

Day 1

Testing lab environment

```
oc version
kubectl version
kn version
helm version

oc get nodes
kubectl get nodes

cat ~/openshift.txt
```

Expected output

```
jegan@tektutor.org ~ /openshift-july-2024 $ main oc get nodes
NAME           STATUS   ROLES      AGE    VERSION
master-1.ocp4.tektutor.org.labs Ready    control-plane,master,worker 7d2h   v1.28.10+a2c84a5
master-2.ocp4.tektutor.org.labs Ready    control-plane,master,worker 7d2h   v1.28.10+a2c84a5
master-3.ocp4.tektutor.org.labs Ready    control-plane,master,worker 7d2h   v1.28.10+a2c84a5
worker-1.ocp4.tektutor.org.labs Ready    worker     7d1h   v1.28.10+a2c84a5
worker-2.ocp4.tektutor.org.labs Ready    worker     7d1h   v1.28.10+a2c84a5

jegan@tektutor.org ~ /openshift-july-2024 $ main cat ~/openshift.txt
Red Hat API Server Endpoint URL
+++++++++++++++++++++++++++++
https://api.ocp4.training.tektutor:6443

Red Hat OpenShift web-console
+++++++++++++++++++++++++++++
https://console.openshift-console.apps.ocp4.tektutor.org.labs

Login Credentials
+++++++++++++++++++
username : kubeadmin
password : 9fSDY-Xckzz-DQDHJ-FaLT6

jegan@tektutor.org ~ /openshift-july-2024 $ main oc version
Client Version: 4.15.0-202405141637.p0.g7693229,assembly.stream.el8-7693229
Kustomize Version: v5.0.4-0.20230601165947-6ce0bf390ce3
Server Version: 4.15.18
Kubernetes Version: v1.28.10+a2c84a5

jegan@tektutor.org ~ /openshift-july-2024 $ main kubectl version
Client Version: v1.28
Kustomize Version: v5.0.4-0.20230601165947-6ce0bf390ce3
Server Version: v1.28.10+a2c84a5

jegan@tektutor.org ~ /openshift-july-2024 $ main kn version
Version: v1.12.0
Build Date: 2024-06-10 11:52:29
Git Revision: 415d3186b
Supported APIs:
* Serving
  - serving.knative.dev/v1 (knative-serving v1.12.0)
* Eventing
  - sources.knative.dev/v1 (knative-eventing v1.12.0)
  - eventing.knative.dev/v1 (knative-eventing v1.12.0)

jegan@tektutor.org ~ /openshift-july-2024 $ main helm version
WARNING: Kubernetes configuration file is group-readable. This is insecure. Location: /home/jegan/.kube/config
version BuildInfoVersion:"v3 14 4" GitCommit:"81r9a2a123467fd4052hr5e9aa9c513c4c8fc1d2" GitTreeState:"clean" GoVersion:"go1.21.9"
```

Info - What is dual/multi booting?

- assume in your laptop you have installed Windows 11 OS as your primary operating system
- for some R&D purpose, you need let's say Ubuntu 24.04 64-bit OS
- either you can remove the Windows 11 and install Ubuntu 24.04 or you can retain the Windows 11 OS
- you can install Boot Loader system utility like
- Boot loader is a tiny system utility which has to fit within 512 bytes
- In Hard Disk, the Sector 0 and Byte 0 is referred as Master Boot Record
- The Boot loader system utility is installed in the Master Boot Record

1. LILO (Linux Loader)
2. GRUB 2 (Boot Loader software that get's installed in Master Boot Record(MBR))
3. For Mac Book Pro, BootCamp is a commercial Boot loader that works in Macbooks
 - Whenever we boot our machine, once the Power On Self Test (BIOS POST) completes, the BIOS will instruct the CPU to load and execute the Boot loader from MBR
 - Once the CPU starts executing the Boot loader utility, it will scan the hard disk looking for installed Operating Systems
 - In case the boot loader finds more than 1 OS, then it gives a menu for you to choose which OS you wish to boot into
 - Only one OS can be active at point of time
 - In case you have booted into Windows, if you wish to work in Ubuntu then you need to first shutdown Windows, then boot into Ubuntu

Info - Hypervisor Overview

- heavy weight virtualization technology
 - each virtual machine has to be allocated with dedicated Hardware resources
 - CPU Cores
 - RAM
 - Disk
 - hypervisor is nothing but virtualization technology
 - this came around year 2000
 - unlike the boot loader, more than one Operating System can be active at the same time
 - this was considered a IT revolution
 - It comes in 2 flavours
 1. Type 1 - Bare Metal Hypervisor - Used in Server/Workstations
 2. Type 2 - Used in Laptop/Desktops/Workstations
 - Type 1
 - is called Bare Metal because to run the OS within Virtual Machine, you don't need to install any Host OS
 - Examples
 - VMWare vSphere/vCenter
 - Type 2
 - Oracle virtualbox - Free and supported in Windows, Linux and Mac
 - KVM - Opensource, supports all Linux distributions
 - Parallel - supported in Mac
 - VMWare (Paid software)
 - Workstation - Supports Linux & Mac
 - Fusion - supported in Mac
 - main advantage of Virtualization over Dual/Multi booting is, more than OS can be actively running in the same laptop/desktop/workstation/server
 - helps in consolidating many servers into 1 (few physical servers)
 - technically possible to host 1000+ OS Virtual Machines within a single Physical Server
 - Server Motherboards with 8 Sockets
 - If you install MCM(Multi chip Module - many processors can be fitted in a

```
single socket)
- each Virtual Machine represents 1 fully function Operating System
- Viratual Machine(VM) is also called as Guest OS
- Each Processor supports
  - 128 CPU Cores
  - 256 CPU Cores
  - 512 CPU Cores
- Total Physical CPU Cores, on a 8 Socket Motherboard with MCM(1 IC
contains 4 Processor, each Processor support 256 Cores)
  8 x 4 x 256 = 8192 Physical Cores
- Hyperthreading
  - each Physical CPU Cores supports 2 logical/virtual cores
  - Total virtual cpu cores = 8192 x 2 = 16384
```

Info - Containerization version

- light-weight application virtualization technology
 - because containers don't get their own dedicated hardware resource
 - containers running in the same host machines, they all share the hardware resources available on the Host OS
- each container represents one application or one application component (Message Queue or DB Server, App Server)
- containers runs on top of an OS/VM
- containers will never replace Operating System
- containers don't have their own OS Kernel
- containers doens't represent an Operating System
- similarities between OS and containers
 - containers also get their own Network Card
 - containers get their own IP Address
 - containers get their own file system
 - containers also has their own network stack (7 OSI Layers)

Info - What is Container Runtime?

- is a low-level software to manage container images and containers
- it is not so user-friendly to manage containers directly using container runtime softwares
- hence, end-users like us normally won't use container runtimes
- Examples
 - runC is a container runtime
 - CRI-O Container Runtime

Info - What is Container Engine?

- a high-level user-friendly software that helps us manage container images and containers

- end-users don't have to have low-level kernel knowledge to manage container images and containers when they work in container engines
- container engines internally they depend on Container runtimes to manage images and containers
- Example
 - Docker is a Container Engine, internally it depends on containerd which in turn depends on runC container runtime
 - Podman is a Container Engine, internally it depends on CRI-O container runtime

Info - Container Orchestration Platform Overview

- Container Orchestration Platform
 - helps us in making our application high available (HA)
 - they support scaling up/down our containerized application workloads based on user-traffic
 - rolling update - is a way you can upgrade your containerized application from one version to other without any downtime
 - roll back - revert back to older version in case any defects are identified in the latest version of your application
 - also provides in-built monitoring
 - it checks whether application is running or crashed, in case your application aborted/crashed it will be restarted, replaced with another healthy instance of your application
 - health check of your application
 - readiness check of your application
 - repairs your application when found to be functional as expected
 - supports exposing your containerized application either within the cluster or for external access via Services
 - supports ingress forwarding rules to integrate multiple containerized applications from a main public URL
 - running stateful and stateless application
 - Examples
 1. Docker SWARM
 2. Google Kubernetes
 3. OKD - open-source variant of Red Hat OpenShift
 4. Red Hat OpenShift
 5. AWS - EKS (Elastic Kubernetes Service - Managed K8s cluster)
 6. AWS - ROSA (Red Hat OpenShift as a managed Service)
 7. Azure - AKS (Azure Kubernetes managed Service)
 8. Azure - ARO (Azure Red Hat OpenShift managed Service)

Info - Docker Overview

- Docker is a Container Engine
- Developed in GoLang by a company called Docker Inc
- comes in 2 flavours
 1. Docker Community Edition - Docker CE (Free)
 2. Docker Enterprise Edition - Docker EE (Paid)

- follows Client/Server Architecture
- Docker Registry
 - collection of many Docker Images
- Supports 3 types of Docker Registries
 1. Local Docker Registry
 2. Private Docker Registry
 - setup using JFrog Artifactory or Sonatype Nexus
 3. Remote Docker Registry
 - website maintained by Docker Inc
 - provides many opensource docker images

Info - Podman Overview

- alternate to Docker Container Engine
- rootless - allows running user application only as a non-admin user
- is a stand-alone tool which doesn't follow client/server
- maintained by Red Hat but it is opensource project

Info - Docker SWARM

- is Docker Inc's native Container Orchestration Platform
- is a light-weight setup - you can install this easily on your laptop with low-end configuration
- easy to install, learn
- not production grade
- good for learning, dev/qa setup
- only supports docker containerized application workloads

Info - Google Kubernetes

- is opensource, hence free for personal and commercial use
- you get only community support
- you get professional support from GCP/AWS/Azure in case you are using Kubernetes Managed Service
- is a robust, works well in local as well in production grade setup
- Kubernetes also supports extending Kubernetes API by using Custom Resource Definition & Custom Controllers
- Kubernetes Operators
 - You could add new functionality by using third-party Operators in your K8s Cluster
 - You could develop your own Custom Operators
 - Operators
 - is a combination of Custom Resources and Custom Controller
- supports command line only
- user managed is not supported, also doesn't support profession Webconsole
- Kubernetes Dashboard is considered insecure, hence normally

Administrators disable

- doesn't support internal container registry out of the box

Info - OKD

- is opensource Container Orchestration Platform maintained by opensource community, led by Red Hat
- is developed on top of Google Kubernetes
- supports both CLI and webconsole
- comes with in-built internal Image Registry
- you only get community support
- supports user-management
- supports deploying application from source code is called S2I (Source to Image)
- supports CI/CD
- support Virtualization

Info - Red Hat OpenShift

- is an enterprise product from Red Hat
- is Red Hat's distribution of Kubernetes with many additional features running on top of Kubernetes
- is a superset of Kubernetes with many additional features
- it comes with support from Red Hat (an IBM company)
- requires license for commerical use
- support user-management
- supports deploying application from source code is called S2I (Source to Image)
- supports CI/CD
- support Virtualization

Info - Container

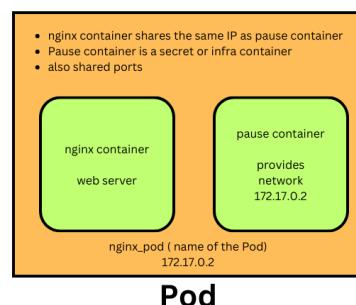
- application run inside a container
- containers has their own namespaces
- using namespaces containers are isolated from each other
- running instance of a Container Image

Info - Pod Overview

- is a group of related containers
- in every Pod there will be atleast two containers
- there is secret/hidden/infra container called pause container
- the pause container containers provides networking support

- pause containers gets a hostname and network card with IP address
- application container - that can run webserver, application server, REST API , SOAP API, Web Service, Microservice, DB Servers, etc.,
- recommended best practice
 - one application per Pod (pause container is not counted)
- Pod is the smallest resource that can be deployed in Kubernetes/OpenShift
- Pod is a resource (YAML documents) which is stored in etcd database
- Pod is managed as a database record by API Server control plane component
- the containers that are part of the same Pod, shares the same IP address, Port range, etc.,

How does a Pod look?



Info - Pod and Container states

<https://kubernetes.io/docs/concepts/workloads/pods/pod-lifecycle/>

Lab - Creating a Pod with plain Docker

```
docker run -d --name nginx_pause --hostname nginx
gcr.io/google_containers/pause:latest
docker ps
docker run -d --name nginx --network=container:nginx_pause nginx:latest
docker ps
```

Finding the IP address of the nginx_pause container

```
docker inspect -f {{.NetworkSettings.IPAddress}} nginx_pause
```

Getting inside the nginx container shell

```
docker exec -it nginx sh
hostname -i
hostname
exit
```

Expected output

```
jegan@tektutor.org ~ -/openshift-july-2024 [main] docker run -d --name nginx_pause --hostname nginx gcr.io/google_containers/pause:latest
jegan@tektutor.org ~ -/openshift-july-2024 [main] docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
3e84a88d25733c349655685e65088e39140960aa396f5de09d596b6aaaf5072ad "/pause" 2 seconds ago Up 1 second nginx_pause
jegan@tektutor.org ~ -/openshift-july-2024 [main] docker run -d --name nginx --network=container:nginx_pause nginx:latest
2676031b527d075d6aa35f35c3023688a9bbad0281654eb039d3e33af45b707e
jegan@tektutor.org ~ -/openshift-july-2024 [main] docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
2676031b527d nginx:latest "/docker-entrypoint..." 2 seconds ago Up 2 seconds nginx
3e84a88d2573 gcr.io/google_containers/pause:latest "/pause" 48 seconds ago Up 47 seconds nginx_pause
jegan@tektutor.org ~ -/openshift-july-2024 [main] docker inspect -f {{.NetworkSettings.IPAddress}} nginx_pause
172.17.0.2
jegan@tektutor.org ~ -/openshift-july-2024 [main] docker exec -it nginx sh
# hostname -i
172.17.0.2
# hostname
nginx
# exit
jegan@tektutor.org ~ -/openshift-july-2024 [main]
```

testing lab environment

```
oc version
kubectl version
kn version
helm version

oc get nodes
kubectl get nodes
```

Info - ReplicaSet

Pod

- Containerized Applications runs within Pod

Running multiples instances of our containerized application using ReplicaSet

- ReplicaSet indicates, how many Pods of a specific application should be running
- it has fields/attributes to denote
 - desiredCount - this tells, how many pod instance are expected to be running within openshift
 - currentCount - this tells, how many pod instances are currently running

```
within openshift
  - readyCount - this tells, how many pods are in ready state to serve the
end-users
  - it is an openshift resource that is stored and maintained within etcd
key-value database by API Server
```

Info - Deployment

```
- stateless application are deployed into openshift as a Deployment
- Deployment is a Kubernetes/OpenShift resource that represents an
application deployed into Kubernetes/OpenShift
- this has certain attributes that describes
  - what is the container image that must be used to deploy the Pod with
the deployment
  - it has captures how many Pod instances that must be running at any
point of time
  - name of the deployment
- this is stored within etcd key-value datastore by API Server ( Control
Plane Component )
```

Info - What are Kubernetes/OpenShift Control Plane Components?

Points to note

```
- the node where the Control plane components are running is called master
node
- usually the user applications (pods) won't be deployed on to the master
node
- but the master nodes can be configured to accept user applications as
Pods
- in our lab setup, the master nodes are configured to accept user
applications in addition to worker nodes
```

Below are the control plane components that runs in every master node

```
- API Server
- etcd key-value database
- scheduler
- controller managers
```

Info - API Server

List all the API server pods running in master1, master2 and master3 OpenShift nodes

```
oc get pods -n openshift-oauth-apiserver | grep apiserver
```

- is the heart of Kubernetes/OpenShift
- all crucial components in K8s/OpenShift communicate with API server using REST API calls
- API Server responds to REST calls by sending broadcasting events
- API Server is the only component that has read/write permissions to etcd database
- API server triggers broad-casting events whenever
 - a new record is added into the etcd database
 - an existing record is updated in the etcd database
 - an existing record is deleted in the etcd database

Info - etcd database

Listing the etcd pod instances running in master1, master2 and master3 OpenShift nodes

```
oc get pods -n openshift-etcd -o wide | grep etcd-master
```

- it is an open-source independent database project
- it is used in K8s/OpenShift cluster to maintain the application and cluster status
- it generally works as a cluster of etcd databases
- when one etcd database is updated, the other etcd database nodes get synchronized automatically
- in OpenShift, minimum 3 master nodes are created by default, one of the primary reasons for that is the etcd database minimum required is 3 nodes/instances
- distributed database
- stores data in form of key-value
- data is organized by key within etcd database

Info - Scheduler

Listing all the scheduler pods running in master1, master2 and master3 OpenShift nodes

```
oc get pods -n openshift-kube-scheduler -o wide | grep openshift-kube-scheduler-master
```

Responsibilities of a scheduler

- the responsibility of scheduler is find a node where a new Pod can be deployed
- the scheduler shares the scheduling recommendation for each Pod via REST calls to API Server

Info - Controller Managers

Listing all the controller pods running in master1, master2 and master 3 openshift nodes

```
oc get pods -n openshift-controller-manager -o wide | grep controller-manager
```

Responsibilities of a Controller

- controller is an application that runs as a Pod with special permissions to monitor certain resources running in any namespace
- is a collection of many controllers
- application that runs in an infinite loop
- in high-level controllers job is make sure the current state of cluster matches with the expected/desired state
- whenever there is a deviation between the current state and desired state, the controller do everything that is required to make the current state matching the desired state
- each controller manages a single Kubernetes/openshift resource
- in order for the controller to manage a specific type of resource, they will be monitoring all the namespaces cluster-wide
 - a new deployment created
 - an existing deploymnet is edited
 - an existing deployment is scaled up/down
 - Pod is created/deleted
- Examples
 - Deployment Controller manages Deployment resource
 - ReplicaSet Controller manages ReplicaSet resource
 - Job Controller
 - CronJob Controller
 - Endpoint Controller
 - StatefulSet Controller
 - DaemonSet Controller
 - Storage Controller

Info - Openshift client tools

- Openshift client tool is oc
- since openshift is developed on top of Kubernetes, the kubernetes client tool kubectl also works in openshift

Both the openshift clients, will fetch the API Server details from user home, hidden directory named .kube and file name is config

```
cat /home/jegan/.kube/config
```

Expected output

```
Activities Terminal
Jul 1 15:30 •

jegan@tektutor.org
jegan@tektutor.org
jegan@tektutor.org

user:
token: sha256-fqNMHEPkAIPJIGUzyjIM-i8MKnGof9BRqEneBzCXHw
- name: system:admin-api-ocp4-tektutor-org-labs:6443
user:
client-certificate-data: LS0tLS1CRDjtBDRVJJSUZQ0FURS0tLS0tCk1JSURaekNDQWsR0Z0F3SUJBZ0lJVDErT29aNeVw0Wd3RFFZSktvWklodmN0QVFTEJRX0d
OakXVU1JTB0RExVUUK3hNSm1QzQmxbk5YVdaME1TQXd1zLEVLFRREV4ZGhaRzFwYmkxmcrXSxMjl1Wm1sbkxYTnBaMjVsY2pBZQpGdzB5TkrBmk1qUXdNFV4TwpKYUZ3MHP
OREEvTwpJd01UVxhNakphTURBxEZ6QVZCZ05W0KFvVERUjVjm1jsCmJUcHRZWE4wLhKek1SVxFd11EVLFRRREV3eHplWE4wLcwnLLXUnRhVzR3ZdFaU1BMEdu3FUh0lMi0R
RRUIKQVFVQUE0SUJEEd0F32ZdFS0FvJSUJBuURLK0cwTKYv0XhWVXFianpuS2NlTxM0d9s0UpzTE5vMkddpVRM0jNqUwpWsfhFenJEN01qTuTfM2t1T0WRi1TmdX01EL3pZRFJVV
WEe
vOuRoZmEwUg84LytSGMVZURzc1BmZ3R3vNiBtE1LcmxQanpGL1d1RxZPw0dIwK12CwZHjBtamKHyjtwfu0tMyVzWZPSHk2MSEHgQWNOXZls3SfmdFzS2c5QnNr0WgkCrVmM3c
3b2p0cnJmB2LZhzbYEWYzWPMFxwYllhWxJ5TTVj0w1hamN4TXU3SEwTQVUHbLmvNj1tBES1NQZApkSejweVN2ZG14MDg1SHYyR01jZ2pvpVERmg43U2hwdUtPunZub1dRKZ2
vODNwN1dIWGsVY3YvaYv0bnphSm1JckhDunY2eWF4RVJHZE9KuZRHrEkvNlNLvM84cmMrVwlslazh5UctxbEJSSXR0QwdNQkFBR2pmek15TUE0R0ExVWQKRHdFQi93UvUb0lGb0R
BZE1NT1ZU1V1FmpBVJUu3ZCJ0QV01jFjREFRWRU1Ld1CQfFSEF3X3djeQVLeVIwApBU0gV0kFjd0fFEQWRCZ05WSE0RzuUvVFFxfhzUzvdJrEgd1M3IwRj14NmLf1d0z3Zr
3ShdRZFSZGMPQcmd3CzKV0Z3VJub226GvHzDaXNxLudsVzDQjVnAm1K13RFZSkvtWklodmN0QVFTE1RQURzNzQVUJmWnAzTmKTKVpWftTndTaisz0lrmVVPQksxaR
rM0l0b2N5Z3R3ZVJ0cFVTyNMyC8wNWfvUDNIK3Jobkc50vHRY1labwpczJNzczFFU2cZy21nW2Uc3RVSv1ybl0qr0tw0mt6Q3RDZDtbwD4UzDswGFIwDc5Z3hqcXh0eU1enN
PY2ZCJfLtmNxeHYR05tP0mtoWmN2z3c0xUjJfEbfUR1lMvnS3dYKptdW0reG1Qy2s1c0tqTHbzW3frEp4QlUK0S9pc1bU05MystmWkZmVzY20TBnRzFzekf3dEE4NmR
kZEkhalB5WdhM0qJkndNs2pab1R5az3bvm05i9yagpp0lknRkxBazUrZ0gwN05p0G9sr1EwbdndZUDuxVThMUGU1ZG1WamxqNHZkhnod94b1lF1VuxuN3F2aW5M2VvChvV
k9
zQVjzE5JY1LVGyZ0kLs0tLs1FTk0q0vSeLGSUNBVEutLs0tL0q=
client-key-data: LS0tLS1CRDjtIBSu0EgFJYVkfURSBLRvtLs0tL0pNs0tF0EJkFb50NbUUVBeXzd0ERSz19jYUldA04MhLuSgpMT02McGZTykN6YU50b3jRexd
KndBsP4F4T7Z3C16t5xpdaE410n1V3pRnR6Q584MkewVzC3U9C9RNFgyE0Q2FuFvcFizUDnN0xEmzRPTUzVh3p5bnBndH4jEkcmhMen1j0JUJztDze055m1u1cvbkyXT
YlZLnuemg4dKREv2dIRfb1M2lxbjdvTENVUFFISLBZYws20ThPngpjejY2etZHeW90TepSzjNueE5aYVcy0m1L06pWfWbabw8zTvrMdXh3tKmWmRh02WhRyaUrd3lrajNTUhdhY2t
ycjNac2RQ1130wHqSelJN4Vks5KkZBvVmJpamt1NTZGa1Bu1NlB0NmUxaDe1UDnmlzRsZu04M1zau33a21r2c0k1JfUm5Ubl1V0nQntctrawxhUeszUgxJcfpoTwovcXbrVvN
MvffjJrefRQujBb01CQZnb2syMx3c3h4GeNnthaQyVxZtLjBQ0t1u3QzCfVt0E5uREVzWfVwGn1tUx4akZ0Wm1NMTfnaGpBbUevcjNjcPmqhRBejR
BTGpnjdRfnjVkdvd4dm3taCwyaWchvtmiliaB1R5p3fLMX5fTzGnMUNYtJrMfZubm1nleLmkrjdeUvJry0VmXoxNbnLntLHNgVjwVjptVxxOhAw52vam1ldf1s0n1ha3a
au2ZCM0xkb1vNuNzFekTzLcrRp0MdnvJv0adzcr1V0wv0thWmxkckpoahTm7Wbm9jJfc1710xtAwMvFve1QwDjNv3R0vBq0GjxK3Fxc2Zxr0f0cRmQngdhSmFablk0S2Pcr0p
Sc2PfaFzjYkd2Y3pk0w1lZ3sMtLzWpxYmPmNy0FcvFymVHuzKvzW5faGfub2MkWrwH0DbcvUvnwUvBnhWvtt0V0k1rZw80UefUvNmda2WnTgxSwFwtWpxEgPsw90nph0ckv
ysVzLr204RxlSwpsa09qsjRc054ttLxaFnjWukvUfgrV2vQxZa3MtfmQkrhTm2R2NxUs9Tuvdbm10WgKwhe94Utlmag50s3i5Cjvre3pSTVpuwzTzd3nx3FqlLltBkltMn
WmxpEsZfK0hPyQjX1Z290s2d50FnudnyzLhvbszhdZ1lF0TvrjYkUtdyZp2DrGxydfod0p2rVhTwgrwdBwsgx0suje1R3mu9FsVb1Rjh1Mg1ldmIweup5ak3t3zdBwxfvrv0v
50qspzsJrcE21svdrR0wzTvxT0jU3YwY2Z3MgXdku10W10Mv3UHrns3gvSdlHaJnfW1BzDvY0DpjAeBegCmCnytdzndlwPhwxvhlmfffs5kzveWtzM9y29h3VlZvR
5YxVzUvnwUWbMxdqWzUdrhtr1aude0z1nLckJtcm5b3v3dUpytEx2Npx62r4Z7JdM2yJ0wRfBzJ2zHt2yVkl50Xwvzly1sVrdrzzyUhrLhe55nBdrdtawpoawfws1o
rTxfbnb14L22JtjI0d04z2xmodxw5B2Tz2UuFVxyJtcm1ebzczm93bmhmvtVx0m1UvptnRa05jCmvlWmtwvjkybq0undzdXnjehru0jN02dZqVfjdnlfLatVtsld6k3ftc1n
1rj2Tjwds0t0YBwai90Qk0rWtYKrzBaeu5YjM5d2cWleJm1t4Mc1d0N1YydseneMrgQ1ka4w4ca4dhssLpapawsm1da0ad0kcx3nHo2cFfoaX1IygpEvu0dJz1Ltvds3n1Luzk
1b0fdFure1tc3v5u3G5c1Vyl0jkVllrc2JzJ3isb3n5j52NmepxcdmZkev42Rulc1Z1nsZu0tCfZ1Rnhs0Lhs0FdBmBzZstkhwU82aWnvFgvdrhpzkdjrfjrsdrvcd
YblhKQ3lUvMmj0T0wKnmpabu9imzFhRkjlYlv6Zhphtlvuzenhrudqk1p0ue9ae1JtshrzmgmyQthwjnjbzd2fuu14cy80Mlrxa2fmuaPmkkrUedqs0ljs3V1R2j3z3y2c3f3Th
0xZf0Gth1Vg1L2QTN3dgxumtu0t0DFw3Gx4Bf5uNc9p0otLs0tL0UvORCSBU0egfJjVkfURSBLRvtLs0tL0o=
jegan@tektutor.org -> /openShift-in-2024 - 1 main
```

Demo - Kubeconfig

The standard location where oc/kubectl will attempt to locate the kubeconfig file is user home directory, .kube folder and the file name is config

```
cat /home/jegan/.kube/config
```

In case the kubeconfig file is kept in a different directory and kubeconfig file name is different, we could use `--kubeconfig` flag.

```
oc get nodes --kubeconfig /home/jegan/.kube/config.bak
```

The other option is, we could use the KUBECONFIG environment variable to point the kubeconfig file in any directory, the config file can be named anything

```
export KUBECONFIG=/home/jegan/.kube/config.bak
oc get nodes
UNSET KUBECONFIG
oc get nodes
```

Expected output

The screenshot shows a macOS terminal window with two tabs: 'jegan@tektutor.org' and 'jegan@tektutor.org'. The first tab contains the command 'mv ~.kube/config ~.kube/config.bak' followed by 'error: Missing or incomplete configuration info. Please point to an existing, complete config file:'. The second tab shows the command 'oc get nodes' failing with the same error message. Below these, a section titled 'To view or setup config directly use the 'config' command.' is shown, followed by three methods: 1. Via the command-line flag --kubeconfig, 2. Via the KUBECONFIG environment variable, and 3. In your home directory as ~/.kube/config. The third method is demonstrated with the command 'export KUBECONFIG=/home/jegan/.kube/config.bak', which successfully lists the cluster's nodes in the second tab.

```
jegan@tektutor.org ~ ~/openshift-july-2024 mv ~.kube/config ~.kube/config.bak
jegan@tektutor.org ~ ~/openshift-july-2024 oc get nodes
error: Missing or incomplete configuration info. Please point to an existing, complete config file:

1. Via the command-line flag --kubeconfig
2. Via the KUBECONFIG environment variable
3. In your home directory as ~/.kube/config

To view or setup config directly use the 'config' command.
x jegan@tektutor.org ~ ~/openshift-july-2024 oc get nodes --kubeconfig=~/home/jegan/.kube/config.bak
error: stat ~/home/jegan/.kube/config.bak: no such file or directory
x jegan@tektutor.org ~ ~/openshift-july-2024 oc get nodes --kubeconfig ~/home/jegan/.kube/config.bak
NAME STATUS ROLES AGE VERSION
master-1.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
master-2.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
master-3.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
worker-1.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5
worker-2.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5
jegan@tektutor.org ~ ~/openshift-july-2024 export KUBECONFIG=/home/jegan/.kube/config.bak
jegan@tektutor.org ~ ~/openshift-july-2024 oc get nodes
NAME STATUS ROLES AGE VERSION
master-1.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
master-2.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
master-3.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
worker-1.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5
worker-2.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5
jegan@tektutor.org ~ ~/openshift-july-2024 unset KUBECONFIG
jegan@tektutor.org ~ ~/openshift-july-2024 oc get nodes
error: Missing or incomplete configuration info. Please point to an existing, complete config file:

1. Via the command-line flag --kubeconfig
2. Via the KUBECONFIG environment variable
3. In your home directory as ~/.kube/config
```

```

Activities Terminal Jul 1 15:38 • jegan@tektutor.org
jegan@tektutor.org x jegan@tektutor.org

1. Via the command-line flag --kubeconfig
2. Via the KUBECONFIG environment variable
3. In your home directory as ~/.kube/config

To view or setup config directly use the 'config' command.
x jegan@tektutor.org > ~/openshift-july-2024 > \ main oc get nodes --kubeconfig=~/kube/config.bak
error: stat ~/kube/config.bak: no such file or directory
x jegan@tektutor.org > ~/openshift-july-2024 > \ main oc get nodes --kubeconfig ~/kube/config.bak
NAME STATUS ROLES AGE VERSION
master-1.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
master-2.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
master-3.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
worker-1.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5
worker-2.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5
jegan@tektutor.org > ~/openshift-july-2024 > \ main export KUBECONFIG=/home/jegan/.kube/config.bak
jegan@tektutor.org > ~/openshift-july-2024 > \ main oc get nodes
error: Missing or incomplete configuration info. Please point to an existing, complete config file:

1. Via the command-line flag --kubeconfig
2. Via the KUBECONFIG environment variable
3. In your home directory as ~/.kube/config

To view or setup config directly use the 'config' command.
x jegan@tektutor.org > ~/openshift-july-2024 > \ main

Activities Terminal Jul 1 15:42 • jegan@tektutor.org
jegan@tektutor.org x jegan@tektutor.org

error: stat ~/kube/config.bak: no such file or directory
x jegan@tektutor.org > ~/openshift-july-2024 > \ main oc get nodes --kubeconfig ~/kube/config.bak
NAME STATUS ROLES AGE VERSION
master-1.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
master-2.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
master-3.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
worker-1.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5
worker-2.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5
jegan@tektutor.org > ~/openshift-july-2024 > \ main export KUBECONFIG=/home/jegan/.kube/config.bak
jegan@tektutor.org > ~/openshift-july-2024 > \ main oc get nodes
error: Missing or incomplete configuration info. Please point to an existing, complete config file:

1. Via the command-line flag --kubeconfig
2. Via the KUBECONFIG environment variable
3. In your home directory as ~/.kube/config

To view or setup config directly use the 'config' command.
x jegan@tektutor.org > ~/openshift-july-2024 > \ main mv ~/kube/config.bak ~/kube/config
jegan@tektutor.org > ~/openshift-july-2024 > \ main oc get nodes
NAME STATUS ROLES AGE VERSION
master-1.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
master-2.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
master-3.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
worker-1.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5
worker-2.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5
jegan@tektutor.org > ~/openshift-july-2024 > \ main

```

Lab - Finding which user you have logged in currently from command line

```
oc whoami
```

Expected output

```

Activities Terminal Jul 1 15:43 • jegan@tektutor.org
jegan@tektutor.org
NAME STATUS ROLES AGE VERSION
master-1.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
master-2.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
master-3.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
worker-1.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5
worker-2.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5
jegan@tektutor.org >~/openshift-july-2024> \ main> export KUBECONFIG=/home/jegan/.kube/config.bak
jegan@tektutor.org >~/openshift-july-2024> \ main> oc get nodes
NAME STATUS ROLES AGE VERSION
master-1.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
master-2.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
master-3.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
worker-1.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5
worker-2.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5
jegan@tektutor.org >~/openshift-july-2024> \ main> unset KUBECONFIG
jegan@tektutor.org >~/openshift-july-2024> \ main> oc get nodes
error: Missing or incomplete configuration info. Please point to an existing, complete config file.

1. Via the command-line flag --kubeconfig
2. Via the KUBECONFIG environment variable
3. In your home directory as ~/.kube/config

To view or setup config directly use the 'config' command.
x jegan@tektutor.org >~/openshift-july-2024> \ main> mv ~/.kube/config.bak ~/.kube/config
jegan@tektutor.org >~/openshift-july-2024> \ main> oc get nodes
NAME STATUS ROLES AGE VERSION
master-1.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
master-2.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
master-3.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
worker-1.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5
worker-2.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5
jegan@tektutor.org >~/openshift-july-2024> \ main> oc whoami
system:admin
jegan@tektutor.org >~/openshift-july-2024> \ main>

```

Lab - Login to openshift as a kube administrator from command line

```
cat ~/openshift.txt
oc login -u kubeadmin
```

Expected output

```

Activities Terminal Jul 1 15:46 • jegan@tektutor.org
jegan@tektutor.org
jegan@tektutor.org >~/openshift-july-2024> \ main> cat ~/openshift.txt
Red Hat API Server Endpoint URL
#####
https://api.ocp4.training.tektutor:6443

Red Hat OpenShift web-console
#####
https://console-openshift-console.apps.ocp4.tektutor.org.labs

Login Credentials
#####
username : kubeadmin
password : 9fSDY-XckzZ-DQDHJ-FaLT6
jegan@tektutor.org >~/openshift-july-2024> \ main> oc login -u kubeadmin
Console URL: https://api.ocp4.tektutor.org.labs:6443/console
Authentication required for https://api.ocp4.tektutor.org.labs:6443 (openshift)
Username: kubeadmin
Password:
Login successful.

You have access to 75 projects, the list has been suppressed. You can list all projects with 'oc projects'

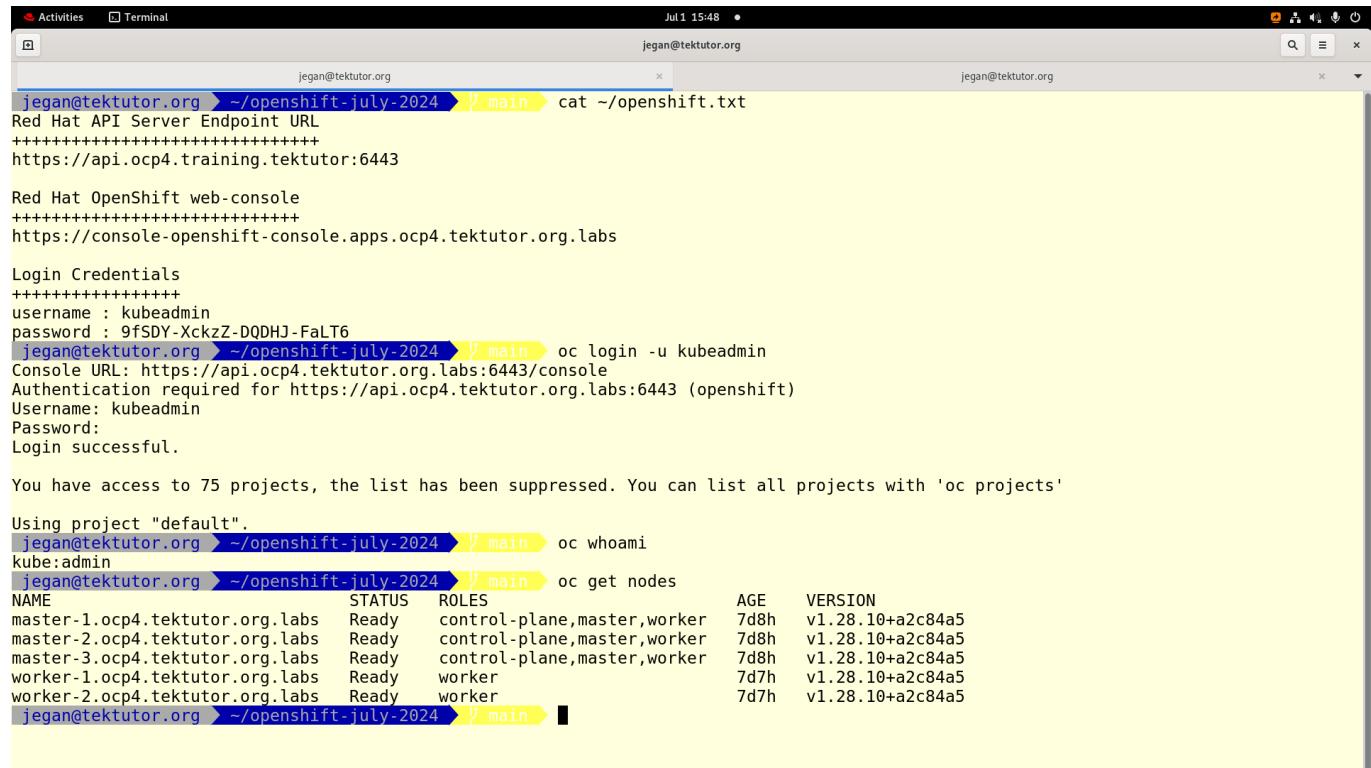
Using project "default".
jegan@tektutor.org >~/openshift-july-2024> \ main> oc whoami
kube:admin
jegan@tektutor.org >~/openshift-july-2024> \ main>

```

Lab - Listing the nodes in the openshift cluster

```
oc get nodes
```

Expected output



The screenshot shows a terminal window with two tabs. The active tab displays the output of the 'oc get nodes' command. The output lists five nodes: master-1.ocp4.tektutor.org.labs, master-2.ocp4.tektutor.org.labs, master-3.ocp4.tektutor.org.labs, worker-1.ocp4.tektutor.org.labs, and worker-2.ocp4.tektutor.org.labs. Each node is in a 'Ready' state, has the 'control-plane,master,worker' role, and is 7d8h old. All nodes are running version v1.28.10+a2c84a5.

```
jegan@tektutor.org ~ /openshift-july-2024 $ main cat ~/openshift.txt
Red Hat API Server Endpoint URL
+++++
https://api.ocp4.training.tektutor:6443

Red Hat OpenShift web-console
+++++
https://console-openshift-console.apps.ocp4.tektutor.org.labs

Login Credentials
+++++
username : kubeadmin
password : 9f5DY-XckzZ-DQDHJ-FaLT6
jegan@tektutor.org ~ /openshift-july-2024 $ main oc login -u kubeadmin
Console URL: https://api.ocp4.tektutor.org.labs:6443/console
Authentication required for https://api.ocp4.tektutor.org.labs:6443 (openshift)
Username: kubeadmin
Password:
Login successful.

You have access to 75 projects, the list has been suppressed. You can list all projects with 'oc projects'

Using project "default".
jegan@tektutor.org ~ /openshift-july-2024 $ main oc whoami
kube:admin
jegan@tektutor.org ~ /openshift-july-2024 $ main oc get nodes
NAME           STATUS   ROLES      AGE    VERSION
master-1.ocp4.tektutor.org.labs   Ready    control-plane,master,worker   7d8h   v1.28.10+a2c84a5
master-2.ocp4.tektutor.org.labs   Ready    control-plane,master,worker   7d8h   v1.28.10+a2c84a5
master-3.ocp4.tektutor.org.labs   Ready    control-plane,master,worker   7d8h   v1.28.10+a2c84a5
worker-1.ocp4.tektutor.org.labs  Ready    worker      7d7h   v1.28.10+a2c84a5
worker-2.ocp4.tektutor.org.labs  Ready    worker      7d7h   v1.28.10+a2c84a5
jegan@tektutor.org ~ /openshift-july-2024 $ main
```

Listing the nodes with node IP details

```
oc get nodes -o wide
```

Expected output

```

Activities Terminal Jul 1 15:49
jegan@tektutor.org
username : kubeadmin
password : 9fSDY-XckZZ-DQDHJ-FaLT6
jegan@tektutor.org >~/openshift-july-2024> oc login -u kubeadmin
Console URL: https://api.ocp4.tektutor.org.labs:6443/console
Authentication required for https://api.ocp4.tektutor.org.labs:6443 (openshift)
Username: kubeadmin
Password:
Login successful.

You have access to 75 projects, the list has been suppressed. You can list all projects with 'oc projects'

Using project "default".
jegan@tektutor.org >~/openshift-july-2024> oc whoami
kube:admin
jegan@tektutor.org >~/openshift-july-2024> oc get nodes
NAME STATUS ROLES AGE VERSION
master-1.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
master-2.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
master-3.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5
worker-1.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5
worker-2.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5
jegan@tektutor.org >~/openshift-july-2024> oc get nodes -o wide
NAME STATUS ROLES AGE KERNEL-VERSION INTERNAL-IP EXTERNAL-IP OS-IM
AGE
master-1.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5 192.168.122.77 <none> Red H
at Enterprise Linux CoreOS 415.92.202406111137-0 (Plow) 5.14.0-284.69.1.el9_2.x86_64 cri-o://1.28.7-3.rhaos4.15.gitf52304f.el9
master-2.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5 192.168.122.249 <none> Red H
at Enterprise Linux CoreOS 415.92.202406111137-0 (Plow) 5.14.0-284.69.1.el9_2.x86_64 cri-o://1.28.7-3.rhaos4.15.gitf52304f.el9
master-3.ocp4.tektutor.org.labs Ready control-plane,master,worker 7d8h v1.28.10+a2c84a5 192.168.122.172 <none> Red H
at Enterprise Linux CoreOS 415.92.202406111137-0 (Plow) 5.14.0-284.69.1.el9_2.x86_64 cri-o://1.28.7-3.rhaos4.15.gitf52304f.el9
worker-1.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5 192.168.122.185 <none> Red H
at Enterprise Linux CoreOS 415.92.202406111137-0 (Plow) 5.14.0-284.69.1.el9_2.x86_64 cri-o://1.28.7-3.rhaos4.15.gitf52304f.el9
worker-2.ocp4.tektutor.org.labs Ready worker 7d7h v1.28.10+a2c84a5 192.168.122.192 <none> Red H
at Enterprise Linux CoreOS 415.92.202406111137-0 (Plow) 5.14.0-284.69.1.el9_2.x86_64 cri-o://1.28.7-3.rhaos4.15.gitf52304f.el9
jegan@tektutor.org >~/openshift-july-2024> oc main

```

Info - Operating System installed in Openshift nodes

- Openshift Master nodes can only install Red Hat Enterprise Linux Core OS (RHCOS)
- Openshift Worker nodes can install either
 - Red Hat Enterprise Linux (RHEL)
 - Red Hat Enterprise Linux Core OS (RHCOS)
- However, it is recommended to install RHCOS in worker and master nodes, as it is easier to upgrade the OS using oc commands or from Red Hat Openshift web console if you opted for RHCOS in all the nodes

Info - About Red Hat Enterprise Linux Core OS (RHCOS)

- it is an optimized OS for Container Orchestration Platforms
- in case of Kubernetes, the nodes can install any Linux Distributions
 - Ubuntu
 - CentOS
 - Rock Linux
 - Fedora
 - RHEL
 - any Linux distributions is supported
- RHCOS is a secured Operating System that enforces the best practices are always followed
- RHCOS also comes with pre-installed Podman container engine and CRI-O Container Runtime
- Each RHCOS version comes with a specific version of Podman and CRI-O pre-installed

- RHCOS reserves certain ports for Openshift internal use, any port below 1024 are reserved, user applications are not allowed to use ports upto 1024, anything above 1024 can be used by user application if available
- RHCOS gives only Read-only permissions to certain folder
- RHCOS won't allow writing certain folders, if application attempts to modify a read-only folder then the application will be denied permission to run

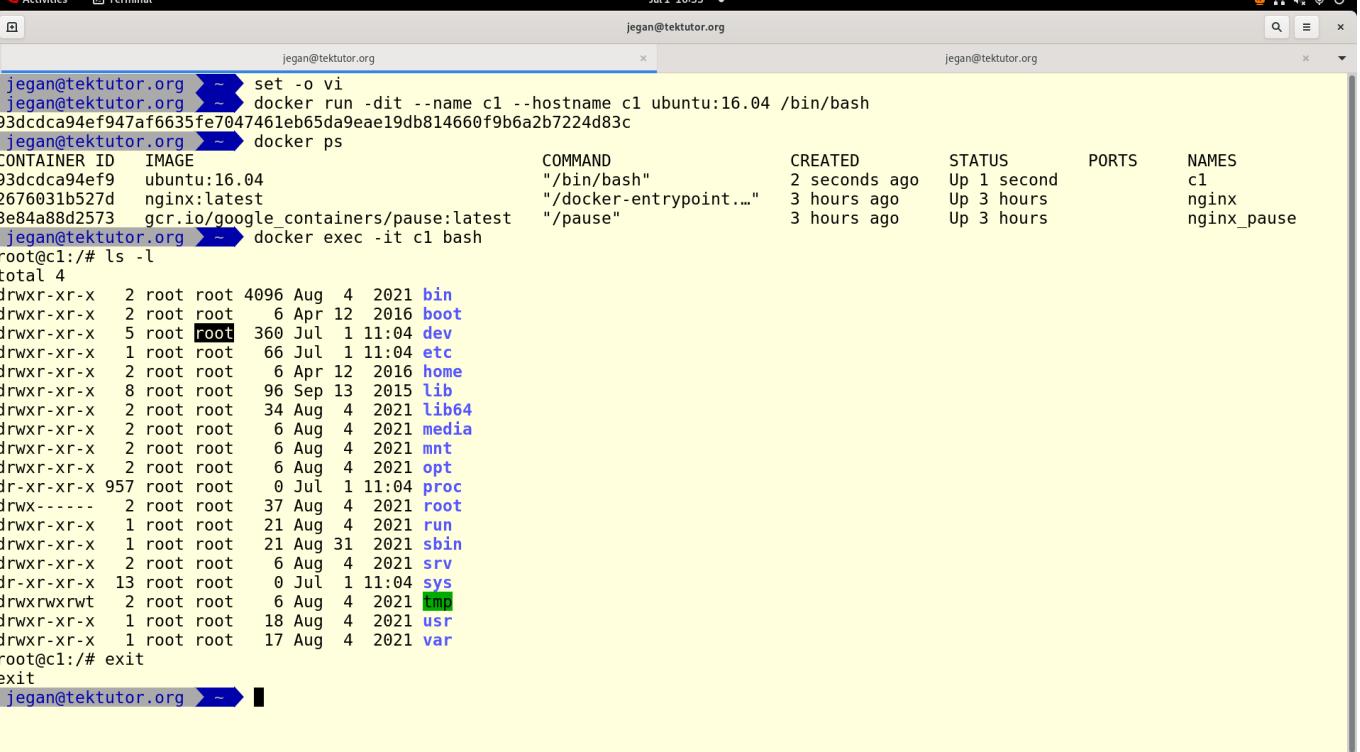
Red Hat Openshift v3.x and v4.x

- Until Red Hat Openshift v3.x(v3.11), docker was the default container engine supported by Kubernetes and Red Hat Openshift
- starting from Red Hat Openshift v4.x, docker support was dropped by Kubernetes and Red Hat Openshift
- Kubernetes supports many different container runtimes and engines, however by default it was supporting Docker and runC out of the box
- For this, Kubernetes maintained a Container Interface called DockerShim, which is used by kubelet container agent to communicate with docker engine
- the DockerShim was developed and maintained by Kubernetes team itself
- In year 2020, Google announced that they won't maintain/support DockerShim moving forward
- Google also introduced something called CRI (Container Runtime Interface), which is a specification that the container software vendors must implement in order for Kubernetes to support their container type
- Red Hat and Google identified a security flaw in Docker Architecture, they reported the security issue to Docker Inc, but due to some reason they didn't fix the issue for several months as they had their priorities
- Red Hat acquired a company called CoreOS, they had interesting products
 1. Core OS - optimized linux OS for Container Orchestration Platforms
 2. rkt - a container runtime which comes out of the box with their Core OS
- Red Hat killed the rkt container runtime project, instead they developed something called CRI-O Container Runtime
 - the Core OS comes in 2 flavours
 1. Fedora Core OS - open source linux os optimized for Container Orchestration Platforms (used in OKD)
 2. Red Hat Enterprise Linux Core OS (RHCOS) which is used in Red Hat Openshift commercial licensed product

Lab - Understanding docker security flaw

```
docker run -dit --name c1 --hostname c1 ubuntu:16.04 /bin/bash
docker ps
docker exec -it c1 bash
ls -l
exit
exit
```

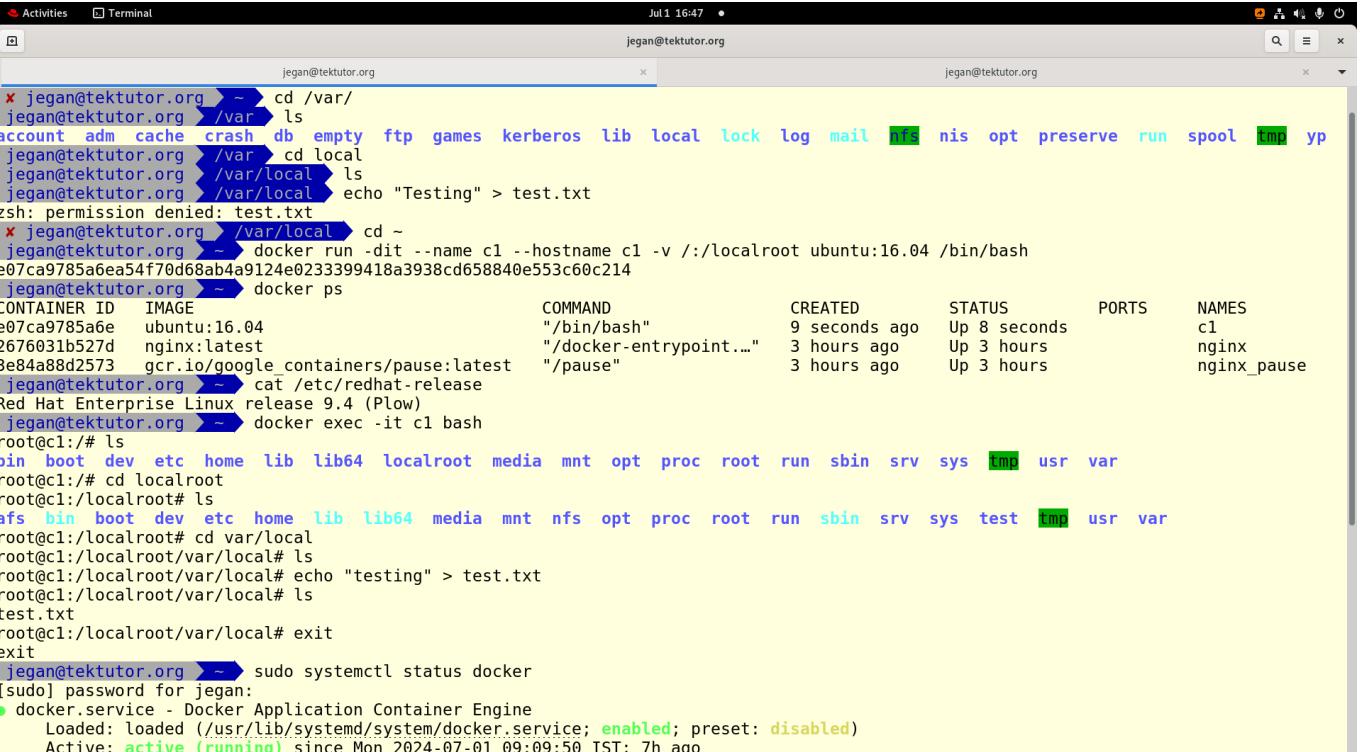
Expected output



```

jegan@tektutor.org ~ set -o vi
jegan@tektutor.org ~ docker run -dit --name c1 --hostname c1 ubuntu:16.04 /bin/bash
93dcda94ef947af6635fe7047461eb65da9eae19db814660f9b6a2b7224d83c
jegan@tektutor.org ~ docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
93dcda94ef94 ubuntu:16.04 "/bin/bash" 2 seconds ago Up 1 second
2676031b527d nginx:latest "/docker-entrypoint..." 3 hours ago Up 3 hours
3e8aa88d2573 gcr.io/google_containers/pause:latest "/pause" 3 hours ago Up 3 hours
jegan@tektutor.org ~ docker exec -it c1 bash
root@c1:/# ls -l
total 4
drwxr-xr-x 2 root root 4096 Aug 4 2021 bin
drwxr-xr-x 2 root root 6 Apr 12 2016 boot
drwxr-xr-x 5 root root 360 Jul 1 11:04 dev
drwxr-xr-x 1 root root 66 Jul 1 11:04 etc
drwxr-xr-x 2 root root 6 Apr 12 2016 home
drwxr-xr-x 8 root root 96 Sep 13 2015 lib
drwxr-xr-x 2 root root 34 Aug 4 2021 lib64
drwxr-xr-x 2 root root 6 Aug 4 2021 media
drwxr-xr-x 2 root root 6 Aug 4 2021 mnt
drwxr-xr-x 2 root root 6 Aug 4 2021 opt
dr-xr-xr-x 957 root root 0 Jul 1 11:04 proc
drwxr-xr-x 2 root root 37 Aug 4 2021 root
drwxr-xr-x 1 root root 21 Aug 4 2021 run
drwxr-xr-x 1 root root 21 Aug 31 2021 sbin
drwxr-xr-x 2 root root 6 Aug 4 2021 srv
dr-xr-xr-x 13 root root 0 Jul 1 11:04 sys
drwxrwxrwt 2 root root 6 Aug 4 2021 tmp
drwxr-xr-x 1 root root 18 Aug 4 2021 usr
drwxr-xr-x 1 root root 17 Aug 4 2021 var
root@c1:/# exit
exit
jegan@tektutor.org ~

```

```

x jegan@tektutor.org ~ cd /var/
jegan@tektutor.org /var ls
account adm cache crash db empty ftp games kerberos lib local lock log mail nfs nis opt preserve run spool tmp yp
jegan@tektutor.org /var cd local
jegan@tektutor.org /var/local ls
jegan@tektutor.org /var/local echo "Testing" > test.txt
zsh: permission denied: test.txt
x jegan@tektutor.org /var/local cd ~
jegan@tektutor.org ~ docker run -dit --name c1 --hostname c1 -v /:/localroot ubuntu:16.04 /bin/bash
e07ca9785a6ea54f70d68ab49124e023399418a3938cd658840e553c60c214
jegan@tektutor.org ~ docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
e07ca9785a6ea54f70d68ab49124e023399418a3938cd658840e553c60c214
2676031b527d nginx:latest "/docker-entrypoint..." 3 hours ago Up 3 hours
3e8aa88d2573 gcr.io/google_containers/pause:latest "/pause" 3 hours ago Up 3 hours
jegan@tektutor.org ~ cat /etc/redhat-release
Red Hat Enterprise Linux release 9.4 (Plow)
jegan@tektutor.org ~ docker exec -it c1 bash
root@c1:/# ls
bin boot dev etc home lib lib64 localroot media mnt opt proc root run sbin srv sys tmp usr var
root@c1:/# cd localroot
root@c1:/localroot# ls
afs bin boot dev etc home lib lib64 media mnt nfs opt proc root run sbin srv sys test tmp usr var
root@c1:/localroot# cd var/local
root@c1:/localroot/var/local# ls
root@c1:/localroot/var/local# echo "testing" > test.txt
root@c1:/localroot/var/local# ls
test.txt
root@c1:/localroot/var/local# exit
exit
jegan@tektutor.org ~ sudo systemctl status docker
[sudo] password for jegan:
● docker.service - Docker Application Container Engine
   Loaded: loaded (/usr/lib/systemd/system/docker.service; enabled; preset: disabled)
     Active: active (running) since Mon 2024-07-01 09:09:50 IST; 7h ago
    TriggeredBy: ● docker.socket

```

Lab - Finding more details about Openshift node

```
oc describe node master-1.ocp4.tektutor.org.labs
```

Expected output

The screenshot shows a terminal window with two tabs. The left tab is titled 'jegan@tektutor.org' and contains the command 'oc get nodes'. The right tab is also titled 'jegan@tektutor.org' and contains the command 'oc describe node master-1.ocp4.tektutor.org.labs'. The terminal output is as follows:

```
jegan@tektutor.org ➔ oc get nodes
NAME           STATUS  ROLES          AGE   VERSION
master-1.ocp4.tektutor.org.labs  Ready   control-plane,master,worker  7d9h  v1.28.10+a2c84a5
master-2.ocp4.tektutor.org.labs  Ready   control-plane,master,worker  7d9h  v1.28.10+a2c84a5
master-3.ocp4.tektutor.org.labs  Ready   control-plane,master,worker  7d9h  v1.28.10+a2c84a5
worker-1.ocp4.tektutor.org.labs  Ready   worker           7d8h  v1.28.10+a2c84a5
worker-2.ocp4.tektutor.org.labs  Ready   worker           7d8h  v1.28.10+a2c84a5

jegan@tektutor.org ➔ oc describe node master-1.ocp4.tektutor.org.labs
Name:           master-1.ocp4.tektutor.org.labs
Roles:          control-plane,master,worker
Labels:         beta.kubernetes.io/arch=amd64
                beta.kubernetes.io/os=linux
                kubernetes.io/arch=amd64
                kubernetes.io/hostname=master-1.ocp4.tektutor.org.labs
                kubernetes.io/os=linux
                node-role.kubernetes.io/control-plane=
                node-role.kubernetes.io/master=
                node-role.kubernetes.io/worker=
                node.openshift.io/os_id=rhcos
Annotations:    k8s.ovn.org/host-cidrs: ["192.168.122.77/24"]
                k8s.ovn.org/l3-gateway-config:
                  {"default":{"mode":"shared","interface-id":"br-ex_master-1.ocp4.tektutor.org.labs","mac-address":"52:54:00:57:65:a
a","ip-addresses":["192...
                k8s.ovn.org/network-ids: {"default":"0"}
                k8s.ovn.org/node-chassis-id: 0e81aaef0-47f2-495b-8d82-4f9265bddc98
                k8s.ovn.org/node-gateway-router-lrp-ifaddr: {"ipv4":"100.64.0.4/16"}
                k8s.ovn.org/node-id: 4
                k8s.ovn.org/node-mgmt-port-mac-address: 2a:35:f0:fc:c4:d0
                k8s.ovn.org/node-primary-ifaddr: {"ipv4":"192.168.122.77/24"}
                k8s.ovn.org/node-subnets: {"default":["10.128.0.0/23"]}
                k8s.ovn.org/node-transit-switch-port-ifaddr: {"ipv4":"100.88.0.4/16"}
                k8s.ovn.org/remote-zone-migrated: master-1.ocp4.tektutor.org.labs
                k8s.ovn.org/zone-name: master-1.ocp4.tektutor.org.labs
machineconfiguration.openshift.io/controlPlaneTopology: HighlyAvailable
machineconfiguration.openshift.io/currentConfig: rendered-master-7b78469312188f8fc026e379fa589ec8
machineconfiguration.openshift.io/deploymentConfig: rendered-master-7b78469312188f8fc026e379fa589ec8
```

```

Activities Terminal Jul 1 16:49 • jegan@tektutor.org
jegan@tektutor.org x jegan@tektutor.org x
jegan@tektutor.org

Unschedulable: false
Lease:
  HolderIdentity: master-1.ocp4.tektutor.org.labs
  AcquireTime: <unset>
  RenewTime: Mon, 01 Jul 2024 16:48:49 +0530
Conditions:
  Type      Status  LastHeartbeatTime          LastTransitionTime        Reason                Message
  ----      -----  -----                      -----                  -----                -----
  MemoryPressure  False   Mon, 01 Jul 2024 16:45:31 +0530  Mon, 24 Jun 2024 07:32:57 +0530  KubeletHasSufficientMemory  kubelet has sufficient memory available
  DiskPressure   False   Mon, 01 Jul 2024 16:45:31 +0530  Mon, 24 Jun 2024 07:32:57 +0530  KubeletHasNoDiskPressure  kubelet has no disk pressure
  PIDPressure    False   Mon, 01 Jul 2024 16:45:31 +0530  Mon, 24 Jun 2024 07:32:57 +0530  KubeletHasSufficientPID   kubelet has sufficient PID available
  Ready         True    Mon, 01 Jul 2024 16:45:31 +0530  Mon, 24 Jun 2024 07:39:03 +0530  KubeletReady            kubelet is posting ready status
Addresses:
  InternalIP: 192.168.122.77
  Hostname: master-1.ocp4.tektutor.org.labs
Capacity:
  cpu:           8
  ephemeral-storage: 51837932Ki
  hugepages-1Gi: 0
  hugepages-2Mi: 0
  memory:        15991656Ki
  pods:          250
Allocatable:
  cpu:           7500m
  ephemeral-storage: 46700096229
  hugepages-1Gi: 0
  hugepages-2Mi: 0
  memory:        14840680Ki
  pods:          250
System Info:
  Machine ID: ee397eca09f54a38835e43c86bcf5df5
  System UUID: ee397eca-09f5-4a38-835e-43c86bcf5df5
Activities Terminal Jul 1 16:54 • jegan@tektutor.org
jegan@tektutor.org x jegan@tektutor.org x
jegan@tektutor.org

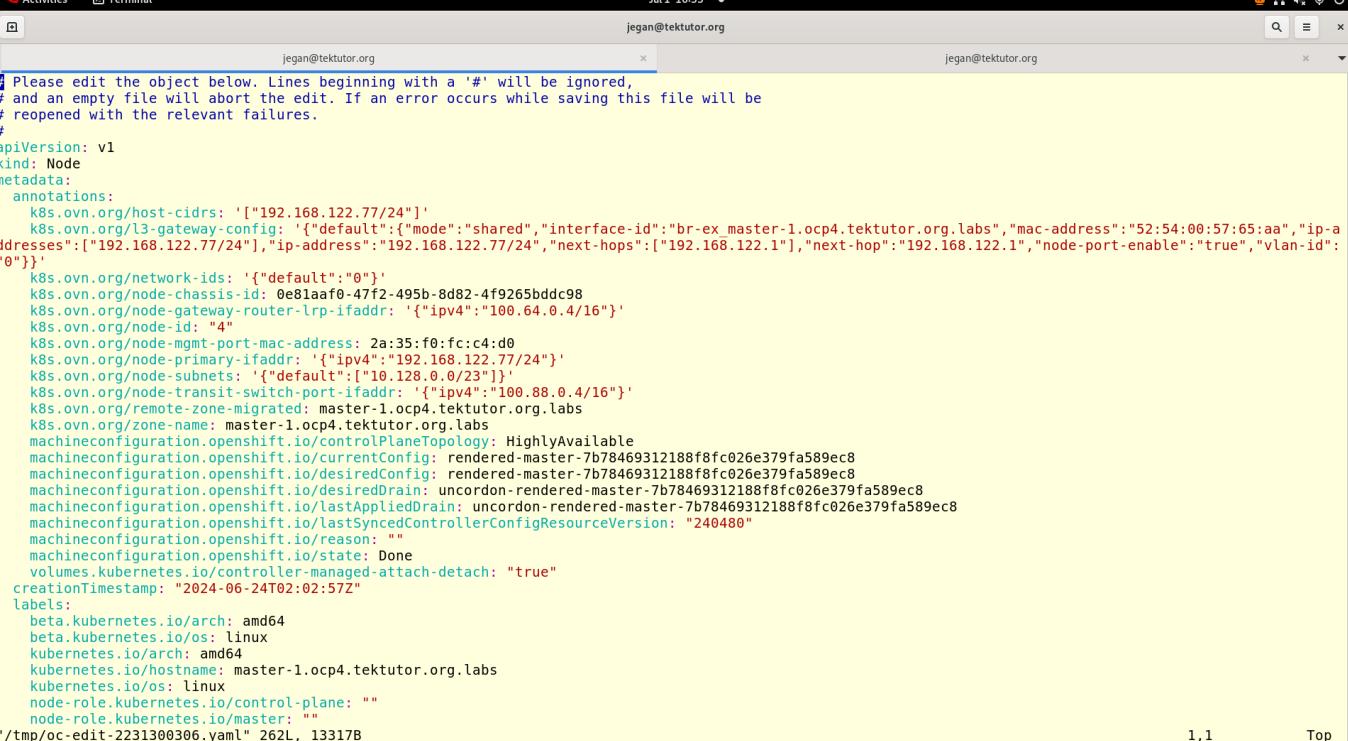
  openshift-monitoring      prometheus-k8s-1           75m (1%)  0 (0%)  1104Mi (7%)  0
  openshift-monitoring      prometheus-operator-admission-webhook-5cbc6679f6-2x9hj  5m (0%)  0 (0%)  30Mi (0%)  0
  openshift-monitoring      thanos-querier-779595dbdd-d981n  15m (0%)  0 (0%)  87Mi (0%)  0
  openshift-multus          multus-additional-cni-plugins-vwptp  10m (0%)  0 (0%)  10Mi (0%)  0
  openshift-multus          multus-admission-controller-7bc567c58d-tk7df  20m (0%)  0 (0%)  70Mi (0%)  0
  openshift-multus          multus-tqd7c           10m (0%)  0 (0%)  65Mi (0%)  0
  openshift-multus          network-metrics-daemon-ckc4q   20m (0%)  0 (0%)  120Mi (0%)  0
  openshift-network-diagnostics network-check-source-66bf455fcb-6lnvg  10m (0%)  0 (0%)  40Mi (0%)  0
  openshift-network-diagnostics network-check-target-rkq7r   10m (0%)  0 (0%)  15Mi (0%)  0
  openshift-network-node-identity network-node-identity-8h6c8   20m (0%)  0 (0%)  100Mi (0%)  0
  openshift-oauth-apiserver apiserver-65dbc77c5-flnch  150m (2%) 0 (0%)  200Mi (1%)  0
  openshift-ovn-kubernetes ovnkube-control-plane-5bf6c7f49-lr49h  20m (0%)  0 (0%)  320Mi (2%)  0
  openshift-ovn-kubernetes ovnkube-node-d8j2p   80m (1%)  0 (0%)  1630Mi (11%) 0
  openshift-route-controller-manager route-controller-manager-9b4f9b487-xbnz  100m (1%) 0 (0%)  100Mi (0%)  0
  openshift-service-ca       service-ca-5b58db65bf-jrx8d  10m (0%)  0 (0%)  120Mi (0%)  0
Allocated resources:
  (Total limits may be over 100 percent, i.e., overcommitted.)
  Resource     Requests     Limits
  -----      -----      -----
  cpu          2203m (29%)  1 (13%)
  memory       8910Mi (61%) 1000Mi (6%)
  ephemeral-storage 0 (0%)  0 (0%)
  hugepages-1Gi 0 (0%)  0 (0%)
  hugepages-2Mi 0 (0%)  0 (0%)
Events: <none>
jegan@tektutor.org ➔

```

Lab - Edit openshift node (don't edit anything)

```
oc edit node master-1.ocp4.tektutor.org.labs
```

Expected output



```
jegan@tektutor.org Jul 1 16:55 • jegan@tektutor.org jegan@tektutor.org

# Please edit the object below. Lines beginning with a '#' will be ignored,
# and an empty file will abort the edit. If an error occurs while saving this file will be
# reopened with the relevant failures.
#
apiVersion: v1
kind: Node
metadata:
  annotations:
    k8s.ovn.org/host-cidrs: '[{"192.168.122.77/24"}'
    k8s.ovn.org/l3-gateway-config: '{"default":{"mode":"shared","interface-id":"br-ex_master-1.ocp4.tektutor.org.labs","mac-address":"52:54:00:57:65:aa","ip-addresses":["192.168.122.77/24"],"ip-address":"192.168.122.77/24","next-hops":[{"192.168.122.1"}, {"next-hop":"192.168.122.1","node-port-enable":"true","vlan-id":0}]}'
    k8s.ovn.org/network-ids: [{"default":"0"}]
    k8s.ovn.org/node-chassis-id: 0e81aaaf0-47f2-495b-8d82-4f9265ddc98
    k8s.ovn.org/node-gateway-router-lrp-ifaddr: '{"ipv4":"100.64.0.4/16"}'
    k8s.ovn.org/node-id: "4"
    k8s.ovn.org/node-mgmt-port-mac-address: 2a:35:f0:fc:c4:d0
    k8s.ovn.org/node-primary-ifaddr: '{"ipv4":"192.168.122.77/24"}'
    k8s.ovn.org/node-subnets: '{"default":["10.128.0.0/23"]}'
    k8s.ovn.org/node-transit-switch-port-ifaddr: '{"ipv4":"100.88.0.4/16"}'
    k8s.ovn.org/remote-zone-migrated: master-1.ocp4.tektutor.org.labs
    k8s.ovn.org/zone-name: master-1.ocp4.tektutor.org.labs
machineconfiguration.openshift.io/controlPlaneTopology: HighlyAvailable
machineconfiguration.openshift.io/currentConfig: rendered-master-7b78469312188f8fc026e379fa589ec8
machineconfiguration.openshift.io/desiredConfig: rendered-master-7b78469312188f8fc026e379fa589ec8
machineconfiguration.openshift.io/desiredBrain: uncordon-rendered-master-7b78469312188f8fc026e379fa589ec8
machineconfiguration.openshift.io/lastAppliedBrain: uncordon-rendered-master-7b78469312188f8fc026e379fa589ec8
machineconfiguration.openshift.io/lastSyncedControllerConfigResourceVersion: "240480"
machineconfiguration.openshift.io/reason: ""
machineconfiguration.openshift.io/state: Done
volumes.kubernetes.io/controller-managed-attach-detach: "true"
creationTimestamp: "2024-06-24T02:02:57Z"
labels:
  beta.kubernetes.io/arch: amd64
  beta.kubernetes.io/os: linux
  kubernetes.io/arch: amd64
  kubernetes.io/hostname: master-1.ocp4.tektutor.org.labs
  kubernetes.io/os: linux
  node-role.kubernetes.io/control-plane: ""
  node-role.kubernetes.io/master: ""
"/tmp/oc-edit-2231300306.yaml" 262L, 13317B
```

1,1

Top

```

jegan@tektutor.org
jegan@tektutor.org
jegan@tektutor.org

k8s.ovn.org/node-transit-switch-port-ifaddr: '{"ipv4":"100.88.0.4/16"}'
k8s.ovn.org/remote-zone-migrated: master-1.ocp4.tektutor.org.labs
k8s.ovn.org/zone-name: master-1.ocp4.tektutor.org.labs
machineconfiguration.openshift.io/controlPlaneTopology: HighlyAvailable
machineconfiguration.openshift.io/currentConfig: rendered-master-7b78469312188f8fc026e379fa589ec8
machineconfiguration.openshift.io/desiredConfig: rendered-master-7b78469312188f8fc026e379fa589ec8
machineconfiguration.openshift.io/desiredDrain: uncordon-rendered-master-7b78469312188f8fc026e379fa589ec8
machineconfiguration.openshift.io/lastAppliedDrain: uncordon-rendered-master-7b78469312188f8fc026e379fa589ec8
machineconfiguration.openshift.io/lastSyncedControllerConfigResourceVersion: "240480"
machineconfiguration.openshift.io/reason: ""
machineconfiguration.openshift.io/state: Done
volumes.kubernetes.io/controller-managed-attach-detach: "true"
creationTimestamp: "2024-06-24T02:02:57Z"
labels:
  beta.kubernetes.io/arch: amd64
  beta.kubernetes.io/os: linux
  kubernetes.io/arch: amd64
  kubernetes.io/hostname: master-1.ocp4.tektutor.org.labs
  kubernetes.io/os: linux
  node-role.kubernetes.io/control-plane: ""
  node-role.kubernetes.io/master: ""
  node-role.kubernetes.io/worker: ""
  node.openshift.io/os_id: rhcos
name: master-1.ocp4.tektutor.org.labs
resourceVersion: "1519931"
uid: de791c9f-9557-4c2f-9bd9-7074d4404cf5
spec: {}
status:
  addresses:
    - address: 192.168.122.77
      type: InternalIP
    - address: master-1.ocp4.tektutor.org.labs
      type: Hostname
  allocatable:
    cpu: 7500m
    ephemeral-storage: "46700096229"
    hugepages-1Gi: "0"
    hugepages-2Mi: "0"
    memory: 14840680Ki
    pods: "250"
52,5   7%

```



```

jegan@tektutor.org
jegan@tektutor.org
jegan@tektutor.org

- quay.io/openshift-release-dev/ocp-v4.0-art-dev@sha256:bf09d8508e1ff6b75edb0b559fac9ce9a8f8785f9cac951011d1db037103ad65
sizeBytes: 483440576
- names:
- quay.io/openshift-release-dev/ocp-v4.0-art-dev@sha256:a0ff9a85dc4121a4efc2c07d7e1148671e75c69a4b966ae07afa487b2747c4e1
sizeBytes: 482702931
- names:
- quay.io/openshift-release-dev/ocp-v4.0-art-dev@sha256:ee7b6d7807b49e7ff265d3a5b09fac35c9eb59e863e3bf6cd20fbf8a2f41c342
sizeBytes: 479388147
- names:
- quay.io/openshift-release-dev/ocp-release@sha256:0f55261077557d1bb909c06b115e0c79b0025677be57ba2f045495c11e2443ee
sizeBytes: 478204279
- names:
- quay.io/openshift-release-dev/ocp-v4.0-art-dev@sha256:9fb85269a43c579c5be076865a2a14c48affa14fc9d412b384e09c0c5965d2d6
sizeBytes: 469909493
- names:
- quay.io/openshift-release-dev/ocp-v4.0-art-dev@sha256:a7c2af909541cc22711ddccb5b69400b2fe4988664258b10c8f4acb54fe0f8b0
sizeBytes: 459539017
- names:
- quay.io/openshift-release-dev/ocp-v4.0-art-dev@sha256:a438c5196a05de97d5ab23a5c253da78bdb78b063baaa8f710e9b287c722dc7
sizeBytes: 456767509
- names:
- quay.io/openshift-release-dev/ocp-v4.0-art-dev@sha256:c2e43004a17edd4c3ac629e96c8a7577cd4ae480031ac2e358cc9f169e67c0f4
sizeBytes: 452296807
- names:
- quay.io/openshift-release-dev/ocp-v4.0-art-dev@sha256:a72ccb4a9578ec6fb4e10755ce1e882a0f1e118550b2664a0d957d9aed53a97a
sizeBytes: 447305840
- names:
- quay.io/openshift-release-dev/ocp-v4.0-art-dev@sha256:32a95f18b5d680b21af54970294f7d8cfa84e5a9e3520b410c71dbc17ad56e4b
sizeBytes: 445675764
nodeInfo:
  architecture: amd64
  bootID: 331621eb-d138-4090-88b3-f3f9912250e6
  containerRuntimeVersion: cri-o://1.28.7-3.rhaos4.15.gitf52304f.el9
  kernelVersion: 5.14.0-284.69.1.el9_2.x86_64
  kubeProxyVersion: v1.28.10+a2c84a5
  kubeletVersion: v1.28.10+a2c84a5
  machineID: ee397eca09f54a38835e43c86bcf5df5
  operatingSystem: linux
  osImage: Red Hat Enterprise Linux CoreOS 415.92.202406111137-0 (Plow)
  systemUUID: ee397eca09f54-4a38-835e-43c86bcf5df5
262,5   Bot

```

Lab - Get detailed yaml definition of any node in openshift

```
oc get node/master-1.ocp4.tektutor.org.labs -o yaml
```

Expected output

```
jegan@tektutor.org ~ ➤ oc get node/master-1.ocp4.tektutor.org.labs -o yaml
apiVersion: v1
kind: Node
metadata:
  annotations:
    k8s.ovn.org/host-cidrs: '[{"cidr": "192.168.122.77/24"}]'
    k8s.ovn.org/l3-gateway-config: '{"default":{"mode":"shared","interface-id":"br-ex_master-1.ocp4.tektutor.org.labs","mac-address":"52:54:00:57:65:aa","ip-addresses":["192.168.122.77/24"],"ip-address":"192.168.122.77/24","next-hops":["192.168.122.1"],"next-hop":"192.168.122.1","node-port-enable":true,"vlan-id":0}}'
    k8s.ovn.org/network-ids: '{"default":0}'
    k8s.ovn.org/node-chassis-id: 0e81aaef-47f2-495b-8d82-4f9265bddc98
    k8s.ovn.org/node-gateway-router-lrp-ifaddr: '{"ipv4": "100.64.0.4/16"}'
    k8s.ovn.org/node-id: "4"
    k8s.ovn.org/node-mgmt-port-mac-address: 2a:35:f0:fc:c4:d0
    k8s.ovn.org/node-primary-ifaddr: '{"ipv4": "192.168.122.77/24"}'
    k8s.ovn.org/node-subnets: '{"default": ["10.128.0.0/23"]}'
    k8s.ovn.org/node-transit-switch-port-ifaddr: '{"ipv4": "100.88.0.4/16"}'
    k8s.ovn.org/remote-zone-migrated: master-1.ocp4.tektutor.org.labs
    k8s.ovn.org/zone-name: master-1.ocp4.tektutor.org.labs
  machineconfiguration.openshift.io/controlPlaneTopology: HighlyAvailable
  machineconfiguration.openshift.io/currentConfig: rendered-master-7b78469312188f8fc026e379fa589ec8
  machineconfiguration.openshift.io/desiredConfig: rendered-master-7b78469312188f8fc026e379fa589ec8
  machineconfiguration.openshift.io/desiredBrain: uncordon-rendered-master-7b78469312188f8fc026e379fa589ec8
  machineconfiguration.openshift.io/lastAppliedDraIn: uncordon-rendered-master-7b78469312188f8fc026e379fa589ec8
  machineconfiguration.openshift.io/lastSyncedControllerConfigResourceVersion: "240480"
  machineconfiguration.openshift.io/reason: ""
  machineconfiguration.openshift.io/state: Done
  volumes.kubernetes.io/controller-managed-attach-detach: "true"
  creationTimestamp: "2024-06-24T02:02:57Z"
  labels:
    beta.kubernetes.io/arch: amd64
    beta.kubernetes.io/os: linux
    kubernetes.io/arch: amd64
    kubernetes.io/hostname: master-1.ocp4.tektutor.org.labs
    kubernetes.io/os: linux
    node-role.kubernetes.io/control-plane: ""
    node-role.kubernetes.io/master: ""
    node-role.kubernetes.io/worker: ""
    node.openshift.io/os_id: rhcos
  name: master-1.ocp4.tektutor.org.labs
  resourceVersion: "1519931"
  uid: d67919f-9557-4c7f-9hd9-7a74d44a4cf5
```

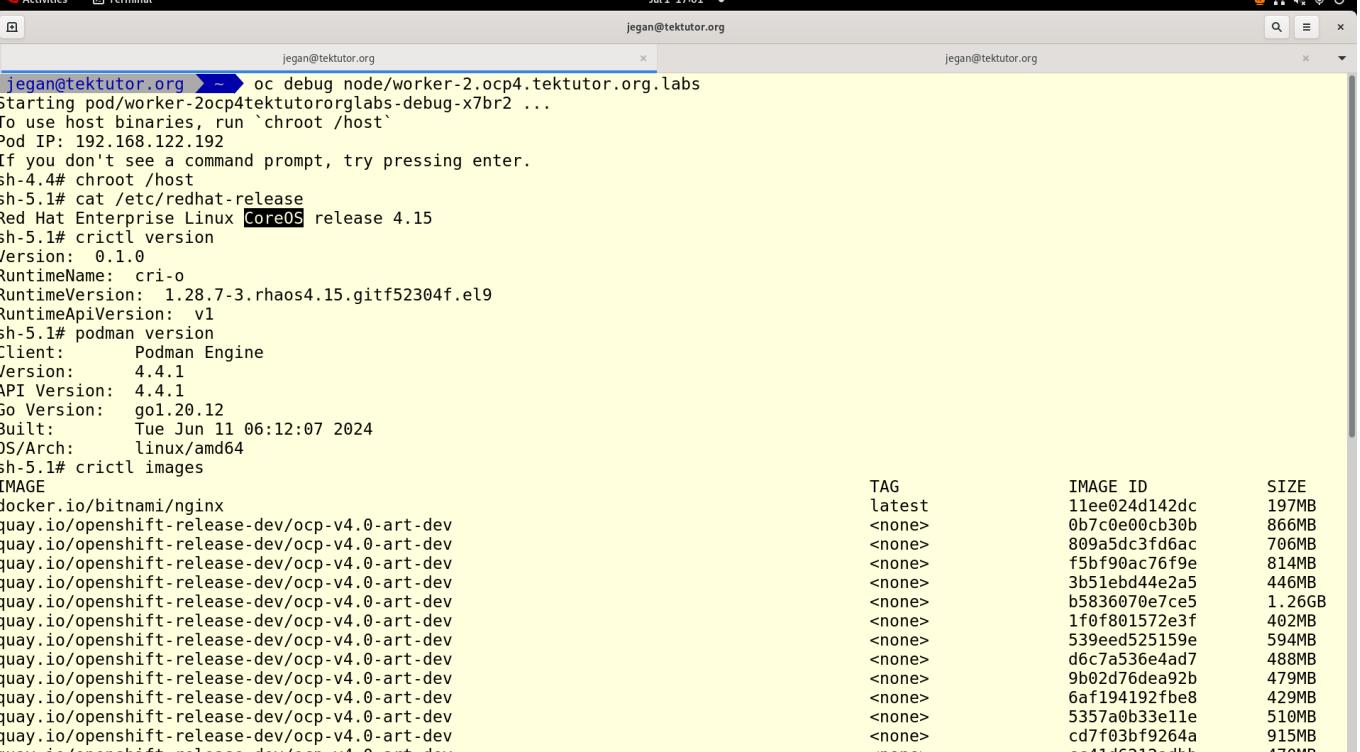


```
jegan@tektutor.org ~ ➤ oc get node/master-1.ocp4.tektutor.org.labs -o yaml
apiVersion: v1
kind: Node
metadata:
  annotations:
    quay.io/openshift-release-dev/ocp-v4.0-art-dev@sha256:bf09d8508e1ff6b75edb0b559fac9ce9a8f8785f9cac951011d1db037103ad65
    sizeBytes: 483440576
  names:
    - quay.io/openshift-release-dev/ocp-v4.0-art-dev@sha256:a0ff9a85dc4121a4efc2c07d7e1148671e75c69a4b966ae07afa487b2747c4e1
    sizeBytes: 482702931
  names:
    - quay.io/openshift-release-dev/ocp-v4.0-art-dev@sha256:ee7b6d7807b49e7ff265d3a5b09fac35c9eb59e863e3bf6cd20fbf8a2f41c342
    sizeBytes: 479388147
  names:
    - quay.io/openshift-release-dev/ocp-release@sha256:0f55261077557d1bb909c06b115e0c79b0025677be57ba2f045495c11e2443ee
    sizeBytes: 478204279
  names:
    - quay.io/openshift-release-dev/ocp-v4.0-art-dev@sha256:9fb85269a43c579c5be076865a2a14c48affa14fc9d412b384e09c0c5965d2d6
    sizeBytes: 469989493
  names:
    - quay.io/openshift-release-dev/ocp-v4.0-art-dev@sha256:a7c2af909541cc22711ddccb5b69400b2fe4988664258b10c8f4acb54fe0f8b0
    sizeBytes: 459539017
  names:
    - quay.io/openshift-release-dev/ocp-v4.0-art-dev@sha256:a438c5196a05de97d5ab23a5c253da78dbdb78b063baaa8f710e9b287c722dc7
    sizeBytes: 456767509
  names:
    - quay.io/openshift-release-dev/ocp-v4.0-art-dev@sha256:c2e43004a17edd4c3ac629e96c8a7577cd480031ac2e358cc9f169e67c0f4
    sizeBytes: 452296807
  names:
    - quay.io/openshift-release-dev/ocp-v4.0-art-dev@sha256:a72ccb4a9578ec6fb4e10755ce1e882a0f1e118550b2664a0d957d9aed53a97a
    sizeBytes: 447305840
  names:
    - quay.io/openshift-release-dev/ocp-v4.0-art-dev@sha256:32a95f18b5d680b21af54970294f7d8cfa84e5a9e3520b410c71dbc17ad56e4b
    sizeBytes: 445675764
  nodeInfo:
    architecture: amd64
    bootID: 331621eb-d138-4090-88b3-f3f9912250e6
    containerRuntimeVersion: cri-o://1.28.7-3.rhaos4.15.gitf52304f.el9
    kernelVersion: 5.14.0-284.69.1.el9_2.x86_64
    kubeProxyVersion: v1.28.10+a2c84a5
    kubeletVersion: v1.28.10+a2c84a5
    machineID: ee397eca09f54a38835e43c86bcf5df5
    operatingSystem: linux
    osImage: Red Hat Enterprise Linux CoreOS 415.92.202406111137-0 (Plow)
    systemUUID: ee397eca-09f5-4a38-835e-43c86bcf5df5
```

Lab - Getting inside an openshift node shell (this is useful to troubleshoot issues as an Administrator)

```
oc debug node/worker-2.ocp4.tektutor.org.labs
```

Expected output



```
jegan@tektutor.org ➤ oc debug node/worker-2.ocp4.tektutor.org.labs
Starting pod/worker-2ocp4tektutororglabs-debug-x7br2 ...
To use host binaries, run `chroot /host`
Pod IP: 192.168.122.192
If you don't see a command prompt, try pressing enter.
sh-4.4# chroot /host
sh-5.1# cat /etc/redhat-release
Red Hat Enterprise Linux CoreOS release 4.15
sh-5.1# crictl version
Version: 0.1.0
RuntimeName: cri-o
RuntimeVersion: 1.28.7-3.rhaos4.15.gitf52304f.el9
RuntimeApiVersion: v1
sh-5.1# podman version
Client: Podman Engine
Version: 4.4.1
API Version: 4.4.1
Go Version: go1.20.12
Built: Tue Jun 11 06:12:07 2024
OS/Arch: linux/amd64
sh-5.1# crictl images
IMAGE TAG IMAGE ID SIZE
docker.io/bitnami/nginx latest 11ee024d142dc 197MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev <none> 0b7c0e0cb30b 866MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev <none> 809a5dc3fd6ac 706MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev <none> f5bf90ac76f9e 814MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev <none> 3b51ebd44e2a5 446MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev <none> b5836070e7ce5 1.26GB
quay.io/openshift-release-dev/ocp-v4.0-art-dev <none> 1f0f801572e3f 402MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev <none> 539eed525159e 594MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev <none> d6c7a536e4ad7 488MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev <none> 9b02d76dea92b 479MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev <none> 6af194192fbe8 429MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev <none> 5357a0b33e11e 510MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev <none> cd7f03bf9264a 915MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev <none> cc11d6212adbb 470MB
```

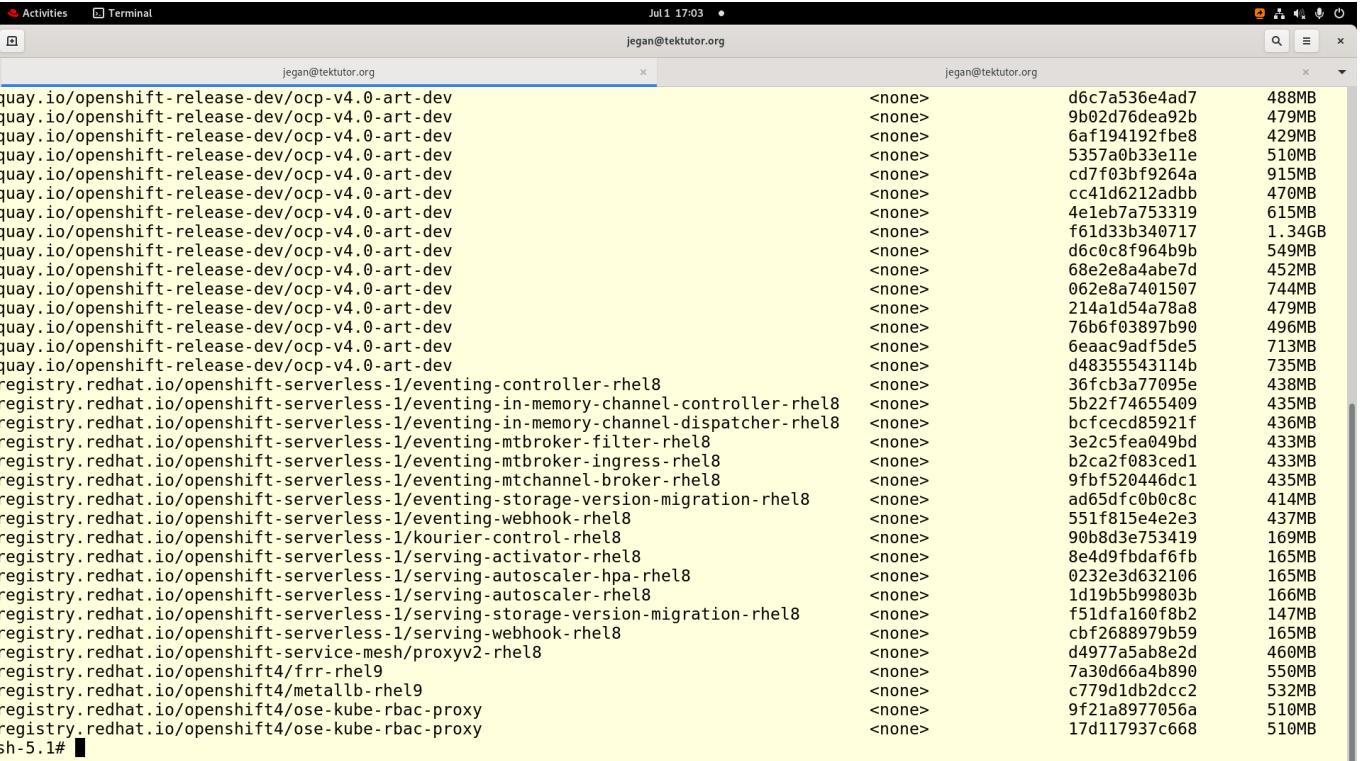


IMAGE	TAG	IMAGE ID	SIZE
quay.io/openshift-release-dev/ocp-v4.0-art-dev	<none>	d6c7a536e4ad7	488MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev	<none>	9b02d76dea92b	479MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev	<none>	6af194192fbe8	429MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev	<none>	5357a0b33e11e	510MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev	<none>	cd7f03bf9264a	915MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev	<none>	cc11d6212adbb	470MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev	<none>	4e1eb7a753319	615MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev	<none>	f61d33b340717	1.34GB
quay.io/openshift-release-dev/ocp-v4.0-art-dev	<none>	d6c0c8f964b9b	549MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev	<none>	68e2e8a4abe7d	452MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev	<none>	062e8a7401507	744MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev	<none>	214a1d54a78a8	479MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev	<none>	76b6f03897b90	496MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev	<none>	6eaac9adf5de5	713MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev	<none>	d48355543114b	735MB
quay.io/openshift-release-dev/ocp-v4.0-art-dev	<none>	36fcba77095e	438MB
registry.redhat.io/openshift-serverless-1/eventing-controller-rhel8	<none>	5b22f74655409	435MB
registry.redhat.io/openshift-serverless-1/eventing-in-memory-channel-controller-rhel8	<none>	bfcfed85921f	436MB
registry.redhat.io/openshift-serverless-1/eventing-in-memory-channel-dispatcher-rhel8	<none>	3e2c5fea049bd	433MB
registry.redhat.io/openshift-serverless-1/eventing-mtbroker-filter-rhel8	<none>	b2ca2f083ced1	433MB
registry.redhat.io/openshift-serverless-1/eventing-mtbroker-ingress-rhel8	<none>	9fbff520446dc1	435MB
registry.redhat.io/openshift-serverless-1/eventing-mtchannel-broker-rhel8	<none>	ad65dfc0b0c8c	414MB
registry.redhat.io/openshift-serverless-1/eventing-storage-version-migration-rhel8	<none>	551f815e4e2e3	437MB
registry.redhat.io/openshift-serverless-1/eventing-webhook-rhel8	<none>	90b8d3e753419	169MB
registry.redhat.io/openshift-serverless-1/kourier-control-rhel8	<none>	8e4d9fbdaef6b	165MB
registry.redhat.io/openshift-serverless-1/serving-activator-rhel8	<none>	0232e3d632106	165MB
registry.redhat.io/openshift-serverless-1/serving-autoscaler-hpa-rhel8	<none>	1d19b5b99803b	166MB
registry.redhat.io/openshift-serverless-1/serving-autoscaler-rhel8	<none>	f51dfa160f8b2	147MB
registry.redhat.io/openshift-serverless-1/serving-storage-version-migration-rhel8	<none>	cbf2688979b59	165MB
registry.redhat.io/openshift-service-mesh/proxyv2-rhel8	<none>	d4977a5ab8e2d	460MB
registry.redhat.io/openshift4/frr-rhel9	<none>	7a30d66a4b890	550MB
registry.redhat.io/openshift4/metallb-rhel9	<none>	c779d1db2dcc2	532MB
registry.redhat.io/openshift4/ose-kube-rbac-proxy	<none>	9f21a8977056a	510MB
registry.redhat.io/openshift4/ose-kube-rbac-proxy	<none>	17d117937c668	510MB

Listing the containers running inside the worker2 node

```
crictl ps
crictl pods
exit
exit
```

Expected output

CONTAINER	IMAGE	CREATED	STATE	NAME	ATTEMPT
beb4b2e110d92	cd7f03bf9264ac5deb6217929b79edc64d125cd8d1db10375b5ded0171b9553	14 seconds ago	Running	container-00	0
810bafe81578b	worker-2ocp4tektutororglabs-debug-8vt2h				
3c5c5403323e4	9f21a8977056a689d0987144b69401ad4e5c8a33b5ef168a76a4b3dc82e743b6	8 hours ago	Running	kube-rbac-proxy	1
a9eba84c137d8	mt-broker-controller-57d9bd8bc4-7ng5n				
2f8f63a0ab108	registry.redhat.io/openshift-serverless-1/eventing-mtchannel-broker-rhel8@sha256:7949087ff89604fd77a0fd5aa0648999146				
2d82a48da224b2b98abb8d69acd27	8 hours ago	Running	mt-broker-controller		1
a9eba84c137d8	mt-broker-controller-57d9bd8bc4-7ng5n				
c2551006ace87	registry.redhat.io/openshift-serverless-1/eventing-controller-rhel8@sha256:125d5cc02f87a538eae11dbf4def83770258b9664				
2afaa07d34a96825d4fea35	8 hours ago	Running	eventing-controller		1
081a09c8df1c0	eventing-controller-6fff65478b-bhmzs				
69ac973ce0868	9f21a8977056a689d0987144b69401ad4e5c8a33b5ef168a76a4b3dc82e743b6	8 hours ago	Running	kube-rbac-proxy	1
e6317908652ba	eventing-webhook-6c98cdc545-gns8p				
b1b86310cc66e	registry.redhat.io/openshift-serverless-1/eventing-webhook-rhel8@sha256:9a70eda695b9cf1b77382f7812481eab6bb53fd9c9e				
99c381288aad2f4c5b01	8 hours ago	Running	eventing-webhook		1
e6317908652ba	eventing-webhook-6c98cdc545-gns8p				
354d213959423	9f21a8977056a689d0987144b69401ad4e5c8a33b5ef168a76a4b3dc82e743b6	8 hours ago	Running	kube-rbac-proxy	1
a26a144622ae7	imc-dispatcher-944ccfd9f-qbw7				
d1d414788095a	registry.redhat.io/openshift-serverless-1/eventing-in-memory-channel-dispatcher-rhel8@sha256:3361f71390529b1a8c6a424				
068d63d984ccbb94179241a1718d7e2a93fae1dd0	8 hours ago	Running	dispatcher		1
a26a144622ae7	imc-dispatcher-944ccfd9f-qbw7				
df9f5a0032701	9f21a8977056a689d0987144b69401ad4e5c8a33b5ef168a76a4b3dc82e743b6	8 hours ago	Running	kube-rbac-proxy	1
a230231f79314	mt-broker-ingress-f9566c58d-v7hlf				
07354295da77d	registry.redhat.io/openshift-serverless-1/eventing-mtbroker-ingress-rhel8@sha256:4dcf5b1d0d038fe737ecc8f06e4a91a73b3				
3158a85b08abccf2f3276f3f208b7	8 hours ago	Running	ingress		1
a230231f79314	mt-broker-ingress-f9566c58d-v7hlf				
e854b63e8485f	9f21a8977056a689d0987144b69401ad4e5c8a33b5ef168a76a4b3dc82e743b6	8 hours ago	Running	kube-rbac-proxy	1

```

Activities Terminal jegan@tektutor.org jegan@tektutor.org jegan@tektutor.org
jegan@tektutor.org
0b46c1f80b9d4 node-exporter-glxxm 3b51ebd44e2a56943bdbed6bceadfc5e7df1e50ee14d58faaa2d627b8b598bb8
24804b7c9ffe9 8 hours ago Running node-exporter 5
0b46c1f80b9d4 node-exporter-glxxm 5357a0b33e11ebe617150b6c7b7beda031cf1b197b2bdffd5863b97f0ba564b
5703bad8edcaa 8 hours ago Running kube-rbac-proxy-crio 7
e75531376692b kube-rbac-proxy-crio-worker-2.ocp4.tektutor.org.labs
sh-5.1# crictl pods
POD ID CREATED STATE NAME NAMESPACE
810bafe81578b About a minute ago Ready worker-2ocp4tektutororglabs-debug-8vt2h default
a8a0967532dd7 5 minutes ago NotReady collect-profiles-28663890-qv8vk openshift-operator-l
ifeecycle-manager 0 (default)
8e485a0713004 20 minutes ago NotReady collect-profiles-28663875-t5lg9 openshift-operator-l
ifeecycle-manager 0 (default)
4f930e9c4a197 35 minutes ago NotReady collect-profiles-28663860-zz7qw openshift-operator-l
ifeecycle-manager 0 (default)
3a697e03dc13c 8 hours ago Ready network-check-target-zp8nn openshift-network-di
agnostics 0 (default)
3ded5360aa371 8 hours ago Ready activator-69d945764d-dddkw knative-serving
82dfb7214cc4b 8 hours ago Ready autoscaler-59f6769648-b95t8 knative-serving
4145cb56005c3 8 hours ago Ready webhook-7fdc7fd58-8tcxz knative-serving
47beec5cf8623 8 hours ago Ready dns-default-h6rx5 openshift-dns
1485b6d80f6a7 8 hours ago Ready metallb-operator-webhook-server-54668d4c87-pvxqd metallb-system
7a20b49512d73 8 hours ago Ready ngnix-6bd86c9678-kwv6t nitesh
081a09c8df1c0 8 hours ago Ready eventing-controller-6fff654788-bhmzs knative-eventing
dedc1a3c9edcd 8 hours ago Ready imc-controller-6c54cb675d-wtst8 knative-eventing
sh-5.1# Activities Terminal jegan@tektutor.org jegan@tektutor.org jegan@tektutor.org
jegan@tektutor.org
a230231f79314 8 hours ago Ready mt-broker-ingress-f9566c58d-v7hlf knative-eventing
914c4544b16e8 8 hours ago Ready 3scale-kourier-gateway-f8f56b976-sr76v knative-serving-ingr
ess 0 (default)
bbf017164f570 8 hours ago Ready network-metrics-daemon-76xq8 openshift-multus
234b2e3ef85b6 8 hours ago Ready ingress-canary-bwhmq openshift-ingress-ca
nary 0 (default)
b4dcf8c5c9295 8 hours ago Ready speaker-5lh2c metallb-system
be067d75ee0c5 8 hours ago Ready node-ca-fnqtg openshift-image-regi
stry 0 (default)
fb3d214c03576 8 hours ago Ready multus-additional-cni-plugins-77m6w openshift-multus
0b46c1f80b9d4 8 hours ago Ready node-exporter-glxxm openshift-monitoring
5dfbc110817a5 8 hours ago Ready multus-7jwpq openshift-multus
a183dd6237537 8 hours ago Ready machine-config-daemon-qc886 openshift-machine-co
nfig-operator 0 (default)
b386436a1d7a7 8 hours ago Ready ovnkube-node-s89hc openshift-ovn-kubern
etes 0 (default)
b9fb5ff8e1c6a 8 hours ago Ready tuned-9ht9b openshift-cluster-no
de-tuning-operator 0 (default)
a0f66d6901fbc 8 hours ago Ready node-resolver-62fgx openshift-dns
e75531376692b 8 hours ago Ready kube-rbac-proxy-crio-worker-2.ocp4.tektutor.org.labs openshift-machine-co
nfig-operator 0 (default)
sh-5.1# exit
exit
sh-4.4# exit
exit

Removing debug pod ...
jegan@tektutor.org ➜

```

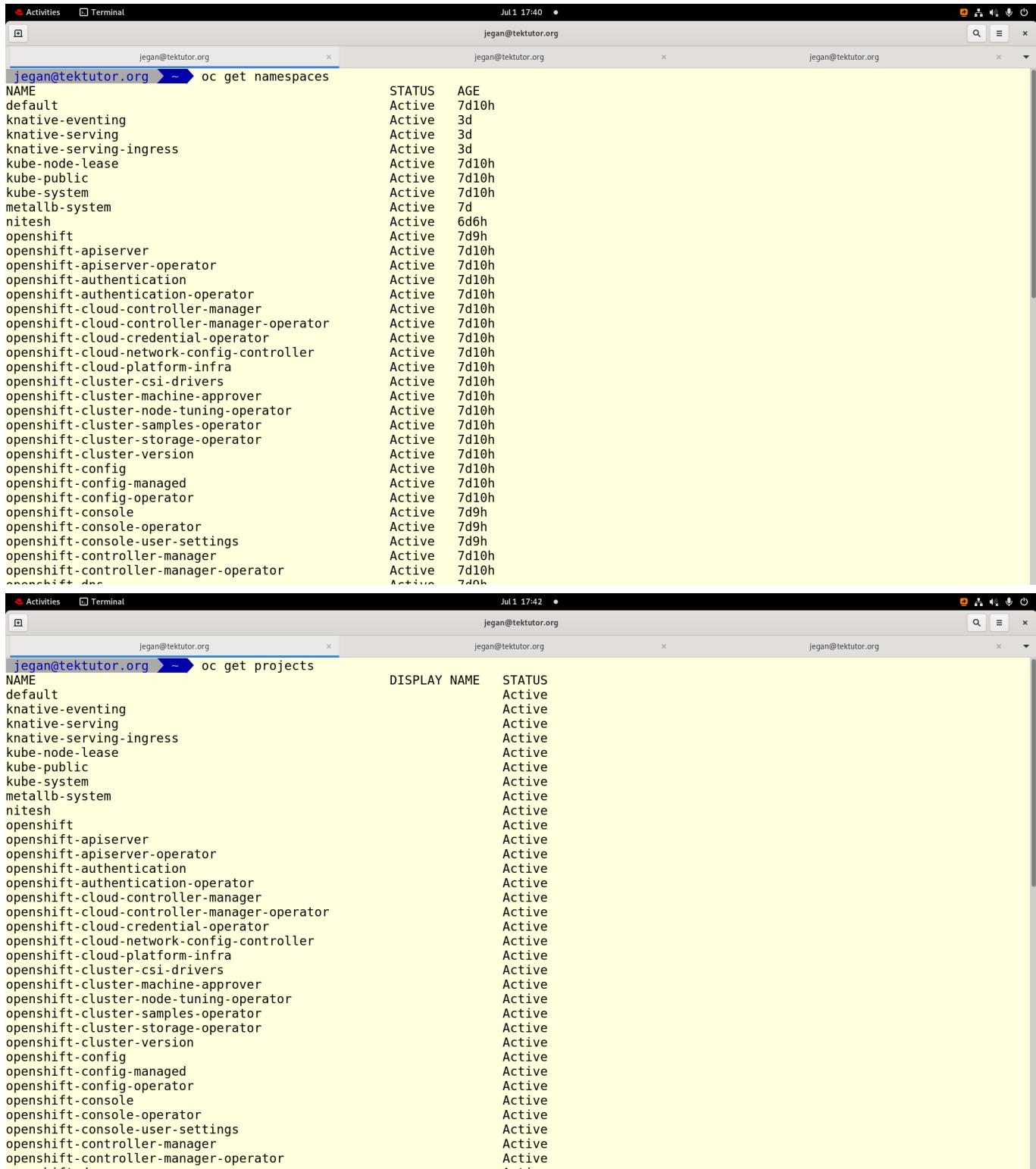
Info - Openshift Project

- in order to segregate applications deployed by one team from the other, project namespaces are used
- openshift project gives the administrators control on which all openshift users have access to projects and who don't have access
- it is always a best practice to deploy application within your project
- when project is deleted, it also ensure all the resources inside the project are also deleted

Lab - Listing the namespaces and projects

```
oc get namespaces  
oc get namespace  
oc get ns  
  
oc get projects  
oc get project
```

Expected output



The screenshot shows two terminal windows side-by-side. Both windows have a title bar 'Activities Terminal' and a user name 'jegan@tektutor.org'. The left terminal window displays the command 'jegan@tektutor.org ~ oc get namespaces' followed by a table of namespace information. The right terminal window displays the command 'jegan@tektutor.org ~ oc get projects' followed by a table of project information.

Output of 'oc get namespaces':

NAME	STATUS	AGE
default	Active	7d10h
knative-eventing	Active	3d
knative-serving	Active	3d
knative-serving-ingress	Active	3d
kube-node-lease	Active	7d10h
kube-public	Active	7d10h
kube-system	Active	7d10h
metallb-system	Active	7d
nitesh	Active	6d6h
openshift	Active	7d9h
openshift-apiserver	Active	7d10h
openshift-apiserver-operator	Active	7d10h
openshift-authentication	Active	7d10h
openshift-authentication-operator	Active	7d10h
openshift-cloud-controller-manager	Active	7d10h
openshift-cloud-controller-manager-operator	Active	7d10h
openshift-cloud-credential-operator	Active	7d10h
openshift-cloud-network-config-controller	Active	7d10h
openshift-cloud-platform-infra	Active	7d10h
openshift-cluster-csi-drivers	Active	7d10h
openshift-cluster-machine-approver	Active	7d10h
openshift-cluster-node-tuning-operator	Active	7d10h
openshift-cluster-samples-operator	Active	7d10h
openshift-cluster-storage-operator	Active	7d10h
openshift-cluster-version	Active	7d10h
openshift-config	Active	7d10h
openshift-config-managed	Active	7d10h
openshift-config-operator	Active	7d10h
openshift-console	Active	7d9h
openshift-console-operator	Active	7d9h
openshift-console-user-settings	Active	7d9h
openshift-controller-manager	Active	7d10h
openshift-controller-manager-operator	Active	7d10h
openshift-dns	Active	7d9h

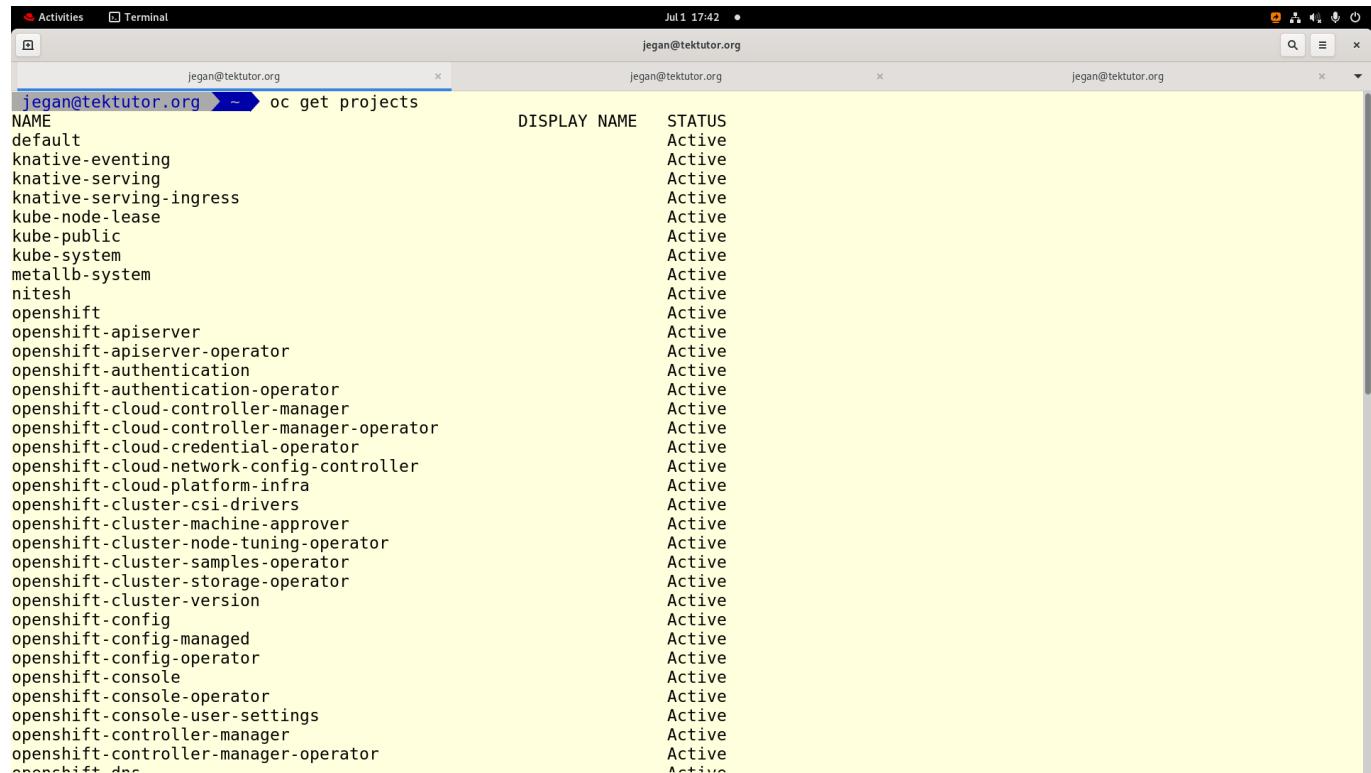
Output of 'oc get projects':

NAME	DISPLAY NAME	STATUS
default		Active
knative-eventing		Active
knative-serving		Active
knative-serving-ingress		Active
kube-node-lease		Active
kube-public		Active
kube-system		Active
metallb-system		Active
nitesh		Active
openshift		Active
openshift-apiserver		Active
openshift-apiserver-operator		Active
openshift-authentication		Active
openshift-authentication-operator		Active
openshift-cloud-controller-manager		Active
openshift-cloud-controller-manager-operator		Active
openshift-cloud-credential-operator		Active
openshift-cloud-network-config-controller		Active
openshift-cloud-platform-infra		Active
openshift-cluster-csi-drivers		Active
openshift-cluster-machine-approver		Active
openshift-cluster-node-tuning-operator		Active
openshift-cluster-samples-operator		Active
openshift-cluster-storage-operator		Active
openshift-cluster-version		Active
openshift-config		Active
openshift-config-managed		Active
openshift-config-operator		Active
openshift-console		Active
openshift-console-operator		Active
openshift-console-user-settings		Active
openshift-controller-manager		Active
openshift-controller-manager-operator		Active
openshift-dns		Active

Lab - Finding the currently active project from CLI

```
oc project
```

Expected output



NAME	DISPLAY NAME	STATUS
default		Active
knative-eventing		Active
knative-serving		Active
knative-serving-ingress		Active
kube-node-lease		Active
kube-public		Active
kube-system		Active
metallb-system		Active
nitesh		Active
openshift		Active
openshift-apiserver		Active
openshift-apiserver-operator		Active
openshift-authentication		Active
openshift-authentication-operator		Active
openshift-cloud-controller-manager		Active
openshift-cloud-controller-manager-operator		Active
openshift-cloud-credential-operator		Active
openshift-cloud-network-config-controller		Active
openshift-cloud-platform-infra		Active
openshift-cluster-csi-drivers		Active
openshift-cluster-machine-approver		Active
openshift-cluster-node-tuning-operator		Active
openshift-cluster-samples-operator		Active
openshift-cluster-storage-operator		Active
openshift-cluster-version		Active
openshift-config		Active
openshift-config-managed		Active
openshift-config-operator		Active
openshift-console		Active
openshift-console-operator		Active
openshift-console-user-settings		Active
openshift-controller-manager		Active
openshift-controller-manager-operator		Active
openshift-dns		Active

Lab - Creating a new project and switching between projects

```
oc new-project jegan
oc project
oc project default
oc project jegan
```

Expected output

```
jegan@tektutor.org ➤ oc project
Using project "default" on server "https://api.ocp4.tektutor.org.labs:6443".
jegan@tektutor.org ➤ oc new-project jegan
Now using project "jegan" on server "https://api.ocp4.tektutor.org.labs:6443".
You can add applications to this project with the 'new-app' command. For example, try:
  oc new-app rails-postgresql-example
to build a new example application in Ruby. Or use kubectl to deploy a simple Kubernetes application:
  kubectl create deployment hello-node --image=registry.k8s.io/e2e-test-images/agnhost:2.43 -- /agnhost serve-hostname
jegan@tektutor.org ➤ oc project
Using project "jegan" on server "https://api.ocp4.tektutor.org.labs:6443".
jegan@tektutor.org ➤ oc project default
Now using project "default" on server "https://api.ocp4.tektutor.org.labs:6443".
jegan@tektutor.org ➤ oc project
Using project "default" on server "https://api.ocp4.tektutor.org.labs:6443".
jegan@tektutor.org ➤ oc project jegan
Now using project "jegan" on server "https://api.ocp4.tektutor.org.labs:6443".
jegan@tektutor.org ➤ 
```

Lab - Deploying your first application into openshift using imperative command

- In the below create command, --image indicates the container image that should used to create the Pod application container.
- The nginx container image will downloaded from Docker Hub Remote Registry.
- The nginx container image may have several tagged version, the term latest indicates we wish to use the latest version of the nginx image from Docker Hub portal while creating the Pod application container

```
oc project jegan
oc create deployment nginx --image=nginx:latest --replicas=3
```

Listing the deployments in the currently active project

```
oc get deployments
oc get deployment
oc get deploy
```

Listing all replicasesets in the currently active project

```
oc get replicaset  
oc get replicaset  
oc get rs
```

Listing all pods in the currently active projects

```
oc get pods  
oc get pod  
oc get po
```

Expected output

```
jegan@tektutor.org ➔ oc project  
Using project "default" on server "https://api.ocp4.tektutor.org.labs:6443".  
jegan@tektutor.org ➔ oc new-project jegan  
Now using project "jegan" on server "https://api.ocp4.tektutor.org.labs:6443".  
You can add applications to this project with the 'new-app' command. For example, try:  
  oc new-app rails-postgresql-example  
to build a new example application in Ruby. Or use kubectl to deploy a simple Kubernetes application:  
  kubectl create deployment hello-node --image=registry.k8s.io/e2e-test-images/agnhost:2.43 -- /agnhost serve-hostname  
jegan@tektutor.org ➔ oc project  
Using project "jegan" on server "https://api.ocp4.tektutor.org.labs:6443".  
jegan@tektutor.org ➔ oc project default  
Now using project "default" on server "https://api.ocp4.tektutor.org.labs:6443".  
jegan@tektutor.org ➔ oc project  
Using project "default" on server "https://api.ocp4.tektutor.org.labs:6443".  
jegan@tektutor.org ➔ oc project jegan  
Now using project "jegan" on server "https://api.ocp4.tektutor.org.labs:6443".  
jegan@tektutor.org ➔ oc create deployment nginx --image=nginx:latest --replicas=3  
deployment.apps/nginx created  
jegan@tektutor.org ➔ oc get deployments  
NAME READY UP-TO-DATE AVAILABLE AGE  
nginx 0/3 3 0 5s  
jegan@tektutor.org ➔ oc get deployment  
NAME READY UP-TO-DATE AVAILABLE AGE  
nginx 0/3 3 0 8s  
jegan@tektutor.org ➔ oc get deploy  
NAME READY UP-TO-DATE AVAILABLE AGE  
nginx 0/3 3 0 11s  
jegan@tektutor.org ➔
```

```
jegan@Activities Terminal Jul 1 17:48 •  
jegan@tektutor.org  
jegan@tektutor.org  
jegan@tektutor.org  
  
deployment.apps/nginx created  
jegan@tektutor.org ➔ oc get deployments  
NAME READY UP-TO-DATE AVAILABLE AGE  
nginx 0/3 3 0 5s  
jegan@tektutor.org ➔ oc get deployment  
NAME READY UP-TO-DATE AVAILABLE AGE  
nginx 0/3 3 0 8s  
jegan@tektutor.org ➔ oc get deploy  
NAME READY UP-TO-DATE AVAILABLE AGE  
nginx 0/3 3 0 11s  
jegan@tektutor.org ➔ oc get replicsets  
NAME DESIRED CURRENT READY AGE  
nginx-56fcf95486 3 3 0 111s  
jegan@tektutor.org ➔ oc get replicaset  
NAME DESIRED CURRENT READY AGE  
nginx-56fcf95486 3 3 0 114s  
jegan@tektutor.org ➔ oc get rs  
NAME DESIRED CURRENT READY AGE  
nginx-56fcf95486 3 3 0 117s  
jegan@tektutor.org ➔ oc get pods  
NAME READY STATUS RESTARTS AGE  
nginx-56fcf95486-frsh9 0/1 Error 4 (56s ago) 2m3s  
nginx-56fcf95486-szl8s 0/1 CrashLoopBackOff 3 (55s ago) 2m3s  
nginx-56fcf95486-zxtdm 0/1 CrashLoopBackOff 4 (16s ago) 2m3s  
jegan@tektutor.org ➔ oc get pod  
NAME READY STATUS RESTARTS AGE  
nginx-56fcf95486-frsh9 0/1 Error 4 (58s ago) 2m5s  
nginx-56fcf95486-szl8s 0/1 CrashLoopBackOff 3 (57s ago) 2m5s  
nginx-56fcf95486-zxtdm 0/1 CrashLoopBackOff 4 (18s ago) 2m5s  
jegan@tektutor.org ➔ oc get po  
NAME READY STATUS RESTARTS AGE  
nginx-56fcf95486-frsh9 0/1 Error 4 (60s ago) 2m7s  
nginx-56fcf95486-szl8s 0/1 Error 4 (59s ago) 2m7s  
nginx-56fcf95486-zxtdm 0/1 CrashLoopBackOff 4 (20s ago) 2m7s  
jegan@tektutor.org ➔
```

```
Activities Terminal Jul 1 18:00 •
jegan@tektutor.org
jegan@tektutor.org
jegan@tektutor.org

NAME READY STATUS RESTARTS AGE
nginx-56fcf95486-frsh9 0/1 Error 4 (56s ago) 2m3s
nginx-56fcf95486-szl8s 0/1 CrashLoopBackOff 3 (55s ago) 2m3s
nginx-56fcf95486-zxtdm 0/1 CrashLoopBackOff 4 (16s ago) 2m3s
jegan@tektutor.org ➔ ~ oc get pod
NAME READY STATUS RESTARTS AGE
nginx-56fcf95486-frsh9 0/1 Error 4 (58s ago) 2m5s
nginx-56fcf95486-szl8s 0/1 CrashLoopBackOff 3 (57s ago) 2m5s
nginx-56fcf95486-zxtdm 0/1 CrashLoopBackOff 4 (18s ago) 2m5s
jegan@tektutor.org ➔ ~ oc get po
NAME READY STATUS RESTARTS AGE
nginx-56fcf95486-frsh9 0/1 Error 4 (60s ago) 2m7s
nginx-56fcf95486-szl8s 0/1 Error 4 (59s ago) 2m7s
nginx-56fcf95486-zxtdm 0/1 CrashLoopBackOff 4 (20s ago) 2m7s
jegan@tektutor.org ➔ ~ oc logs nginx-56fcf95486-zxtdm
/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: can not modify /etc/nginx/conf.d/default.conf (read-only file system?)
/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
2024/07/01 12:22:52 [warn] 1#1: the "user" directive makes sense only if the master process runs with super-user privileges, ignored in /etc/nginx/nginx.conf:2
nginx: [warn] the "user" directive makes sense only if the master process runs with super-user privileges, ignored in /etc/nginx/nginx.conf:2
2024/07/01 12:22:52 [emerg] 1#1: mkdir() "/var/cache/nginx/client_temp" failed (13: Permission denied)
nginx: [emerg] mkdir() "/var/cache/nginx/client_temp" failed (13: Permission denied)
jegan@tektutor.org ➔ ~ oc get po
NAME READY STATUS RESTARTS AGE
nginx-56fcf95486-frsh9 0/1 Error 7 (5m11s ago) 11m
nginx-56fcf95486-szl8s 0/1 CrashLoopBackOff 6 (4m53s ago) 11m
nginx-56fcf95486-zxtdm 0/1 CrashLoopBackOff 6 (5m10s ago) 11m
jegan@tektutor.org ➔ ~
```