Day 2

Lab - Login to OpenShift cluster from CLI

```
oc version
kubectl version
oc login -u kubeadmin https://api.ocp4.tektutor.org.labs:6443
```

Expected output

```
jegan@tektutor.org $ oc version
Client Version: 4.15.12
Kustomize Version: v5.0.4-0.20230601165947-6ce0bf390ce3
Server Version: 4.15.12
Kubernetes Version: v1.28.9+2f7b992

jegan@tektutor.org $ kubectl version
Client Version: v1.28.2
Kustomize Version: v5.0.4-0.20230601165947-6ce0bf390ce3
Server Version: v1.28.9+2f7b992

jegan@tektutor.org $ oc login -u kubeadmin
https://api.ocp4.tektutor.org.labs:6443
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 74 projects, the list has been suppressed. You can list
all projects with 'oc projects'

Using project "jegan".
```

Lab - Scale up/down nginx deployment

```
oc get deploy,po
oc scale deploy/nginx --replicas=5
oc get po -w
oc get po
oc scale deploy/nginx --replicas=3
oc get po -w
oc get po
```

Expected output

```
```

Lab - Rolling update (upgrade nginx deploy image version)

Delete the existing nginx deployment before proceeding

```
oc delete deploy/nginx
```

You can now deploy nginx version 1.18

```
oc project
oc create deployment nginx --image=bitnami/nginx:1.18 --replicas=3
oc get rs,po
```

Now you can edit the nginx deployment and replace the nginx image version from bitnami/nginx:1.18 to bitnami/nginx:1.19 and save it

```
oc edit deploy/nginx
oc get rs,po
```

Check the status of the rolling update

```
oc rollout status deploy/nginx
```

Rolling back to previous version (i.e from 1.19 to 1.18)

```
oc rollout undo deploy/nginx
```

Let's upgrade nginx to version 1.20

```
oc set image deploy/nginx nginx=bitnami/nginx:1.20
oc get po
oc describe deploy/nginx
```

Rolling back to any specific old revision

```
```

```
oc rollout undo deploy/nginx --to-revision=1
```

Info - What happens when we issue the below command

```
oc create deployment nginx --image=bitnami/nginx:latest --replicas=3
```

These are the chain of things that happens when we issue the above command

```
- oc client tool will make a REST call to API Server requesting it to
create a deployment with name nginx using image bitnami/nginx:latest with 3
Pod instances
- API Server receives the REST call from oc client tool, it then creates a
deployment yaml record in the etcd database
- API Server then sends a broadcasting event to notify that a new
deployment is created
- Deployment Controller receives the new deployment created event, it then
makes a REST call to API Server requesting to create a ReplicaSet for the
nginx deployment
- API Server receives the request from deployment controller, it then
creates a ReplicaSet yaml record in the etcd database
- API Server then sends a broadcasting event to notify that a new
replicaset is created
- ReplicaSet controller receives the new replicaset created event, it then
makes REST call to create 3 Pods
- API Server receives the REST call from ReplicaSet controller, it then
creates 3 Pod yaml records in the etcd database
- API Server then sends a broadcasting event to notify that new Pods are
created
- Scheduler receives the new Pod created events, it then finds a healthy
node where specific pods can be deployed
- Scheduler makes REST call to API server with its scheduling
recommendations for each new Pods
- API Server receives the scheduling recommendation from Scheduler, it
retrieves the existing Pod record from etcd database and then it updates
the scheduling recommendation it received from SCheduler
- API Server then sends broadcasting event for each Pod to notify that Pod
is scheduler to a specific node
- kubelet container running that runs on the specific node receives the
event from API Server, it then pulls/downloads the container image, it
creates container and starts the container.
- kubelet updates the status of the Pod containers to the API Server via
REST calls
- API Server receives the status from kubelet, it then retrieves the
respective record from etcd database it then updates the Pod status
- kubelet on each node keeps monitoring the container status and it keeps
reporting their status to API Server via REST calls
- API Server udpates the status of the Pod as it receives the status from
respective kubelet running on each node
```

Find more details about deployment,replicaset, pod

```
oc describe deploy/nginx
oc describe rs/nginx-566b5879cb
oc describe pod/nginx-6b49c75d9-xsh5t
```

Info - What is OpenShift Operator?

```
- collection of many custom resources and custom controllers
- custom resources can be added by defining Custom Resource Definitions
(CRD)
- to manage the Custom Resources, we also have to provide Custom
Controllers
```

Accessing the ClusterIP Service

ClusterIP Service is an internal service, hence we can only access from with the cluster i.e from some pod we can access.

In order access the nginx clusterip internal service, let's create a test pod

```
oc create deploy test --image=tektutor/spring-ms:1.0
oc get po
oc rsh deploy/test
curl http://<service-name>:<service-port>
curl http://nginx:8080
curl http://<service-ip>::<service-port>
curl http://172.30.159.204:8080
```

About Service Discovery

In openshift, one DNS Pod per node is deployed by default as a Daemonset. When pod container is created by kubelet container agent, it configures the /etc/resolv.conf file to point to the default dns of kubernetes. The DNS service is normally 172.30.0.10 is configured in all the pods. The DNS Pod helps in resolving the service name to its respective IP address.

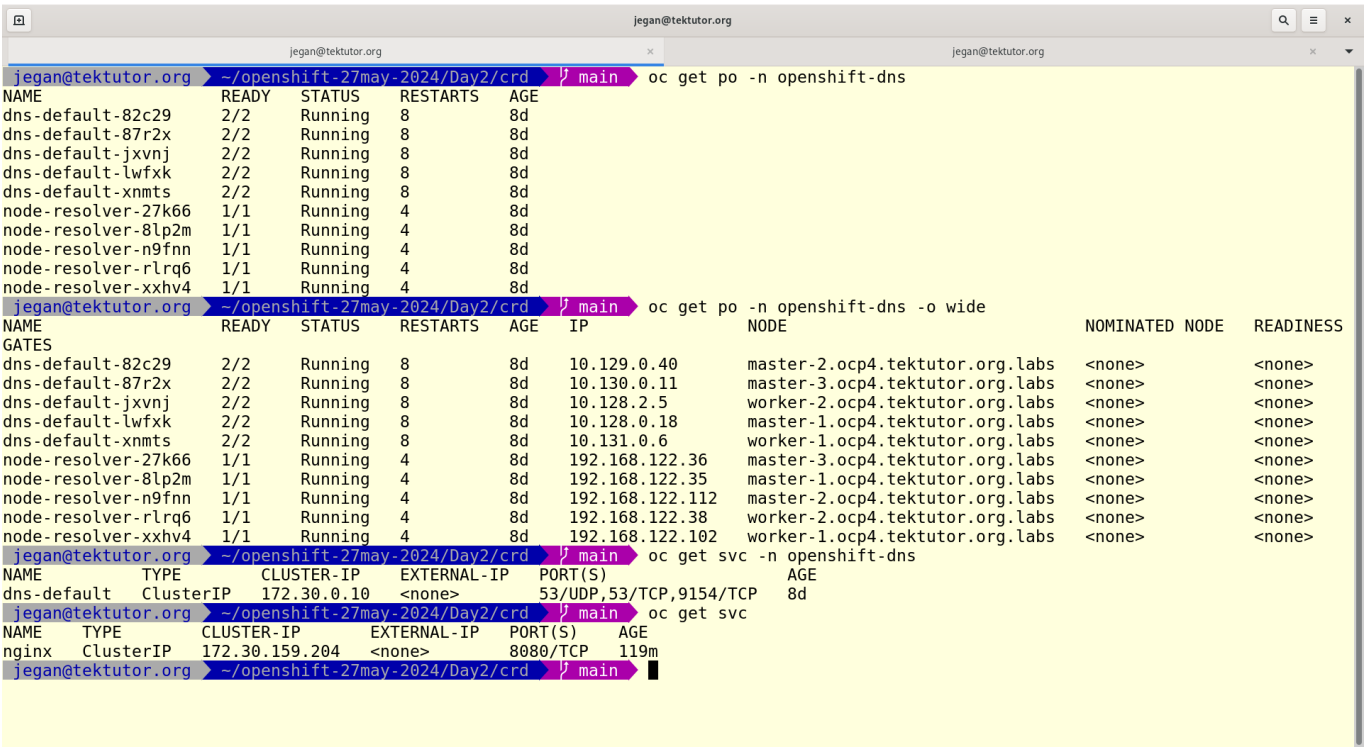
Listing the dns pods in openshift

```
oc get po -n openshift-dns
```

Listing the dns service

```
oc get svc -n openshift-dns
```

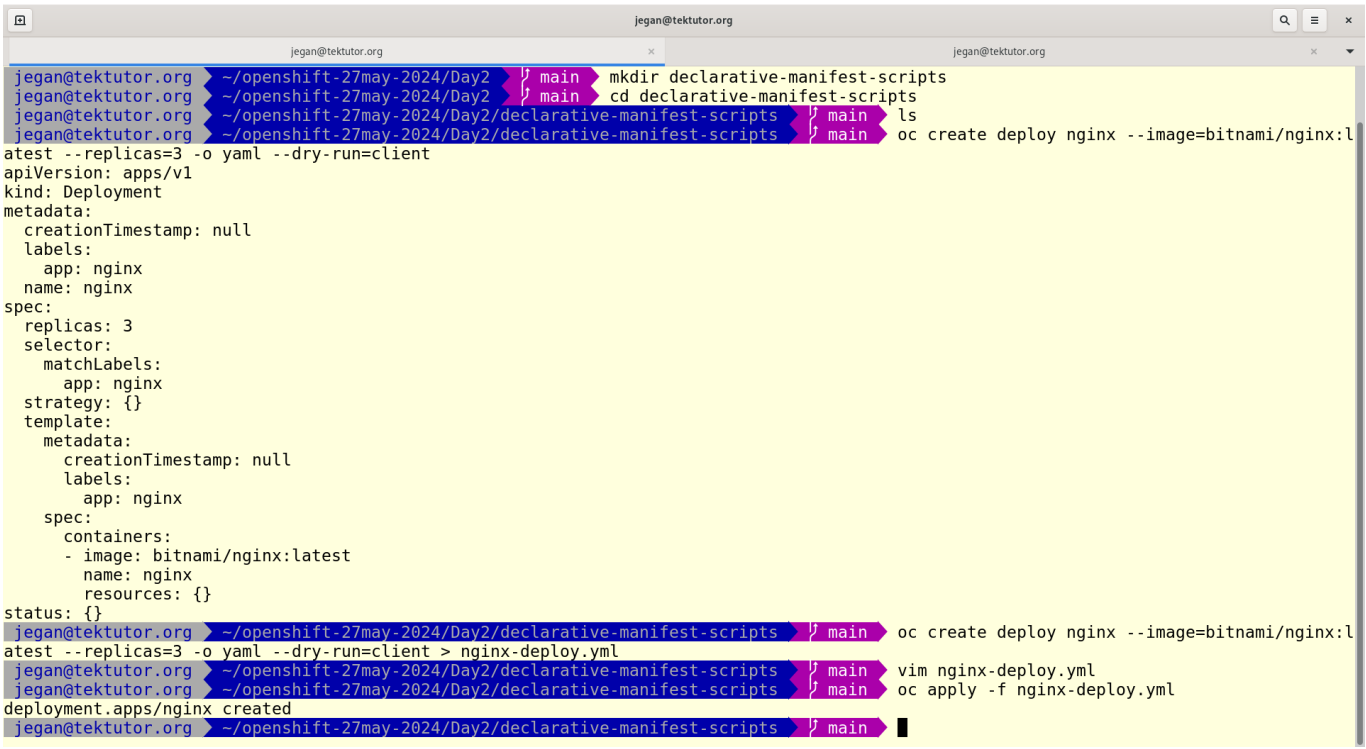
Expected output



Lab - Declaratively creating a deployment

```
oc create deploy nginx --image=bitnami/nginx:latest --replicas=3 -o yaml --
dry-run=client
oc create deploy nginx --image=bitnami/nginx:latest --replicas=3 -o yaml --
dry-run=client > nginx-deploy.yml
oc apply -f nginx-deploy.yml
oc get deploy,rs,po
```

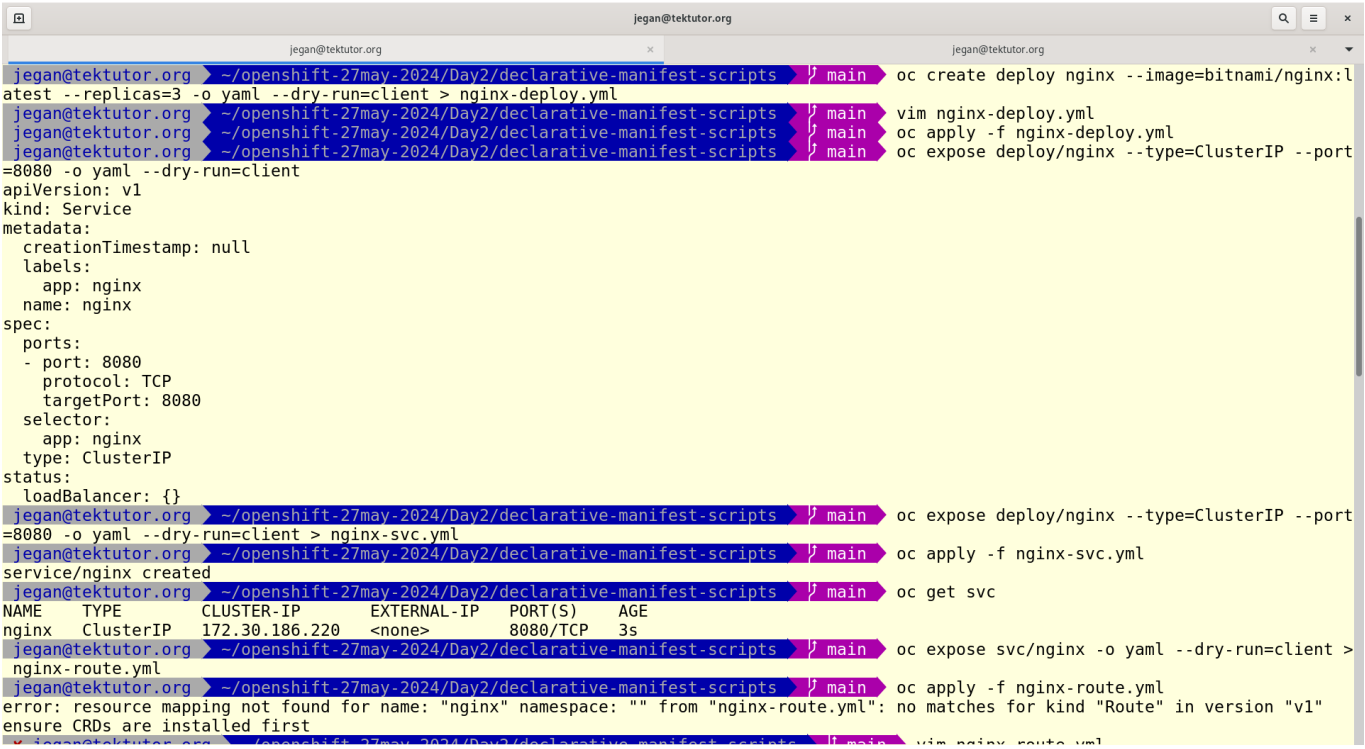
Expected output



Lab - Declaratively creating an internal clusterip service

```
oc expose deploy/nginx --type=ClusterIP --port=8080 -o yaml --dry-
run=client
oc expose deploy/nginx --type=ClusterIP --port=8080 -o yaml --dry-
run=client > nginx-clusterip-svc.yml
oc apply -f nginx-clusterip-svc.yml
oc get svc
oc describe svc/nginx
```

Expected output



Lab - Declaratively creating an external route with public url

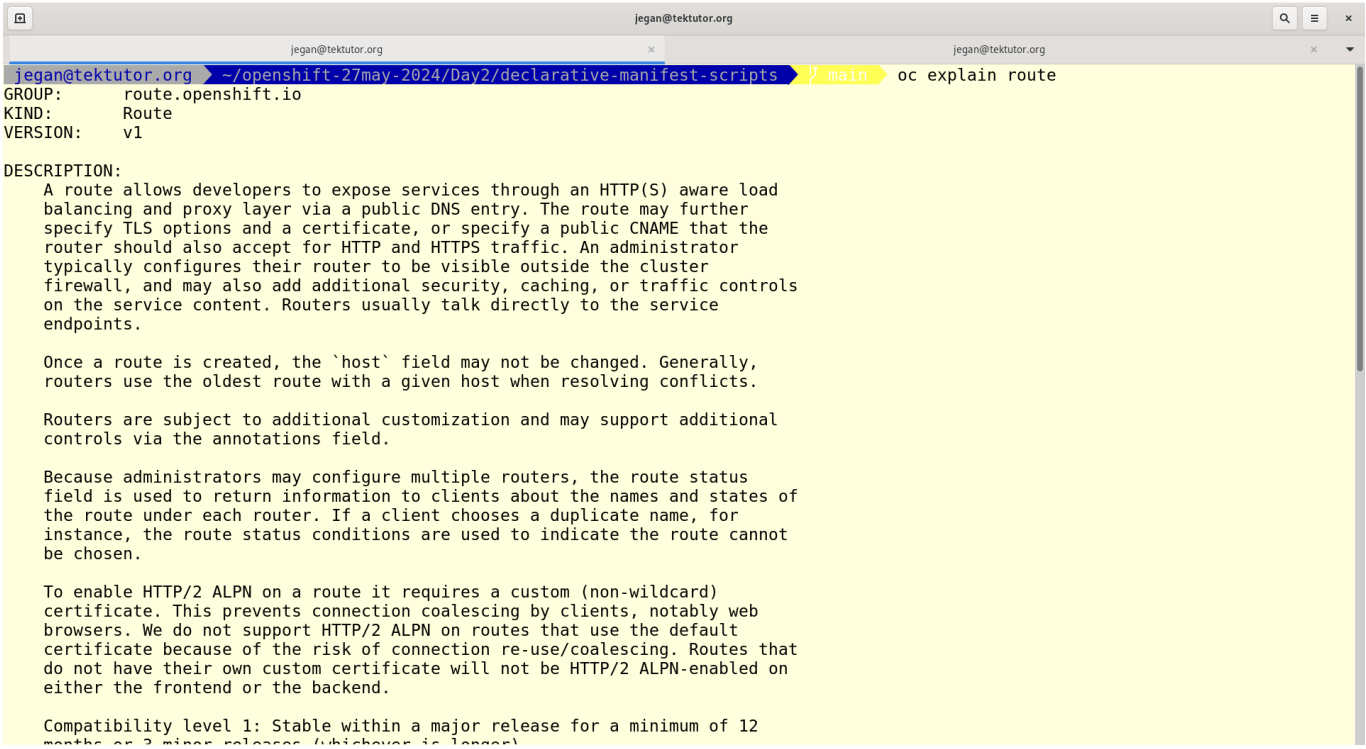
After generating the nginx-route.yml edit the file and make sure the apiVersion appears as route.openshift.io/v1

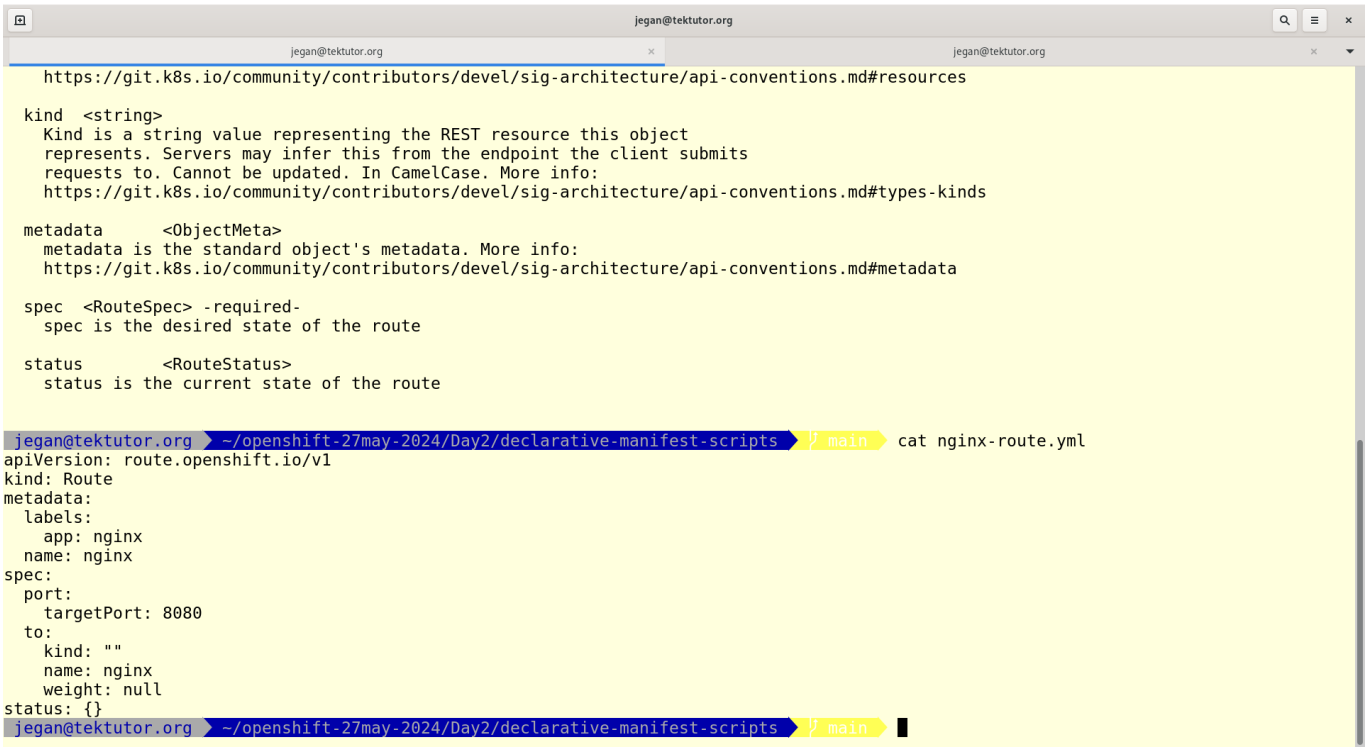
```
oc expose svc/nginx -o yaml --dry-run=client
oc expose svc/nginx -o yaml --dry-run=client > nginx-route.yml
oc explain route
oc apply -f nginx-route.yml
oc get route
```

Expected output

```
NAME    TYPE        CLUSTER-IP       EXTERNAL-IP   PORT(S)    AGE
nginx   ClusterIP   172.30.186.220   <none>        8080/TCP   3s
 jegan@tektutor.org  ~/openshift-27may-2024/Day2/declarative-manifest-scripts  main  oc expose svc/nginx -o yaml --dry-run=client >
 nginx-route.yml
 jegan@tektutor.org  ~/openshift-27may-2024/Day2/declarative-manifest-scripts  main  oc apply -f nginx-route.yml
error: resource mapping not found for name: "nginx" namespace: "" from "nginx-route.yml": no matches for kind "Route" in version "v1"
ensure CRDs are installed first
 ✘ jegan@tektutor.org  ~/openshift-27may-2024/Day2/declarative-manifest-scripts  main  vim nginx-route.yml
 jegan@tektutor.org  ~/openshift-27may-2024/Day2/declarative-manifest-scripts  main  oc apply -f nginx-route.yml
error: resource mapping not found for name: "nginx" namespace: "" from "nginx-route.yml": no matches for kind "Route" in version "v1"
ensure CRDs are installed first
 ✘ jegan@tektutor.org  ~/openshift-27may-2024/Day2/declarative-manifest-scripts  main  vim nginx-route.yml
 jegan@tektutor.org  ~/openshift-27may-2024/Day2/declarative-manifest-scripts  main  oc apply -f nginx-route.yml
error: resource mapping not found for name: "nginx" namespace: "" from "nginx-route.yml": no matches for kind "Route" in version "v1"
ensure CRDs are installed first
 ✘ jegan@tektutor.org  ~/openshift-27may-2024/Day2/declarative-manifest-scripts  main  vim nginx-route.yml
 jegan@tektutor.org  ~/openshift-27may-2024/Day2/declarative-manifest-scripts  main  oc apply -f nginx-route.yml
error: resource mapping not found for name: "nginx" namespace: "" from "nginx-route.yml": no matches for kind "Route" in version "v1"
ensure CRDs are installed first
 ✘ jegan@tektutor.org  ~/openshift-27may-2024/Day2/declarative-manifest-scripts  main  vim nginx-route.yml
 jegan@tektutor.org  ~/openshift-27may-2024/Day2/declarative-manifest-scripts  main  oc explain Route
GROUP:      route.openshift.io
KIND:       Route
VERSION:    v1

DESCRIPTION:
    A route allows developers to expose services through an HTTP(S) aware load
    balancing and proxy layer via a public DNS entry. The route may further
    specify TLS options and a certificate, or specify a public CNAME that the
    router should also accept for HTTP and HTTPS traffic. An administrator
    typically configures their router to be visible outside the cluster
    firewall, and may also add additional security, caching, or traffic controls
    on the service content. Routers usually talk directly to the service
    endpoints.

    Once a route is created, the `host` field may not be changed. Generally
```

```
    certificate because of the risk of connection re-use/coalescing. Routes that
    do not have their own custom certificate will not be HTTP/2 ALPN-enabled on
    either the frontend or the backend.

    Compatibility level 1: Stable within a major release for a minimum of 12
    months or 3 minor releases (whichever is longer).

FIELDS:
  apiVersion    <string>
    APIVersion defines the versioned schema of this representation of an object.
    Servers should convert recognized schemas to the latest internal value, and
    may reject unrecognized values. More info:
    https://git.k8s.io/community/contributors/devel/sig-architecture/api-conventions.md#resources

  kind  <string>
    Kind is a string value representing the REST resource this object
    represents. Servers may infer this from the endpoint the client submits
    requests to. Cannot be updated. In CamelCase. More info:
    https://git.k8s.io/community/contributors/devel/sig-architecture/api-conventions.md#types-kinds

  metadata      <ObjectMeta>
    metadata is the standard object's metadata. More info:
    https://git.k8s.io/community/contributors/devel/sig-architecture/api-conventions.md#metadata

  spec  <RouteSpec> -required-
    spec is the desired state of the route

  status        <RouteStatus>
    status is the current state of the route


 jegan@tektutor.org  ~/openshift-27may-2024/Day2/declarative-manifest-scripts  main  vim nginx-route.yml
 jegan@tektutor.org  ~/openshift-27may-2024/Day2/declarative-manifest-scripts  main  oc apply -f nginx-route.yml
route.route.openshift.io/nginx created
 jegan@tektutor.org  ~/openshift-27may-2024/Day2/declarative-manifest-scripts  main 
```

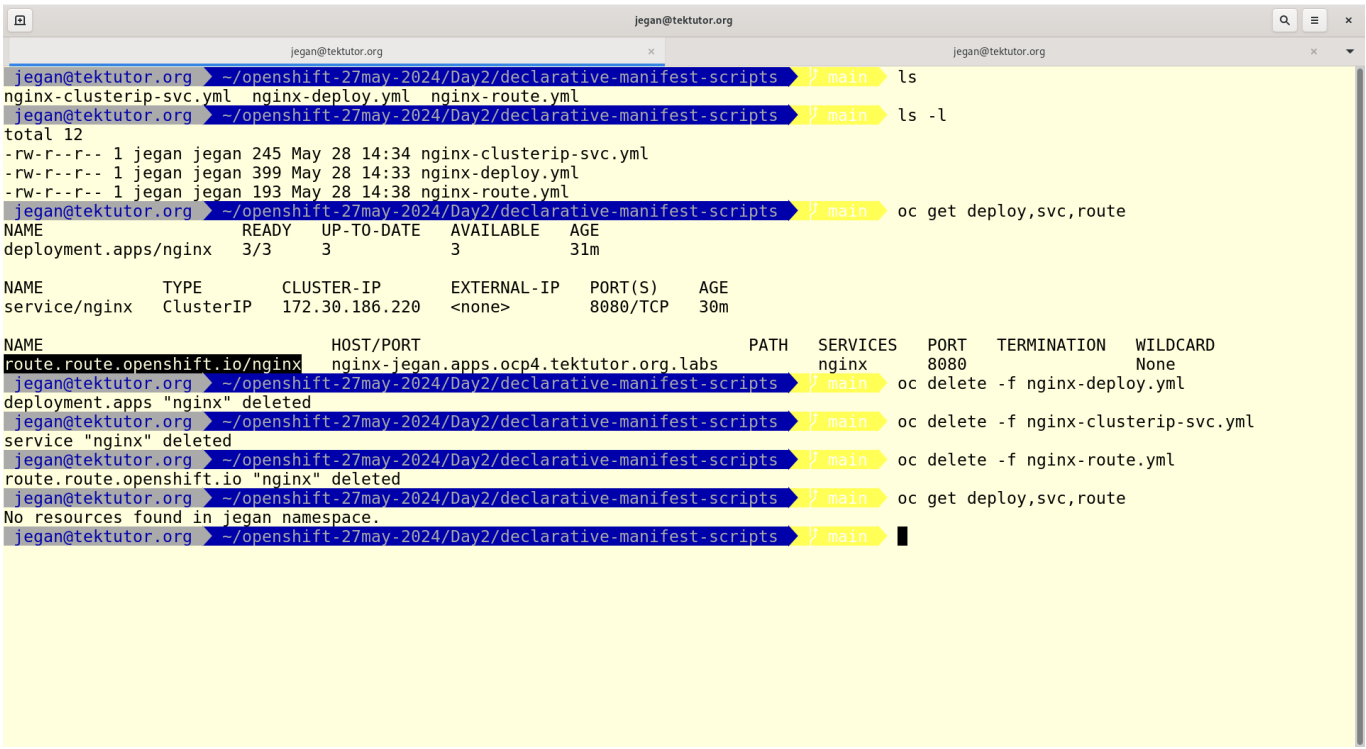




Lab - Declaratively deleting deployment, service and route

```
oc delete -f nginx-deploy.yml
oc delete -f nginx-clusterip-svc.yml
oc delete -f nginx-route.yml

oc get deploy,svc,route
```

Expected output



Lab - Declaratively creating nodeport and loadbalancer external services

```
oc delete -f nginx-clusterip-svc.yml
oc expose deploy/nginx --type=NodePort --port=8080 -o yaml --dry-run=client
oc expose deploy/nginx --type=NodePort --port=8080 -o yaml --dry-run=client
> nginx-nodeport-svc.yml
oc expose deploy/nginx --type=LoadBalancer --port=8080 -o yaml --dry-
run=client > nginx-lb-svc.yml
ls -l
```

Let's create the nodeport external service

```
oc apply -f nginx-nodeport-svc.yml
oc get svc
```

Lets access the nodeport service

```
oc get nodes
curl http://master-1.ocp4.tektutor.org.labs:30515
curl http://master-2.ocp4.tektutor.org.labs:30515
curl http://master-3.ocp4.tektutor.org.labs:30515
curl http://worker-1.ocp4.tektutor.org.labs:30515
curl http://worker-2.ocp4.tektutor.org.labs:30515
```

Lab - Creating a load balancer service declaratively

Things to note

```
- As Load Balancer service is meant for public cloud environments like AWS, Azure, GCP, Digital Ocean, etc.,
- It won't work out of the box in an on-prem openshift setup like our lab setup.
- Hence we need to install MetalLB Operator( it is already installed on your lab environment but needs to be configured )
```

For configuring Metallb operator, you can refer my medium blog

```
https://medium.com/tektutor/using-metallb-loadbalancer-with-bare-metal-openshift-onprem-4230944bfa35
```

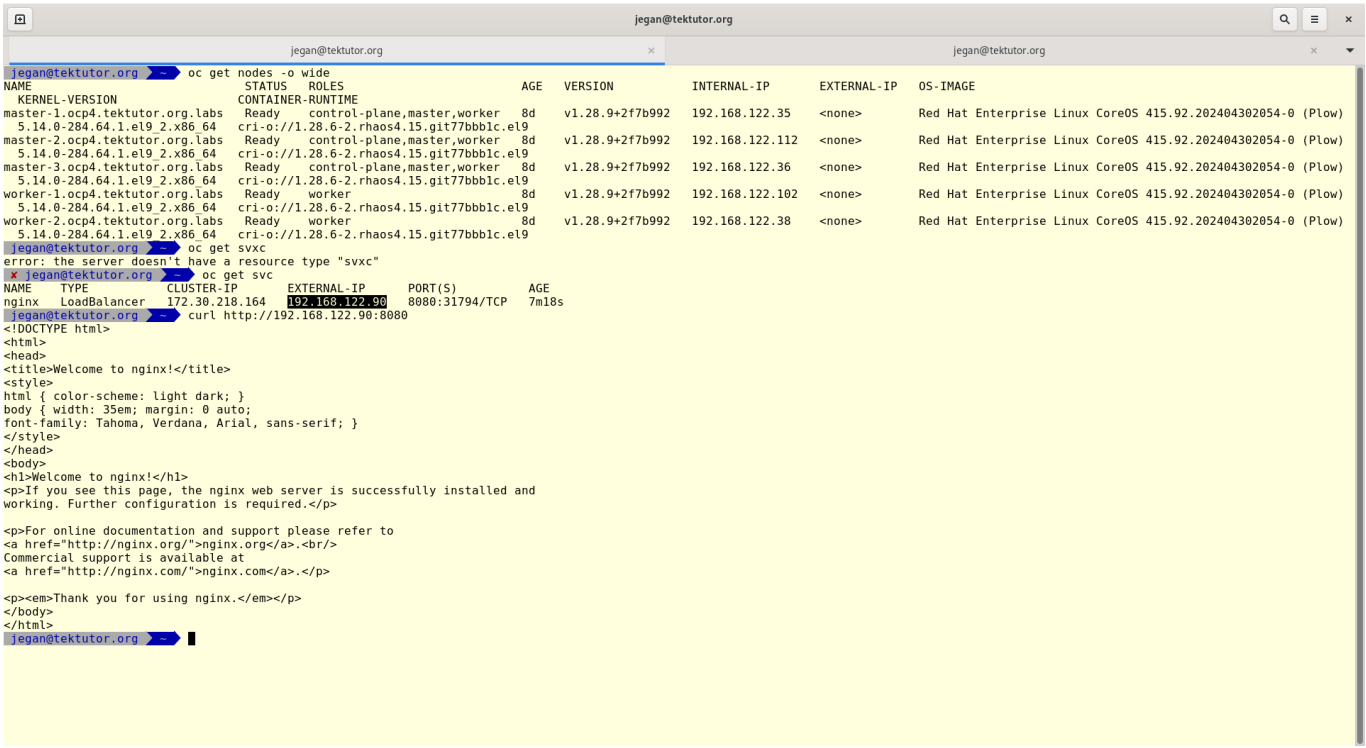
Let's create a load balancer service

```
oc delete -f nginx-nodeport-svc.yml
oc apply -f nginx-lb-svc.yml
oc get svc
```

Accessing the load balancer service

```
curl http://192.168.122.90:8080
```

Expected output



Lab - Ingress

Let's create nginx deployment with 3 Pods

```
oc delete project/jegan
oc new-project jegan
oc new-app --name=nginx bitnami/nginx:latest
oc scale deploy/nginx --replicas=3
oc get svc
oc describe svc/nginx
```

Let's create hello deployment with 3 Pods

```
oc new-app --name=hello tektutor/spring-ms:1.0
oc scale deploy/nginx --replicas=3
oc get svc
oc describe svc/hello
```

Lab - Declaratively creating a replicaset without deployment

```
cd ~/openshift-27may-2024
git pull
cd Day2/declarative-manifest-scripts

oc apply -f nginx-rs.yml
```

Expected output

```
jegan@tektutor.org  ~/openshift-27may-2024/Day2/declarative-manifest-
scripts $ oc apply -f nginx-rs.yml
replicaset.apps/nginx-rs created

jegan@tektutor.org  ~/openshift-27may-2024/Day2/declarative-manifest-
scripts $ oc get deploy,rs,po
NAME                         DESIRED   CURRENT   READY   AGE
replicaset.apps/nginx-rs   3         3         2       5s

NAME                 READY   STATUS              RESTARTS   AGE
pod/nginx-rs-7c9wp   1/1     Running             0          5s
pod/nginx-rs-ldcjb   0/1     ContainerCreating   0          5s
pod/nginx-rs-zp7bl   1/1     Running             0          5s

 jegan@tektutor.org  ~/openshift-27may-2024/Day2/declarative-manifest-
scripts $ oc get deploy,rs,po
NAME                         DESIRED   CURRENT   READY   AGE
replicaset.apps/nginx-rs   3         3         3       15s
```

```
NAME                 READY   STATUS    RESTARTS   AGE
pod/nginx-rs-7c9wp   1/1     Running   0          15s
pod/nginx-rs-ldcjb   1/1     Running   0          15s
pod/nginx-rs-zp7bl   1/1     Running   0          15s
```

Info - What is Persistent Volume (PV) ?

- any stateful application that stores & retrieves data would require external storage
- system administrators create disks of different sizes and access mode in Openshift called Persisten volumes
- Persistent volumes are external storage
- it could be a NFS storage, AWS EBS, AWS S3 Bucket, Azure Storage, etc
- it can be provisioned manually or dynamically using StorageClass
- this is created on the cluster wide scope (global scope)

Info - What is Persistent Volume Claim (PVC) ?

- applications that requires external stores has to request for external storage by defining their requirement in the form of Persistent volume claim (PVC)
- openshift storage controller will search for matching Persistent volume if it finds a match then it lets' the PVC claim and use the Persistent Volume
- Persistent Volume is created without a project namespace by developers
- Persistent volumes claims has to be specify
    - what is size of storage expected ?
    - what is access mode expected
    - From what type of StorageClass(AWS,Azure Storge, NFS Storage)
    - StorageClass is optional but if mentioned only if openshift finds a PV of that type of StorageClass your application can use that