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How to Setup Dynamic NFS Provisioning in a Kubernetes Cluster

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Dynamic NFS storage provisioning in Kubernetes streamlines the creation and management of NFS volumes for your Kubernetes applications. It eliminates the need for manual intervention or pre-provisioned storage. The NFS provisioner dynamically creates persistent volumes (PVs) and associates them with persistent volume claims (PVCs), making the process more efficient. If you have an external NFS share and want to use it in a pod or deployment, the nfs-subdir-external-provisioner provides a solution for effortlessly setting up a storage class to automate the management of your persistent volumes.

Prerequisites

- Pre-installed Kubernetes Cluster

- A Regular user which has admin rights on the Kubernetes cluster

- Internet Connectivity

Step 1: Installing the NFS Server

```
sudo apt-get update
sudo apt-get install nfs-common nfs-kernel-server -y
```

Create a directory to export:

```
sudo mkdir -p /data/nfs
sudo chown nobody:nogroup /data/nfs
sudo chmod 2770 /data/nfs
```

Export directory and restart NFS service:

```
echo -e "/data/nfs\t10.124.0.0/24(rw,sync,no_subtree_check,no_root_squash)" | s
```

```
sudo exportfs -av
```

```
root@master:~# sudo exportfs -av
exporting 10.124.0.0/24:/data/nfs
root@master:~#
```

```
# Restart and show logs
sudo systemctl restart nfs-kernel-server
sudo systemctl status nfs-kernel-server
```

```
root@master:~# sudo systemctl restart nfs-kernel-server
sudo systemctl status nfs-kernel-server
● nfs-server.service - NFS server and services
     Loaded: loaded (/lib/systemd/system/nfs-server.service; enabled; preset: enabled)
     Active: active (exited) since Fri 2023-11-03 16:53:28 UTC; 43ms ago
    Process: 398572 ExecStartPre=/usr/sbin/exportfs -r (code=exited, status=0/SUCCESS)
    Process: 398573 ExecStart=/usr/sbin/rpc.nfsd (code=exited, status=0/SUCCESS)
   Main PID: 398573 (code=exited, status=0/SUCCESS)
        CPU: 7ms
```

Show Export Details:

```
/sbin/showmount -e 10.124.0.9
```

```
root@master:~# /sbin/showmount -e 10.124.0.9
Export list for 10.124.0.9:
/data/nfs 10.124.0.0/24
root@master:~#
```

Step 2: Install NFS client packages on K8s Nodes

Make sure all your Kubernetes nodes have the NFS client packages installed. On Ubuntu-based nodes, install `nfs-common`:

```
sudo apt update
sudo apt install nfs-common -y
```

Step 3: Install and Configure NFS Client Provisioner

Deploy the NFS Subdir External Provisioner in your Kubernetes cluster to automate the creation and management of NFS-backed Persistent Volumes (PVs) and Persistent Volume Claims (PVCs).

Install Helm3 on Debian/Ubuntu using the following commands:

```
curl https://baltocdn.com/helm/signing.asc | sudo apt-key add -
sudo apt-get install apt-transport-https --yes
echo "deb https://baltocdn.com/helm/stable/debian/ all main" | sudo tee /etc/ap
sudo apt-get update
sudo apt-get install helm
```

Add Helm Repository for `nfs-subdir-external-provisioner`:

```
helm repo add nfs-subdir-external-provisioner https://kubernetes-sigs.github.ic
```

Install Helm Chart for NFS

```
helm install nfs-subdir-external-provisioner \
nfs-subdir-external-provisioner/nfs-subdir-external-provisioner \
--set nfs.server=10.124.0.9 \
--set nfs.path=/data/nfs \
--set storageClass.onDelete=true
```

```
root@master:~# helm install nfs-subdir-external-provisioner \
nfs-subdir-external-provisioner/nfs-subdir-external-provisioner \
--set nfs.server=10.124.0.9 \
--set nfs.path=/data/nfs \
--set storageClass.onDelete=true
NAME: nfs-subdir-external-provisioner
LAST DEPLOYED: Fri Nov  3 16:59:55 2023
NAMESPACE: default
STATUS: deployed
REVISION: 1
TEST SUITE: None
```

```
# Check pods and storage classes:
kubectl get pod
kubectl get sc
```

```
root@master:~# kubectl get po
NAME                                                    READY   STATUS    RESTARTS   AGE
nfs-subdir-external-provisioner-658d6d459f-2k4tr        1/1     Running   0          2m31s
root@master:~#
```

```
root@master:~# kubectl get sc
NAME         PROVISIONER                                     RECLAIMPOLICY   VOLUMEBINDINGMODE   ALLOWVOLUMEEXPANSION   AGE
nfs-client   cluster.local/nfs-subdir-external-provisioner   Delete          Immediate           true                  15m
```

NFS dynamic storage class was installed and **"nfs-client"** storage was created.

Step 4: Dynamic PVC Volume Create Testing:

Now we can test creating dynamic PVC volume.

nfs-pvc.yaml

```yaml
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: nfs-pvc
spec:
  accessModes:
    - ReadWriteOnce
  storageClassName: nfs-client
  resources:
    requests:
      storage: 5Gi
```

Create an NGINX pod that mounts the NFS export in its web directory:

deployment.yaml

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  labels:
    app: nginx
  name: nfs-nginx
spec:
  replicas: 1
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
    spec:
      volumes:
        - name: nfs-nginx
          persistentVolumeClaim:
            claimName: nfs-pvc
      containers:
        - image: nginx
          name: nginx
          volumeMounts:
            - name: nfs-nginx
              mountPath: /usr/share/nginx/html
```

```
kubectl apply -f nfs-pvc.yaml
kubectl apply -f deployment.yaml
```

Apply this file to create an NGINX pod with the NFS volume mounted at

`/usr/share/nginx/html`

Now, let's enter the pod and create an 'index.html' file under '/usr/share/nginx/html.'

```
kubectl get po
kubectl exec -it nfs-nginx-66bcd8b957-7vl2g sh
#now we are into pod
# cd /usr/share/nginx/html
# ls -l
# echo "hello world" >index.html
# ls -l
# exit
```

```
cd /data
cd nfs
ls -l
cd default-nfs-pvc-pvc-8a531138-1a09-4e7e-a963-fbec5ecd0a41/
```


During our testing, we observed that we could access the file (index.html) we created from the '/data/nfs' folder on the server, confirming that the NFS server share is also accessible within the pod.

Nfs Server   Kubernetes Cluster   Persistent Volume   Persistent Volume Claim

Storageclass

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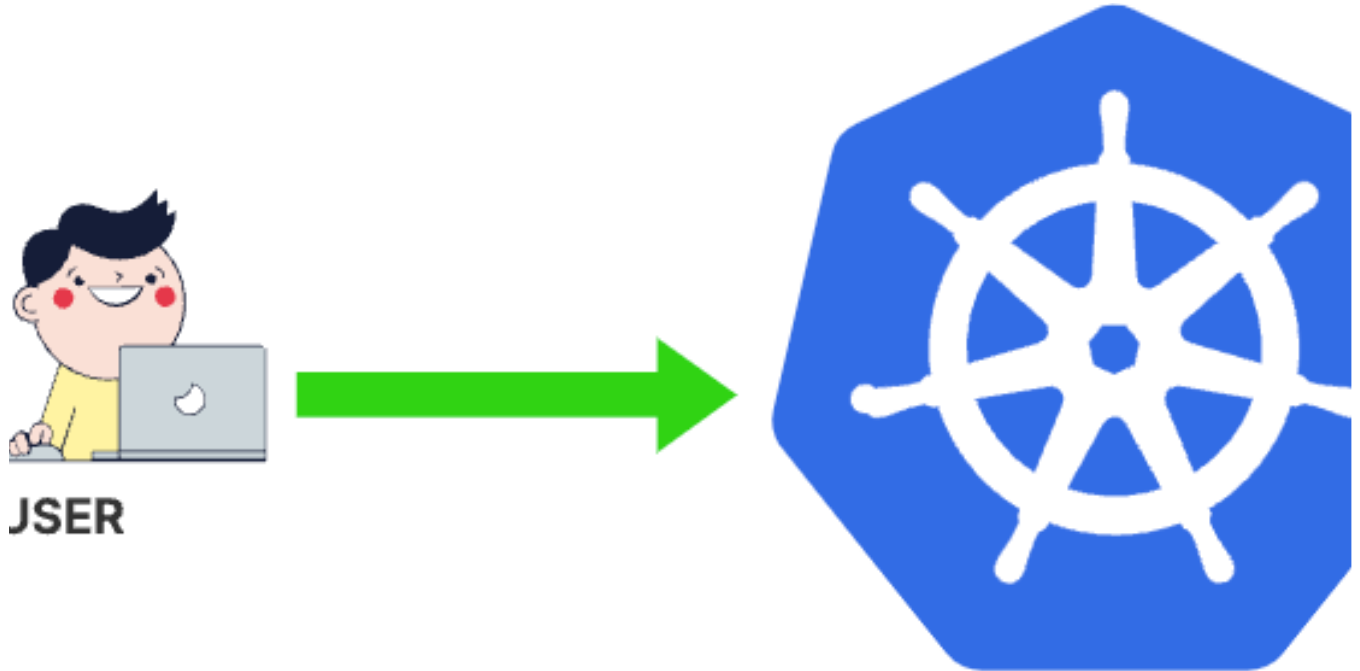

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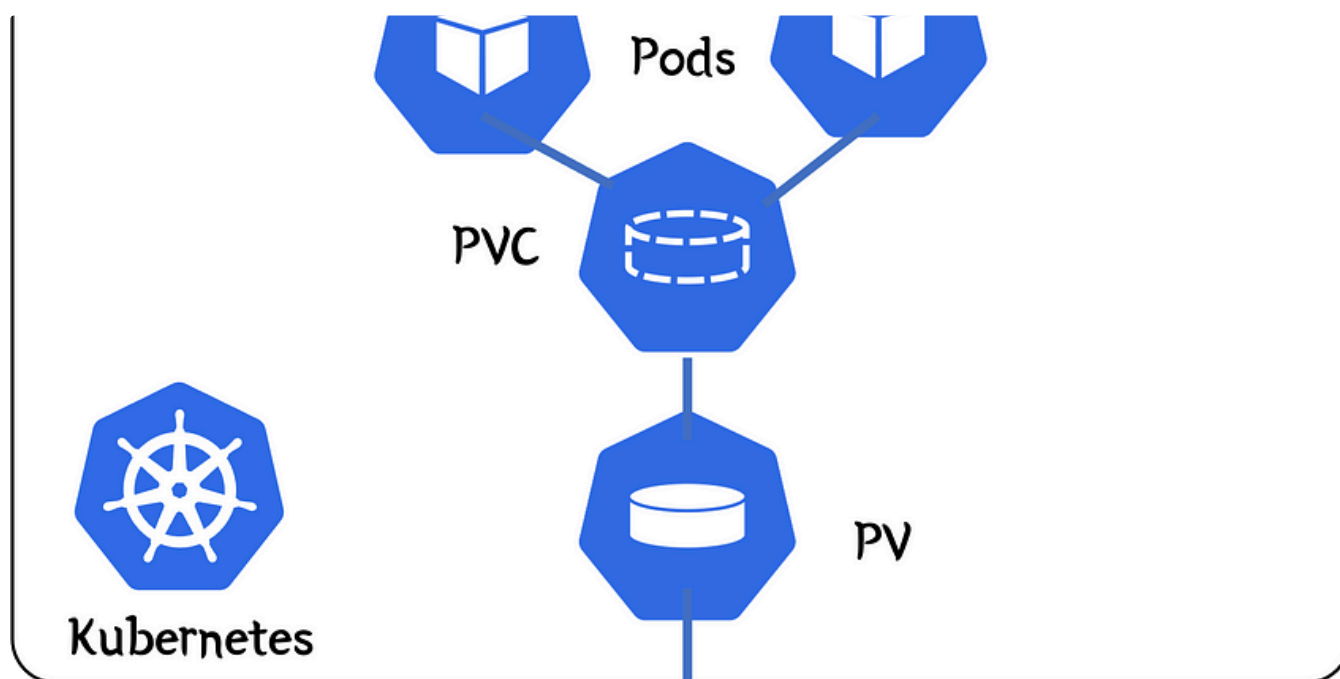
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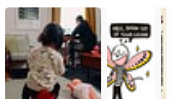
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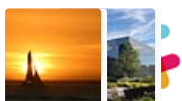
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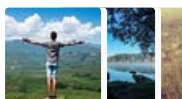### Staff Picks
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