

CKA Hands-on Labs

Docker Installation:

```
txp@ip-172-31-33-230:~| log | +  
txp@ip-172-31-33-230:~$ sudo apt update  
sudo apt install -y ca-certificates curl gnupg  
sudo install -m 0755 -d /etc/apt/keyrings  
curl https://download.docker.com/linux/ubuntu/gpg | \  
  sudo gpg --dearmor -o /etc/apt/keyrings/docker.gpg  
sudo chmod a+r /etc/apt/keyrings/docker.gpg  
echo \  
"deb [arch=$dpkg --print-architecture] \  
signed-by=/etc/apt/keyrings/docker.gpg \  
http://download.docker.com/linux/ubuntu \  
$UbuntuRelease <> stable" \  
sudo tee /etc/apt/sources.list.d/docker.list > /dev/null  
sudo apt update  
sudo apt install -y docker-ce docker-ce-cli containerd.io docker-buildx-plugin docker-compose-plugin  
docker --version  
HTTP:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease  
HTTP:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease  
HTTP:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease  
HTTP:4 http://security.ubuntu.com/ubuntu jammy-security InRelease  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
86 packages can be upgraded. Run 'apt list --upgradable' to see them.  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
ca-certificates is already the newest version (20240203-22.04.1).  
curl is already the newest version (7.81.0-ubuntu1.21).  
curl is currently not installed.  
gnupg is already the newest version (2.2.27-1ubuntu2.4).  
gnupg is set to manually installed.  
0 upgraded, 0 newly installed, 0 to remove and 86 not upgraded.  
File /etc/apt/keyrings/docker.gpg exists. Overwrite? (y/N) yes  
HTTP:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease  
HTTP:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease  
HTTP:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease  
HTTP:4 http://download.docker.com/linux/ubuntu jammy InRelease [48.5 kB]  
HTTP:5 http://download.docker.com/linux/ubuntu jammy-security InRelease  
Get:6 https://download.docker.com/linux/ubuntu jammy/stable amd64 Packages [66.1 kB]  
Fetched 115 kB in 1s (203 kB/s)  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
86 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

2:

```
txp@ip-172-31-33-230:~| log | +  
txp@ip-172-31-33-230:~$ 13.235.8.73:8080  
Preparing to unpack .../docker-ce-rootless-extras_533a29.1.3-1~ubuntu.22.04-jammy_amd64.deb ...  
Unpacking docker-ce-rootless-extras (5:29.1.3-1~ubuntu.22.04-jammy) ...  
Selecting previously unselected package docker-compose-plugin.  
Preparing to unpack .../0-docker-ce_2.3.1-1~ubuntu.22.04-jammy_amd64.deb ...  
Unpacking docker-ce_2.3.1-1~ubuntu.22.04-jammy (5:0.0.1-ubuntu.22.04-jammy) ...  
Selecting previously unselected package liblslip0_4.6.1-1build1_amd64.deb.  
Preparing to unpack .../1-lslip0_amd64 (4.6.1-1build1) ...  
Unpacking liblslip0_amd64 (4.6.1-1build1) ...  
Selecting previously unselected package slirp4netns.  
Preparing to unpack .../2-slirp4netns_1.0.1-2_amd64.deb ...  
Unpacking slirp4netns (1.0.1-2) ...  
Setting up docker-buildx-plugin (0.30.1-1~ubuntu.22.04-jammy) ...  
Setting up containerd.io (2.2.3-1~ubuntu.22.04-jammy) ...  
Creating symlink /etc/systemd/system/multi-user.target.wants/containerd.service → /lib/systemd/system/containerd.service.  
Setting up docker-ce_2.3.1-1~ubuntu.22.04-jammy (5:0.0.1-ubuntu.22.04-jammy) ...  
Setting up docker-ce-cl1 (5:29.1.3-1~ubuntu.22.04-jammy) ...  
● docker-service - Docker Application Container Engine  
  Loaded: loaded (/lib/systemd/system/docker.service; enabled; vendor preset: enabled)  
  Active: active (running) since Wed 2025-12-31 05:06:06 UTC; 2min 53s ago  
    TriggeredBy: ● docker.socket  
    Docs: https://docs.docker.com  
      Main PID: 3716 (dockerd)  
        Tasks: 9  
          Memory: 25.0M  
            CPU: 374ms  
          CGroup: /system.slice/docker.service  
              └─3716 /usr/bin/dockerd -H fd:// --containerd=/run/containerd/containerd.sock  
Dec 31 05:06:06 ip-172-31-33-230 dockerd[3716]: time="2025-12-31T05:06:06.393137974Z" level=info msg="Restoring containers: start."  
Dec 31 05:06:06 ip-172-31-33-230 dockerd[3716]: time="2025-12-31T05:06:06.439499438Z" level=info msg="Deleting nftables IPv4 rules" error="exit status 1"  
Dec 31 05:06:06 ip-172-31-33-230 dockerd[3716]: time="2025-12-31T05:06:06.448506986Z" level=info msg="Deleting nftables IPv6 rules" error="exit status 1"  
Dec 31 05:06:06 ip-172-31-33-230 dockerd[3716]: time="2025-12-31T05:06:06.738295570Z" level=info msg="Loading containers: done."  
Dec 31 05:06:06 ip-172-31-33-230 dockerd[3716]: time="2025-12-31T05:06:06.738303462Z" level=info msg="Docker daemon" context=fbfb3ed2 containerd-snapshotter=true storage-driver=overlayfs version=29.1.3  
Dec 31 05:06:06 ip-172-31-33-230 dockerd[3716]: time="2025-12-31T05:06:06.738303462Z" level=info msg="API listen on /run/docker.sock"  
Dec 31 05:06:06 ip-172-31-33-230 dockerd[3716]: time="2025-12-31T05:06:06.818228626Z" level=info msg="Daemon has completed initialization"  
Dec 31 05:06:06 ip-172-31-33-230 dockerd[3716]: time="2025-12-31T05:06:06.818282381Z" level=info msg="API listen on /run/docker.sock[1]  
Dec 31 05:06:06 ip-172-31-33-230 systemd[1]: Started Docker Application Container Engine.
```

3:

```
txp@ip-172-31-33-230:~| lo: x +  
← → C ⚠ Not secure 13.235.8.73:8080  
☆ 🌐 🔍  
  
txp@ip-172-31-33-230:~$ docker run hello-world  
permission denied while trying to connect to the docker API at unix:///var/run/docker.sock  
txp@ip-172-31-33-230:~$ sudo docker run hello-world  
Unable to find image 'hello-world:latest' locally  
latest: Pulling from library/hello-world  
17escfbcb3d0: Download complete  
eaf2d208000b: Download complete  
Digest: sha256:d9aaab6242eekac83e02e17a2ed3d779d18fbfd83042ea58f2995626396a274  
Status: Downloaded newer image for hello-world:latest  
  
Hello from Docker!  
This message shows that your installation appears to be working correctly.  
  
To generate this message, Docker took the following steps:  
1. The Docker client contacted the Docker daemon.  
2. The Docker daemon pulled the "hello-world" image from the Docker Hub.  
(cmd5)  
3. The Docker daemon created a new container from that image which runs the executable that produces the output you are currently reading.  
4. The Docker daemon streamed that output to the Docker client, which sent it to your terminal.  
  
To try something more ambitious, you can run an Ubuntu container with:  
$ docker run -it ubuntu bash  
  
Share images, automate workflows, and more with a free Docker ID:  
https://hub.docker.com/  
  
For more examples and ideas, visit:  
https://docs.docker.com/get-started/  
  
txp@ip-172-31-33-230:~$ docker ps  
permission denied while trying to connect to the docker API at unix:///var/run/docker.sock  
txp@ip-172-31-33-230:~$ sudo docker ps  
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES  
txp@ip-172-31-33-230:~$ sudo docker ps -a  
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES  
79f2540139b0 hello-world "Hello" About a minute ago Exited (0) About a minute ago busy_maxwell  
txp@ip-172-31-33-230:~$ sudo docker images  
  
IMAGE ID          IMAGE          REPOSITORY          TAG          SIZE  
hello-world:latest d1anab6242e0  25.9 kB   9.52 kB  [U]  
txp@ip-172-31-33-230:~$ sudo docker rm %  
txp@ip-172-31-33-230:~$ sudo docker rm 79f2540139b0  
79f2540139b0  
Info → In Use
```

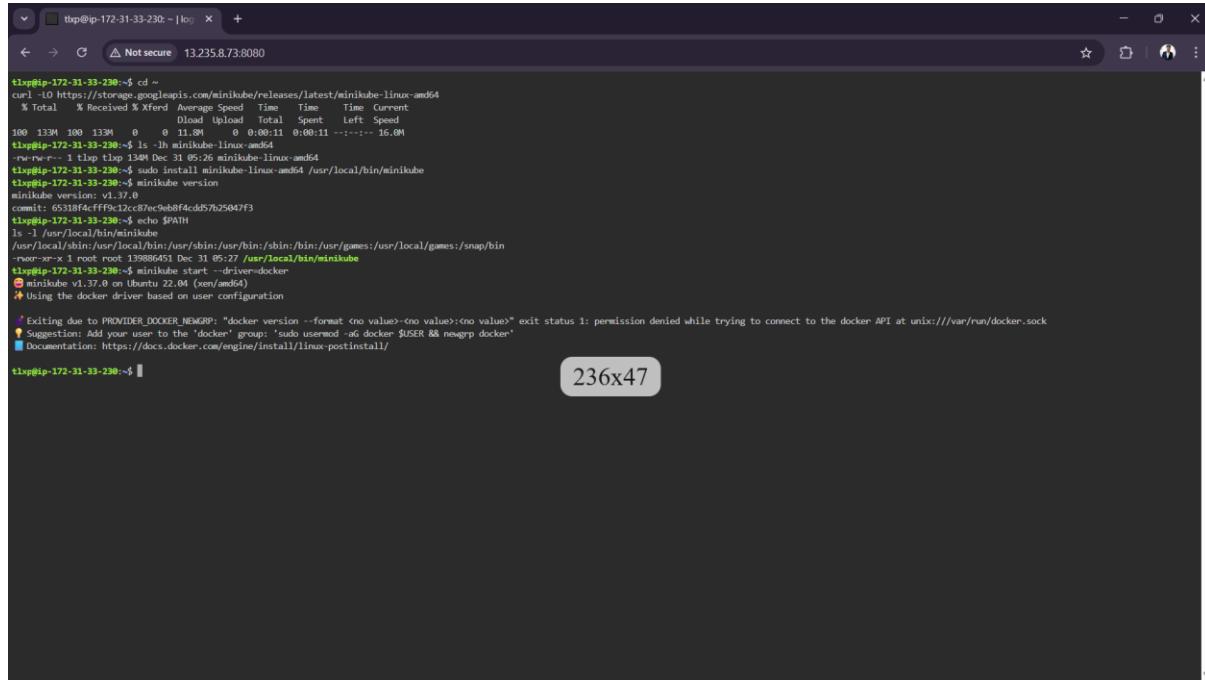
4:

```
tlpp@ip-172-31-33-230:~$ docker ps
permission denied while trying to connect to the docker API at unix:///var/run/docker.sock
tlpp@ip-172-31-33-230:~$ sudo docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
tlpp@ip-172-31-33-230:~$ sudo docker ps -a
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
79f25a0139e0 "Hello world" "Hello" About a minute ago Exited (0) About a minute ago busy_maxwell
tlpp@ip-172-31-33-230:~$ sudo docker images
Info → In Use

IMAGE ID      REPOSITORY TAG      IMAGE SIZE
HelloWorld:latest d4aab6242e0 25.9 kB 9.52 kB [U]
Unagged:          d4aab6242e0cace87e2ec17a2ed3d79d18fbfd03042sa58f2995626396a274
tlpp@ip-172-31-33-230:~$ sudo docker rm 79f25a0139e0
79f25a0139e0
tlpp@ip-172-31-33-230:~$ sudo docker rmi d4aab6242e0
Untagged:        d4aab6242e0cace87e2ec17a2ed3d79d18fbfd03042sa58f2995626396a274
Deleted:        sha256:d4aab6242e0cace87e2ec17a2ed3d79d18fbfd03042sa58f2995626396a274
tlpp@ip-172-31-33-230:~$
```

MiniKube Installation:

2:

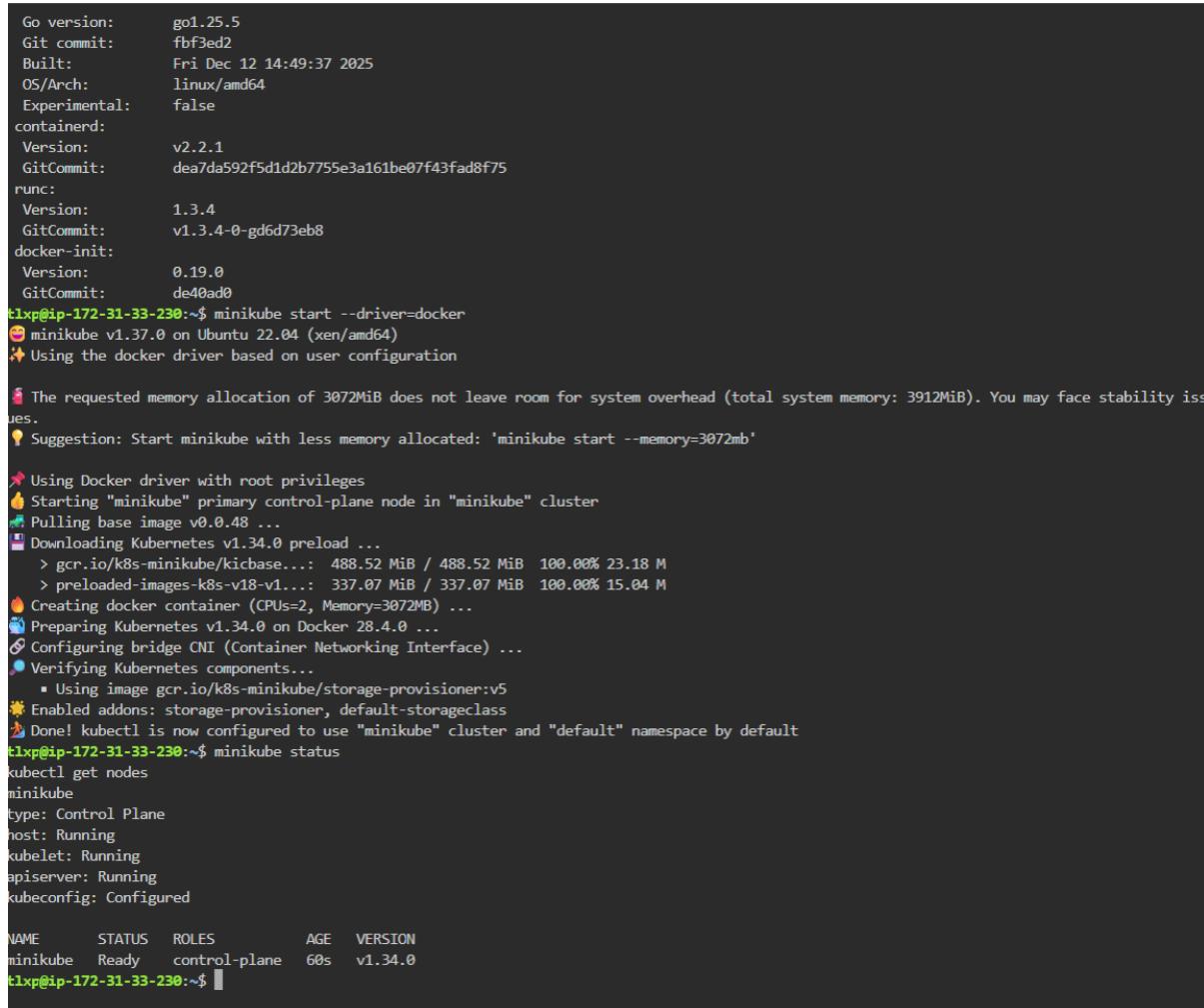


```
tlx@ip-172-31-33-230:~$ cd ~
curl -LO https://storage.googleapis.com/minikube/releases/latest/minikube-linux-amd64
% Total    % Received % Xferd  Average Speed   Time   Time  Current
          Dload Upload Total Spent  Left Speed
100 132M  100 132M    0     0      0:00:11  0:00:11  ---:-- 16.0M
tlx@ip-172-31-33-230:~$ ls -lh minikube-linux-amd64
-rwxr-xr-x 1 tlx 134M Dec 31 05:26 minikube-linux-amd64
tlx@ip-172-31-33-230:~$ sudo install minikube-linux-amd64 /usr/local/bin/minikube
tlx@ip-172-31-33-230:~$ minikube version
minikube version: v1.37.0
commit: 65318f4cfff9c12cc87e9eb8f4cd5b7b5047f3
tlx@ip-172-31-33-230:~$ echo $PATH
ls -l /usr/local/bin/minikube
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/usr/games:/usr/local/games:/snap/bin
-rw-r--r-- 1 tlx 134M Dec 31 05:27 /usr/local/bin/minikube
tlx@ip-172-31-33-230:~$ minikube start --driver=docker
⌚ minikube v1.37.0 on Ubuntu 22.04 (xen/amd64)
👉 Using the docker driver based on user configuration

💡 Exiting due to PROVIDER_DOCKER_NEGRP: "docker version --format <no value><no value><no value>" exit status 1: permission denied while trying to connect to the docker API at unix:///var/run/docker.sock
💡 Suggestion: Add your user to the "docker" group: "sudo usermod -aG docker $USER && newgrp docker"
💡 Documentation: https://docs.docker.com/engine/install/linux-postinstall/
tlx@ip-172-31-33-230:~$
```

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3:



```
Go version:      go1.25.5
Git commit:      fbf3ed2
Built:           Fri Dec 12 14:49:37 2025
OS/Arch:         linux/amd64
Experimental:    false
containerd:
  Version:        v2.2.1
  GitCommit:      dea7da592f5d1d2b7755e3a161be07f43fad8f75
runc:
  Version:        1.3.4
  GitCommit:      v1.3.4-0-gd6d73eb8
docker-init:
  Version:        0.19.0
  GitCommit:      de4bad0
tlx@ip-172-31-33-230:~$ minikube start --driver=docker
⌚ minikube v1.37.0 on Ubuntu 22.04 (xen/amd64)
👉 Using the docker driver based on user configuration

💡 The requested memory allocation of 3072MiB does not leave room for system overhead (total system memory: 3912MiB). You may face stability issues.
💡 Suggestion: Start minikube with less memory allocated: 'minikube start --memory=3072mb'

👉 Using Docker driver with root privileges
👉 Starting "minikube" primary control-plane node in "minikube" cluster
👉 Pulling base image v0.0.48 ...
👉 Downloading Kubernetes v1.34.0 preload ...
  > gcr.io/k8s-minikube/kicbase...: 488.52 MiB / 488.52 MiB 100.00% 23.18 M
  > preloaded-images-k8s-v18-v1...: 337.07 MiB / 337.07 MiB 100.00% 15.04 M
👉 Creating docker container (CPUs=2, Memory=3072MB) ...
👉 Preparing Kubernetes v1.34.0 on Docker 28.4.0 ...
👉 Configuring bridge CNI (Container Networking Interface) ...
👉 Verifying Kubernetes components...
  * Using image gcr.io/k8s-minikube/storage-provisioner:v5
💡 Enabled addons: storage-provisioner, default-storageclass
👉 Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default
tlx@ip-172-31-33-230:~$ minikube status
kubectl get nodes
minikube
type: Control Plane
host: Running
kublet: Running
apiserver: Running
kubeconfig: Configured

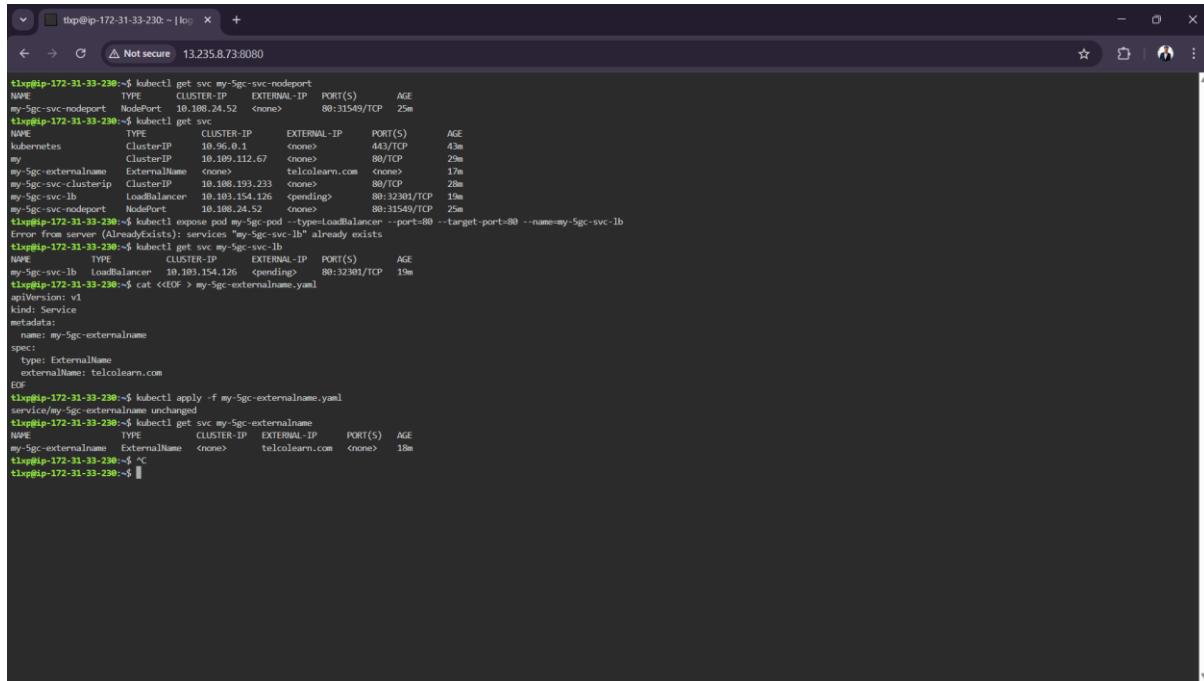
NAME      STATUS   ROLES      AGE   VERSION
minikube Ready   control-plane  60s   v1.34.0
tlx@ip-172-31-33-230:~$
```

Create a Pod from YAML:

```
t1v@ip-172-31-33-230:~$ kubectl get pods -A
NAMESPACE     NAME           READY   STATUS    RESTARTS   AGE
kube-system   coredns-6bbc5c9577-gcccf   1/1    Running   0          5m26s
kube-system   etcd-minikube      1/1    Running   0          5m31s
kube-system   kube-apiserver-minikube  1/1    Running   0          5m33s
kube-system   kube-controller-manager-minikube  1/1    Running   0          5m31s
kube-system   kube-proxy-mpkz      1/1    Running   0          5m27s
kube-system   kube-scheduler-minikube  1/1    Running   0          5m33s
kube-system   storage-provisioner   1/1    Running   1 (4m56s ago)  5m29s
t1v@ip-172-31-33-230:~$ cat ~/yaml_files/my-5gc-pod.yaml
apiVersion: v1
kind: Pod
metadata:
  name: my-5gc-pod
  labels:
    app: my-5gc
spec:
  containers:
    - name: my-5gc-container
      image: nginx:latest
      ports:
        - containerPort: 80
pod/my-5gc-pod created
t1v@ip-172-31-33-230:~$ kubectl get pods
kubectl describe pod my-5gc-pod
NAME        READY   STATUS    RESTARTS   AGE
my-5gc-pod  0/1    ContainerCreating   0          10s
Namespace:  default
Priority:  0
Service Account: default
Node:       minikube/192.168.49.2
Start Time:  Wed, 31 Dec 2025 05:50:04 +0000
Labels:     app: my-5gc
Annotations: <none>
Status:    Pending
IP:        <none>
Containers:
  my-5gc-container:
    Container ID:  docker://my-5gc-container
    Image:         nginx:latest
    Image ID:      sha256:54321...
    Port:          80/TCP
    Host Port:    0/TCP
    State:        Waiting
    Reason:       ContainerCreating
```

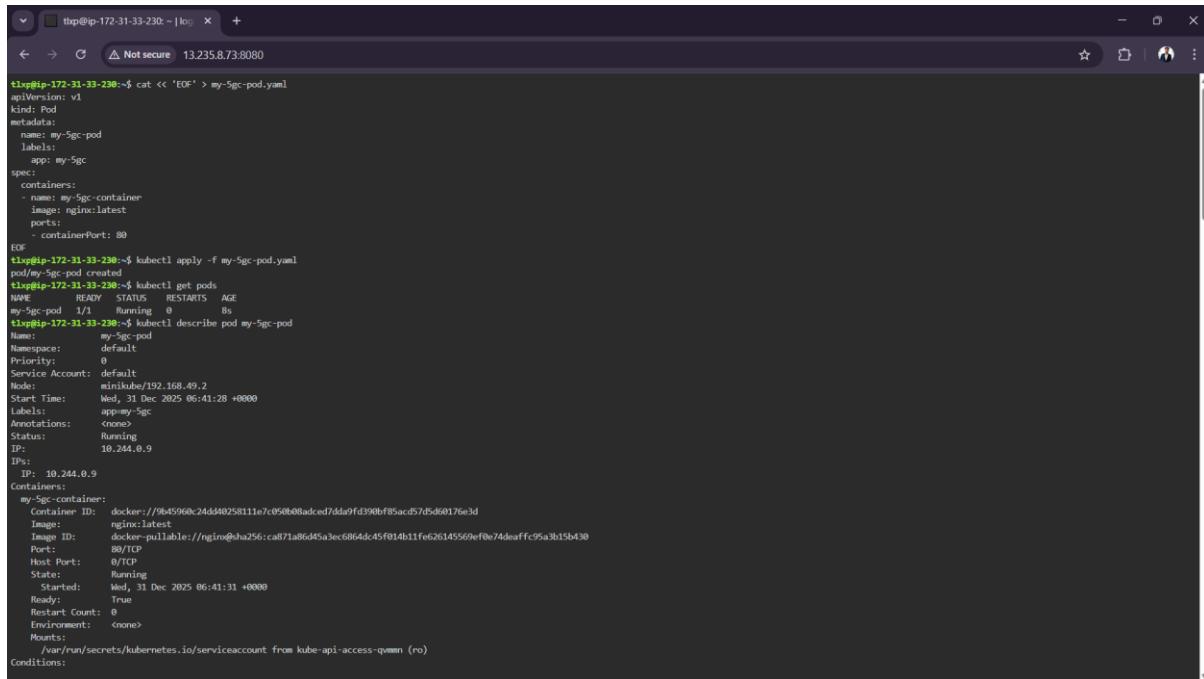
2:

Exploring K8s Services:



```
tixp@ip-172-31-33-230:~$ kubectl get svc my-5gc-svc-nodeport
NAME           TYPE      CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
my-5gc-svc-nodeport  NodePort  10.108.24.52 <none>        80:31549/TCP  25m
tixp@ip-172-31-33-230:~$ kubectl get svc
NAME           TYPE      CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
kubernetes     ClusterIP  10.96.0.1    <none>        443/TCP   43m
my-5gc-externalname  ExternalName  telcolearn.com  <none>        17m
my-5gc-svc-clusterip  ClusterIP  10.108.193.233 <none>        80/TCP    28m
my-5gc-svc-loadbalancer  LoadBalancer  10.103.154.126 <pending>   80:32301/TCP  19m
my-5gc-svc-nodeport  NodePort  10.108.24.52 <none>        80:31549/TCP  25m
tixp@ip-172-31-33-230:~$ kubectl expose pod my-5gc-pod --type=LoadBalancer --port=80 --target-port=80 --name=my-5gc-svc-lb
Error from server: (AlreadyExists): services "my-5gc-svc-lb" already exists
tixp@ip-172-31-33-230:~$ kubectl get svc my-5gc-svc-lb
NAME           TYPE      CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
my-5gc-svc-lb  LoadBalancer  10.103.154.126 <pending>   80:32301/TCP  19m
tixp@ip-172-31-33-230:~$ cat <<EOF >> my-5gc-externalname.yaml
apiVersion: v1
kind: Service
metadata:
  name: my-5gc-externalname
spec:
  type: ExternalName
  externalName: telcolearn.com
EOF
tixp@ip-172-31-33-230:~$ kubectl apply -f my-5gc-externalname.yaml
service/my-5gc-externalname unchanged
tixp@ip-172-31-33-230:~$ kubectl get svc my-5gc-externalname
NAME           TYPE      CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
my-5gc-externalname  ExternalName  <none>        telcolearn.com  <none>        18m
tixp@ip-172-31-33-230:~$ ^C
tixp@ip-172-31-33-230:~$
```

K8s Workloads:

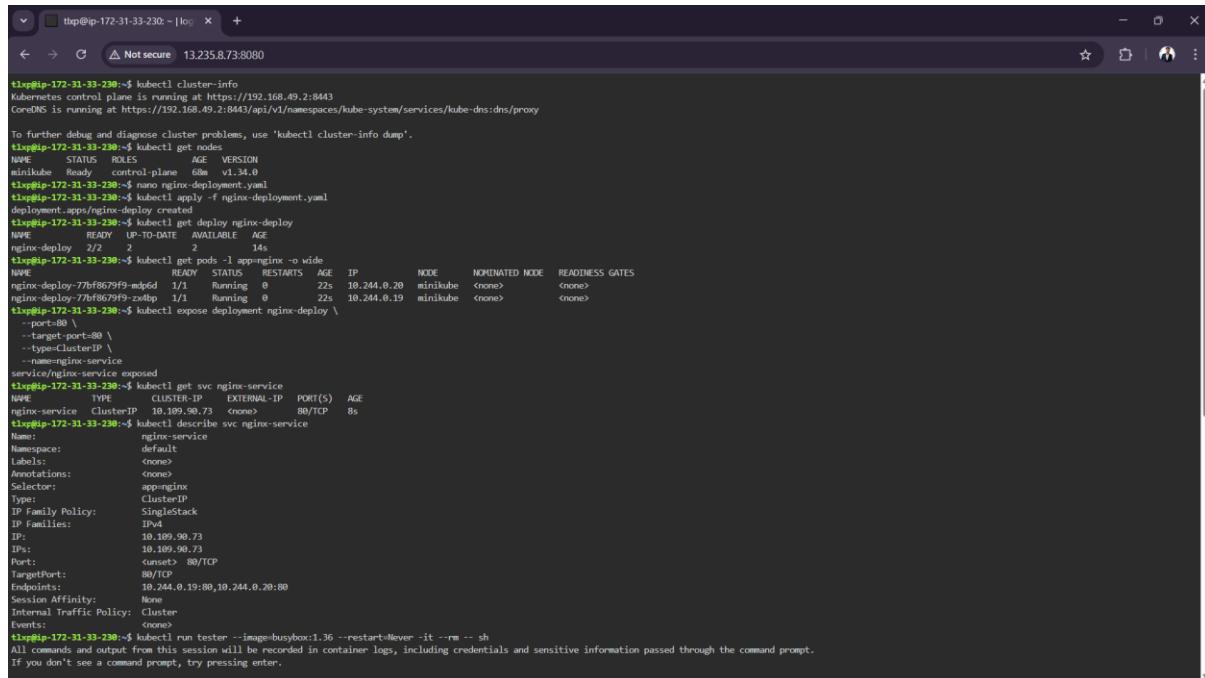


```
tixp@ip-172-31-33-230:~$ cat <<EOF >> my-5gc-pod.yaml
apiVersion: v1
kind: Pod
metadata:
  name: my-5gc-pod
  labels:
    app: my-5gc
spec:
  containers:
    - name: my-5gc-container
      image: nginx:latest
      ports:
        - containerPort: 80
EOF
tixp@ip-172-31-33-230:~$ kubectl apply -f my-5gc-pod.yaml
pod/my-5gc-pod created
tixp@ip-172-31-33-230:~$ kubectl get pods
NAME          READY   STATUS    RESTARTS   AGE
my-5gc-pod   1/1     Running   0          8s
tixp@ip-172-31-33-230:~$ kubectl describe pod my-5gc-pod
Name:           my-5gc-pod
Namespace:      default
Priority:      0
Service Account: default
Node:          tixpkuke/192.168.49.2
Start Time:    Wed, 31 Dec 2025 06:41:28 +0000
Labels:         app:my-5gc
Annotations:   <none>
Status:        Running
IP:            10.244.0.9
IPs:
  IP: 10.244.0.9
Containers:
  my-5gc-container:
    Container ID:  docker://9bd5960c24dd40258111e7c050b00adced7ddaf9fd390bf85acd57d5d60176e3d
    Image:         nginx:latest
    Image ID:     docker-pullable://nginx@sha256:ca871a86d45a3ec6864dc45f014b11fe626145569ef0e74deaffc95a3b15b430
    Port:         80/TCP
    Host Port:   0/TCP
    State:       Running
      Started:   Wed, 31 Dec 2025 06:41:31 +0000
    Ready:       True
    Restart Count: 0
    Environment: <none>
    Mounts:
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-qmmn (ro)
Conditions:
```

2:

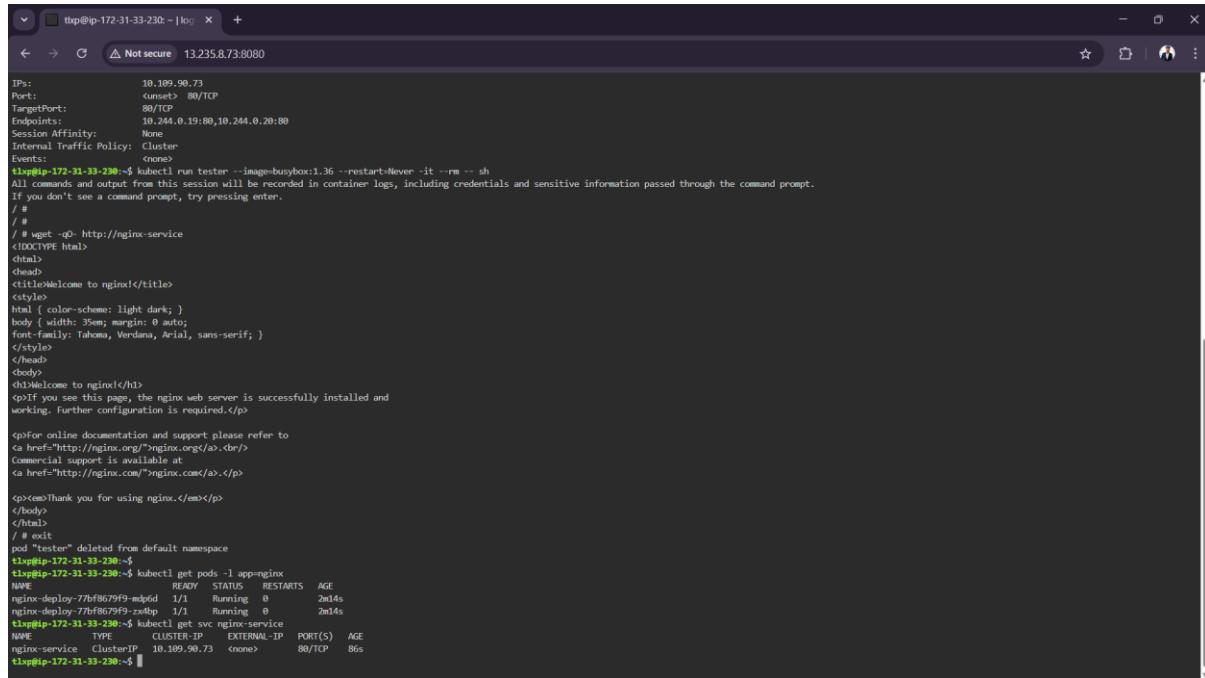
```
tlap@ip-172-31-33-230:~$ kubectl apply -f my-5gc-deployment.yaml
kubect...l get deploy
kubect...l get rs
kubect...l get pods -l app=my-5gc
deployment.apps/my-5gc-deployment created
NAME          READY   UP-TO-DATE   AVAILABLE   AGE
my-5gc-deployment   0/3     0           0           0s
NAME          DESIRED   CURRENT   READY   AGE
my-5gc-deployment-57966f4d88   3       3       0       0s
NAME          READY   STATUS      RESTARTS   AGE
my-5gc-deployment-57966f4d88-jfrxp   0/1   ContainerCreating   0   0s
my-5gc-deployment-57966f4d88-nmgx2   0/1   ContainerCreating   0   0s
my-5gc-deployment-57966f4d88-pzgdx   0/1   ContainerCreating   0   0s
my-5gc-deployment-57966f4d88-rhw5t   0/1   ContainerCreating   0   0s
my-5gc-deployment-57966f4d88-vz55v   0/1   ContainerCreating   0   0s
my-5gc-deployment-57966f4d88-z4kpx   0/1   Running      0   7s
tlap@ip-172-31-33-230:~$ kubectl scale deployment my-5gc-deployment --replicas=6
kubect...l get pods -l app=my-5gc
deployment.apps/my-5gc-deployment scaled
NAME          READY   STATUS      RESTARTS   AGE
my-5gc-deployment-57966f4d88-jfrxp   0/1   Running      0   7s
my-5gc-deployment-57966f4d88-nmgx2   0/1   ContainerCreating   0   0s
my-5gc-deployment-57966f4d88-pzgdx   0/1   Running      0   7s
my-5gc-deployment-57966f4d88-rhw5t   0/1   Pending      0   0s
my-5gc-deployment-57966f4d88-vz55v   0/1   Pending      0   0s
my-5gc-deployment-57966f4d88-z4kpx   0/1   Running      0   7s
tlap@ip-172-31-33-230:~$ kubectl delete deployment my-5gc-deployment
kubect...l get deploy
kubect...l get rs
kubect...l get pods
deployment.apps "my-5gc-deployment" deleted from default namespace
No resources found in default namespace.
No resources found in default namespace.
NAME          READY   STATUS      RESTARTS   AGE
my-5gc-deployment-57966f4d88-jfrxp   0/1   Terminating   0   21s
my-5gc-deployment-57966f4d88-nmgx2   0/1   Terminating   0   14s
my-5gc-deployment-57966f4d88-pzgdx4   0/1   Terminating   0   21s
my-5gc-deployment-57966f4d88-rhw5t   0/1   Terminating   0   14s
my-5gc-deployment-57966f4d88-vz55v   0/1   Terminating   0   14s
my-5gc-deployment-57966f4d88-z4kpx   0/1   Terminating   0   21s
tlap@ip-172-31-33-230:~$ cat my-5gc-replicaset.yaml
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: my-5gc-replicaset
  labels:
    app: my-5gc
spec:
  replicas: 3
  selector:
```

Kubernetes Networking Exercise:



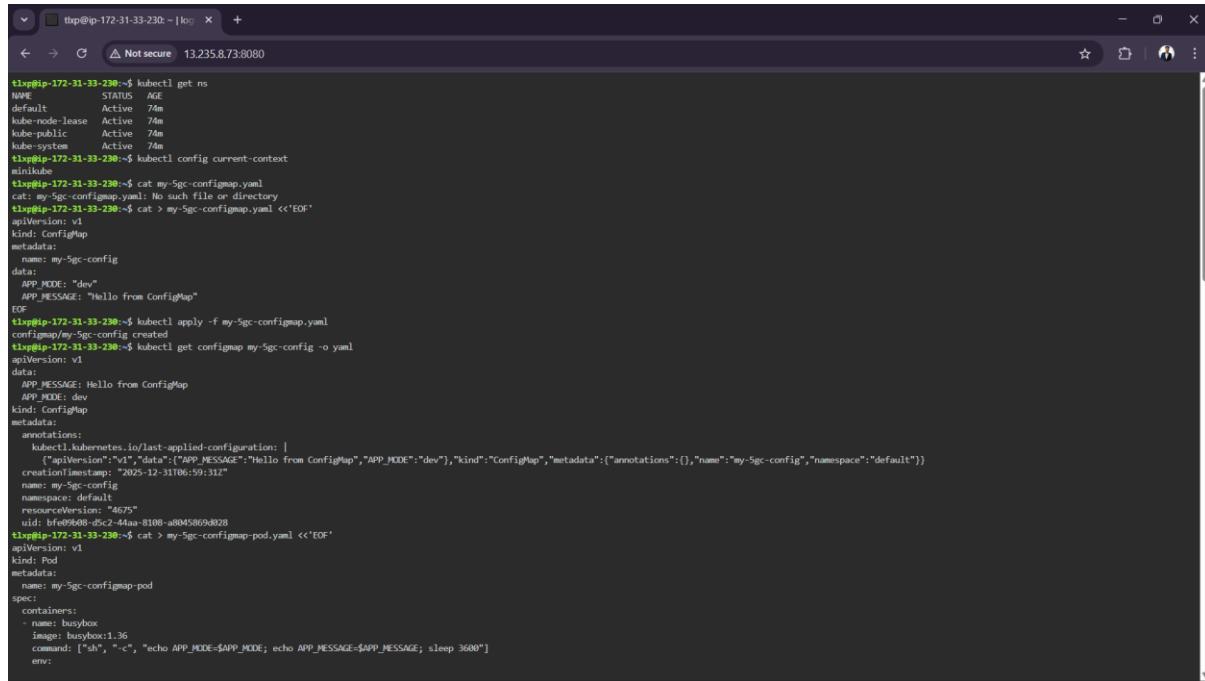
```
tibp@ip-172-31-33-230: ~ | log x +  
← → C △ Not secure 13.235.8.73:8080  
  
tibp@ip-172-31-33-230:~$ kubectl cluster-info  
Kubernetes control plane is running at https://192.168.49.2:8443  
CoreDNS is running at https://192.168.49.2:8443/api/v1/namespaces/kube-system/services/kube-dns:proxy  
  
To further debug and diagnose cluster problems, use 'kubectl cluster-info dump'.  
tibp@ip-172-31-33-230:~$ kubectl get nodes  
NAME STATUS ROLES AGE VERSION  
minikube Ready control-plane 68m v1.34.0  
tibp@ip-172-31-33-230:~$ nano nginx-deployment.yaml  
tibp@ip-172-31-33-230:~$ kubectl apply -f nginx-deployment.yaml  
deployment.apps/nginx-deploy created  
tibp@ip-172-31-33-230:~$ kubectl get deploy nginx-deploy  
NAME READY LP-TO-DATE AVAILABLE AGE  
nginx-deploy 2/2 2 2 14s  
tibp@ip-172-31-33-230:~$ kubectl get pods -l app=nginx -o wide  
NAME READY STATUS RESTARTS AGE IP NODE NOMINATED NODE READINESS GATES  
nginx-deploy-77bf8679f9-mdpd 1/1 Running 0 22s 10.244.6.20 minikube <none> <none>  
nginx-deploy-77bf8679f9-zxdt 1/1 Running 0 22s 10.244.6.19 minikube <none> <none>  
tibp@ip-172-31-33-230:~$ kubectl expose deployment nginx-deploy \  
--port=80 \  
--target-port=80 \  
--type=ClusterIP \  
--name=nginx-service  
service/nginx-service exposed  
tibp@ip-172-31-33-230:~$ kubectl get svc nginx-service  
NAME TYPE CLUSTER-IP EXTERNAL-IP PORT(S) AGE  
nginx-service ClusterIP 10.109.90.73 <none> 80/TCP 8s  
tibp@ip-172-31-33-230:~$ kubectl describe svc nginx-service  
Name: nginx-service  
Namespace: default  
Labels: <none>  
Annotations: <none>  
Selector: app=nginx  
Type: ClusterIP  
IP Family Policy: SingleStack  
IP Families: IPv4  
IP: 10.109.90.73  
IPs: 10.109.90.73  
Port: <unset> 80/TCP  
Target Port: 80/TCP  
Endpoints: 10.244.0.19:80,10.244.0.20:80  
Session Affinity: None  
Internal Traffic Policy: Cluster  
Events: <none>  
tibp@ip-172-31-33-230:~$ kubectl run tester --image=busybox:1.36 --restart=Never -it --rm -- sh  
All commands and output from this session will be recorded in container logs, including credentials and sensitive information passed through the command prompt.  
If you don't see a command prompt, try pressing enter.
```

2:



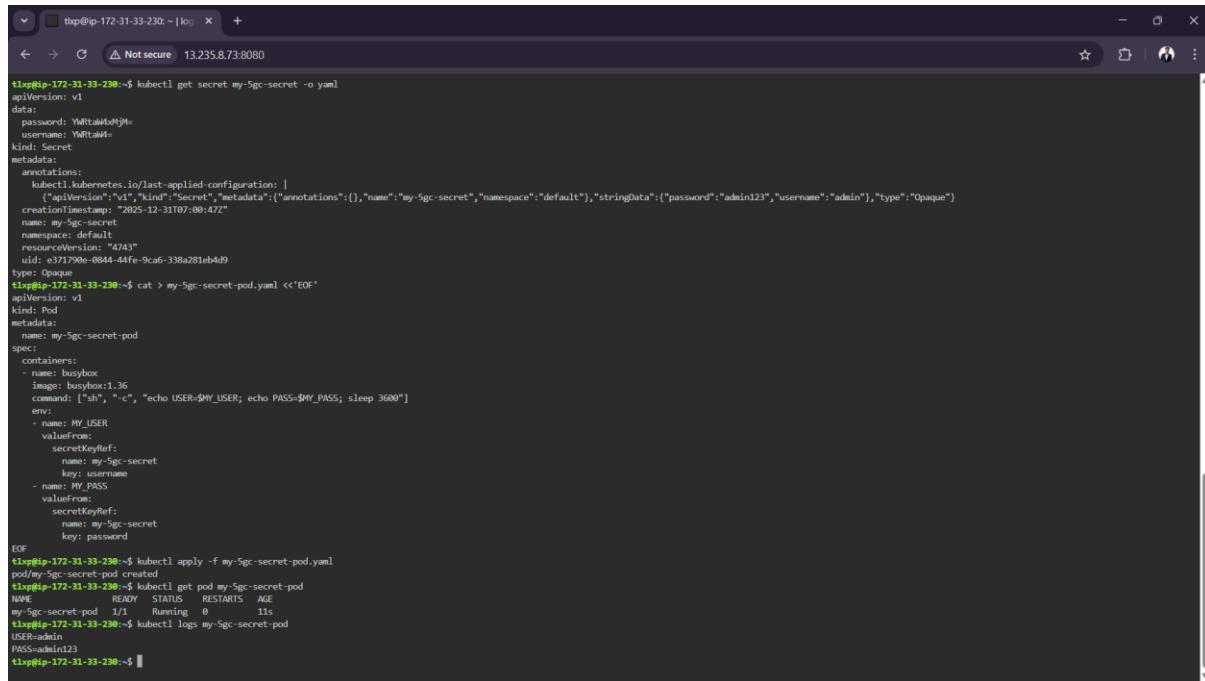
```
tibp@ip-172-31-33-230: ~ | log x +  
← → C △ Not secure 13.235.8.73:8080  
  
IPs: 10.109.90.73  
Port: <unset> 80/TCP  
TargetPort: 80/TCP  
Endpoints: 10.244.0.19:80,10.244.0.20:80  
Session Affinity: None  
Internal Traffic Policy: Cluster  
Events: <none>  
tibp@ip-172-31-33-230:~$ kubectl run tester --image=busybox:1.36 --restart=Never -it --rm -- sh  
All commands and output from this session will be recorded in container logs, including credentials and sensitive information passed through the command prompt.  
If you don't see a command prompt, try pressing enter.  
/ #  
/ # wget -qO - http://nginx-service  
<!DOCTYPE html>  
(HTML)  
dhead>  
<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>  
<body>  
ch3>Welcome to nginx!</h3>  
<p>If you see this page, the nginx web server is successfully installed and working. Further configuration is required.</p>  
<p>For online documentation and support please refer to  
<a href="http://nginx.org/">http://nginx.org/, or<br/>Commercial support is available at  
<a href="http://nginx.com/">http://nginx.com/.</p>  
<p><em>Thank you for using nginx.</em></p>  
</body>  
</html>  
/ # exit  
pod "tester" deleted from default namespace  
tibp@ip-172-31-33-230:~$  
tibp@ip-172-31-33-230:~$ kubectl get pods -l app=nginx  
NAME READY STATUS RESTARTS AGE  
nginx-deploy-77bf8679f9-mdpd 1/1 Running 0 2m4s  
nginx-deploy-77bf8679f9-zxdt 1/1 Running 0 2m4s  
tibp@ip-172-31-33-230:~$ kubectl get svc nginx-service  
NAME TYPE CLUSTER-IP EXTERNAL-IP PORT(S) AGE  
nginx-service ClusterIP 10.109.90.73 <none> 80/TCP 86s  
tibp@ip-172-31-33-230:~$
```

ConfigMap and Secrets:



```
t1xg@ip-172-31-33-230:~$ kubectl get ns
NAME          STATUS   AGE
default        Active   7m
kube-node-lease Active   7m
kube-public    Active   7m
kube-system   Active   7m
t1xg@ip-172-31-33-230:~$ kubectl config current-context
minikube
t1xg@ip-172-31-33-230:~$ cat my-5gc-configmap.yaml
cat: my-5gc-configmap.yaml: No such file or directory
t1xg@ip-172-31-33-230:~$ cat > my-5gc-configmap.yaml <<'EOF'
apiVersion: v1
kind: ConfigMap
metadata:
  name: my-5gc-config
data:
  APP_MESSAGE: "Hello from ConfigMap"
EOF
t1xg@ip-172-31-33-230:~$ kubectl apply -f my-5gc-configmap.yaml
configmap/my-5gc-config created
t1xg@ip-172-31-33-230:~$ kubectl get configmap my-5gc-config -o yaml
apiVersion: v1
data:
  APP_MESSAGE: Hello from ConfigMap
  APP_MODE: dev
kind: ConfigMap
metadata:
  annotations:
    kubernetes.io/last-applied-configuration: |
      {"apiVersion":"v1","data":{"APP_MESSAGE":"Hello from ConfigMap","APP_MODE":"dev"},"kind":"ConfigMap","metadata":{"annotations":{},"name":"my-5gc-config","namespace":"default"}}
  creationTimestamp: "2025-12-31T06:59:31Z"
  name: my-5gc-config
  namespace: default
  resourceVersion: "4675"
  uid: bfe9e52d-4d4a-8108-a045869d028
t1xg@ip-172-31-33-230:~$ cat > my-5gc-secret-pod.yaml <<'EOF'
apiVersion: v1
kind: Pod
metadata:
  name: my-5gc-secret-pod
spec:
  containers:
  - name: busybox
    image: busybox:1.36
    command: ["sh", "-c", "echo APP_MODE=$APP_MODE; echo APP_MESSAGE=$APP_MESSAGE; sleep 3600"]
  env:
EOF
```

2:



```
t1xg@ip-172-31-33-230:~$ kubectl get secret my-5gc-secret -o yaml
apiVersion: v1
data:
  password: YmRtaW4tMjM=
  username: YmRtaW4=
kind: Secret
metadata:
  annotations:
    kubernetes.io/last-applied-configuration: |
      {"apiVersion":"v1","kind":"Secret","metadata":{"annotations":{},"name":"my-5gc-secret","namespace":"default"},"stringData":{"password":"admin123","username":"admin"},"type":"Opaque"}
  creationTimestamp: "2025-12-31T07:00:47Z"
  name: my-5gc-secret
  namespace: default
  resourceVersion: "4743"
  uid: e371790e-0844-44fe-9ca6-338a281eb4d9
type: Opaque
t1xg@ip-172-31-33-230:~$ cat > my-5gc-secret-pod.yaml <<'EOF'
apiVersion: v1
kind: Pod
metadata:
  name: my-5gc-secret-pod
spec:
  containers:
  - name: busybox
    image: busybox:1.36
    command: ["sh", "-c", "echo USER=$MY_USER; echo PASS=$MY_PASS; sleep 3600"]
  env:
  - name: MY_USER
    valueFrom:
      secretKeyRef:
        name: my-5gc-secret
        key: username
  - name: MY_PASS
    valueFrom:
      secretKeyRef:
        name: my-5gc-secret
        key: password
EOF
t1xg@ip-172-31-33-230:~$ kubectl apply -f my-5gc-secret-pod.yaml
pod/my-5gc-secret-pod created
t1xg@ip-172-31-33-230:~$ kubectl get pod my-5gc-secret-pod
NAME          READY   STATUS    RESTARTS   AGE
my-5gc-secret-pod  1/1    Running   0          1s
t1xg@ip-172-31-33-230:~$ kubectl logs my-5gc-secret-pod
USER=admin
PASS=admin123
t1xg@ip-172-31-33-230:~$
```