Kubernetes Volumes

Volume

On-disk files in a container are ephemeral, which presents some problems for non-trivial applications when running in containers. One problem is the loss of files when a container crashes. The kubelet restarts the container but with a clean state. A second problem occurs when sharing files between containers running together in a Pod. The Kubernetes volume abstraction solves both of these problems. Familiarity with Pods is suggested

Kubernetes supports many types of volumes. A Pod can use any number of volume types simultaneously. Ephemeral volume types have a lifetime of a pod, but persistent volumes exist beyond the lifetime of a pod. When a pod ceases to exist, Kubernetes destroys ephemeral volumes; however, Kubernetes does not destroy persistent volumes. For any kind of volume in a given pod, data is preserved across container restarts.

PV and PVC

Persistent Volume (PV) – It’s a piece of network storage that has been provisioned by the administrator. It’s a resource in the cluster which is independent of any individual pod that uses the PV.

Persistent Volume Claim (PVC) – The storage requested by Kubernetes for its pods is known as PVC. The user does not need to know the underlying provisioning. The claims must be created in the same namespace where the pod is created.

Types of Kubernetes Volumes

Kubernetes supports more than 20 types of volumes. One common example is the emptyDir volume, created when a Pod is first assigned to a Node. The volume is initially empty, with all containers in the Pod able to read from it. This emptyDir volume allows users to mount multiple paths in each container. Another example of a common volume is hostPath, which mounts a directory from the host node filesystem into a Pod.A local volume can represent mounted local storage devices such as partitions, directories or disks.Specialty volumes are used to mount platform-specific volumes into containers. Examples include AzureFileVolume and AzureDiskVolume for the Microsoft Azure public cloud, and vsphereVolume for VMware virtualized environments.

Use Cases

A Kubernetes volume is a directory that contains data accessible to containers in a given Pod in the orchestration and scheduling platform. Volumes provide a plug-in mechanism to connect ephemeral containers with persistent data stores elsewhere.

Kubernetes volumes persist until the Pod Kubernetes atomic unit of container deployment is deleted.

When a Pod with a unique identification is deleted, the volume associated with it gets destroyed. If a Pod is deleted but replaced with an identical Pod, a new and identical volume is also created. No matter what Node a logical grouping of host resources the Pod runs on, Kubernetes will mount the Pod's volumes to it, allowing containers to move across infrastructure without losing access to the externally hosted data that they require for the workload.

Limitation

The cluster-admin is operating a cluster on behalf of a user population and the admin wants to control how much storage a single namespace can consume in order to control cost.

The admin would like to limit:

1. The number of persistent volume claims in a namespace
2. The amount of storage each claim can request
3. The amount of cumulative storage the namespace can have