Documenting: Learn Kubernetes Basics

Starting a Kubernetes Minikube:

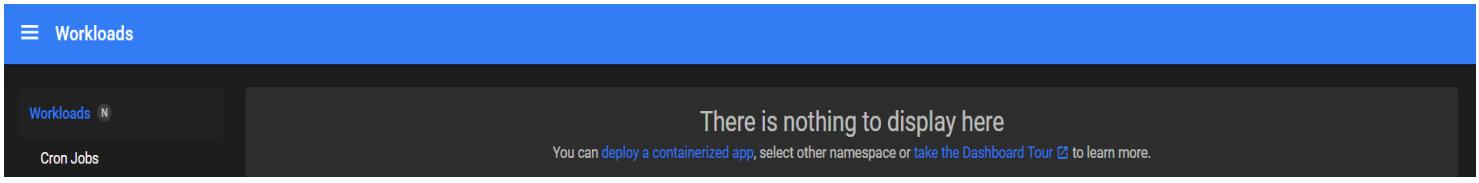
```
PS C:\Users\c_bro> minikube start
W0218 15:51:46.914081    4696 main.go:291] Unable to resolve the current Docker CLI context "default":
 context "default": context not found: open C:\Users\c_bro\.docker\contexts\meta\37a8eec1ce19687d132fe
29051dca629d164e2c4958ba141d5f4133a33f0688f\meta.json: The system cannot find the path specified.
😄  minikube v1.32.0 on Microsoft Windows 11 Home 10.0.22631.3007 Build 22631.3007
✨  Automatically selected the docker driver. Other choices: hyperv, virtualbox, ssh
📌  Using Docker Desktop driver with root privileges
👍  Starting control plane node minikube in cluster minikube
🚜  Pulling base image ...
💾  Downloading Kubernetes v1.28.3 preload ...
    > preloaded-images-k8s-v18-v1...:  403.35 MiB / 403.35 MiB  100.00% 5.54 Mi
    > gcr.io/k8s-minikube/kicbase...:  453.90 MiB / 453.90 MiB  100.00% 5.66 Mi
🔥  Creating docker container (CPUs=2, Memory=3900MB) ...
❗  Executing "docker ps -a --format {{.Names}}" took an unusually long time: 3.518372s
💡  Restarting the docker service may improve performance.
🐳  Preparing Kubernetes v1.28.3 on Docker 24.0.7 ...
    ▪ Generating certificates and keys ...
    ▪ Booting up control plane ...
    ▪ Configuring RBAC rules ...
🔗  Configuring bridge CNI (Container Networking Interface) ...
🔎  Verifying Kubernetes components...
    ▪ Using image gcr.io/k8s-minikube/storage-provisioner:v5
🌟  Enabled addons: storage-provisioner, default-storageclass
💡  kubectl not found. If you need it, try: 'minikube kubectl -- get pods -A'
🏄  Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default
PS C:\Users\c_bro>
```

Opening the Kubernetes dashboard:

```
PS C:\Users\c_bro> minikube dashboard
W0218 15:58:52.101775    8244 main.go:291] Unable to resolve the current Docker CLI context "default":
 context "default": context not found: open C:\Users\c_bro\.docker\contexts\meta\37a8eec1ce19687d132fe
29051dca629d164e2c4958ba141d5f4133a33f0688f\meta.json: The system cannot find the path specified.
🔌  Enabling dashboard ...
    ▪ Using image docker.io/kubernetesui/dashboard:v2.7.0
    ▪ Using image docker.io/kubernetesui/metrics-scraper:v1.0.8
💡  Some dashboard features require the metrics-server addon. To enable all features please run:

        minikube addons enable metrics-server


🤔  Verifying dashboard health ...
🚀  Launching proxy ...
    > kubectl.exe.sha256:  64 B / 64 B [----------------------] 100.00% ? p/s 0s
    > kubectl.exe:  48.25 MiB / 48.25 MiB [------] 100.00% 165.89 KiB p/s 4m58s
🤔  Verifying proxy health ...
🎉  Opening http://127.0.0.1:56602/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-das
hboard:/proxy/ in your default browser...
```



Deploying an App

Creating a Deployment:

```
PS C:\Users\c_bro> kubectl create deployment hello-node --image=registry.k8s.io/e2e-test-images/
agnhost:2.39 -- /agnhost netexec --http-port=8080
deployment.apps/hello-node created
```

Viewing the Deployment:

```
PS C:\Users\c_bro> kubectl get deployments
NAME         READY   UP-TO-DATE   AVAILABLE   AGE
hello-node   1/1     1            1           49s
PS C:\Users\c_bro>
```

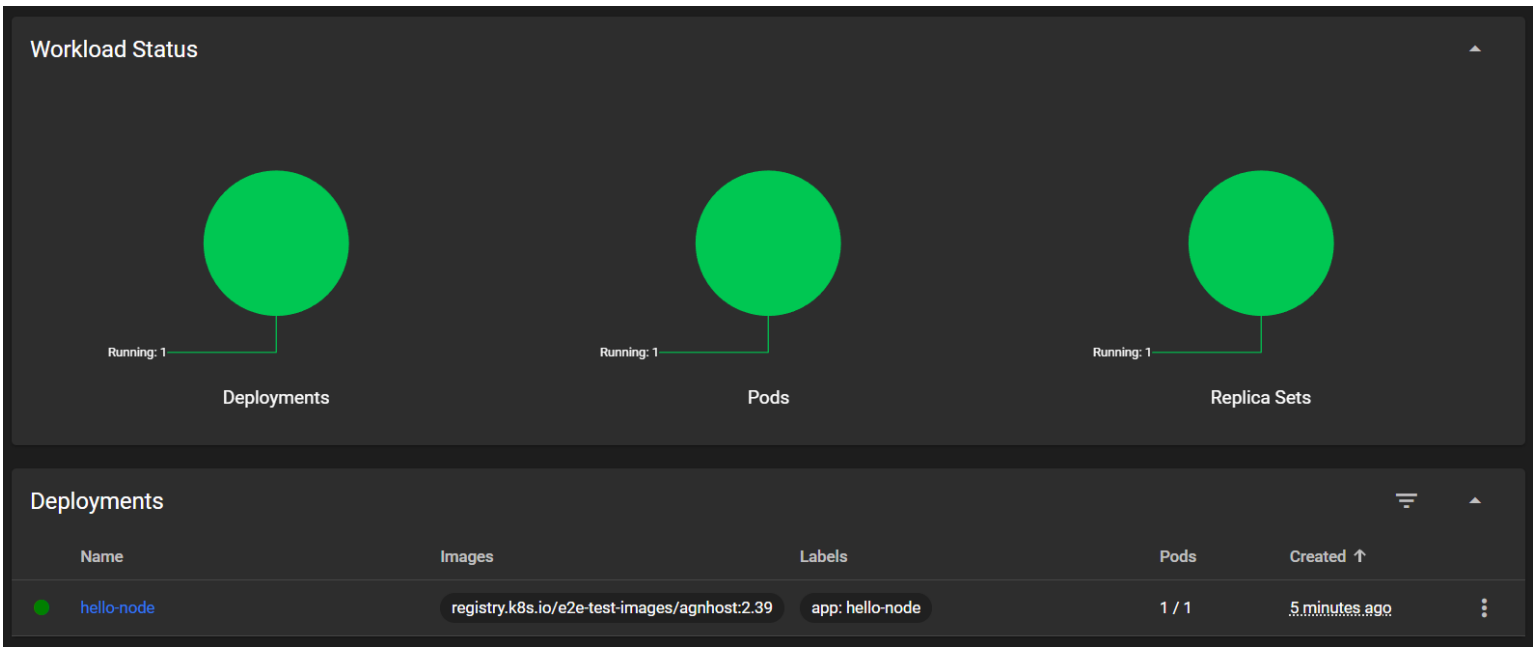
Viewing the Pod:

```
PS C:\Users\c_bro> kubectl get pods
NAME                          READY   STATUS    RESTARTS   AGE
hello-node-ccf4b9788-pgkjk    1/1     Running   0          104s
PS C:\Users\c_bro>
```

Viewing application logs for a container in a pod:

```
PS C:\Users\c_bro> kubectl logs hello-node-ccf4b9788-pgkjk
I0218 16:37:23.709416       1 log.go:195] Started HTTP server on port 8080
I0218 16:37:23.709703       1 log.go:195] Started UDP server on port  8081
PS C:\Users\c_bro>
```

Updated Kubernetes Dashboard:



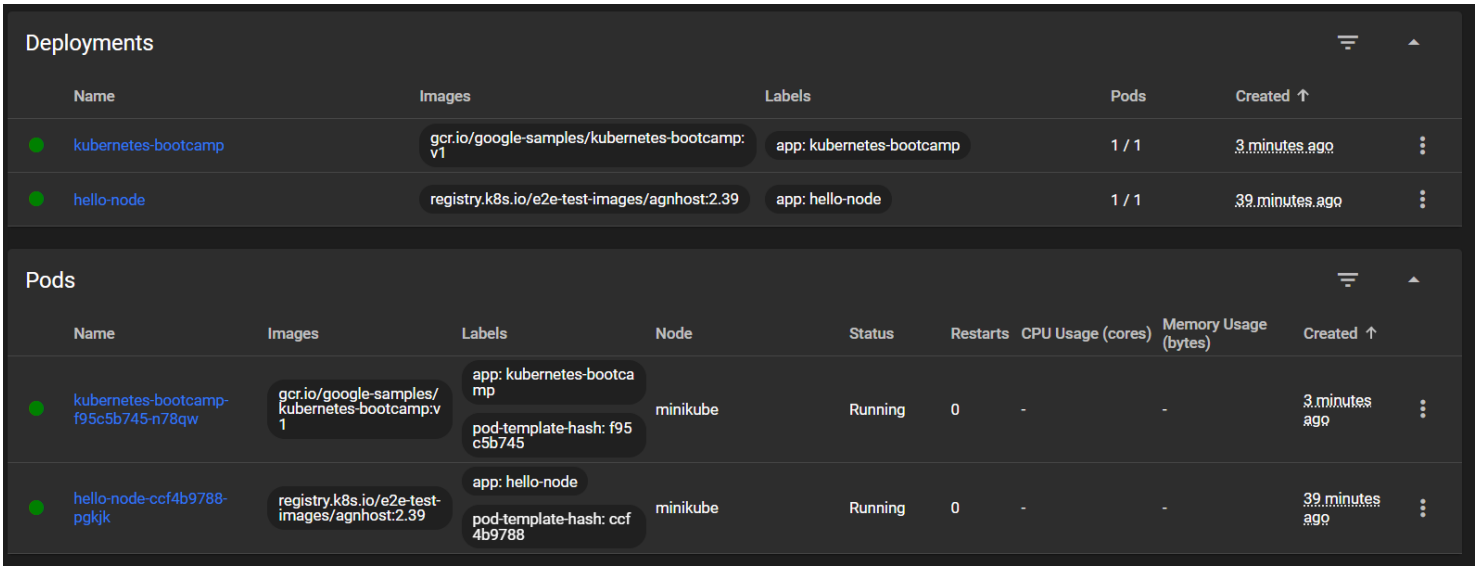
Deploying Kubernetes bootcamp app image:

```
PS C:\Users\c_bro> kubectl create deployment kubernetes-bootcamp --image=gcr.io/google-samples/k
ubernetes-bootcamp:v1
deployment.apps/kubernetes-bootcamp created
```

Listing updated deployments:

```
PS C:\Users\c_bro> kubectl get deployments
NAME                  READY   UP-TO-DATE   AVAILABLE   AGE
hello-node            1/1     1            1           38m
kubernetes-bootcamp   1/1     1            1           100s
```

Checking Dashboard For new Pod:



Checking APIs hosted through the proxy endpoint:

```
PS C:\Users\c_bro> curl http://localhost:8001/version


StatusCode        : 200
StatusDescription : OK
Content           : {
                      "major": "1",
                      "minor": "28",
                      "gitVersion": "v1.28.3",
                      "gitCommit": "a8a1abc25cad87333840cd7d54be2efaf31a3177",
                      "gitTreeState": "clean",
                      "buildDate": "2023-10-18T11:33:18Z",
                      "goVersion"...
RawContent        : HTTP/1.1 200 OK
```

Viewing Pods and Nodes:

Check application configuration:

```
Events:
  Type    Reason     Age   From               Message
  ----    ------     ----  ----               -------
  Normal  Scheduled  21m   default-scheduler  Successfully assigned default/kubernetes-bootcamp-
f95c5b745-n78qw to minikube
  Normal  Pulling    21m   kubelet            Pulling image "gcr.io/google-samples/kubernetes-bo
otcamp:v1"
  Normal  Pulled     20m   kubelet            Successfully pulled image "gcr.io/google-samples/k
ubernetes-bootcamp:v1" in 38.558s (38.558s including waiting)
  Normal  Created    20m   kubelet            Created container kubernetes-bootcamp
  Normal  Started    20m   kubelet            Started container kubernetes-bootcamp
```

Executing commands on the container

Listing Available Commands:

```
PS C:\Users\c_bro> kubectl exec kubernetes-bootcamp-f95c5b745-n78qw -- env
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin
HOSTNAME=kubernetes-bootcamp-f95c5b745-n78qw
KUBERNETES_PORT_443_TCP_ADDR=10.96.0.1
KUBERNETES_SERVICE_HOST=10.96.0.1
KUBERNETES_SERVICE_PORT=443
KUBERNETES_SERVICE_PORT_HTTPS=443
KUBERNETES_PORT=tcp://10.96.0.1:443
KUBERNETES_PORT_443_TCP=tcp://10.96.0.1:443
KUBERNETES_PORT_443_TCP_PROTO=tcp
KUBERNETES_PORT_443_TCP_PORT=443
NPM_CONFIG_LOGLEVEL=info
NODE_VERSION=6.3.1
HOME=/root
```

Starting Bash Session in Pod's container and opening 'server.js':

```
PS C:\Users\c_bro> kubectl exec -ti kubernetes-bootcamp-f95c5b745-n78qw -- bash
root@kubernetes-bootcamp-f95c5b745-n78qw:/# cat server.js
var http = require('http');
var requests=0;
var podname= process.env.HOSTNAME;
var startTime;
var host;
var handleRequest = function(request, response) {
  response.setHeader('Content-Type', 'text/plain');
  response.writeHead(200);
  response.write("Hello Kubernetes bootcamp! | Running on: ");
  response.write(host);
  response.end(" | v=1\n");
  console.log("Running On:" ,host, "| Total Requests:", ++requests,"| App Uptime:", (new Date()
- startTime)/1000 , "seconds", "| Log Time:",new Date());
}
```

Verifying that the application is running:

```
root@kubernetes-bootcamp-f95c5b745-n78qw:/# curl http://localhost:8080
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-f95c5b745-n78qw | v=1
```

Using a Service to Expose Your App:

Creating a New Service:

```
PS C:\Users\c_bro> kubectl get services
NAME         TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
kubernetes   ClusterIP   10.96.0.1    <none>        443/TCP   18d
```

```
PS C:\Users\c_bro> kubectl expose deployment/kubernetes-bootcamp --type="NodePort" --port 8080
service/kubernetes-bootcamp exposed
PS C:\Users\c_bro> kubectl get services
NAME                  TYPE        CLUSTER-IP    EXTERNAL-IP   PORT(S)          AGE
kubernetes            ClusterIP   10.96.0.1     <none>        443/TCP          18d
kubernetes-bootcamp   NodePort    10.99.86.80   <none>        8080:30877/TCP   5s
```

Finding the externally opened port on the service:

```
PS C:\Users\c_bro> kubectl describe services/kubernetes-bootcamp
Name:                     kubernetes-bootcamp
Namespace:                default
Labels:                   app=kubernetes-bootcamp
Annotations:              <none>
Selector:                 app=kubernetes-bootcamp
Type:                     NodePort
IP Family Policy:         SingleStack
IP Families:              IPv4
IP:                       10.99.86.80
IPs:                      10.99.86.80
Port:                     <unset>  8080/TCP
TargetPort:               8080/TCP
NodePort:                 <unset>  30877/TCP
Endpoints:                10.244.0.11:8080
Session Affinity:         None
External Traffic Policy:  Cluster
Events:                   <none>
```

Creating a NODE_PORT environment variable:

```
PS C:\Users\c_bro> $env:NODE_PORT=$(kubectl get services/kubernetes-bootcamp -o go-template='{{(index .spec.po
rts 0).nodePort}}')
```

Testing that the app is exposed outside the cluster using curl:

```
PS C:\Users\c_bro> curl http://127.0.0.1:55353


StatusCode        : 200
StatusDescription : OK
Content           : Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-f95c5b745-n78qw | v=1

RawContent        : HTTP/1.1 200 OK
                    Connection: keep-alive
                    Transfer-Encoding: chunked
                    Content-Type: text/plain
                    Date: Fri, 08 Mar 2024 20:29:58 GMT

                    Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-f95c5...
Forms             : {}
Headers           : {[Connection, keep-alive], [Transfer-Encoding, chunked], [Content-Type, text/plain],
                    [Date, Fri, 08 Mar 2024 20:29:58 GMT]}
Images            : {}
InputFields       : {}
Links             : {}
ParsedHtml        : mshtml.HTMLDocumentClass
RawContentLength  : 83
```

Applying a new label:

```
PS C:\Users\c_bro> kubectl label pods kubernetes-bootcamp-f95c5b745-n78qw version=v1
pod/kubernetes-bootcamp-f95c5b745-n78qw labeled
```

```
PS C:\Users\c_bro> kubectl get pods -l version=v1
NAME                                  READY   STATUS    RESTARTS      AGE
kubernetes-bootcamp-f95c5b745-n78qw   1/1     Running   1 (25h ago)   19d
```

Deleting a service:

```
PS C:\Users\c_bro> kubectl delete service -l app=kubernetes-bootcamp
service "kubernetes-bootcamp" deleted
```

```
PS C:\Users\c_bro> kubectl get services
NAME         TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
kubernetes   ClusterIP   10.96.0.1    <none>        443/TCP   19d
```

Confirming that the route is not exposed anymore:

```
PS C:\Users\c_bro> curl http://127.0.0.1:55353
curl : The underlying connection was closed: An unexpected error occurred on a receive.
At line:1 char:1
+ curl http://127.0.0.1:55353
+ ~~~~~~~~~~~~~~~~~~~~~~~~~~~
    + CategoryInfo          : InvalidOperation: (System.Net.HttpWebRequest:HttpWebRequest) [Invoke-WebReques
   t], WebException
    + FullyQualifiedErrorId : WebCmdletWebResponseException,Microsoft.PowerShell.Commands.InvokeWebRequestCo
   mmand
```

Running Multiple Instances of Your App:

Viewing the ReplicaSet created by the deployment:

```
PS C:\Users\c_bro> kubectl get rs
NAME                              DESIRED   CURRENT   READY   AGE
hello-node-ccf4b9788              1         1         1       19d
kubernetes-bootcamp-f95c5b745     1         1         1       19d
```

Scaling the deployment to 4 replicas:

```
PS C:\Users\c_bro> kubectl scale deployments/kubernetes-bootcamp --replicas=4
deployment.apps/kubernetes-bootcamp scaled
```

```
PS C:\Users\c_bro> kubectl get deployments
NAME                  READY   UP-TO-DATE   AVAILABLE   AGE
hello-node            1/1     1            1           19d
kubernetes-bootcamp   4/4     4            4           19d
```

Checking that the Service is load-balancing the traffic:

```
PS C:\Users\c_bro> curl http://127.0.0.1:64882


StatusCode        : 200
StatusDescription : OK
Content           : Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-f95c5b745-kkshf | v=1

RawContent        : HTTP/1.1 200 OK
                    Connection: keep-alive
                    Transfer-Encoding: chunked
                    Content-Type: text/plain
                    Date: Fri, 08 Mar 2024 21:19:30 GMT

                    Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-f95c5...
Forms             : {}
Headers           : {[Connection, keep-alive], [Transfer-Encoding, chunked], [Content-Type, text/plain],
                    [Date, Fri, 08 Mar 2024 21:19:30 GMT]}
Images            : {}
InputFields       : {}
Links             : {}
ParsedHtml        : mshtml.HTMLDocumentClass
RawContentLength  : 83
```

Scaling Down the application:

```
PS C:\Users\c_bro> kubectl scale deployments/kubernetes-bootcamp --replicas=2
deployment.apps/kubernetes-bootcamp scaled
```

```
PS C:\Users\c_bro> kubectl get pods -o wide
NAME                                  READY   STATUS    RESTARTS      AGE     IP            NODE       NOMINAT
ED NODE   READINESS GATES
hello-node-ccf4b9788-pgkjk            1/1     Running   1 (25h ago)   19d     10.244.0.13   minikube   <none>
          <none>
kubernetes-bootcamp-f95c5b745-kkshf   1/1     Running   0             8m30s   10.244.0.15   minikube   <none>
          <none>
kubernetes-bootcamp-f95c5b745-n78qw   1/1     Running   1 (25h ago)   19d     10.244.0.11   minikube   <none>
          <none>
```

Performing a Rolling Update:

Updating the version of the app to version 2:

```
PS C:\Users\c_bro> kubectl set image deployments/kubernetes-bootcamp kubernetes-bootcamp=docker.io/jocatalin/kubernetes-bootcamp:v2
deployment.apps/kubernetes-bootcamp image updated
```

```
PS C:\Users\c_bro> kubectl get pods
NAME                                   READY   STATUS    RESTARTS      AGE
hello-node-ccf4b9788-pgkjk             1/1     Running   1 (26h ago)   19d
kubernetes-bootcamp-9cfc76686-56ht7    1/1     Running   0             61s
kubernetes-bootcamp-9cfc76686-dwsbm    1/1     Running   0             65s
```

```
PS C:\Users\c_bro> kubectl describe services/kubernetes-bootcamp
Name:                     kubernetes-bootcamp
Namespace:                default
Labels:                   app=kubernetes-bootcamp
Annotations:              <none>
Selector:                 app=kubernetes-bootcamp
Type:                     NodePort
IP Family Policy:         SingleStack
IP Families:              IPv4
IP:                       10.96.129.25
IPs:                      10.96.129.25
Port:                     <unset>  8080/TCP
TargetPort:               8080/TCP
NodePort:                 <unset>  31738/TCP
Endpoints:                10.244.0.18:8080,10.244.0.19:8080
Session Affinity:         None
External Traffic Policy:  Cluster
Events:                   <none>
PS C:\Users\c_bro>
```

Running the roll out status command:

```
PS C:\Users\c_bro> kubectl rollout status deployments/kubernetes-bootcamp
deployment "kubernetes-bootcamp" successfully rolled out
```

Cleaning up the local cluster:

```
PS C:\Users\c_bro> kubectl delete deployments/kubernetes-bootcamp services/kubernetes-bootcamp
deployment.apps "kubernetes-bootcamp" deleted
service "kubernetes-bootcamp" deleted
```