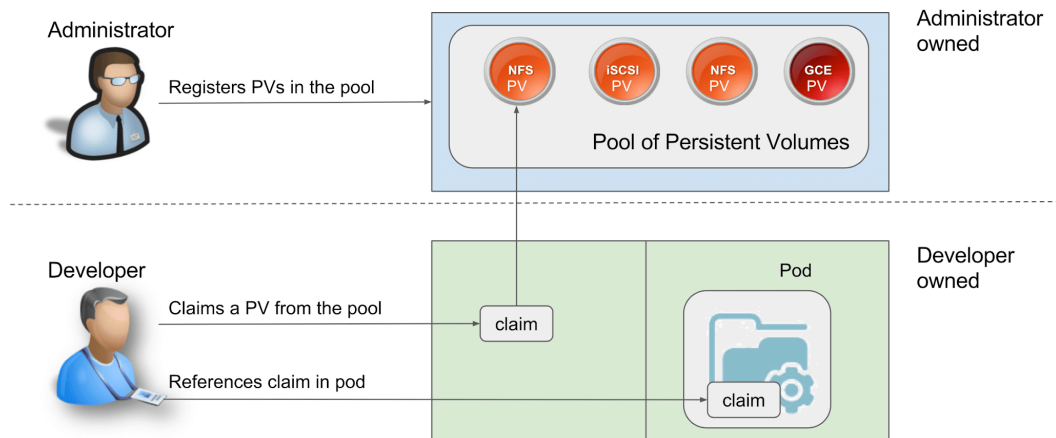
Within the claim, the user needs to specify the size of the volume along with access mode.

Developer:

I want a volume of size 10 GB which has a speed of Fast for my pod.

### 9.3 High-Level Working Steps:

- Storage Administrator takes care of creating PV.
- Developer can raise a “Claim” (I want a specific type of PV).
- Reference that claim within the PodSpec file.



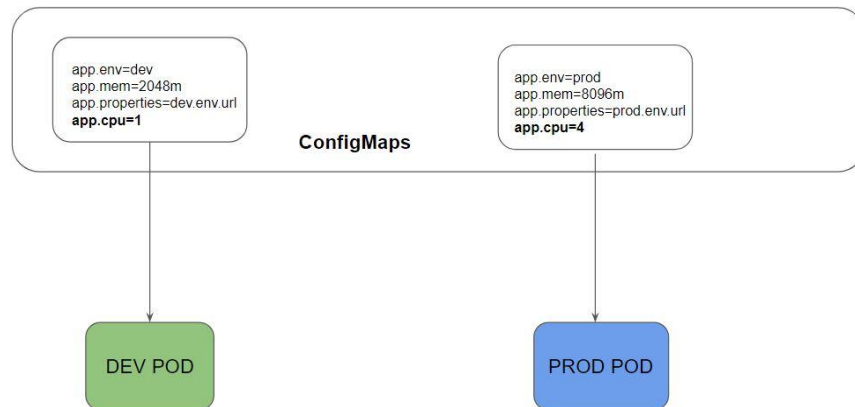
## Module 4: Static vs Dynamic Provisioning of PV

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

Types of PV Provisioning	Description
Static	A cluster administrator creates a number of PVs.
Dynamic	When none of the static PVs the administrator created matches a user's PersistentVolumeClaim, the cluster may try to dynamically provision a volume specially for the PVC.

## Module 5: ConfigMaps

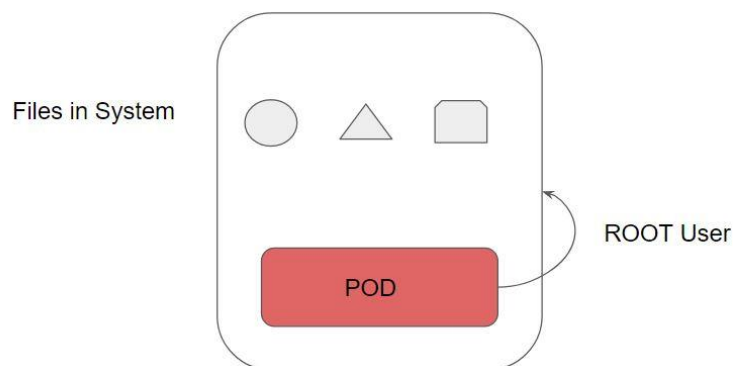
ConfigMaps allow you to decouple configuration artifacts from image content to keep containerized applications portable.



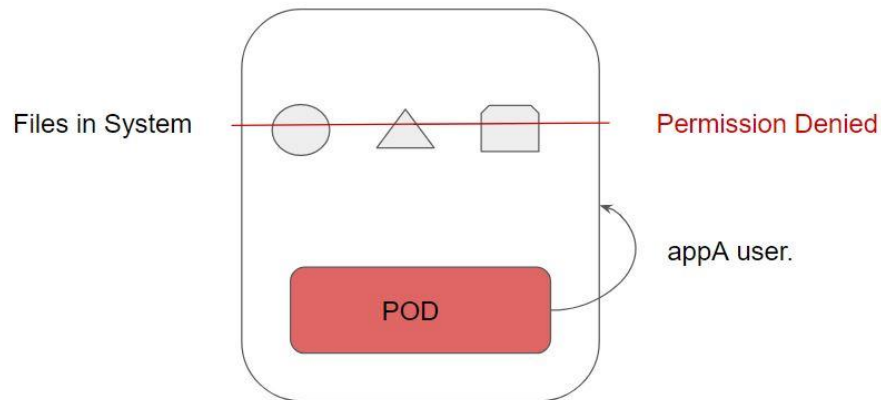
## Module 6: Security Contexts

When you run a container, it runs with the UID 0 (Administrative Privilege)

In-case of container breakouts, attacker can get root privileges to your entire system.



We can run POD and container with limited privilege user instead of the ROOT user.



Following are the three important permissions:

SecurityContext	Description
runAsUser	Specifies the user of the running process in containers.
<u>runAsGroup</u>	Specifies the primary group for all process within containers.
fsGroup	Applies the settings to the volumes.  Volumes which support ownership management are modified to be owned and writable by the GID specified in fsGroup

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