

Local Persistent Volumes - A Step-by-Step Tutorial

Kubernetes local volumes go beta. However, what is it, a Kubernetes local volume? Last time, we have discovered, how to use Kubernetes hostPath volumes. However, we also have seen, that hostPath volumes work well only on single node clusters. Here, Kubernetes local volumes help us to overcome the restriction and we can work in a multi-node environment with no problems.

„Local volumes“ are similar to hostPath volumes, but they allow to pin-point PODs to a specific node, and thus making sure that a restarting POD always will find the data storage in the state it had left it before the reboot. They also make sure that other restrictions are met before the used persistent volume claim is bound to a volume.



Note, the disclaimer on the announcement that local volumes are not suitable for most applications. They are much easier to handle than clustered file systems like glusterfs, though. Still, local volumes are perfect for clustered applications like Cassandra.

References

- [Kubernetes Documentation on persistent Volumes](#)
- [Katacoda persistent Volumes Hello World with an NFS Docker container](#)

Prerequisites

- We need a multi-node Kubernetes Cluster to test all of the features of „local volumes“. A two-node cluster with 2 GB or better 4 GB RAM each will do.

Step 1: Create StorageClass with WaitForFirstConsumer Binding Mode

According to the docs, persistent local volumes require to have a binding mode of WaitForFirstConsumer. the only way to assign the volumeBindingMode to a persistent volume seems to be to create a storageClass with the respective volumeBindingMode and to assign the storageClass to the persistent volume. Let us start with

```
cat > storageClass.yaml << EOF
kind: StorageClass
apiVersion: storage.k8s.io/v1
metadata:
  name: my-local-storage
provisioner: kubernetes.io/no-provisioner
```

```
volumeBindingMode: WaitForFirstConsumer
EOF
```

```
kubectl create -f storageClass.yaml
```

The output should be:

```
storageclass.storage.k8s.io/my-local-storage created
```

Step 2: Create Local Persistent Volume

Since the storage class is available now, we can create local persistent volume with a reference to the storage class we have just created:

```
cat > persistentVolume.yaml << EOF
apiVersion: v1
kind: PersistentVolume
metadata:
  name: my-local-pv
spec:
  capacity:
    storage: 500Gi
  accessModes:
    - ReadWriteOnce
  persistentVolumeReclaimPolicy: Retain
  storageClassName: my-local-storage
  local:
    path: /mnt/disk/vol1
  nodeAffinity:
    required:
      nodeSelectorTerms:
        - matchExpressions:
            - key: kubernetes.io/hostname
              operator: In
              values:
                - node1
EOF
```



Note: You might need to exchange the hostname value „**node1**“ in the nodeAffinity section by the name of the node that matches your environment.

The „hostPath“ we had defined in our last blog post is replaced by the so-called „**local path**“.

Similar to what we have done in case of a hostPath volume in our last blog post, we need to prepare

the volume on node1, before we create the persistent local volume on the master:

```
# on the node, where the POD will be located (node1 in our case):
DIRNAME="vol1"
mkdir -p /mnt/disk/$DIRNAME
chcon -Rt svirt_sandbox_file_t /mnt/disk/$DIRNAME
chmod 777 /mnt/disk/$DIRNAME

# on master:
kubectl create -f persistentVolume.yaml
```

The output should look like follows:

```
persistentvolume/my-local-pv created
```

Step 3: Create a Persistent Volume Claim

Similar to hostPath volumes, we now create a persistent volume claim that describes the volume requirements. One of the requirement is that the persistent volume has the [volumeBindingMode: WaitForFirstConsumer](#). We can assure this by referencing the previously created a storageClass:

```
cat > persistentVolumeClaim.yaml << EOF
kind: PersistentVolumeClaim
apiVersion: v1
metadata:
  name: my-claim
spec:
  accessModes:
    - ReadWriteOnce
  storageClassName: my-local-storage
  resources:
    requests:
      storage: 500Gi
EOF

kubectl create -f persistentVolumeClaim.yaml
```

With the answer:

```
persistentvolumeclaim/my-claim created
```

From point of view of the persistent volume claim, this is the only difference between a local volume and a host volume. However, different to our observations about host volumes in the last blog post, the persistent volume claim is not bound to the persistent volume automatically. Instead, it will remain „Available“ until the first consumer shows up:

```
# kubectl get pv
```

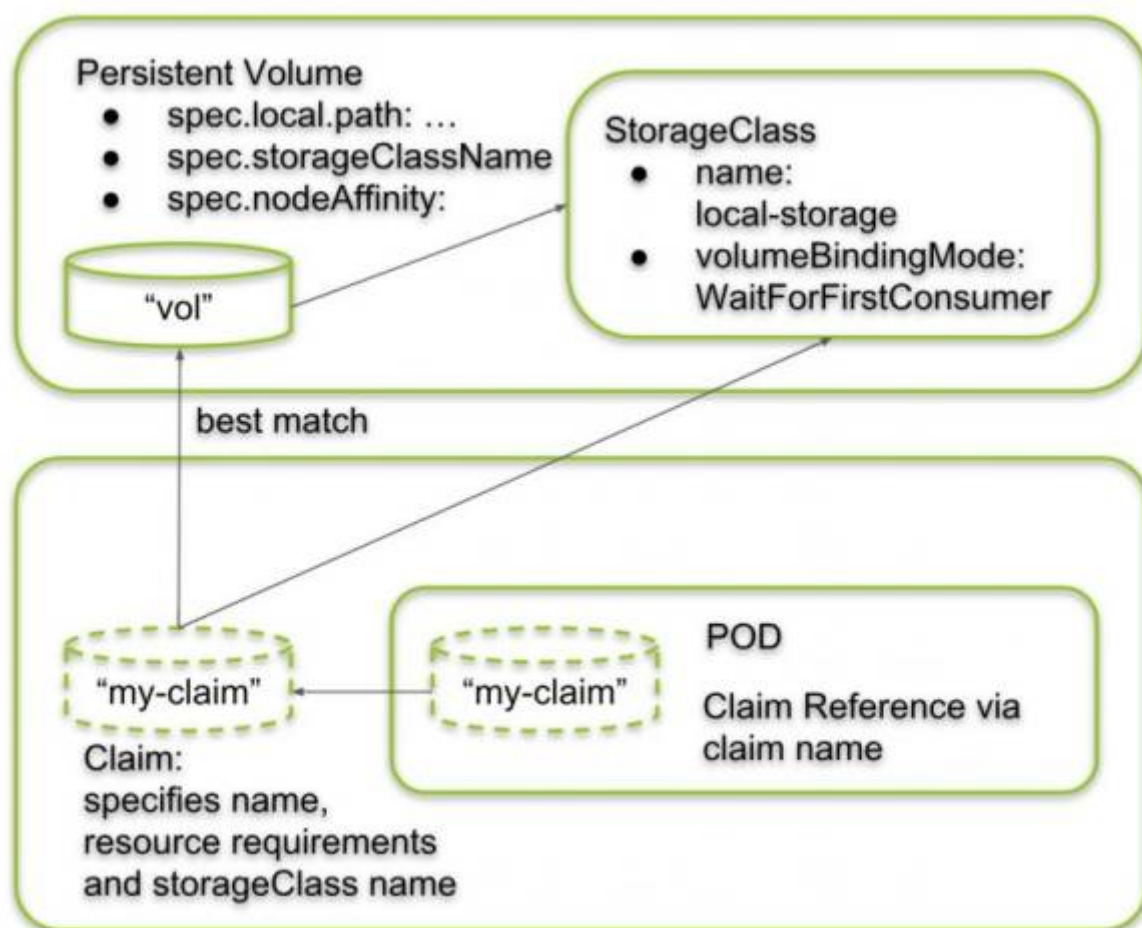
NAME	CAPACITY	ACCESS MODES	RECLAIM POLICY	STATUS	CLAIM
STORAGECLASS	REASON	AGE			

my-local-pv	500Gi	RWO	Retain	Available
my-local-storage		3m59s		

This should change in the next step.

Step 4: Create a POD with local persistent Volume

The Kubernetes Architects have done a good job in abstracting away the volume technology from the POD. As with other volume technologies, the POD just needs to reference the volume claim. The volume claim, in turn, specifies its resource requirements. One of those is the volumeBindingMode to be WaitForFirstConsumer. This is achieved by referencing a storageClass with this property:



Once a POD is created that references the volume claim by name, a „best match“ choice is performed under the restriction that the storage class name matches as well.

Okay, let us perform the last required step to complete the described picture. The only missing piece is the POD, which we will create now:

```
cat > http-pod.yaml << EOF
apiVersion: v1
kind: Pod
```

```
metadata:
  name: www
  labels:
    name: www
spec:
  containers:
    - name: www
      image: nginx:alpine
      ports:
        - containerPort: 80
          name: www
      volumeMounts:
        - name: www-persistent-storage
          mountPath: /usr/share/nginx/html
  volumes:
    - name: www-persistent-storage
      persistentVolumeClaim:
        claimName: my-claim
EOF
```

```
kubectl create -f http-pod.yaml
```

This should yield:

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