

What is a



kubernetes

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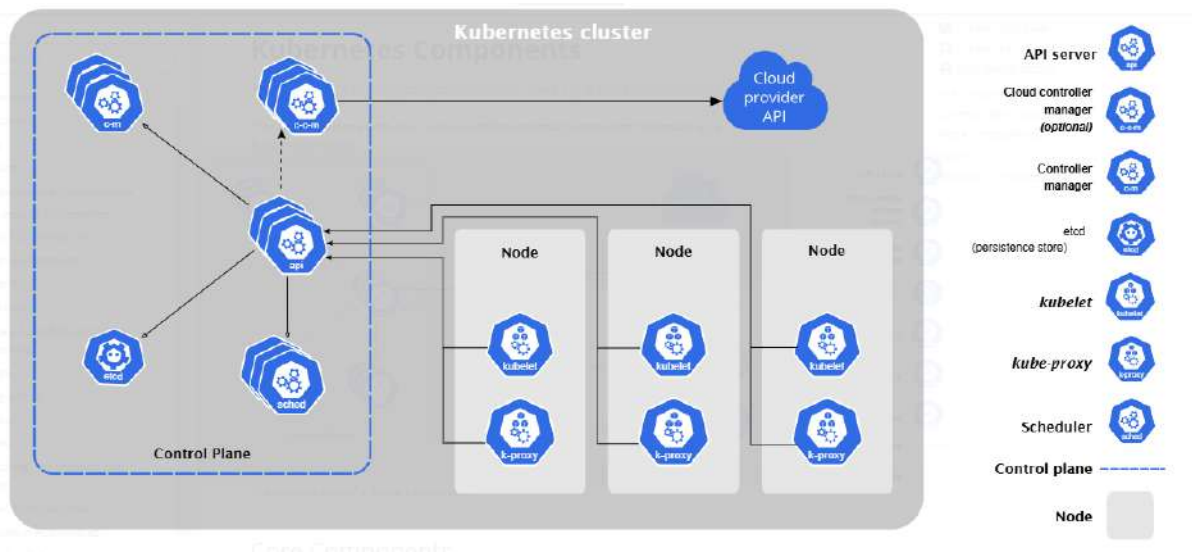
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Why Kubernetes –

- Auto start of container
- Health check
- Autoscaling
- Load balancing
- Network
- Auto-healing
- Auto-node allocating
- Updates/new release/deployment
- Secrete / config (master node)

Kubernetes architecture –



Kubernetes Objects –

- Pod
- Service
- Volume
- Network
- Configmap
- Secret
- Ingress

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-deployment
spec:
  selector:
    matchLabels:
      app: nginx
  replicas: 2 # tells deployment to run 2 pods matching the template
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
        - name: nginx
          image: nginx:1.14.2
          ports:
            - containerPort: 80
```

1. Pod

- **Definition:** The smallest and simplest Kubernetes object, representing a single instance of a running process in your cluster.
- **Purpose:** Groups one or more containers (e.g., Docker containers) that share the same network namespace and storage volumes.
- **Key Features:**
 - Containers in a pod share the same IP address and port space.
 - Pods are ephemeral; when a pod is deleted, a new pod may be created with a different IP.
- **Example –**

```
apiVersion: v1
kind: Pod
metadata:
  name: my-pod
spec:
  containers:
  - name: my-container
    image: nginx
```

2. Service

- **Definition:** A stable, permanent endpoint to access one or more pods.
- **Purpose:** Provides load balancing and service discovery for pods.
- **Key Features:**

- Types: ClusterIP (default), NodePort, LoadBalancer, ExternalName.
- Abstracts away the dynamic nature of pod IPs.

- **Example:**

```
apiVersion: v1
kind: Service
metadata:
  name: my-service
spec:
  selector:
    app: my-app
  ports:
    - protocol: TCP
      port: 80
      targetPort: 8080
  type: ClusterIP
```

3. Volume

- **Definition:** A way to provide persistent storage to containers running inside a pod.
- **Purpose:** Persist data beyond the lifetime of a pod and share data between containers in a pod.
- **Key Features:**
 - Types include emptyDir, hostPath, NFS, ConfigMap, Secret, PersistentVolume, PersistentVolumeClaim.
 - Decouples storage from pod lifecycle.

- **Example**

```
apiVersion: v1
kind: Pod
```

```
metadata:
  name: my-pod
spec:
  containers:
  - name: my-container
    image: nginx
    volumeMounts:
    - mountPath: "/data"
      name: my-volume
  volumes:
  - name: my-volume
    emptyDir: {}
```

4. Network

- **Definition:** Refers to Kubernetes networking objects and policies that manage communication within and outside the cluster.
- **Purpose:** Allow communication between pods, services, and external resources.
- **Key Features:**
 - Kubernetes assigns each pod a unique IP address.
 - Supports network policies for controlling traffic flow.
 - Uses CNI (Container Network Interface) plugins like Calico, Flannel, or WeaveNet.

- **Example (Network Policy):**

```
apiVersion: networking.k8s.io/v1
kind: NetworkPolicy
metadata:
  name: allow-traffic
spec:
```

```
podSelector:
  matchLabels:
    app: my-app
ingress:
  - from:
      - podSelector:
          matchLabels:
            app: allowed-app
```

5. ConfigMap

- **Definition:** Stores configuration data as key-value pairs.
- **Purpose:** Allows separation of configuration from application code.
- **Key Features:**
 - Inject configuration data into containers as environment variables, command-line arguments, or mounted files.
 - Non-sensitive data storage

- **Example**

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: my-config
data:
  key1: value1
  key2: value2
```

7. Ingress

- **Definition:** Manages external HTTP/S access to services within the cluster.

- **Purpose:** Acts as a reverse proxy and load balancer, enabling custom URLs and SSL/TLS termination.
- **Key Features:**
 - Provides routing rules based on hostnames and paths.
 - Requires an ingress controller (e.g., NGINX, Traefik) to function.
- **Example :**

apiVersion: networking.k8s.io/v1

kind: Ingress

metadata:

name: my-ingress

spec:

rules:

- host: example.com

http:

paths:

- path: /

pathType: Prefix

backend:

service:

name: my-service

port:

number: 80

These objects together provide the building blocks for deploying, scaling, and managing applications in Kubernetes.

Kubernetes Installation –

Launching two ubuntu server named masternode (t2. small) and workernode(t2. micro)

On masternode and workernode - ->

```
sudo apt-get update
```

```
sudo apt-get install docker.io
```

```
sudo apt-get install -y apt-transport-https ca-certificates curl gnupg
```

```
sudo mkdir -p /etc/apt/keyrings
```

```
curl -fsSL https://pkgs.k8s.io/core:/stable:/v1.30/deb/Release.key | sudo gpg --  
dearmor -o /etc/apt/keyrings/kubernetes-apt-keyring.gpg
```

```
sudo chmod 644 /etc/apt/keyrings/kubernetes-apt-keyring.gpg
```

```
echo 'deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg]  
https://pkgs.k8s.io/core:/stable:/v1.30/deb/ /' | sudo tee  
/etc/apt/sources.list.d/kubernetes.list
```

```
sudo chmod 644 /etc/apt/sources.list.d/kubernetes.list
```

```
sudo apt-get install -y kubectl kubeadm kubelet
```

On masternode - - >

```
sudo kubeadm init --ignore-preflight-errors=all
```

```
mkdir -p $HOME/.kube
```

```
sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config
```

```
sudo chown $(id -u):$(id -g) $HOME/.kube/config
```

```
kubectl apply -f
```

```
https://raw.githubusercontent.com/projectcalico/calico/v3.26.0/manifests/calico.yaml
```

```
kubeadm token create --print-join-command
```

[add port 6443 in both master and worker node]

On Worker - >

Use kubeadm join command with token (copy the command from master and paste on worker)

sudo (command)

On Master - ->

kubectl get nodes

```
ubuntu@ip-172-31-21-116:~$ kubectl get nodes
NAME                STATUS    ROLES    AGE   VERSION
ip-172-31-21-116    Ready    control-plane   11m   v1.30.7
ip-172-31-94-46     Ready    <none>        92s   v1.30.7
ubuntu@ip-172-31-21-116:~$ |
```

Pod creation –

kubectl get nodes

```
ubuntu@ip-172-31-21-116:~$ kubectl get nodes
NAME                STATUS    ROLES    AGE   VERSION
ip-172-31-21-116    Ready     control-plane   30h   v1.30.7
ip-172-31-94-46     Ready     <none>         30h   v1.30.7
```

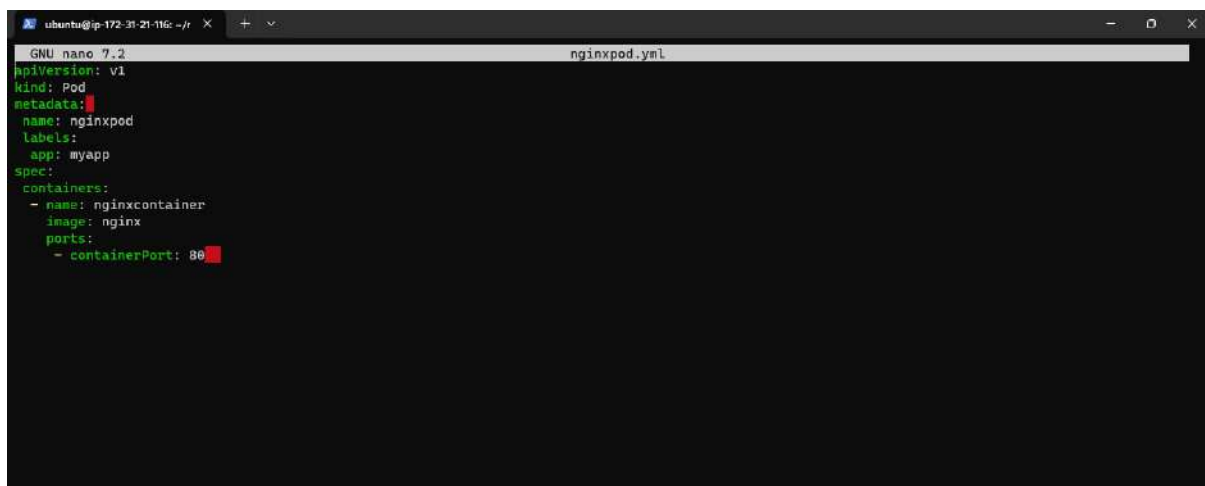
kubectl get pods -n kube-system

```
ubuntu@ip-172-31-21-116:~$ kubectl get pods -n kube-system
NAME                                                    READY   STATUS    RESTARTS   AGE
calico-kube-controllers-6cdb97b867-zk6tr              1/1     Running   2 (3m8s ago)   30h
calico-node-8k8bg                                      0/1     Running   9 (2m5s ago)   30h
calico-node-j5mqz                                      0/1     Running   4 (30h ago)    30h
coredns-55cb58b774-84665                             1/1     Running   1 (3m8s ago)   30h
coredns-55cb58b774-zgx4j                             1/1     Running   1 (3m6s ago)   30h
etcd-ip-172-31-21-116                                 1/1     Running   1 (3m8s ago)   30h
kube-apiserver-ip-172-31-21-116                      1/1     Running   1 (3m8s ago)   30h
kube-controller-manager-ip-172-31-21-116             1/1     Running   1 (3m8s ago)   30h
kube-proxy-96fds                                       1/1     Running   9 (69s ago)    30h
kube-proxy-d572p                                       1/1     Running   7 (63s ago)    30h
kube-scheduler-ip-172-31-21-116                      1/1     Running   1 (3m8s ago)   30h
```

mkdir nginxpod

cd nginxpod

nano nginxpod.yml



```
GNU nano 7.2 nginxpod.yml
apiVersion: v1
kind: Pod
metadata:
  name: nginxpod
  labels:
  app: myapp
spec:
  containers:
  - name: nginxcontainer
    image: nginx
    ports:
    - containerPort: 80
```

kubectl get pods

```
ubuntu@ip-172-31-21-116:~/nginxpod$ kubectl get pods
NAME        READY   STATUS    RESTARTS   AGE
nginxpod    1/1     Running   0           6m17s
```

kubectl describe pod podname

kubectl logs pod_name

kubectl exec -it nginxpod -- /bin/bash

```

ubuntu@ip-172-31-21-116:~/nginxpod$ kubectl exec -it nginxpod -- /bin/bash
root@nginxpod:/# ls
bin boot dev docker-entrypoint.d docker-entrypoint.sh etc home lib lib64 media mnt opt proc root run sbin srv sys tmp usr var
root@nginxpod:/# cd /usr/share/nginx/html
root@nginxpod:/usr/share/nginx/html# ls
50x.html index.html
root@nginxpod:/usr/share/nginx/html# nano index.html
bash: nano: command not found
root@nginxpod:/usr/share/nginx/html# nano index.html
bash: nano: command not found
root@nginxpod:/usr/share/nginx/html# sudo nano index.html
bash: sudo: command not found
root@nginxpod:/usr/share/nginx/html# cat index.html
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
html { color-scheme: light dark; }
body { width: 35em; margin: 0 auto;
font-family: Tahoma, Verdana, Arial, sans-serif; }
</style>
</head>

```

```

ubuntu@ip-172-31-21-116:~/nginxpod$ kubectl describe pod nginxpod
Name:          nginxpod
Namespace:     default
Priority:       0
Service Account: default
Node:          ip-172-31-94-46/172.31.94.46
Start Time:    Wed, 11 Dec 2024 10:34:24 +0000
Labels:        app=myapp
Annotations:    cnf.projectcalico.org/containerID: 7dd18d0e3adf9c0446912651ade6401146e9f0bff9f329ec058974bf4779ae3e
                cnf.projectcalico.org/podIP: 192.168.205.131/32
                cnf.projectcalico.org/podIPs: 192.168.205.131/32
Status:        Running
IP:            192.168.205.131
IPs:
  IP: 192.168.205.131
Containers:
  nginxcontainer:
    Container ID:   containerd://af1bab342d114b9eb2b4a65d75d0dc4f9dee591d1b1c6610cc1bba78e8996884
    Image:          nginx
    Image ID:       docker.io/library/nginx@sha256:fb197595ebe76b9c0c14ab68159fd3c08bd067ec62300583543f0ebda353b5be
    Port:           80/TCP
    Host Port:      0/TCP
    State:          Running
      Started:      Wed, 11 Dec 2024 10:34:29 +0000
    Ready:          True
    Restart Count:  0
    Environment:    <none>
    Mounts:
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-jb7db (ro)

```

```

ubuntu@ip-172-31-21-116:~/nginxpod$ kubectl logs nginxpod
/docker-entrypoint.sh: /docker-entrypoint.d/ is not empty, will attempt to perform configuration
/docker-entrypoint.sh: Looking for shell scripts in /docker-entrypoint.d/
/docker-entrypoint.sh: Launching /docker-entrypoint.d/10-listen-on-ipv6-by-default.sh
10-listen-on-ipv6-by-default.sh: info: Getting the checksum of /etc/nginx/conf.d/default.conf
10-listen-on-ipv6-by-default.sh: info: Enabled listen on IPv6 in /etc/nginx/conf.d/default.conf
/docker-entrypoint.sh: Sourcing /docker-entrypoint.d/15-local-resolvers.envsh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-templates.sh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/30-tune-worker-processes.sh
/docker-entrypoint.sh: Configuration complete; ready for start up
2024/12/11 10:34:29 [notice] 1#1: using the "epoll" event method
2024/12/11 10:34:29 [notice] 1#1: nginx/1.27.3
2024/12/11 10:34:29 [notice] 1#1: built by gcc 12.2.0 (Debian 12.2.0-14)
2024/12/11 10:34:29 [notice] 1#1: OS: Linux 6.8.0-1018-aws
2024/12/11 10:34:29 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
2024/12/11 10:34:29 [notice] 1#1: start worker processes
2024/12/11 10:34:29 [notice] 1#1: start worker process 29

```

Kubernetes Services –

1)NodePort –

```
cd nodepod
```

```
ls
```

```
nano myservicepod.yml
```

```
apiVersion: v1
```

```
kind: Service
```

```
metadata:
```

```
  name: mynodeportservice
```

```
spec:
```

```
  type: NodePort
```

```
  selector:
```

```
    app: myapp
```

```
  ports:
```

```
    - protocol: TCP
```

```
      port: 80
```

```
      targetPort: 80
```

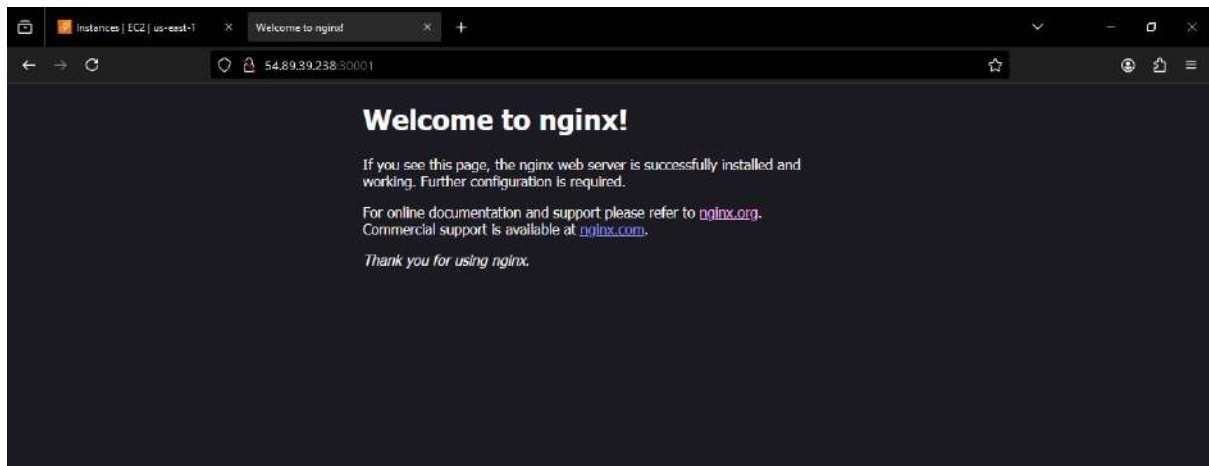
```
      nodePort: 30001
```

```
kubectl apply -f myservice.yml
```

```
kubectl get pods
```

```
kubectl get services
```

Add 30000-32000 in worker node security inbound rule.



```
kubectl exec -it nginxpod -- /bin/bash
```

```
cd /usr/share/nginx/html
```

```
ls
```

```
touch ravi.html
```

```
echo "this is ravi.html page under nginxpod" >ravi.html
```



```
root@nginxpod:/usr/share/nginx/html# ls
50x.html  index.html  ravi.html
root@nginxpod:/usr/share/nginx/html# |
```

For load balancing –

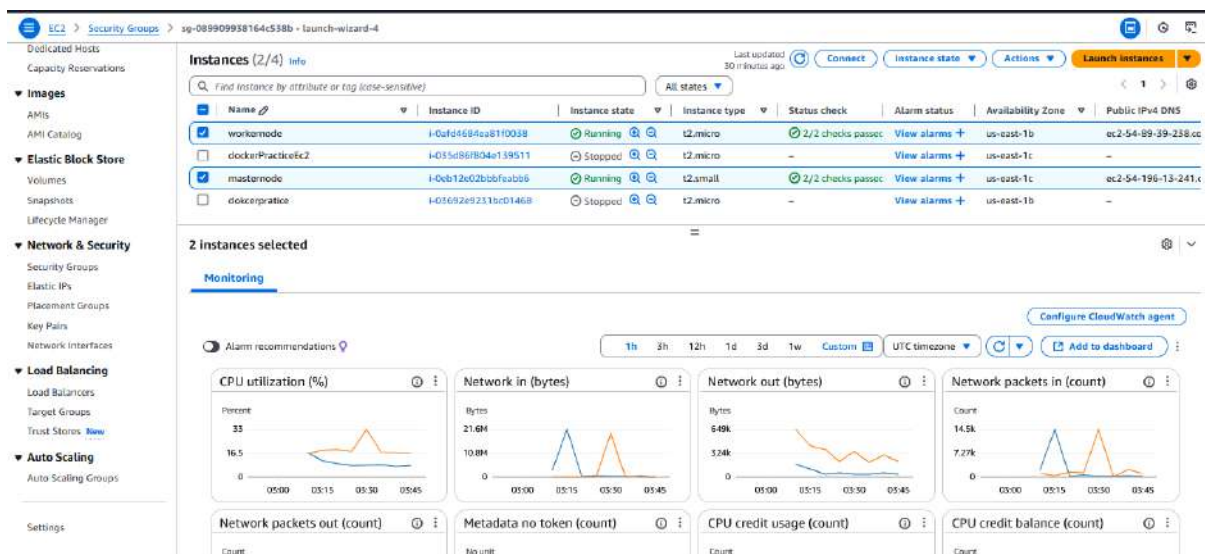
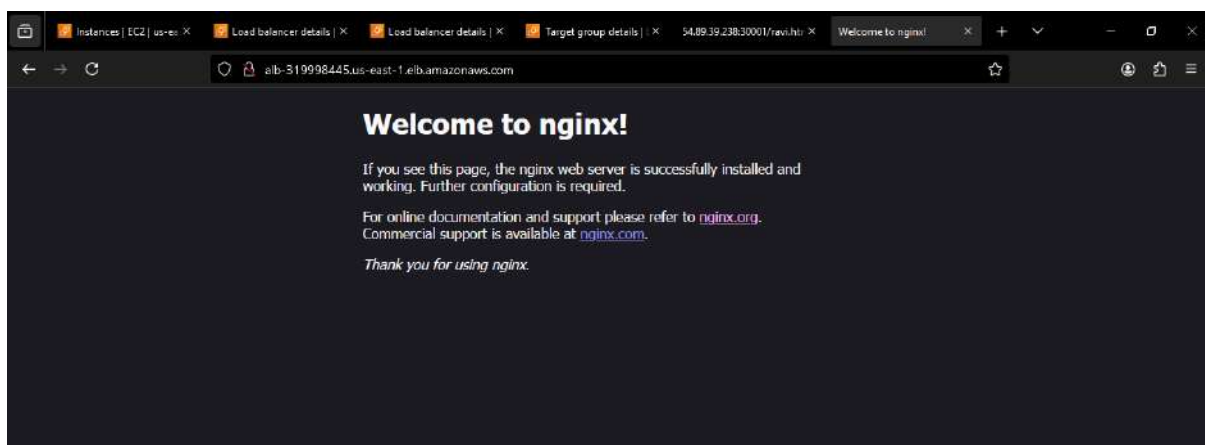
```
cd nginxpod
```

```
cp myservice.yml loadwalaservice.yml
```

(changes in loadwalaservice.yml)

```
GNU nano 7.2 loadbalanceservice.yml *
apiVersion: v1
kind: Service
metadata:
  name: loadbalanceservice
spec:
  type: LoadBalancer
  selector:
    app: myapp
  ports:
    - protocol: TCP
      port: 80
      targetPort: 80
```

Create load balancer in AWS and add target group (add load balancer service port)
Copy DNS of load balancer.



ReplicationController –

ReplicationController –

- Pod recreation
- Scaling (manual)
- Replicas

Practical -

kubectl get nodes

kubectl delete all --all --force

mkdir replicationController

cd replicationController

nano mynginx.yml

```
ubuntu@ip-172-31-21-116:~$ mkdir replicationcontrollerwala
ubuntu@ip-172-31-21-116:~$ cd replicationcontrollerwala
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ ls
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ nano mynginx.yml
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ ls
mynginx.yml
```

kubectl apply -f mynginx.yml

kubectl get rc

```
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ kubectl get rc
NAME      DESIRED   CURRENT   READY   AGE
myrc      3         3         3       110s
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ |
```

kubectl get pods

```
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ kubectl get pod
NAME      READY   STATUS    RESTARTS   AGE
myrc-grcq6 1/1     Running   0          2m18s
myrc-snz48 1/1     Running   0          2m18s
myrc-wn2zt 1/1     Running   0          2m18s
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ |
```

kubectl delete pod anypod_name --force

(to checking auto creation of pod or not)

```
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ kubectl delete pod myrc-grcq6 --force
Warning: Immediate deletion does not wait for confirmation that the running resource has been terminated. The resource may continue to run on the cluster indefinitely.
pod "myrc-grcq6" force deleted
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$
```

kubectl get pods -o wide

```
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ kubectl get pod -o wide
NAME          READY   STATUS    RESTARTS   AGE   IP              NODE          NOMINATED NODE   READINESS GATES
myrc-php62    1/1     Running   0           195s  192.168.205.140 ip-172-31-94-46 <none>           <none>
myrc-snz8     1/1     Running   0           4m50s 192.168.205.137 ip-172-31-94-46 <none>           <none>
myrc-wn2zt    1/1     Running   0           4m50s 192.168.205.138 ip-172-31-94-46 <none>           <none>
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$
```

kubectl scale rc myrc --replicas=4

```
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ kubectl scale rc myrc --replicas=4
replicationcontroller/myrc scaled
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$
```

kubectl get rc

kubectl get pod -o wide

```
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ kubectl get rc
NAME    DESIRED   CURRENT   READY   AGE
myrc    4         4         4       6m45s
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ kubectl get pods
NAME          READY   STATUS    RESTARTS   AGE
myrc-php62    1/1     Running   0           3m47s
myrc-snz8     1/1     Running   0           6m52s
myrc-vjfj2    1/1     Running   0           64s
myrc-wn2zt    1/1     Running   0           6m52s
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$
```

kubectl delete all -all -force

```
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ kubectl delete all --all --force
Warning: Immediate deletion does not wait for confirmation that the running resource has been terminated. The resource may continue to run on the cluster indefinitely.
pod "myrc-php62" force deleted
pod "myrc-snz8" force deleted
pod "myrc-vjfj2" force deleted
pod "myrc-wn2zt" force deleted
replicationcontroller "myrc" force deleted
service "kubernetes" force deleted
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$
```

cp mynginx.yml yournginx.yml

cp mynginx.yml ournginx.yml

ls

```
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ cp mynginx.yml yournginx.yml
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ cp mynginx.yml ournginx.yml
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ ls
mynginx.yml  ournginx.yml  yournginx.yml
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$
```

kubectl apply -f yournginx.yml

kubectl apply -f ournginx.yml

```
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ kubectl apply -f yournginx.yml
replicationcontroller/myrc1 created
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ kubectl apply -f ournginx.yml
replicationcontroller/myrc2 created
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ |
```

kubectl get all

```
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ kubectl get all

NAME                READY    STATUS    RESTARTS   AGE
pod/myrc-8t2vg      1/1     Running   0           4m2s
pod/myrc-9bncs      1/1     Running   0           4m2s
pod/myrc-td4km      1/1     Running   0           4m2s
pod/myrc1-d48x2     1/1     Running   0           53s
pod/myrc1-jdp98     1/1     Running   0           53s
pod/myrc1-pjvfk     1/1     Running   0           53s
pod/myrc2-49cr6     1/1     Running   0           36s
pod/myrc2-6v7p6     1/1     Running   0           36s
pod/myrc2-72cg7     1/1     Running   0           36s

NAME                DESIRED   CURRENT   READY    AGE
replicationcontroller/myrc      3         3         3        4m2s
replicationcontroller/myrc1     3         3         3        53s
replicationcontroller/myrc2     3         3         3        36s

NAME                TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)    AGE
service/kubernetes  ClusterIP   10.96.0.1    <none>        443/TCP    5m3s
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ |
```

kubectl get rc -o wide

```
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ kubectl get rc -o wide
NAME    DESIRED   CURRENT   READY   AGE    CONTAINERS   IMAGES   SELECTOR
myrc    3         3         3       4m51s  nginxconatiner  nginx   env=dev
myrc1   3         3         3       102s   nginxconatiner  nginx   env=prod
myrc2   3         3         3       85s    nginxconatiner  nginx   env=testing
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ |
```

kubectl get pod -l env

```
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ kubectl get pod -l env
NAME                READY    STATUS    RESTARTS   AGE
myrc-8t2vg          1/1     Running   0           5m34s
myrc-9bncs          1/1     Running   0           5m34s
myrc-td4km          1/1     Running   0           5m34s
myrc1-d48x2         1/1     Running   0           2m25s
myrc1-jdp98         1/1     Running   0           2m25s
myrc1-pjvfk         1/1     Running   0           2m25s
myrc2-49cr6         1/1     Running   0           2m8s
myrc2-6v7p6         1/1     Running   0           2m8s
myrc2-72cg7         1/1     Running   0           2m8s
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ |
```

kubectl get pod -l env=dev

```
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ kubectl get pod -l env=dev
NAME                READY    STATUS    RESTARTS   AGE
myrc-8t2vg          1/1     Running   0           6m2s
myrc-9bncs          1/1     Running   0           6m2s
myrc-td4km          1/1     Running   0           6m2s
ubuntu@ip-172-31-21-116:~/replicationcontrollerwala$ |
```

ReplicaSet –

cp -r replicationcontroller replicasetwala

cd replicasetwala

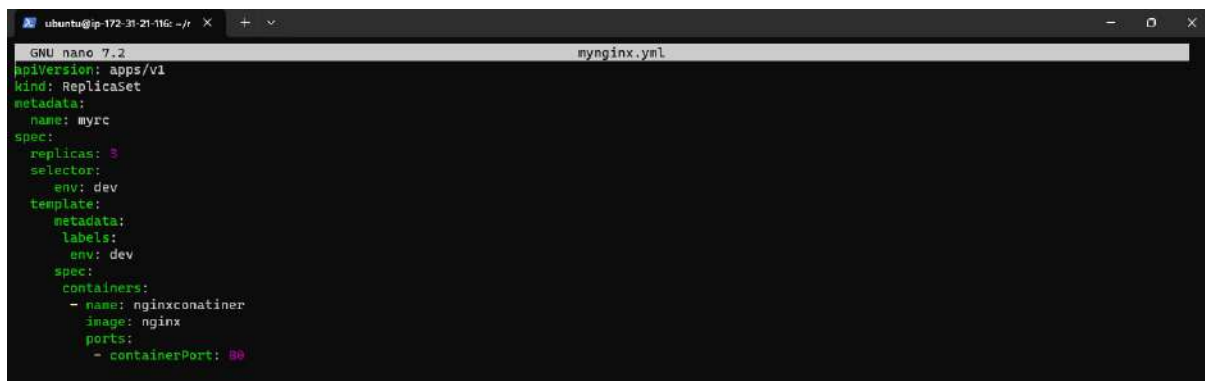
ls

nano mynginx.yml

nano yournginx.yml

nano ournginx.yml

```
ubuntu@ip-172-31-21-116:~/replicasetwala$ ls
mynginx.yml  ournginx.yml  yournginx.yml
ubuntu@ip-172-31-21-116:~/replicasetwala$ |
```



```
ubuntu@ip-172-31-21-116:~/r X + v
GNU nano 7.2 mynginx.yml
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: myrc
spec:
  replicas: 5
  selector:
    env: dev
  template:
    metadata:
      labels:
        env: dev
    spec:
      containers:
        - name: nginxcontainer
          image: nginx
          ports:
            - containerPort: 80
```



```
ubuntu@ip-172-31-21-116:~/r X + v
GNU nano 7.2 yournginx.yml
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: myrc1
spec:
  replicas: 3
  selector:
    matchLabels:
      env: prod
  template:
    metadata:
      labels:
        env: prod
    spec:
      containers:
        - name: nginxcontainer
          image: nginx
          ports:
            - containerPort: 80
```

```
ubuntu@ip-172-31-21-116: ~/r  X + v
GNU nano 7.2 ournginx.yml
apiVersion: apps/v1
kind: Replicaset
metadata:
  name: myrc2
spec:
  replicas: 3
  selector:
    matchLabels:
      env: testing
  template:
    metadata:
      labels:
        env: testing
    spec:
      containers:
      - name: nginxcontainer
        image: nginx
        ports:
        - containerPort: 80
```

kubectl apply -f mynginx.yml

kubectl apply -f yournginx.yml

kunectl apply -f ournginx.yml

```
ubuntu@ip-172-31-21-116:~/replicasetwala$ kubectl apply -f mynginx.yml
replicaset.apps/myrc created
ubuntu@ip-172-31-21-116:~/replicasetwala$ kubectl apply -f yournginx.yml
replicaset.apps/myrc1 created
ubuntu@ip-172-31-21-116:~/replicasetwala$ kubectl apply -f ournginx.yml
replicaset.apps/myrc2 created
ubuntu@ip-172-31-21-116:~/replicasetwala$ |
```

kubectl get all

```
ubuntu@ip-172-31-21-116:~/replicasetwala$ kubectl get all
NAME                READY   STATUS    RESTARTS   AGE
pod/myrc-8n9vh      1/1     Running   0           56s
pod/myrc-m97vm      1/1     Running   0           56s
pod/myrc-s4hvb      1/1     Running   0           56s
pod/myrc1-5hkhj     1/1     Running   0           44s
pod/myrc1-gqc29     1/1     Running   0           44s
pod/myrc1-mhjld     1/1     Running   0           44s
pod/myrc2-5cjlq     1/1     Running   0           35s
pod/myrc2-qczlp     1/1     Running   0           35s
pod/myrc2-xrwh9     1/1     Running   0           35s

NAME                TYPE          CLUSTER-IP   EXTERNAL-IP   PORT(S)    AGE
service/kubernetes  ClusterIP     10.96.0.1    <none>        443/TCP    68s

NAME                DESIRED   CURRENT   READY   AGE
replicaset.apps/myrc      3         3         3       56s
replicaset.apps/myrc1     3         3         3       44s
replicaset.apps/myrc2     3         3         3       35s
ubuntu@ip-172-31-21-116:~/replicasetwala$ |
```

kubectl get pods - - selector 'env in (dev, testing)'

```
ubuntu@ip-172-31-21-116:~/replicasetwala$ kubectl get pods --selector 'env in (dev,testing)'
NAME                READY   STATUS    RESTARTS   AGE
myrc-8n9vh          1/1     Running   0           115s
myrc-m97vm          1/1     Running   0           115s
myrc-s4hvb          1/1     Running   0           115s
myrc2-5cjlq         1/1     Running   0           94s
myrc2-qczlp         1/1     Running   0           94s
myrc2-xrwh9         1/1     Running   0           94s
ubuntu@ip-172-31-21-116:~/replicasetwala$ |
```

Deployment –

Deployment is internally replica set, internally replication controller, internally pod.

Deployment solved problem of -

- a) Rolling update
- b) Give batch wise update
- c) Rollback functionality

mkdir deployment

cd deployment

```
ubuntu@ip-172-31-21-116:~$ ls
nginxpod  replicasetwala  replicationcontrollerwala
ubuntu@ip-172-31-21-116:~$ mkdir deployment
ubuntu@ip-172-31-21-116:~$ ls
deployment  nginxpod  replicasetwala  replicationcontrollerwala
ubuntu@ip-172-31-21-116:~$ cd deployment
ubuntu@ip-172-31-21-116:~/deployment$
```

nano mynginx.yml



```
GNU nano 7.2 mynginx.yml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: mydeploy
spec:
  replicas: 2
  selector:
    matchLabels:
      env: dev
  template:
    metadata:
      labels:
        env: dev
    spec:
      containers:
        - name: nginxcontainer
          image: nginx
          ports:
            - containerPort: 80
```

kubectl apply -f mynginx.yml

```
ubuntu@ip-172-31-21-116:~/deployment$ nano mynginx.yml
ubuntu@ip-172-31-21-116:~/deployment$ kubectl apply -f mynginx.yml
deployment.apps/mydeploy created
ubuntu@ip-172-31-21-116:~/deployment$ |
```

kubectl get deploy

kubectl get all

```
ubuntu@ip-172-31-21-116:~/deployment$ kubectl get deploy
NAME      READY   UP-TO-DATE   AVAILABLE   AGE
mydeploy  2/2     2            2           28s
ubuntu@ip-172-31-21-116:~/deployment$ kubectl get all
NAME                                     READY   STATUS    RESTARTS   AGE
pod/mydeploy-7769958795-96d8l          1/1     Running   0           60s
pod/mydeploy-7769958795-p5hll          1/1     Running   0           60s

NAME              TYPE          CLUSTER-IP   EXTERNAL-IP   PORT(S)    AGE
service/kubernetes  ClusterIP     10.96.0.1    <none>        443/TCP    117s

NAME                  READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/mydeploy  2/2     2            2           60s

NAME                  DESIRED   CURRENT   READY   AGE
replicaset.apps/mydeploy-7769958795  2         2         2       60s
ubuntu@ip-172-31-21-116:~/deployment$ |
```

For update –

kubectl set image deployment mydeploy
nginxcontainer=httpd

kubectl rollout status deployment mydeploy

```
ubuntu@ip-172-31-21-116:~/deployment$ kubectl set image deployment mydeploy nginxcontainer=httpd
deployment.apps/mydeploy image updated
ubuntu@ip-172-31-21-116:~/deployment$ kubectl rollout status deployment mydeploy
deployment "mydeploy" successfully rolled out
ubuntu@ip-172-31-21-116:~/deployment$ |
```

kubectl rollout history deployment mydeploy

```
ubuntu@ip-172-31-21-116:~/deployment$ kubectl rollout history deploy mydeploy
deployment.apps/mydeploy
REVISION   CHANGE-CAUSE
1          <none>
2          <none>
ubuntu@ip-172-31-21-116:~/deployment$ |
```

kubectl get deployment mydeploy -o wide

```
ubuntu@ip-172-31-21-116:~/deployment$ kubectl get deployment mydeploy -o wide
NAME      READY   UP-TO-DATE   AVAILABLE   AGE   CONTAINERS   IMAGES   SELECTOR
mydeploy  2/2     2            2           4m12s  nginxcontainer  httpd    env=dev
ubuntu@ip-172-31-21-116:~/deployment$ |
```

kubectl get deployment mydeploy -o yaml

```

    env: dev
  spec:
    containers:
    - image: httpd
      imagePullPolicy: Always
      name: nginxcontainer
      ports:
      - containerPort: 80
        protocol: TCP
      resources: {}
      terminationMessagePath: /dev/termination-log
      terminationMessagePolicy: File
    dnsPolicy: ClusterFirst
    restartPolicy: Always
    schedulerName: default-scheduler
    securityContext: {}
    terminationGracePeriodSeconds: 30
  status:
    availableReplicas: 2
    conditions:
    - lastTransitionTime: "2024-12-17T03:40:07Z"
      lastUpdateTime: "2024-12-17T03:40:07Z"
      message: Deployment has minimum availability.
      reason: MinimumReplicasAvailable
      status: "True"
      type: Available
    - lastTransitionTime: "2024-12-17T03:40:05Z"
      lastUpdateTime: "2024-12-17T03:47:43Z"
      message: ReplicaSet "mydeploy-68cc955b75" has successfully progressed.
      reason: NewReplicaSetAvailable
      status: "True"
      type: Progressing
    observedGeneration: 5
    readyReplicas: 2
    replicas: 2
    updatedReplicas: 2
ubuntu@ip-172-31-21-116:~/deployment$ |

```

kubectl apply -f mynginx.yml

kubectl rollout history deployment mydeploy

```

ubuntu@ip-172-31-21-116:~/deployment$ kubectl apply -f mynginx.yml
deployment.apps/mydeploy configured
ubuntu@ip-172-31-21-116:~/deployment$ kubectl get deploy mydeploy -o wide
NAME      READY   UP-TO-DATE   AVAILABLE   AGE   CONTAINERS   IMAGES   SELECTOR
mydeploy  2/2     2            2           5m55s nginxcontainer nginx   env=dev
ubuntu@ip-172-31-21-116:~/deployment$ kubectl rollout history deployment mydeploy
deployment.apps/mydeploy
REVISION  CHANGE-CAUSE
2         <none>
3         <none>
ubuntu@ip-172-31-21-116:~/deployment$ |

```

kubectl rollout undo deployment mydeploy - -to-revision=2

kubectl rollout history deployment mydeploy

```

ubuntu@ip-172-31-21-116:~/deployment$ kubectl rollout undo deployment mydeploy --to-revision=2
deployment.apps/mydeploy rolled back
ubuntu@ip-172-31-21-116:~/deployment$ kubectl rollout history deployment mydeploy
deployment.apps/mydeploy
REVISION  CHANGE-CAUSE
3         <none>
4         <none>
ubuntu@ip-172-31-21-116:~/deployment$ |

```

kubectl annotate deployments.apps mydeploy

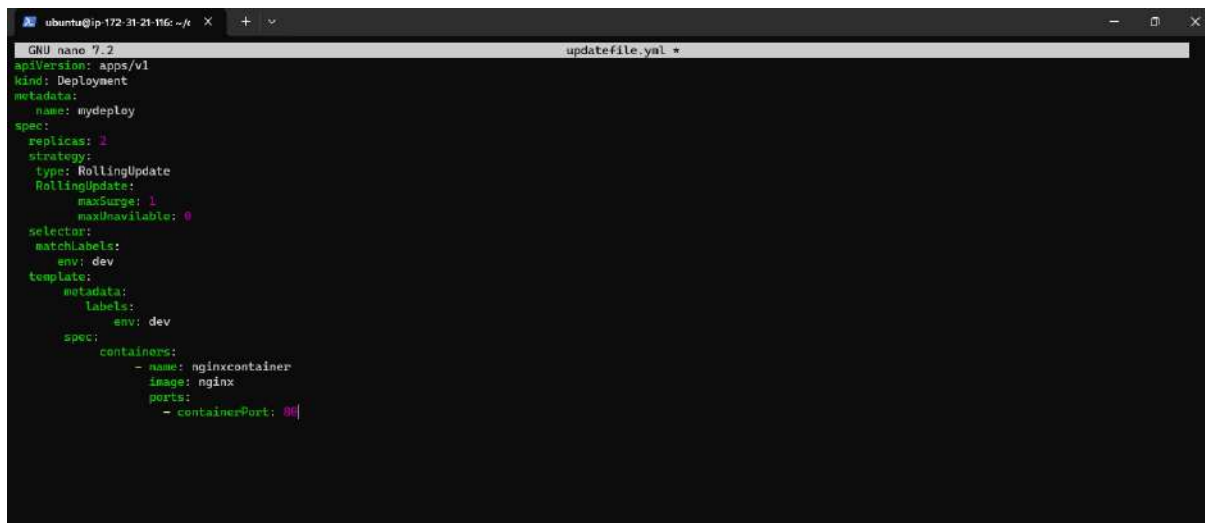
kubernetes.io/change-cause="version4"

```

ubuntu@ip-172-31-21-116:~/deployment$ kubectl annotate deployment.apps mydeploy kubernetes.io/change-cause="version4"
deployment.apps/mydeploy annotated
ubuntu@ip-172-31-21-116:~/deployment$ kubectl rollout history deployment mydeploy
deployment.apps/mydeploy
REVISION  CHANGE-CAUSE
3         <none>
4         version4
ubuntu@ip-172-31-21-116:~/deployment$ |

```


nano updatefile.yml



```
GNU nano 7.2 updatefile.yml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: mydeploy
spec:
  replicas: 2
  strategy:
    type: RollingUpdate
  RollingUpdate:
    maxSurge: 1
    maxUnavailable: 0
  selector:
    matchLabels:
      env: dev
  template:
    metadata:
      labels:
        env: dev
    spec:
      containers:
        - name: nginxcontainer
          image: nginx
          ports:
            - containerPort: 80
```

kubectl apply -f updatefile.yml

kubectl rollout history deployment mydeployment

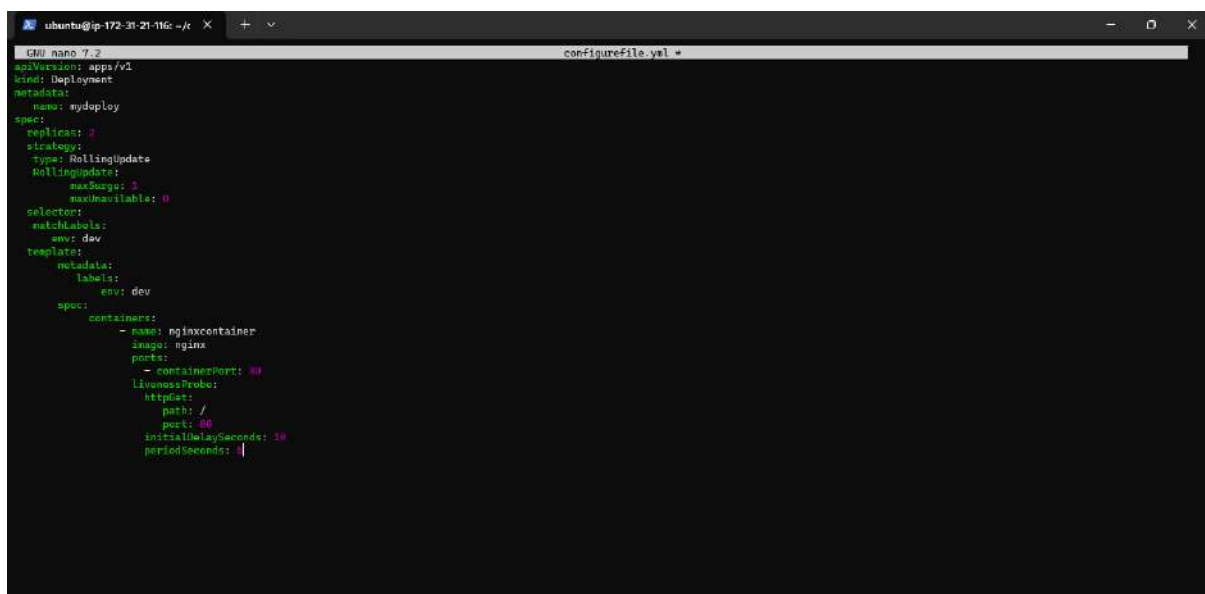
kubectl get deploy - -watch

kubectl get deploy/mydeploy - -watch

For configure (healthProbe) -

nano configurefile.yml

#livenessProbe



```
GNU nano 7.2 configurefile.yml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: mydeploy
spec:
  replicas: 2
  strategy:
    type: RollingUpdate
  RollingUpdate:
    maxSurge: 1
    maxUnavailable: 0
  selector:
    matchLabels:
      env: dev
  template:
    metadata:
      labels:
        env: dev
    spec:
      containers:
        - name: nginxcontainer
          image: nginx
          ports:
            - containerPort: 80
          livenessProbe:
            httpGet:
              path: /
              port: 80
            initialDelaySeconds: 10
            periodSeconds: 4
```

kubecttl apply -f configurefile.yml

```
ubuntu@ip-172-31-21-116:~/deployment$ nano configurefile.yml
ubuntu@ip-172-31-21-116:~/deployment$ kubecttl apply -f configurefile.yml
deployment.apps/mydeploy created
ubuntu@ip-172-31-21-116:~/deployment$
```

kubecttl get pod

kubecttl get all

```
ubuntu@ip-172-31-21-116:~/deployment$ kubecttl get all
NAME                                READY    STATUS    RESTARTS   AGE
pod/mydeploy-86cb6f57d6-9k9j5      1/1      Running   0           23s
pod/mydeploy-86cb6f57d6-m95nj      1/1      Running   0           23s

NAME                                TYPE     CLUSTER-IP   EXTERNAL-IP   PORT(S)    AGE
service/kubernetes                  ClusterIP   10.96.0.1    <none>        443/TCP    7m52s

NAME                                READY    UP-TO-DATE   AVAILABLE    AGE
deployment.apps/mydeploy            2/2      2             2             23s

NAME                                DESIRED   CURRENT   READY    AGE
replicaset.apps/mydeploy-86cb6f57d6 2          2          2          23s
ubuntu@ip-172-31-21-116:~/deployment$ kubecttl get pods
NAME                                READY    STATUS    RESTARTS   AGE
mydeploy-86cb6f57d6-9k9j5          1/1      Running   0           35s
mydeploy-86cb6f57d6-m95nj          1/1      Running   0           35s
ubuntu@ip-172-31-21-116:~/deployment$
```

kubecttl delete pod_name - - force

```
ubuntu@ip-172-31-21-116:~/deployment$ kubecttl get pod
NAME                                READY    STATUS    RESTARTS   AGE
mydeploy-86cb6f57d6-9k9j5          1/1      Running   0           6m38s
mydeploy-86cb6f57d6-m95nj          1/1      Running   0           6m38s
ubuntu@ip-172-31-21-116:~/deployment$ kubecttl delete pod mydeploy-86cb6f57d6-9k9j5 --force
Warning: Immediate deletion does not wait for confirmation that the running resource has been terminated. The resource may continue to run on the cluster indefinitely.
pod "mydeploy-86cb6f57d6-9k9j5" force deleted
```

kubecttl get pods

```
ubuntu@ip-172-31-21-116:~/deployment$ kubecttl get pods
NAME                                READY    STATUS    RESTARTS   AGE
mydeploy-86cb6f57d6-m5hbm          1/1      Running   0           16s
mydeploy-86cb6f57d6-m95nj          1/1      Running   0           7m14s
ubuntu@ip-172-31-21-116:~/deployment$
```

Check another pod is created or not intent of crashed Pod.

Health Probe –

Kubernetes has various types of probes:

Liveness probe

Liveness probes determine when to restart a container. For example, liveness probes could catch a deadlock when an application is running but unable to make progress.

If a container fails its liveness probe repeatedly, the kubelet restarts the container.

Liveness probes do not wait for readiness probes to succeed. If you want to wait before executing a liveness probe, you can either define `initialDelaySeconds` or use startup probe.

```
ubuntu@ip-172-31-21-116:~$ mkdir healthprobe
mkdir: cannot create directory 'healthprobe': File exists
ubuntu@ip-172-31-21-116:~$ cd healthprobe/
ubuntu@ip-172-31-21-116:~/healthprobe$ ls
livenessprobe.yml  readinessprobe.yml  startupprobe.yml
ubuntu@ip-172-31-21-116:~/healthprobe$ rm livenessprobe.yml
ubuntu@ip-172-31-21-116:~/healthprobe$ ls
readinessprobe.yml  startupprobe.yml
ubuntu@ip-172-31-21-116:~/healthprobe$ nano livenessfile.yml
```

```
ubuntu@ip-172-31-21-116:~/healthprobe$ kubectl apply -f livenessfile.yml
replicationcontroller/mypod created
ubuntu@ip-172-31-21-116:~/healthprobe$ kubectl get pods
NAME          READY   STATUS    RESTARTS   AGE
mypod-2qt2r   1/1     Running   0           5s
mypod-6kp68   1/1     Running   0           5s
mypod-fdbbp   1/1     Running   0           5s
mypod-k4g9s   1/1     Running   0           5s
mypod-tk4sq   1/1     Running   0           5s
ubuntu@ip-172-31-21-116:~/healthprobe$
```

```
ubuntu@ip-172-31-21-116:~/healthprobe$ nano livenesscommandlinefile.yml
ubuntu@ip-172-31-21-116:~/healthprobe$ kubectl apply -f livenesscommandlinefile.yml
replicationcontroller/mypod created
ubuntu@ip-172-31-21-116:~/healthprobe$ kubectl get pods
NAME          READY   STATUS    RESTARTS   AGE
mypod-4npph   1/1     Running   0           6s
mypod-dhblr   1/1     Running   0           6s
mypod-jw8s8   1/1     Running   0           6s
mypod-sq8vs   1/1     Running   0           6s
mypod-xq87h   1/1     Running   0           6s
ubuntu@ip-172-31-21-116:~/healthprobe$
```

```
GNU nano 7.2                                livenesscommandlinefile.yml
apiVersion: v1
kind: ReplicationController
metadata:
  name: mypod
spec:
  replicas: 5
  template:
    metadata:
      labels:
        app: test
    spec:
      containers:
        - image: nginx
          name: mycont
          ports:
            - containerPort: 80
          livenessProbe:
            exec:
              command:
                - ls /usr/share/nginx/html
```

Readiness probe

Readiness probes determine when a container is ready to start accepting traffic. This is useful when waiting for an application to perform time-consuming initial tasks, such as establishing network connections, loading files, and warming caches.

If the readiness probe returns a failed state, Kubernetes removes the pod from all matching service endpoints.

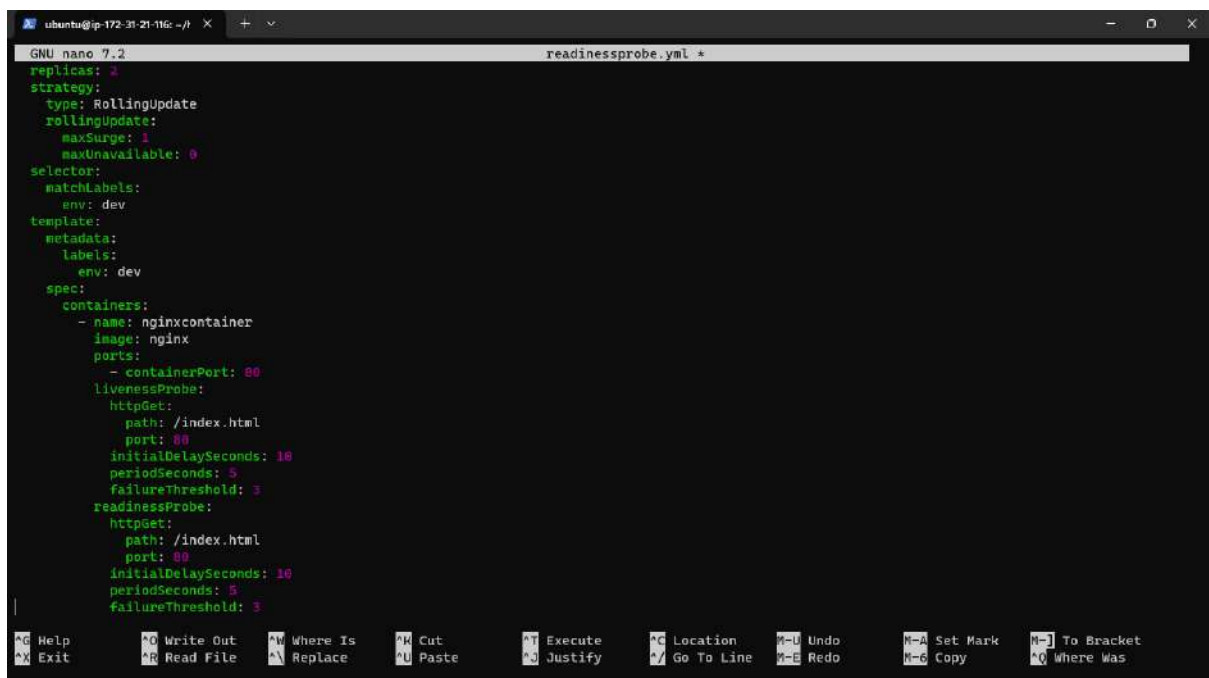
Readiness probes run on the container during its whole lifecycle.

mkdir healthprobe

cd healthprobe

nano readinessprobe.yml

```
ubuntu@ip-172-31-21-116:~$ mkdir healthprobe
ubuntu@ip-172-31-21-116:~$ ls
deployment healthprobe nginxpod replicasetwala replicationcontrollerwala
ubuntu@ip-172-31-21-116:~$ cd healthprobe
ubuntu@ip-172-31-21-116:~/healthprobe$ ls
ubuntu@ip-172-31-21-116:~/healthprobe$ nano livenessprobe.yml
ubuntu@ip-172-31-21-116:~/healthprobe$ nano readinessprobe.yml
ubuntu@ip-172-31-21-116:~/healthprobe$
```



```
GNU nano 7.2                      readinessprobe.yml *
replicas: 2
strategy:
  type: RollingUpdate
  rollingUpdate:
    maxSurge: 1
    maxUnavailable: 0
selector:
  matchLabels:
    env: dev
template:
  metadata:
    labels:
      env: dev
  spec:
    containers:
      - name: nginxcontainer
        image: nginx
        ports:
          - containerPort: 80
        livenessProbe:
          httpGet:
            path: /index.html
            port: 80
            initialDelaySeconds: 10
            periodSeconds: 5
            failureThreshold: 3
        readinessProbe:
          httpGet:
            path: /index.html
            port: 80
            initialDelaySeconds: 10
            periodSeconds: 5
            failureThreshold: 3
|
⌕ Help  ⌕ Write Out  ⌕ Where Is  ⌕ Cut  ⌕ Execute  ⌕ Location  ⌕ Undo  ⌕ Set Mark  ⌕ To Bracket
⌕ Exit  ⌕ Read File  ⌕ Replace  ⌕ Paste  ⌕ Justify  ⌕ Go To Line  ⌕ Redo  ⌕ Copy  ⌕ Where Was
```

kubectl apply -f readinessprobe.yml

```
ubuntu@ip-172-31-21-116:~/healthprobe$ kubectl apply -f readinessprobe.yml
deployment.apps/mydeploy created
ubuntu@ip-172-31-21-116:~/healthprobe$
```

kubectl get all

```

ubuntu@ip-172-31-21-116:~/healthprobe$ kubectl get all
NAME                                READY   STATUS    RESTARTS   AGE
pod/mydeploy-57f99b6f89-qgsvs      1/1     Running   0           106s
pod/mydeploy-57f99b6f89-v89ms      1/1     Running   0           106s

NAME                                TYPE               CLUSTER-IP   EXTERNAL-IP   PORT(S)    AGE
service/kubernetes                 ClusterIP        10.96.0.1    <none>        443/TCP    23h

NAME                                READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/mydeploy           2/2     2             2           106s

NAME                                DESIRED   CURRENT   READY   AGE
replicaset.apps/mydeploy-57f99b6f89 2         2         2       106s
ubuntu@ip-172-31-21-116:~/healthprobe$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
mydeploy-57f99b6f89-qgsvs          1/1     Running   0           114s
mydeploy-57f99b6f89-v89ms          1/1     Running   0           114s
ubuntu@ip-172-31-21-116:~/healthprobe$

```

kubectl exec -it pod_name - - /bin/bash

cd /usr/share/nginx/html

ls

rm index.html

exit

```

ubuntu@ip-172-31-21-116:~/healthprobe$ kubectl exec -it mydeploy-57f99b6f89-qgsvs -- /bin/bash
root@mydeploy-57f99b6f89-qgsvs:/# cd /usr/share/nginx/html
root@mydeploy-57f99b6f89-qgsvs:/usr/share/nginx/html# ls
50x.html  index.html
root@mydeploy-57f99b6f89-qgsvs:/usr/share/nginx/html# rm index.html
root@mydeploy-57f99b6f89-qgsvs:/usr/share/nginx/html# ls
50x.html
root@mydeploy-57f99b6f89-qgsvs:/usr/share/nginx/html# exit
exit
ubuntu@ip-172-31-21-116:~/healthprobe$

```

kubectl get pods - - watch

```

ubuntu@ip-172-31-21-116:~/healthprobe$ kubectl get pod --watch
NAME                                READY   STATUS    RESTARTS   AGE
mydeploy-57f99b6f89-qgsvs          0/1     Running   0           3m49s
mydeploy-57f99b6f89-v89ms          1/1     Running   0           3m49s

```

kubectl exec -it pod_name - - /bin/bash

cd /usr/share/nginx/html

touch index.html

echo "hi there" >index.html

exit

```

ubuntu@ip-172-31-21-116:~/healthprobe$ kubectl exec -it mydeploy-57f99b6f89-qgsvs -- /bin/bash
root@mydeploy-57f99b6f89-qgsvs:/# cd /usr/share/nginx/html
root@mydeploy-57f99b6f89-qgsvs:/usr/share/nginx/html# ls
50x.html
root@mydeploy-57f99b6f89-qgsvs:/usr/share/nginx/html# touch index.html
root@mydeploy-57f99b6f89-qgsvs:/usr/share/nginx/html# echo "hi there" >index.html
root@mydeploy-57f99b6f89-qgsvs:/usr/share/nginx/html# ls
50x.html  index.html
root@mydeploy-57f99b6f89-qgsvs:/usr/share/nginx/html#

```

kubectl get pods

```
ubuntu@ip-172-31-21-116:~/healthprobe$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
mydeploy-57f99b6f89-qgsvs          1/1     Running   0           6m13s
mydeploy-57f99b6f89-v89ms          1/1     Running   0           6m13s
ubuntu@ip-172-31-21-116:~/healthprobe$
```

Startup probe

A startup probe verifies whether the application within a container is started. This can be used to adopt liveness checks on slow starting containers, avoiding them getting killed by the kubelet before they are up and running.

If such a probe is configured, it disables liveness and readiness checks until it succeeds.

This type of probe is only executed at startup, unlike liveness and readiness probes, which are run periodically.

nano startupprobe.yml

```
GNU nano 7.2 startupprobe.yml *
env: dev
template:
  metadata:
    labels:
      env: dev
  spec:
    containers:
      - name: nginxcontainer
        image: nginx
        ports:
          - containerPort: 80
        livenessProbe:
          httpGet:
            path: /index.html
            port: 80
            initialDelaySeconds: 10
            periodSeconds: 5
            failureThreshold: 3
        readinessProbe:
          httpGet:
            path: /index.html
            port: 80
            initialDelaySeconds: 10
            periodSeconds: 5
            failureThreshold: 3
        startupProbe:
          exec:
            command:
              - cat
              - /usr/share/nginx/html/index.html
            initialDelaySeconds: 10
            periodSeconds: 5
|
⌘ Help  ⌘ Write Out  ⌘ Where Is  ⌘ Cut  ⌘ Execute  ⌘ Location  ⌘ Undo  ⌘ Set Mark  ⌘ To Bracket
⌘ Exit  ⌘ Read File  ⌘ Replace  ⌘ Paste  ⌘ Justify  ⌘ Go To Line  ⌘ Redo  ⌘ Copy  ⌘ Where Was
```

kubectl apply -f startupprobe.yml

```
ubuntu@ip-172-31-21-116:~/healthprobe$ ls
livenessprobe.yml  readinessprobe.yml  startupprobe.yml
ubuntu@ip-172-31-21-116:~/healthprobe$ kubectl apply -f startupprobe.yml
deployment.apps/mydeploy created
ubuntu@ip-172-31-21-116:~/healthprobe$
```

kubectl describe pod pod_name

```

ubuntu@ip-172-31-21-116: ~$ kubectl get pod mydeploy-5fd95555b6-4g7tc -o yaml
Type:                               Status
PodReadyToStartContainers           True
Initialized                         True
Ready                               False
ContainersReady                     False
PodScheduled                         True
Volumes:
  kube-api-access-hcvdf:
    Type:                               Projected (a volume that contains injected data from multiple sources)
    TokenExpirationSeconds:              3607
    ConfigMapName:                       kube-root-ca.crt
    ConfigMapOptional:                   <nil>
    DownwardAPI:                         true
QoS Class:                           BestEffort
Node-Selectors:                       <none>
Tolerations:                          node.kubernetes.io/not-ready:NoExecute op=Exists for 300s
                                         node.kubernetes.io/unreachable:NoExecute op=Exists for 300s
Events:
  Type      Reason      Age      From      Message
  ---      -
Normal     Scheduled   4m28s    default-scheduler   Successfully assigned default/mydeploy-5fd95555b6-4g7tc to ip-172-31-94-46
Normal     Pulling     4m28s    kubelet        Pulling image "nginx"
Normal     Pulled      4m27s    kubelet        Successfully pulled image "nginx" in 145ms (237ms including waiting). Image size: 7
2099501 bytes.
Normal     Created     4m27s    kubelet        Created container nginxcontainer
Normal     Started     4m27s    kubelet        Started container nginxcontainer
Warning    Unhealthy   4m2s     kubelet        Liveness probe failed: Get "http://192.168.205.139:80/index.html": dial tcp 192.168
.205.139:80: i/o timeout (Client.Timeout exceeded while awaiting headers)
Warning    Unhealthy   3m57s    kubelet        Liveness probe failed: Get "http://192.168.205.139:80/index.html": context deadline
exceeded (Client.Timeout exceeded while awaiting headers)
Normal     Killing     3m57s    kubelet        Container nginxcontainer failed liveness probe, will be restarted
Warning    Unhealthy   3m56s    kubelet        Readiness probe failed: Get "http://192.168.205.139:80/index.html": dial tcp 192.16
8.205.139:80: i/o timeout (Client.Timeout exceeded while awaiting headers)
Normal     Killing     3m15s    kubelet        Stopping container nginxcontainer
Warning    Unhealthy   3m12s    kubelet        Readiness probe failed: Get "http://192.168.205.139:80/index.html": context deadlin
e exceeded (Client.Timeout exceeded while awaiting headers)
ubuntu@ip-172-31-21-116: ~$ kubectl get pod mydeploy-5fd95555b6-jdbn2 -o yaml
Type:                               Status
PodReadyToStartContainers           True
Initialized                         True
Ready                               False
ContainersReady                     False
PodScheduled                         True
Volumes:
  kube-api-access-hcvdf:
    Type:                               Projected (a volume that contains injected data from multiple sources)
    TokenExpirationSeconds:              3607
    ConfigMapName:                       kube-root-ca.crt
    ConfigMapOptional:                   <nil>
    DownwardAPI:                         true
QoS Class:                           BestEffort
Node-Selectors:                       <none>
Tolerations:                          node.kubernetes.io/not-ready:NoExecute op=Exists for 300s
                                         node.kubernetes.io/unreachable:NoExecute op=Exists for 300s
Events:
  Type      Reason      Age      From      Message
  ---      -
Normal     Scheduled   4m28s    default-scheduler   Successfully assigned default/mydeploy-5fd95555b6-jdbn2 to ip-172-31-94-46
Normal     Pulling     4m28s    kubelet        Pulling image "nginx"
Normal     Pulled      4m27s    kubelet        Successfully pulled image "nginx" in 145ms (237ms including waiting). Image size: 7
2099501 bytes.
Normal     Created     4m27s    kubelet        Created container nginxcontainer
Normal     Started     4m27s    kubelet        Started container nginxcontainer
Warning    Unhealthy   4m2s     kubelet        Liveness probe failed: Get "http://192.168.205.139:80/index.html": dial tcp 192.168
.205.139:80: i/o timeout (Client.Timeout exceeded while awaiting headers)
Warning    Unhealthy   3m57s    kubelet        Liveness probe failed: Get "http://192.168.205.139:80/index.html": context deadline
exceeded (Client.Timeout exceeded while awaiting headers)
Normal     Killing     3m57s    kubelet        Container nginxcontainer failed liveness probe, will be restarted
Warning    Unhealthy   3m56s    kubelet        Readiness probe failed: Get "http://192.168.205.139:80/index.html": dial tcp 192.16
8.205.139:80: i/o timeout (Client.Timeout exceeded while awaiting headers)
Normal     Killing     3m15s    kubelet        Stopping container nginxcontainer
Warning    Unhealthy   3m12s    kubelet        Readiness probe failed: Get "http://192.168.205.139:80/index.html": context deadlin
e exceeded (Client.Timeout exceeded while awaiting headers)

```

kubectl get pods

```

ubuntu@ip-172-31-21-116: ~$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
mydeploy-5fd95555b6-4g7tc          0/1     Running   0           3m55s
mydeploy-5fd95555b6-jdbn2          0/1     Running   0           3m55s

```

kubectl get pods

#After startup

```

ubuntu@ip-172-31-21-116: ~$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
mydeploy-5fd95555b6-4g7tc          1/1     Running   0           9m58s
mydeploy-5fd95555b6-jdbn2          1/1     Running   0           9m58s

```


Namespace -

In Kubernetes, *namespaces* provide a mechanism for isolating groups of resources within a single cluster. Names of resources need to be unique within a namespace, but not across namespaces. Namespace-based scoping is applicable only for namespaced object (*e.g. Deployments, Services, etc.*) and not for cluster-wide objects (*e.g. StorageClass, Nodes, PersistentVolumes, etc.*).

Namespace by commands.

kubectl get namespace

```
ubuntu@ip-172-31-21-116:~$ mkdir namespacewala
ubuntu@ip-172-31-21-116:~$ ls
deployment healthprobe namespacewala nginxpod replicasetwala replicationcontrollerwala
ubuntu@ip-172-31-21-116:~$ cd namespacewala/
ubuntu@ip-172-31-21-116:~/namespacewala$ ls
ubuntu@ip-172-31-21-116:~/namespacewala$ nano namespaceexample.yml
ubuntu@ip-172-31-21-116:~/namespacewala$
```

```
ubuntu@ip-172-31-21-116:~/namespacewala$ kubectl get namespace
NAME                STATUS    AGE
default             Active    9d
kube-node-lease     Active    9d
kube-public         Active    9d
kube-system         Active    9d
ubuntu@ip-172-31-21-116:~/namespacewala$
```

kubectl get pods -n kube-system

```
ubuntu@ip-172-31-21-116:~/namespacewala$ kubectl get pods -n kube-system
NAME                                READY    STATUS              RESTARTS   AGE
calico-kube-controllers-6cdb97b867-zk6tr  1/1     Running            9 (4m3s ago)  9d
calico-node-8k8bg                    0/1     CrashLoopBackOff   66 (16s ago)  9d
calico-node-j5mqz                    0/1     Running            67 (114s ago)  9d
coredns-55cb58b774-84665             1/1     Running            8 (4m3s ago)  9d
coredns-55cb58b774-zgx4j              1/1     Running            8 (4m5s ago)  9d
etcd-ip-172-31-21-116                 1/1     Running            8 (4m3s ago)  9d
kube-apiserver-ip-172-31-21-116        1/1     Running            8 (4m3s ago)  9d
kube-controller-manager-ip-172-31-21-116 1/1     Running            8 (4m3s ago)  9d
kube-proxy-96fds                      0/1     CrashLoopBackOff   72 (23s ago)  9d
kube-proxy-d572p                      1/1     Running            71 (64s ago)  9d
kube-scheduler-ip-172-31-21-116        1/1     Running            8 (4m3s ago)  9d
ubuntu@ip-172-31-21-116:~/namespacewala$
```

kubectl create namespace mynamespace

```
ubuntu@ip-172-31-21-116:~/namespacewala$ kubectl create namespace mynamespace
namespace/mynamespace created
ubuntu@ip-172-31-21-116:~/namespacewala$ kubectl get namespace
NAME                STATUS    AGE
default             Active    9d
kube-node-lease     Active    9d
kube-public         Active    9d
kube-system         Active    9d
mynamespace         Active    5s
ubuntu@ip-172-31-21-116:~/namespacewala$
```

kubectl get namespace


```
ubuntu@ip-172-31-21-116:~/namespacewala$ kubectl create namespace mynamespace
namespace/mynamespace created
ubuntu@ip-172-31-21-116:~/namespacewala$ kubectl get namespace
NAME                STATUS    AGE
default             Active   9d
kube-node-lease     Active   9d
kube-public         Active   9d
kube-system         Active   9d
mynamespace         Active   5s
ubuntu@ip-172-31-21-116:~/namespacewala$ |
```

kubectl apply -f namespaceexample.yml -n mynamespace

```
ubuntu@ip-172-31-21-116:~/namespacewala$ ls
namespaceexample.yml
ubuntu@ip-172-31-21-116:~/namespacewala$ kubectl apply -f namespaceexample.yml -n mynamespace
pod/nginxpod created
ubuntu@ip-172-31-21-116:~/namespacewala$ |
```

kubectl get pods

kubectl get pods -n mynamespace

```
ubuntu@ip-172-31-21-116:~/namespacewala$ kubectl get pods
No resources found in default namespace.
ubuntu@ip-172-31-21-116:~/namespacewala$ kubectl get pods -n mynamespace
NAME      READY   STATUS    RESTARTS   AGE
nginxpod  1/1     Running   0           35s
ubuntu@ip-172-31-21-116:~/namespacewala$ |
```

kubectl config set-context - -current - - namespace mynamespace

#To creating custom namespace as default namespace

```
ubuntu@ip-172-31-21-116:~/namespacewala$ kubectl config set-context --current --namespace mynamespace
Context "kubernetes-admin@kubernetes" modified.
ubuntu@ip-172-31-21-116:~/namespacewala$ |
```

kubectl get pods

```
ubuntu@ip-172-31-21-116:~/namespacewala$ kubectl config set-context --current --namespace mynamespace
Context "kubernetes-admin@kubernetes" modified.
ubuntu@ip-172-31-21-116:~/namespacewala$ kubectl get pods
NAME      READY   STATUS    RESTARTS   AGE
nginxpod  1/1     Running   0           112s
ubuntu@ip-172-31-21-116:~/namespacewala$ |
```

kubectl config set-context - -current - -namespace default

kubectl get pods

```
ubuntu@ip-172-31-21-116:~/namespacewala$ kubectl config set-context --current --namespace default
Context "kubernetes-admin@kubernetes" modified.
ubuntu@ip-172-31-21-116:~/namespacewala$ kubectl get pods
No resources found in default namespace.
ubuntu@ip-172-31-21-116:~/namespacewala$ |
```

kubectl delete namespace mynamespace

```
ubuntu@ip-172-31-21-116:~/namespacewala$ kubectl delete pod nginxpod
Error from server (NotFound): pods "nginxpod" not found
ubuntu@ip-172-31-21-116:~/namespacewala$ kubectl delete pod nginxpod -n mynamespace
pod "nginxpod" deleted
```

```
ubuntu@ip-172-31-21-116:~/namespacewala$ kubectl delete namespace mynamespace --force
Warning: Immediate deletion does not wait for confirmation that the running resource has been terminated. The resource may continue to run on the cluster indefinitely.
namespace "mynamespace" force deleted
```

Namespace by .yaml file

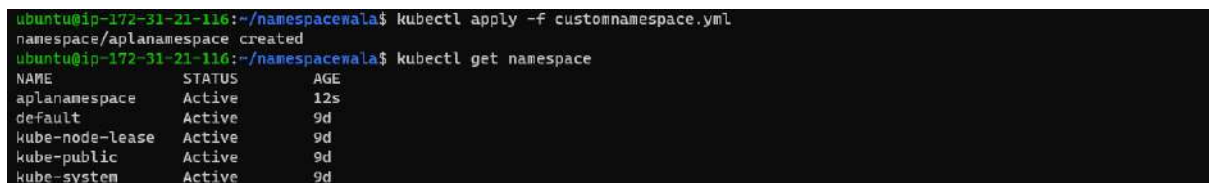
nano customnamespace.yaml



```
ubuntu@ip-172-31-21-116: ~/r X + -
GNU nano 7.2 customnamespace.yaml *
apiVersion: v1
kind: Namespace
metadata:
  name: aplanamespace|
```

kubectl apply -f customnamespace.yaml

kubectl get namespace



```
ubuntu@ip-172-31-21-116: ~/namespacewala$ kubectl apply -f customnamespace.yaml
namespace/aplanamespace created
ubuntu@ip-172-31-21-116: ~/namespacewala$ kubectl get namespace
NAME                STATUS    AGE
aplanamespace       Active    12s
default              Active    9d
kube-node-lease     Active    9d
kube-public          Active    9d
kube-system          Active    9d
```

Volume -

In Kubernetes, Volumes are used to provide persistent or ephemeral storage to containers running within Pods. Unlike container storage, which is ephemeral and tied to the lifecycle of a container, volumes allow data to persist beyond the container's lifecycle.

- emptyDir
- hostPath
- nfs
- persistent volume and persistent volume claim
- configmap
- secret

emptyDir:

emptyDir is a type of Kubernetes volume that is created when a Pod is assigned to a Node. As the name suggests, it starts out empty and is used as a temporary storage location for data. The data in an emptyDir volume is deleted when the Pod is terminated or removed. It's typically used for tasks like caching, temporary file storage, or storing data that doesn't need to persist across Pod restarts.

hostPath:

hostPath is a Kubernetes volume that mounts a file or directory from the host node's filesystem into the Pod. This allows the Pod to access data or configuration files from the host machine. It can be useful in scenarios where you need to access specific files from the host or interact with hardware devices on the host machine. However, it can have security implications, as it provides the Pod access to the host's filesystem.

nfs:

nfs (Network File System) is a volume type that allows Pods to access shared storage over a network. NFS volumes are used when you need to share data across multiple Pods or Nodes. This is helpful in situations where the data needs to be accessible by multiple Pods concurrently or when you want to store data externally.

Persistent Volume (PV) and Persistent Volume Claim (PVC):

- **Persistent Volume (PV):** A PV is a piece of storage in the cluster that has been provisioned by an administrator. It can be backed by various storage backends like NFS, cloud storage, or even local disks. The PV has a lifecycle independent of the Pods that use it.
- **Persistent Volume Claim (PVC):** A PVC is a request for storage by a user. It is similar to a Pod in the sense that it is a resource request for storage. A PVC binds to a PV that matches the requested size and access modes. Once a PVC is bound to a PV, the Pod can use the storage defined in the PV.

ConfigMap:

A ConfigMap is a Kubernetes object that allows you to store configuration data as key-value pairs. ConfigMaps provide a way to inject configuration into Pods without altering the container image. They are often used for environment variables, command-line arguments, or configuration files that Pods can reference at runtime. ConfigMaps help to decouple configuration from the application code, making it easier to manage and change settings without rebuilding or redeploying the application.

Secret:

A Secret is similar to a ConfigMap, but it is used to store sensitive information, such as passwords, API keys, or certificates. Kubernetes secrets are encoded in base64, and while they are more secure than plain text, you should still be careful with access control and encryption to protect sensitive data.

```

ubuntu@ip-172-31-21-116:~$ ls
autoscaling cronjob daemonsetwala healthprobe job jobwala statefulset
ubuntu@ip-172-31-21-116:~$ mkdir emptydir
ubuntu@ip-172-31-21-116:~$ cd emptydir/
ubuntu@ip-172-31-21-116:~/emptydir$ nano emptydirfile.yml

```

```

GNU nano 7.2 emptydirfile.yml
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: mypod2
spec:
  replicas: 5
  selector:
    matchLabels:
      app: dev
  template:
    metadata:
      labels:
        app: dev
    spec:
      containers:
        - image: nginx
          name: mycont
          ports:
            - containerPort: 80
          volumeMounts:
            - name: myvolume
              mountPath: /usr/share/nginx/html/
        - image: nginx
          name: mycont1
          ports:
            - containerPort: 90
          volumeMounts:
            - name: myvolume
              mountPath: /usr/share/nginx/html/
      volumes:
        - name: myvolume
          emptyDir: {}

```

```

ubuntu@ip-172-31-21-116:~/emptydir$ kubectl apply -f emptydirfile.yml
replicaset.apps/mypod2 created
ubuntu@ip-172-31-21-116:~/emptydir$ kubectl get pods
NAME          READY   STATUS    RESTARTS   AGE
mypod2-bkb5r  2/2     Running   0           5s
mypod2-dhxrw  2/2     Running   0           5s
mypod2-dpkfm  2/2     Running   0           5s
mypod2-ts24f  2/2     Running   0           5s
mypod2-zwgxp  2/2     Running   0           5s

```

```

ubuntu@ip-172-31-21-116:~/volume/emptydir$ cd ..
ubuntu@ip-172-31-21-116:~/volume$ mkdir hostpath
ubuntu@ip-172-31-21-116:~/volume$ cd hostpath
ubuntu@ip-172-31-21-116:~/volume/hostpath$ ls
ubuntu@ip-172-31-21-116:~/volume/hostpath$ |

```

```

ubuntu@ip-172-31-21-116:~$ cd volume
ubuntu@ip-172-31-21-116:~/volume$ ls
emptydir hostpath
ubuntu@ip-172-31-21-116:~/volume$ cd hostpath
ubuntu@ip-172-31-21-116:~/volume/hostpath$ ls
ubuntu@ip-172-31-21-116:~/volume/hostpath$ nano hostpathfile.yml
ubuntu@ip-172-31-21-116:~/volume/hostpath$ kubectl get all

```

```

GNU nano 7.2 hostpathfile.yml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: mydeploy
spec:
  replicas: 2
  selector:
    matchLabels:
      env: dev
  template:
    metadata:
      labels:
        env: dev
    spec:
      containers:
        - name: nginxcontainer
          image: nginx
          ports:
            - containerPort: 80
          volumeMounts:
            - mountPath: "/usr/share/nginx/html"
              name: myvolume
      volumes:
        - name: myvolume
          hostPath:
            path: /data
            type: DirectoryOrCreate

```

```
ubuntu@ip-172-31-21-116:~/volume/hostpath$ kubectl apply -f hostpathfile.yml
deployment.apps/mydeploy created
ubuntu@ip-172-31-21-116:~/volume/hostpath$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
mydeploy-7f4d64bc6b-j8mcw          1/1     Running   0           8s
mydeploy-7f4d64bc6b-k46h9          1/1     Running   0           8s
```

The screenshot shows the AWS Elastic File System (EFS) console. A green banner at the top indicates "Success: File system (fs-02831ad2ad482c80b) is available." The left sidebar shows navigation options: File systems, Access points, AWS Backup, AWS DataSync, AWS Transfer, and Documentation. The main content area displays a table of file systems with one entry:

| Name | File system ID | Encrypt | Total size | Size in Standard | Size in IA | Size in Archive | Provisioned Throughput (MiB/s) | File system state | Create time |
|-------|----------------------|---------|------------|------------------|------------|-----------------|--------------------------------|-------------------|-----------------------|
| myefs | fs-02831ad2ad482c80b | Encrypt | 6.00 KiB | 6.00 KiB | 0 Bytes | 0 Bytes | - | Available | Sat, 2 2024 15:56 GMT |

```
ubuntu@ip-172-31-94-46:~$ mkdir myvolume
ubuntu@ip-172-31-94-46:~$ ls
myvolume
ubuntu@ip-172-31-94-46:~$
```

The screenshot shows the "Edit inbound rules" page in the AWS IAM console. The page title is "Edit inbound rules" and it includes a sub-header "Inbound rules control the incoming traffic that's allowed to reach the instance." The main content area displays a table of inbound rules:

| Security group rule ID | Type | Protocol | Port range | Source | Description - optional |
|------------------------|-------------|----------|------------|--------|------------------------|
| sgr-0d6c7d8e8981e434b | All traffic | ALL | ALL | Custom | |
| sgr-0934674f8907c5d2 | HTTP | TCP | 80 | Custom | sg-0d6c7d8e8981e434b |
| - | NFS | TCP | 2049 | Custom | sg-089909938164c538b |

At the bottom, there is a warning message: "Rules with source of 0.0.0.0/0 or ::/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only." Below the warning are buttons for "Cancel", "Preview changes", and "Save rules".

```

ubuntu@ip-172-31-94-46:~$ sudo apt-get update
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:4 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Hit:5 https://prod-cdn.packages.k8s.io/repositories/iso/kubernetes/core/stable/v1.30/deb InRelease
Get:6 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [761 kB]
Get:7 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main Translation-en [173 kB]
Get:8 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 Components [151 kB]
Get:9 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Packages [965 kB]
Get:10 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe Translation-en [238 kB]
Get:11 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [389 kB]
Get:12 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Packages [572 kB]
Get:13 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted Translation-en [118 kB]
Get:14 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Components [212 B]
Get:15 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [948 B]
Get:16 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [288 B]
Get:17 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/universe amd64 Components [11.7 kB]
Get:18 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Components [216 B]
Get:19 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [212 B]
Get:20 http://security.ubuntu.com/ubuntu noble-security/main amd64 Packages [572 kB]
Get:21 http://security.ubuntu.com/ubuntu noble-security/main Translation-en [111 kB]
Get:22 http://security.ubuntu.com/ubuntu noble-security/main amd64 Components [7232 B]
Get:23 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Packages [795 kB]
Get:24 http://security.ubuntu.com/ubuntu noble-security/universe Translation-en [169 kB]
Get:25 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Components [52.8 kB]
Get:26 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Packages [566 kB]
Get:27 http://security.ubuntu.com/ubuntu noble-security/restricted Translation-en [188 kB]
Get:28 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Components [212 B]
Get:29 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Components [288 B]
Fetched 6846 kB in 2s (3272 kB/s)
Reading package lists... Done
ubuntu@ip-172-31-94-46:~$

```

```

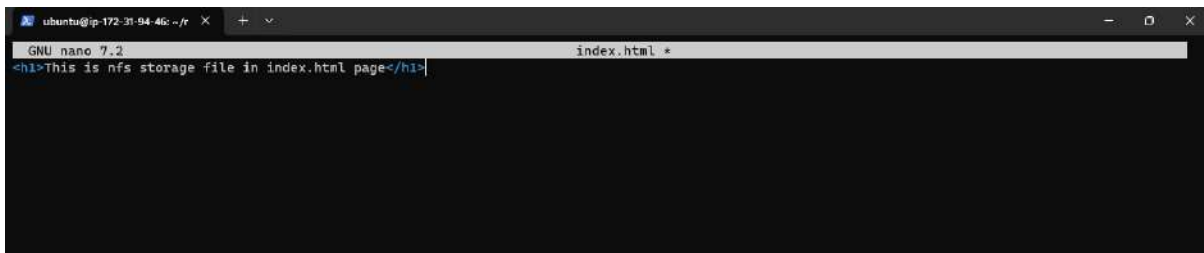
ubuntu@ip-172-31-94-46:~$ sudo apt-get install nfs-common
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  keyutils libnfsidmap1 rpcbind
Suggested packages:
  watchdog
The following NEW packages will be installed:
  keyutils libnfsidmap1 nfs-common rpcbind
0 upgraded, 4 newly installed, 0 to remove and 44 not upgraded.
Need to get 480 kB of archives.
After this operation, 1416 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 libnfsidmap1 amd64 1:2.6.4-3ubuntu5 [48.2 kB]
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 rpcbind amd64 1.2.6-7ubuntu2 [46.5 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 keyutils amd64 1.6.3-3build1 [56.8 kB]
Get:4 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 nfs-common amd64 1:2.6.4-3ubuntu5 [248 kB]
Fetched 480 kB in 0s (15.0 MB/s)
Selecting previously unselected package libnfsidmap1:amd64.
(Reading database ... 101626 files and directories currently installed.)
Preparing to unpack .../libnfsidmap1_1%3a2.6.4-3ubuntu5_amd64.deb ...
Unpacking libnfsidmap1:amd64 (1:2.6.4-3ubuntu5) ...
Selecting previously unselected package rpcbind.
Preparing to unpack .../rpcbind_1.2.6-7ubuntu2_amd64.deb ...
Unpacking rpcbind (1.2.6-7ubuntu2) ...
Selecting previously unselected package keyutils.
Preparing to unpack .../keyutils_1.6.3-3build1_amd64.deb ...
Unpacking keyutils (1.6.3-3build1) ...
Selecting previously unselected package nfs-common.
Preparing to unpack .../nfs-common_1%3a2.6.4-3ubuntu5_amd64.deb ...
Unpacking nfs-common (1:2.6.4-3ubuntu5) ...
Setting up libnfsidmap1:amd64 (1:2.6.4-3ubuntu5) ...
Setting up rpcbind (1.2.6-7ubuntu2) ...
Created symlink /etc/systemd/system/multi-user.target.wants/rpcbind.service → /usr/lib/systemd/system/rpcbind.service.
Created symlink /etc/systemd/system/sockets.target.wants/rpcbind.socket → /usr/lib/systemd/system/rpcbind.socket.

```

```

ubuntu@ip-172-31-94-46:~$ sudo mount -t nfs4 -o nfsvers=4.1,rsize=1048576,wsize=1048576,hard,timeo=600,retrans=2,noresvport fs-02831ad2ad482c80b.efs.us-east-1.amazonaws.com: /myvolume
ubuntu@ip-172-31-94-46:~$

```



```

ubuntu@ip-172-31-94-46:~/myvolume$ sudo rm index.html
ubuntu@ip-172-31-94-46:~/myvolume$ ls
ubuntu@ip-172-31-94-46:~/myvolume$ sudo mkdir test
ubuntu@ip-172-31-94-46:~/myvolume$ cd test
ubuntu@ip-172-31-94-46:~/myvolume/test$ sudo nano index.html
ubuntu@ip-172-31-94-46:~/myvolume/test$

```



```
GNU nano 7.2                                nfsfile.yml
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: mypod2
spec:
  replicas: 3
  selector:
    matchLabels:
      app: dev
  template:
    metadata:
      labels:
        app: dev
    spec:
      containers:
        - image: nginx
          name: mycont
          ports:
            - containerPort: 80
          volumeMounts:
            - name: myvolume
              mountPath: /usr/share/nginx/html/
      volumes:
        - name: myvolume
          nfs:
            server: fs-02831ad2ad482c80b.efs.us-east-1.amazonaws.com
            path: /test
```

```
ubuntu@ip-172-31-21-116:~$ kubectl apply -f nfsfile.yml
replicaset.apps/mypod2 created
ubuntu@ip-172-31-21-116:~$ kubectl get pods
NAME          READY   STATUS    RESTARTS   AGE
mypod2-q4c6g  1/1     Running   0           7s
mypod2-sxxzd  1/1     Running   0           7s
mypod2-x4bpj  1/1     Running   0           7s
ubuntu@ip-172-31-21-116:~$
```

```
Environment:  <none>
Mounts:
  /usr/share/nginx/html/ from myvolume (rw)
  /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-4tcjn (ro)
Conditions:
  Type                 Status
  PodReadyToStartContainers  True
  Initialized           True
  Ready                 True
  ContainersReady       True
  PodScheduled          True
Volumes:
  myvolume:
    Type:  NFS (an NFS mount that lasts the lifetime of a pod)
    Server: fs-02831ad2ad482c80b.efs.us-east-1.amazonaws.com
    Path:  /test
    ReadOnly: false
  kube-api-access-4tcjn:
    Type:  Projected (a volume that contains injected data from multiple sources)
    TokenExpirationSeconds: 3607
    ConfigMapName: kube-root-ca.crt
    ConfigMapOptional: <nil>
    DownwardAPI: true
QoS Class:  BestEffort
Node-Selectors:  <none>
Tolerations:  node.kubernetes.io/not-ready:NoExecute op=Exists for 300s
               node.kubernetes.io/unreachable:NoExecute op=Exists for 300s
Events:
  Type     Reason      Age   From          Message
  ----     ------      ---   -
  Normal   Scheduled   40s   default-scheduler   Successfully assigned default/mypod2-q4c6g to ip-172-31-94-46
  Normal   Pulling     39s   kubelet         Pulling image "nginx"
  Normal   Pulled      39s   kubelet         Successfully pulled image "nginx" in 113ms (113ms including waiting). Image size: 72999410 bytes.
  Normal   Created     39s   kubelet         Created container mycont
  Normal   Started     39s   kubelet         Started container mycont
  Normal   Killing     38s   kubelet         Stopping container mycont
ubuntu@ip-172-31-21-116:~$
```

```
ubuntu@ip-172-31-21-116:~$ kubectl exec -it mypod2-q4c6g -- /bin/bash
root@mypod2-q4c6g:/# cd /usr/share/nginx/html
root@mypod2-q4c6g: /usr/share/nginx/html# ls
index.html
root@mypod2-q4c6g: /usr/share/nginx/html# cat index.html
<h1>This is nfs storage file in index.html page</h1>
root@mypod2-q4c6g: /usr/share/nginx/html#
```

```
ubuntu@ip-172-31-21-116:~$ kubectl get all
NAME          READY   STATUS    RESTARTS   AGE
pod/mypod2-q4c6g  1/1     Running   0           2m18s
pod/mypod2-sxxzd  1/1     Running   0           2m18s
pod/mypod2-x4bpj  1/1     Running   0           2m18s

NAME          TYPE          CLUSTER-IP   EXTERNAL-IP   PORT(S)    AGE
service/kubernetes  ClusterIP   10.96.0.1    <none>        443/TCP    7m58s

NAME          DESIRED   CURRENT   READY   AGE
replicaset.apps/mypod2  3         3         3       2m18s
ubuntu@ip-172-31-21-116:~$
```



```

ubuntu@ip-172-31-21-116:~$ cd volume
ubuntu@ip-172-31-21-116:~/volume$ ls
emptydir hostpath nfsdala
ubuntu@ip-172-31-21-116:~/volume$ mkdir configmap
ubuntu@ip-172-31-21-116:~/volume$ ls
configmap emptydir hostpath nfsdala
ubuntu@ip-172-31-21-116:~/volume$ cd configmap/
ubuntu@ip-172-31-21-116:~/volume/configmap$ |

```

```

GNU nano 7.2 mysqlwala.yml *
apiVersion: v1
kind: Pod
metadata:
  name: mysqlwala
spec:
  containers:
  - name: mysqlcontainer
    image: mysql:8.0
    env:
    - name: MYSQL_ROOT_PASSWORD
      valueFrom:
        configMapKeyRef:
          name: mysql-config
          key: mysql-password

```

```

ubuntu@ip-172-31-21-116:~/volume/configmap$ kubectl create configmap mysql-config --from-literal mysql-password=Pass@123
configmap/mysql-config created

```

```

ubuntu@ip-172-31-21-116:~/volume/configmap$ kubectl get configmap
NAME          DATA  AGE
kube-root-ca.crt  1     13d
mysql-config    1     27s

```

```

ubuntu@ip-172-31-21-116:~/volume/configmap$ kubectl apply -f mysqlwala.yml
pod/mysqlwala created

```

```

ubuntu@ip-172-31-21-116:~/volume/configmap$ kubectl get pods
NAME          READY  STATUS   RESTARTS  AGE
mysqlwala     1/1    Running  0         21s

```

```

GNU nano 7.2 genericcreate.yml
apiVersion: v1
kind: Pod
metadata:
  name: secretwala
spec:
  containers:
  - name: mysqlwalacontainer
    image: mysql:8.0
    env:
    - name: MYSQL_ROOT_PASSWORD
      valueFrom:
        secretKeyRef:
          name: mygenericsecret
          key: mysql-password

```

```

ubuntu@ip-172-31-21-116:~/volume/secret$ kubectl create secret generic mygenericsecret --from-literal=mysql-password=Pass@123
secret/mygenericsecret created

```

```

ubuntu@ip-172-31-21-116:~/volume/secret$ kubectl apply -f genericcreate.yml
pod/secretwala created
ubuntu@ip-172-31-21-116:~/volume/secret$ kubectl get pods
NAME          READY  STATUS   RESTARTS  AGE
secretwala    1/1    Running  0         6s
ubuntu@ip-172-31-21-116:~/volume/secret$ |

```

```

ubuntu@ip-172-31-21-116:~/pv$ nano pvfile.yml
ubuntu@ip-172-31-21-116:~/pv$ kubectl apply -f pvfile.yml
persistentvolume/mypv created
ubuntu@ip-172-31-21-116:~/pv$ |

```

Amazon EFS > File systems

File systems (1) View details Delete Create file system

Filter by property values

| | Name | File system ID | Encrypt | Total size | Size in Standard | Size in IA | Size in Archive | Provisioned Throughput (MiB/s) | File system state | Create time |
|--|--------|----------------------|---------|------------|------------------|------------|-----------------|--------------------------------|-------------------|---------------------|
| | my_efs | fs-05d7f845b3d6afa57 | Encrypt | 6.00 KiB | 6.00 KiB | 0 Bytes | 0 Bytes | - | Available | Sun, 2024 05:15 GMT |

Edit inbound rules

Inbound rules control the incoming traffic that's allowed to reach the instance.

Inbound rules

| Security group rule ID | Type | Protocol | Port range | Source | Description - optional | |
|------------------------|-------------|----------|------------|--------|------------------------|--------|
| sgr-005c108689b1e434b | All traffic | ALL | ALL | Custom | | Delete |
| sgr-0934674f8907c55d2 | HTTP | TCP | 80 | Custom | | Delete |
| sgr-0a618ac11b62d486 | NFS | TCP | 2048 | Custom | | Delete |

[Add rule](#)

Rules with source of 0.0.0.0/0 or ::/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.

[Cancel](#) [Preview changes](#) [Save rules](#)

```
ubuntu@ip-172-31-94-46:~$ #workernode
ubuntu@ip-172-31-94-46:~$ ls
syvolume
ubuntu@ip-172-31-94-46:~$ mkdir mydir
ubuntu@ip-172-31-94-46:~$ ls
mydir syvolume
ubuntu@ip-172-31-94-46:~$ sudo mount -t nfs4 -o nfsvers=4.1,rsize=1048576,wsize=1048576,hard,timeo=600,retrans=2,noresvport fs-05d7f845b3d6afa57.efs.us-east-1.amazonaws.com:/ ~/mydir/
ubuntu@ip-172-31-94-46:~$
```

```
ubuntu@ip-172-31-94-46:~$ sudo apt-get update
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:5 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Hit:4 https://prod-cdn.packages.k8s.io/repositories/isyv/kubernetes:/core:/stable:/v1.30/deb InRelease
Get:6 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 Components [151 kB]
Get:7 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [309 kB]
Get:8 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Components [212 B]
Get:9 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [940 B]
Get:10 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [208 B]
Get:11 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/universe amd64 Components [11.7 kB]
Get:12 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Components [216 B]
Get:13 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [212 B]
Get:14 http://security.ubuntu.com/ubuntu noble-security/main amd64 Components [7224 B]
Get:15 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Components [52.0 kB]
Get:16 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Components [212 B]
Get:17 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Components [212 B]
Fetched 912 kB in 1s (815 kB/s)
Reading package lists... Done
ubuntu@ip-172-31-94-46:~$
```

```
ubuntu@ip-172-31-94-46:~$ sudo apt-get install nfs-common
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
nfs-common is already the newest version (1:2.6.4-3ubuntu5).
0 upgraded, 0 newly installed, 0 to remove and 44 not upgraded.
ubuntu@ip-172-31-94-46:~$
```

```
GNU nano 7.2                                index.html *
<h1>This is pv&pvc efs storage efs index.html file</h1>
```

```
ubuntu@ip-172-31-94-46:~$ cd mydir
ubuntu@ip-172-31-94-46:~/mydir$ sudo mkdir test
ubuntu@ip-172-31-94-46:~/mydir$ cd test
ubuntu@ip-172-31-94-46:~/mydir/test$ sudo nano index.html
ubuntu@ip-172-31-94-46:~/mydir/test$ |
```

```
GNU nano 7.2                                pvfile.yml *
apiVersion: v1
kind: PersistentVolume
metadata:
  name: mypv
  labels:
  app: dev
spec:
  capacity:
    storage: 28Gi
  accessModes:
    - ReadWriteOnce
  persistentVolumeReclaimPolicy: Retain
  nfs:
    server: fs-65d7f845b3d6afa57.efs.us-east-1.amazonaws.com
    path: /test
```

```
ubuntu@ip-172-31-21-116:~/pv$ nano pvfile.yml
ubuntu@ip-172-31-21-116:~/pv$ kubectl apply -f pvfile.yml
persistentvolume/mypv created
ubuntu@ip-172-31-21-116:~/pv$ |
```

```
GNU nano 7.2                                pvcfile.yml *
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: mypvc
  labels:
  app: dev
spec:
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: 10Gi
  selector:
    matchLabels:
      app: dev
```

```
ubuntu@ip-172-31-21-116:~/pv$ nano pvcfile.yml
ubuntu@ip-172-31-21-116:~/pv$ kubectl apply -f pvcfile.yml
persistentvolumeclaim/mypvc created
ubuntu@ip-172-31-21-116:~/pv$ |
```

```
ubuntu@ip-172-31-21-116:~/pv$ kubectl get pv
NAME      CAPACITY  ACCESS MODES  RECLAIM POLICY  STATUS  CLAIM                STORAGECLASS  VOLUMEATTRIBUTESCLASS  REASON  AGE
mypv      28Gi      RWO           Retain          Bound   default/mypvc        <unset>
ubuntu@ip-172-31-21-116:~/pv$ kubectl get pvc
NAME      STATUS  VOLUME  CAPACITY  ACCESS MODES  STORAGECLASS  VOLUMEATTRIBUTESCLASS  AGE
mypvc     Bound   mypv    28Gi      RWO           <unset>
ubuntu@ip-172-31-21-116:~/pv$ |
```

```

GNU nano 7.2 podfile.yml *
apiVersion: v1
kind: Pod
metadata:
  name: mypod
  labels:
    app: dev
spec:
  containers:
    - image: nginx
      name: mycont
      ports:
        - containerPort: 80
      volumeMounts:
        - name: my-volume
          mountPath: /usr/share/nginx/html
  volumes:
    - name: my-volume
      persistentVolumeClaim:
        claimName: mypvc

```

```

ubuntu@ip-172-31-21-116:~/pv$ nano podfile.yml
ubuntu@ip-172-31-21-116:~/pv$ kubectl apply -f podfile.yml
pod/mypod created
ubuntu@ip-172-31-21-116:~/pv$ |

```

```

ubuntu@ip-172-31-21-116:~/pv$ kubectl get pods
NAME      READY   STATUS    RESTARTS   AGE
mypod     1/1     Running   0           24s
ubuntu@ip-172-31-21-116:~/pv$ |

```

```

ubuntu@ip-172-31-21-116:~/pv$ kubectl exec -it mypod -- /bin/bash
root@mypod:/# cd /usr/share/nginx/html
root@mypod:/usr/share/nginx/html# ls
index.html
root@mypod:/usr/share/nginx/html# |

```

DaemonSet –

A daemonSet in Kubernetes ensures that a copy of a specific Pod is running on all (or some) nodes in a cluster. It's commonly used to deploy system-level workloads like logging agents, monitoring daemons, or other infrastructure-related components.

Key Features of DaemonSet :

- **Node-Level Deployment:** Ensures that one Pod is running on each eligible node.
- **Dynamic Scaling:** Automatically deploys Pods to new nodes when they are added to the cluster.
- **Selective Deployment:** Can be restricted to specific nodes using node selectors, affinity rules, or taints and tolerations.
- **Self-Healing:** Automatically redeploys Pods if they fail or if the node, they are on becomes unavailable.

```
ubuntu@ip-172-31-21-116:~$ cd daemonsetwala/  
ubuntu@ip-172-31-21-116:~/daemonsetwala$ ls  
ubuntu@ip-172-31-21-116:~/daemonsetwala$ nano daemonsetfiel.yml
```

```
GNU nano 7.2 daemonsetfiel.yml  
apiVersion: apps/v1  
kind: DaemonSet  
metadata:  
  name: daemonwala  
  labels:  
    app: promi  
spec:  
  selector:  
    matchLabels:  
      app: promi  
  template:  
    metadata:  
      labels:  
        app: promi  
    spec:  
      containers:  
        - name: daemonwala  
          image: influxdb  
          ports:  
            - containerPort: 80
```

```
ubuntu@ip-172-31-21-116:~/daemonsetwala$ kubectl apply -f daemonsetfiel.yml  
daemonset.apps/daemonwala created
```

```
ubuntu@ip-172-31-21-116:~/daemonsetwala$ kubectl get ds  
NAME          DESIRED   CURRENT   READY   UP-TO-DATE   AVAILABLE   NODE SELECTOR   AGE  
daemonwala    1         1         1       1            1           <none>          2m20s  
ubuntu@ip-172-31-21-116:~/daemonsetwala$ kubectl get pods  
NAME          READY   STATUS    RESTARTS   AGE  
daemonwala-c2ng4  1/1     Running   0          2m25s  
ubuntu@ip-172-31-21-116:~/daemonsetwala$
```

Jobs –

A Job creates one or more Pods and will continue to retry execution of the Pods until a specified number of them successfully terminate. As pods successfully complete, the Job tracks the successful completions. When a specified number of successful completions is reached, the task (ie, Job) is complete. Deleting a Job will clean up the Pods it created. Suspending a Job will delete its active Pods until the Job is resumed again.

Definition: A Kubernetes Job is a higher-level abstraction that manages one or more Pods to ensure a task runs to completion successfully.

Purpose: Ideal for batch or one-time tasks like data processing, backups, or running scripts.

Lifecycle: The Job ensures that the specified number of Pods complete successfully.

```
GNU nano 7.2 jobfile.yml
apiVersion: batch/v1
kind: Job
metadata:
  name: hellojob
spec:
  template:
    metadata:
      labels:
        app: hello
    spec:
      containers:
        - name: hello
          image: busybox
          command: ["sh", "-c", "echo hello, k8s"]
          restartPolicy: Never
      backoffLimit: 4

ubuntu@ip-172-31-21-116:~/job$ ls
jobfile.yml
ubuntu@ip-172-31-21-116:~/job$ kubectl apply -f jobfile.yml
job.batch/hellojob created
ubuntu@ip-172-31-21-116:~/job$ kubectl get pods
NAME                                READY    STATUS    RESTARTS   AGE
daemonwala-c2ng4                   1/1      Running   0           8m28s

ubuntu@ip-172-31-21-116:~/job$ ls
jobfile.yml  jobfile1.yml
ubuntu@ip-172-31-21-116:~/job$ nano jobfile1.yml
ubuntu@ip-172-31-21-116:~/job$ |
```

```
GNU nano 7.2 jobfile1.yml
apiVersion: batch/v1
kind: Job
metadata:
  name: myjob
spec:
  completions: 3
  parallelism: 2
  template:
    metadata:
      labels:
        app: myapp
    spec:
      restartPolicy: OnFailure
      containers:
        - name: mycont
          image: luksa/batch-job

ubuntu@ip-172-31-21-116:~/job$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
example-statefulset-0              0/1     Pending   0           15h
myjob-bkjc7                         1/1     Running   0           37s
myjob-lrjtz                         1/1     Running   0           37s
ubuntu@ip-172-31-21-116:~/job$
```

Cronjob –

A cron job is a scheduled task in Unix-like operating systems that allows you to automate repetitive tasks at specified times or intervals. These tasks are executed by the cron daemon.

```
GNU nano 7.2 cronjobFile.yml
apiVersion: batch/v1
kind: CronJob
metadata:
  name: myjob
spec:
  schedule: "*/3 * * * *"
  jobTemplate:
    spec:
      template:
        metadata:
          labels:
            app: myapp
        spec:
          restartPolicy: OnFailure
          containers:
            - name: mycont
              image: luksa/batch-job

ubuntu@ip-172-31-21-116:~/cronjob$ kubectl get cronjob
error: the server doesn't have a resource type "cronjob"
ubuntu@ip-172-31-21-116:~/cronjob$ kubectl get pods --watch
NAME                                READY   STATUS    RESTARTS   AGE
myjob-28921194-qc48x               1/1     Running   0           92s
myjob-28921194-qc48x               0/1     Completed 0           2m1s
myjob-28921194-qc48x               0/1     Completed 0           2m2s
myjob-28921194-qc48x               0/1     Completed 0           2m2s
myjob-28921194-qc48x               0/1     Completed 0           2m3s

ubuntu@ip-172-31-21-116:~/cronjob$ kubectl get cronjob
error: the server doesn't have a resource type "cronjob"
ubuntu@ip-172-31-21-116:~/cronjob$ kubectl get pods --watch
NAME                                READY   STATUS    RESTARTS   AGE
myjob-28921194-qc48x               1/1     Running   0           92s
myjob-28921194-qc48x               0/1     Completed 0           2m1s
myjob-28921194-qc48x               0/1     Completed 0           2m2s
myjob-28921194-qc48x               0/1     Completed 0           2m2s
myjob-28921194-qc48x               0/1     Completed 0           2m3s
```


StatefulSet -

A StatefulSet is a Kubernetes API object used to manage and deploy applications that require stable and unique network identifiers, persistent storage, and ordered or graceful deployment and scaling. It's ideal for stateful applications like databases, messaging systems, and distributed systems.

Key Features of StatefulSet:

1. Stable Pod Identity:
 - Each pod in a StatefulSet gets a unique, stable hostname and identity (e.g., pod-name-0, pod-name-1).
 - This identity persists across pod restarts.
2. Stable Storage:
 - Each pod can be associated with its own PersistentVolume (PV), ensuring data persists even if the pod is rescheduled or restarted.
3. Ordered Deployment and Scaling:
 - Pods are deployed, updated, or deleted sequentially.
 - Ensures that dependent systems can rely on the order of operations.
4. Graceful Rollout and Termination:
 - Pods are scaled up or down gracefully to ensure consistent application behavior.
5. DNS Management:
 - StatefulSets automatically assign DNS names to pods, simplifying service discovery

```
ubuntu@ip-172-31-21-116:~$ cd statefulset/
ubuntu@ip-172-31-21-116:~/statefulset$ ls
pvfile.yml  statefulset.yaml
ubuntu@ip-172-31-21-116:~/statefulset$ nano statefulset.yaml
ubuntu@ip-172-31-21-116:~/statefulset$ kubectl apply -f statefulset.yaml
statefulset.apps/mypod3 created
ubuntu@ip-172-31-21-116:~/statefulset$ kubectl get pods
NAME          READY   STATUS    RESTARTS   AGE
mypod3-0      1/1     Running   0           5s
mypod3-1      1/1     Running   0           4s
mypod3-2      1/1     Running   0           3s
ubuntu@ip-172-31-21-116:~/statefulset$
```



```
GNU nano 7.2 statefulset.yaml
apiVersion: apps/v1
kind: StatefulSet
metadata:
  name: mypod3
spec:
  replicas: 3
  serviceName: mypod-service
  selector:
    matchLabels:
      app: dev
  template:
    metadata:
      labels:
        app: dev
    spec:
      containers:
        - image: nginx
          name: mycont
          ports:
            - containerPort: 80
```

Horizontal Pod Autoscaling –

In Kubernetes, a *HorizontalPodAutoscaler* automatically updates a workload resource (such as deployment or statefulset), with the aim of automatically scaling the workload to match demand.

Horizontal scaling means that the response to increased load is to deploy more pods. This is different from *vertical* scaling, which for Kubernetes would mean assigning more resources (for example: memory or CPU) to the Pods that are already running for the workload.

If the load decreases, and the number of Pods is above the configured minimum, the HorizontalPodAutoscaler instructs the workload resource (the Deployment, StatefulSet, or other similar resource) to scale back down.

Horizontal pod autoscaling does not apply to objects that can't be scaled (for example: a daemonset.)

The HorizontalPodAutoscaler is implemented as a Kubernetes API resource and a controller. The resource determines the behavior of the controller. The horizontal pod autoscaling controller, running within the Kubernetes control plane, periodically adjusts the desired scale of its target (for example, a Deployment) to match observed metrics such as average CPU utilization, average memory utilization, or any other custom metric you specify.

```
ubuntu@ip-172-31-21-116:~$ mkdir autoscaling
ubuntu@ip-172-31-21-116:~$ cd autoscaling/
ubuntu@ip-172-31-21-116:~/autoscaling$ ls
ubuntu@ip-172-31-21-116:~/autoscaling$ nano components.yml
ubuntu@ip-172-31-21-116:~/autoscaling$ kubectl apply -f components.yml
```

```
GNU nano 7.2 components.yml
apiVersion: v1
kind: ServiceAccount
metadata:
  labels:
    k8s-app: metrics-server
  name: metrics-server
  namespace: kube-system
---
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRole
metadata:
  labels:
    k8s-app: metrics-server
  rbac.authorization.k8s.io/aggregate-to-admin: "true"
  rbac.authorization.k8s.io/aggregate-to-edit: "true"
  rbac.authorization.k8s.io/aggregate-to-view: "true"
  name: system:aggregated-metrics-reader
rules:
- apiGroups:
  - metrics.k8s.io
  resources:
  - pods
  - nodes
  verbs:
  - get
  - list
  - watch
---
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRole
metadata:
  labels:
    k8s-app: metrics-server
```

```
ubuntu@ip-172-31-21-116:~/autoscaling$ kubectl get pods -n kube-system
NAME                                READY    STATUS    RESTARTS   AGE
calico-kube-controllers-6cdb97b867-zk6tr  1/1      Running   16 (5m6s ago)    17d
calico-node-8k8bg                       0/1      Running   120 (51s ago)    17d
calico-node-j5mqz                       0/1      Running   125 (2m58s ago)  17d
coredns-55cb58b774-84665               1/1      Running   16 (5m6s ago)    17d
coredns-55cb58b774-vhn2b               1/1      Running   3 (5m6s ago)     3d22h
etcd-ip-172-31-21-116                  1/1      Running   15 (5m6s ago)    17d
kube-apiserver-ip-172-31-21-116         1/1      Running   15 (5m6s ago)    17d
kube-controller-manager-ip-172-31-21-116 1/1      Running   15 (5m6s ago)    17d
kube-proxy-96fds                       1/1      Running   134 (64s ago)    17d
kube-proxy-d57zp                       0/1      CrashLoopBackOff 134 (54s ago)    17d
kube-scheduler-ip-172-31-21-116         1/1      Running   15 (5m6s ago)    17d
metrics-server-554cf459c5-9njq9        1/1      Running   0             2m23s
ubuntu@ip-172-31-21-116:~/autoscaling$
```

```
ubuntu@ip-172-31-21-116:~/autoscaling$ nano mynginx.yml
ubuntu@ip-172-31-21-116:~/autoscaling$ kubectl apply -f mynginx.yml
deployment.apps/mydeployment created
ubuntu@ip-172-31-21-116:~/autoscaling$ kubectl get pods
NAME                                READY    STATUS    RESTARTS   AGE
mydeployment-545fc4bd99-727ds       1/1      Running   0           5s
ubuntu@ip-172-31-21-116:~/autoscaling$
```

```
GNU nano 7.2                                mynginx.yml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: mydeployment
spec:
  replicas: 1
  strategy:
    type: RollingUpdate
    rollingUpdate:
      maxSurge: 2
      maxUnavailable: 0
  selector:
    matchLabels:
      env: dev
  template:
    metadata:
      labels:
        env: dev
    spec:
      containers:
        - name: nginxcontaine
          image: nginx
          ports:
            - containerPort: 80
          resources:
            requests:
              cpu: "100m"
            limits:
              cpu: "500m"
```

```
ubuntu@ip-172-31-21-116:~/autoscaling$ nano hpafile.yml
ubuntu@ip-172-31-21-116:~/autoscaling$ kubectl apply -f hpafile.yml
Command 'kubectl' not found, did you mean:
  command 'kubectl' from snap kubectl (1.31.4)
See 'snap info <snapname>' for additional versions.
ubuntu@ip-172-31-21-116:~/autoscaling$ kubectl apply -f hpafile.yml
horizontalpodautoscaler.autoscaling/nginxhpa created
ubuntu@ip-172-31-21-116:~/autoscaling$
```

```
GNU nano 7.2                                hpafile.yml
apiVersion: autoscaling/v2
kind: HorizontalPodAutoscaler
metadata:
  name: nginxhpa
spec:
  scaleTargetRef:
    apiVersion: apps/v1
    kind: Deployment
    name: mydeployment
  minReplicas: 2
  maxReplicas: 6
  metrics:
    - type: Resource
      resource:
        name: cpu
        target:
          type: Utilization
          averageUtilization: 10
```

```
ubuntu@ip-172-31-21-116:~/autoscaling$ kubectl get hpa
NAME      REFERENCE                TARGETS      MINPODS  MAXPODS  REPLICAS  AGE
nginxhpa  Deployment/mydeployment   cpu: <unknown>/10%    2         6         2         69s
ubuntu@ip-172-31-21-116:~/autoscaling$
```

```
ubuntu@ip-172-31-21-116:~/autoscaling$ kubectl get pods
NAME                                READY    STATUS    RESTARTS   AGE
mydeployment-545fc4bd99-727ds       1/1      Running   0           3m55s
mydeployment-545fc4bd99-kpfbh       1/1      Running   0           86s
ubuntu@ip-172-31-21-116:~/autoscaling$
```

```

ubuntu@ip-172-31-21-116:~/autoscaling$ kubectl run trafficpod --image=busybox -- /bin/sh -c "while true; do wget -q -O - http://192.168.205.179; done"
pod/trafficpod created
ubuntu@ip-172-31-21-116:~/autoscaling$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
mydeployment-545fc4bd99-727ds       1/1     Running   0           9m28s
mydeployment-545fc4bd99-kpfbh       1/1     Running   0           6m51s
trafficpod                           1/1     Running   0           7s
ubuntu@ip-172-31-21-116:~/autoscaling$

```

```

ubuntu@ip-172-31-21-116:~/autoscaling$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
cpu-stress                          1/1     Running   0           3m
mydeployment-545fc4bd99-4v8s8       1/1     Running   0           4m59s
mydeployment-545fc4bd99-kpfbh       1/1     Running   0           16m
trafficpod                           1/1     Running   0           9m29s
trafficpod2                          1/1     Running   0           5m32s
ubuntu@ip-172-31-21-116:~/autoscaling$

```

Ingress –

Ingress in the context of Kubernetes refers to a set of rules that govern how external access to services within a Kubernetes cluster is managed. It acts as an entry point to the cluster, routing external HTTP/HTTPS traffic to the appropriate services.

Benefits of Using Ingress:

1. **Single Entry Point:** Centralized management of external access.
2. **Load Balancing:** Balances traffic across services.
3. **TLS/SSL Termination:** Secure communication with HTTPS.
4. **Path-Based Routing:** Route traffic based on URL paths.
5. **Name-Based Virtual Hosting:** Use multiple domain names to access different services.

```
ubuntu@ip-172-31-21-116:~$ mkdir ingress
ubuntu@ip-172-31-21-116:~$ cd ingress
ubuntu@ip-172-31-21-116:~/ingress$ ls
ubuntu@ip-172-31-21-116:~/ingress$ nano ingressfile.yml
ubuntu@ip-172-31-21-116:~/ingress$ kubectl apply -f ingressfile.yml
ingress.networking.k8s.io/myingress created
```

```
GNU nano 7.2 ingressfile.yml
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  name: myingress
spec:
  rules:
  - host: tujanena.com
    http:
      paths:
      - path: /
        pathType: Prefix
        backend:
          service:
            name: myservice1
            port:
              number: 80
  - host: example.com
    http:
      paths:
      - path: /
        pathType: Prefix
        backend:
          service:
            name: myservice2
            port:
              number: 80
```

```
ubuntu@ip-172-31-21-116:~/ingress$ kubectl get ingress
NAME          CLASS          HOSTS          ADDRESS          PORTS          AGE
myingress     <none>         tujanena.com,example.com          80            3m1s
```