Kubernetes
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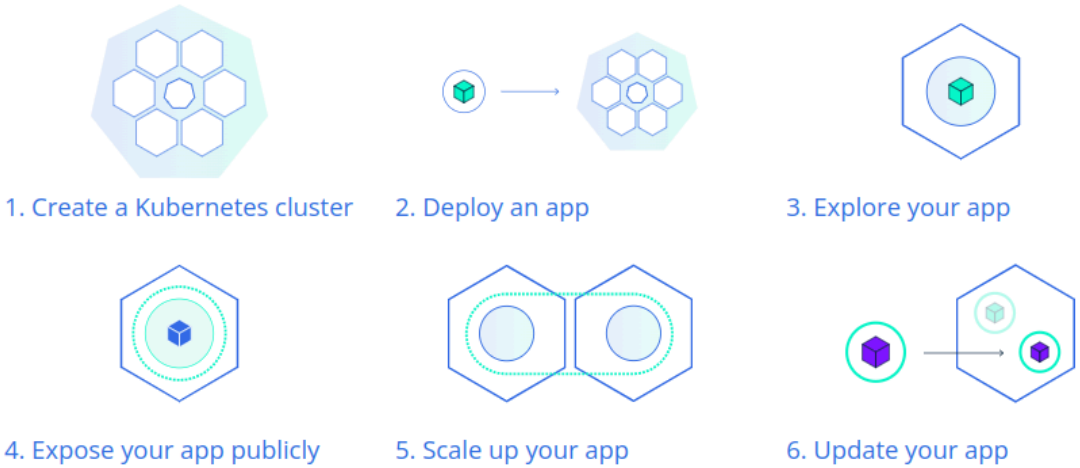
Basics **3**
Creating a cluster 3
Deploying 4
Minikube **5**
Starting Minikube 5
Start Minikube Dashboard (in second terminal) 5
Run “kubectl create” 5
View the new deployment 6
View the pod 6
View events 6
View configuration 6
View app logs for a container in a pod 7
Create a Service 7
Expose Pod 7
View newly created service 7
Run the service 8
Enable Addons in Minikube 8
List currently supported addons 8
Enable an addon 9
View Pod & Service created by an addon 9
Check out from metrics-server 9
Disable metrics-server 10
Clean Up 10
Deploying an App **10**
Check kubectl is connected to your cluster 10
View nodes in your cluster 10
Deploying an app 11
List deployments 11
View deployed App 11
Exploring your App 13
Check application configuration 13
Inspect what containers (and from what images) exist in a pod 13
Querying the pod directly through a proxy 13
Retrieving logs of the container (taken from the standard output of the app) 14
Executing commands from within the Pod 14
Executing a bash shell inside the pod where we run a nodeJS server 14
Checking the app is running (from within the pod context) 15

Quit using ‘exit’....15
Exposing your App Publically....16
Verify the application is running....17
List the current services....17
Create a new exposed service and check it exists....17
Check port....17
Using docker-desktop on windows requires a tunnel to be open....18
Use curl to check that the app was exposed....18
Using Labels....18
Deployments create labels automatically. We can see labels by using describe....18
Query apps & services by labels....18
Add Labels to the Pod....19
Querying our new label by the Pod....19
Deleting Services....19
Delete a service....19
Confirm the service is deleted....19
Pod is now inaccessible from outside cluster....20
Pod is still accessible within the cluster....20
Expose the service....20
Notice only one Pod currently running....20
See the replica set....20
Use the -o wide flag to get info about the replicas....21
Use describe to check the change in the logs....21
Load Balancing....21
Check that service is load balancing traffic....21
We’re hitting different end points on each request indicating that the load-balancing is working....22
Scaling Down....22
We can scale down by lowering the replica count....22
UPDATE YOUR APP....23
Use describe pods to check image version....23
Use set-image to update image version....23
Older version is automatically terminated for newer version....23
Versions can be rolled back....23

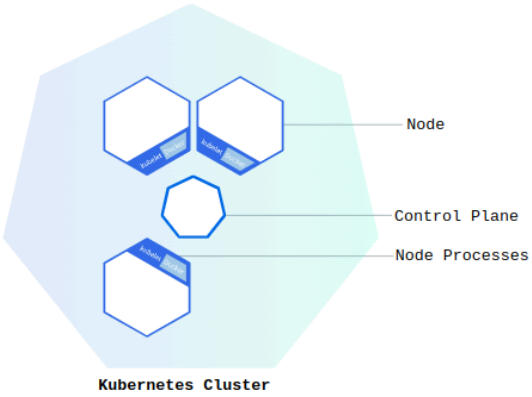
Basics

- Containerization helps package software to serve these goals
    - 24/7 Availability
    - Updates without downtime
    - Multiple deployments each day
- Kubernetes
    - Designed by Google
    - Allows for previous points to be achievable



Creating a cluster

- A Kubernetes cluster consists of two types of resources:
    - The Control Plane coordinates the cluster
    - Nodes are the workers that run applications



- The Control Plane is responsible for managing the cluster.
- A node is a device that serves as a worker machine in a Kubernetes cluster.
- Node-level components communicate with the control plane using the Kubernetes API

Deploying

- Kubernetes coordinates a cluster of connected computers to work as an unit
- Kubernetes automates distribution and scheduling of containers across a cluster efficiently

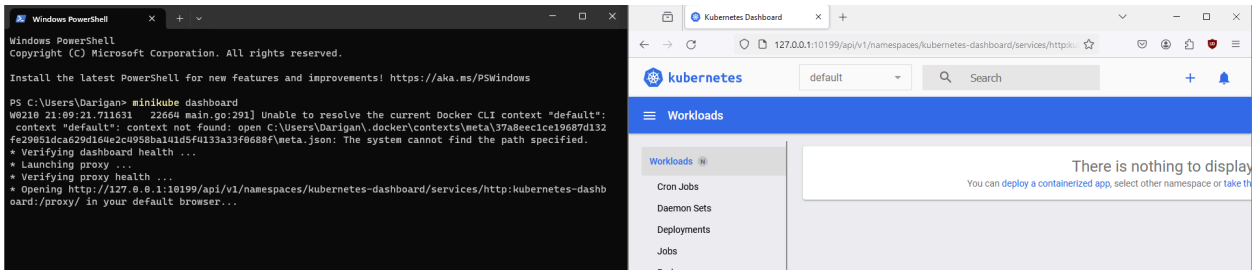
  Prerequisites
  - Install Minikube
    - https://minikube.sigs.k8s.io/docs/start/
  - Install Kubectl
    - https://kubernetes.io/docs/tasks/tools/

Minikube

Starting Minikube

```
PS C:\Users\Darigan> minikube start
W0210 21:06:01.532521    8276 main.go:291] Unable to resolve the current Docker CLI context "default": context "default"
: context not found: open C:\Users\Darigan\.docker\contexts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133
a33f0688f\meta.json: The system cannot find the path specified.
* minikube v1.32.0 on Microsoft Windows 11 Home 10.0.22631.3085 Build 22631.3085
* Automatically selected the docker driver
* 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% 30.17 M
    > gcr.io/k8s-minikube/kicbase...:  453.90 MiB / 453.90 MiB  100.00% 31.37 M
* Creating docker container (CPUs=2, Memory=4000MB) ...
* 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
* Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default
PS C:\Users\Darigan>
```

Start Minikube Dashboard (in second terminal)



Run “kubectl create”

- Creating a deployment that manages a pod
    - A Kubernetes ***Pod*** is a group of one or more Containers, tied together for the purposes of administration and networking

```
PS C:\Users\Darigan> 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
```

View the new deployment

```
PS C:\Users\Darigan> kubectl get deployments
NAME         READY   UP-TO-DATE   AVAILABLE   AGE
hello-node   1/1     1            1           2m
PS C:\Users\Darigan>
```

View the pod

```
NAME                          READY   STATUS    RESTARTS   AGE
hello-node-ccf4b9788-sz45g    1/1     Running   0          2m39s
```

View events

```
PS C:\Users\Darigan> kubectl get events
LAST SEEN   TYPE     REASON                   OBJECT                              MESSAGE
3m2s        Normal   Scheduled                pod/hello-node-ccf4b9788-sz45g      Successfully assigned default/hello-node-ccf4b9788-sz45g to minikube
3m1s        Normal   Pulling                  pod/hello-node-ccf4b9788-sz45g      Pulling image "registry.k8s.io/e2e-test-images/agnhost:2.39"
2m58s       Normal   Pulled                   pod/hello-node-ccf4b9788-sz45g      Successfully pulled image "registry.k8s.io/e2e-test-images/agnhost:2.39" in 2.8
ting)
2m58s       Normal   Created                  pod/hello-node-ccf4b9788-sz45g      Created container agnhost
2m58s       Normal   Started                  pod/hello-node-ccf4b9788-sz45g      Started container agnhost
3m2s        Normal   SuccessfulCreate         replicaset/hello-node-ccf4b9788     Created pod: hello-node-ccf4b9788-sz45g
3m2s        Normal   ScalingReplicaSet        deployment/hello-node               Scaled up replica set hello-node-ccf4b9788 to 1
6m34s       Normal   Starting                 node/minikube                       Starting kubelet.
6m34s       Normal   NodeHasSufficientMemory  node/minikube                       Node minikube status is now: NodeHasSufficientMemory
6m34s       Normal   NodeHasNoDiskPressure    node/minikube                       Node minikube status is now: NodeHasNoDiskPressure
6m34s       Normal   NodeHasSufficientPID     node/minikube                       Node minikube status is now: NodeHasSufficientPID
6m34s       Normal   NodeAllocatableEnforced  node/minikube                       Updated Node Allocatable limit across pods
6m22s       Normal   RegisteredNode           node/minikube                       Node minikube event: Registered Node minikube in Controller
6m20s       Normal   Starting                 node/minikube
PS C:\Users\Darigan>
```

View configuration

```
PS C:\Users\Darigan> kubectl config view
apiVersion: v1
clusters:
- cluster:
    certificate-authority: C:\Users\Darigan\.minikube\ca.crt
    extensions:
    - extension:
        last-update: Sat, 10 Feb 2024 21:07:29 GMT
        provider: minikube.sigs.k8s.io
        version: v1.32.0
      name: cluster_info
    server: https://127.0.0.1:10087
  name: minikube
contexts:
- context:
    cluster: minikube
    extensions:
    - extension:
        last-update: Sat, 10 Feb 2024 21:07:29 GMT
        provider: minikube.sigs.k8s.io
        version: v1.32.0
      name: context_info
    namespace: default
    user: minikube
  name: minikube
current-context: minikube
kind: Config
preferences: {}
users:
- name: minikube
  user:
    client-certificate: C:\Users\Darigan\.minikube\profiles\minikube\client.crt
    client-key: C:\Users\Darigan\.minikube\profiles\minikube\client.key
PS C:\Users\Darigan>
```

View app logs for a container in a pod

```
PS C:\Users\Darigan> kubectl logs hello-node-ccf4b9788-sz45g
I0210 21:11:05.354880       1 log.go:195] Started HTTP server on port 8080
I0210 21:11:05.355057       1 log.go:195] Started UDP server on port  8081
PS C:\Users\Darigan>
```

Create a Service

- Pods are only accessible by IP within the same cluster
- Pod must be exposed as a ***service*** for public communication

Expose Pod

```
PS C:\Users\Darigan> kubectl expose deployment hello-node --type=LoadBalancer --port=8080
service/hello-node exposed
```

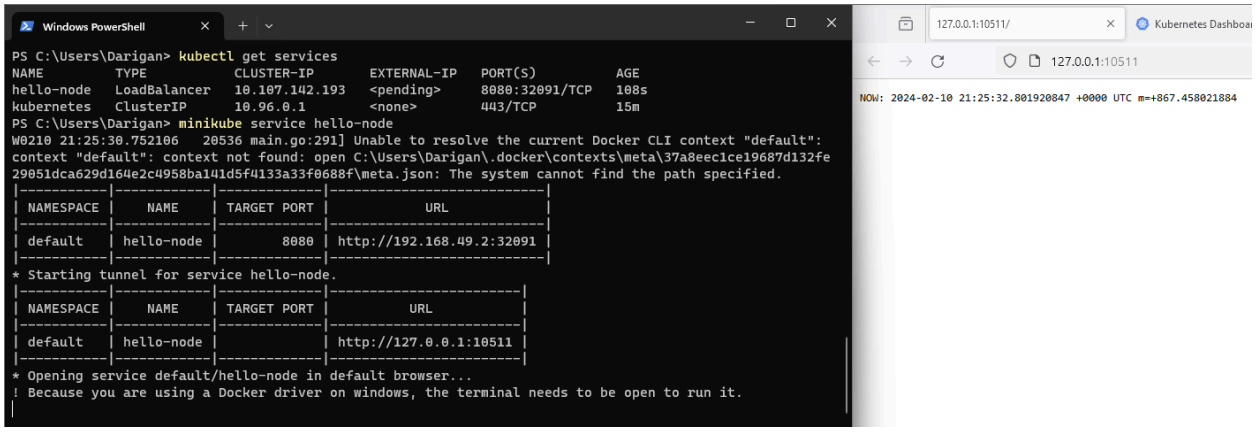
- The --type=LoadBalancer flag indicates that you want to expose your Service outside of the cluster.

View newly created service

```
PS C:\Users\Darigan> kubectl get services
NAME         TYPE           CLUSTER-IP       EXTERNAL-IP   PORT(S)          AGE
hello-node   LoadBalancer   10.107.142.193   <pending>     8080:32091/TCP   108s
kubernetes   ClusterIP      10.96.0.1        <none>        443/TCP          15m
PS C:\Users\Darigan>
```

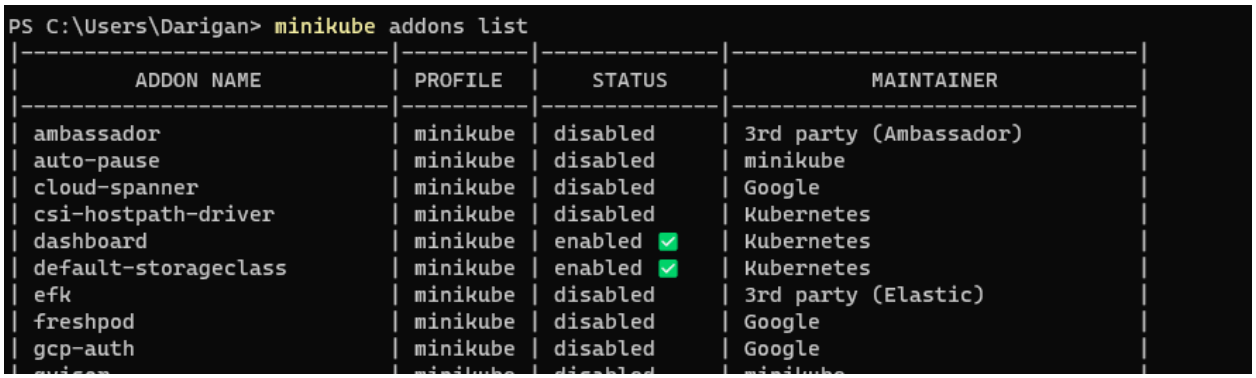
Run the service

- Use “minikube service <service_name>”
- The page that opens is where your app would be served



Enable Addons in Minikube

List currently supported addons



Enable an addon

```
PS C:\Users\Darigan> minikube addons enable auto-pause
* auto-pause is an addon maintained by minikube. For any concerns contact minikube on GitHub.
You can view the list of minikube maintainers at: https://github.com/kubernetes/minikube/blob/master/OWNERS
  - Using image gcr.io/k8s-minikube/auto-pause-hook:v0.0.4
  - auto-pause addon is an alpha feature and still in early development. Please file issues to help us make it better.
  - https://github.com/kubernetes/minikube/labels/co/auto-pause
* The 'auto-pause' addon is enabled
```

ADDON NAME	PROFILE	STATUS	MAINTAINER
ambassador	minikube	disabled	3rd party (Ambassador)
auto-pause	minikube	enabled ✅	minikube
cloud-spanner	minikube	disabled	Google
csi-hostpath-driver	minikube	disabled	Kubernetes

View Pod & Service created by an addon

- Metrics-server in this case

```
PS C:\Users\Darigan> kubectl get pod,svc -n kube-system
NAME                                   READY   STATUS    RESTARTS        AGE
pod/coredns-5dd5756b68-fpf7r           1/1     Running   3 (6m59s ago)   48m
pod/etcd-minikube                      1/1     Running   3 (6m59s ago)   48m
pod/kube-apiserver-minikube            1/1     Running   3 (6m59s ago)   48m
pod/kube-controller-manager-minikube   1/1     Running   3 (6m59s ago)   48m
pod/kube-proxy-ljsd9                   1/1     Running   3 (6m59s ago)   48m
pod/kube-scheduler-minikube            1/1     Running   3 (6m59s ago)   48m
pod/metrics-server-7c66d45ddc-ktckx    1/1     Running   3 (6m59s ago)   23m
pod/storage-provisioner                1/1     Running   7 (6m21s ago)   48m

NAME                     TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)                  AGE
service/kube-dns         ClusterIP   10.96.0.10     <none>        53/UDP,53/TCP,9153/TCP   48m
service/metrics-server   ClusterIP   10.99.22.160   <none>        443/TCP                  23m
PS C:\Users\Darigan>
```

Check out from metrics-server

```
PS C:\Users\Darigan> kubectl top pods
NAME                          CPU(cores)   MEMORY(bytes)
hello-node-ccf4b9788-sz45g    1m           7Mi
PS C:\Users\Darigan>
```

Disable metrics-server

```
PS C:\Users\Darigan> minikube addons disable metrics-server
  "The 'metrics-server' addon is disabled
```

Clean Up

```
PS C:\Users\Darigan> kubectl delete service hello-node
service "hello-node" deleted
PS C:\Users\Darigan> kubectl delete deployment hello-node
deployment.apps "hello-node" deleted
PS C:\Users\Darigan> minikube stop
  Stopping node "minikube"  ...
  Powering off "minikube" via SSH ...
  1 node stopped.
PS C:\Users\Darigan>
```

- You can run ‘minikube delete’ to delete the minikube vm

Deploying an App

Check kubectl is connected to your cluster

```
PS C:\Users\Darigan> kubectl version
Client Version: v1.28.2
Kustomize Version: v5.0.4-0.20230601165947-6ce0bf390ce3
Server Version: v1.28.3
```

View nodes in your cluster

```
PS C:\Users\Darigan> kubectl get nodes
NAME       STATUS   ROLES           AGE   VERSION
minikube   Ready    control-plane   64m   v1.28.3
```

Deploying an app

- Supply deployment name
- Supply full image url

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

List deployments

```
PS C:\Users\Darigan> kubectl get deployments
NAME                  READY   UP-TO-DATE   AVAILABLE   AGE
kubernetes-bootcamp   1/1     1            1           29s
PS C:\Users\Darigan>
```

View deployed App

- Apps inside a cluster can only communicate internally
- We can use proxy to forward requests from outside the cluster

  Start the proxy

```
C:\Users\Darigan>kubectl proxy
Starting to serve on 127.0.0.1:8001
```

We can now send requests to the cluster via that proxy address

```
C:\Users\Darigan>curl http://localhost:8001/version
{
  "major": "1",
  "minor": "28",
  "gitVersion": "v1.28.3",
  "gitCommit": "a8a1abc25cad87333840cd7d54be2efaf31a3177",
  "gitTreeState": "clean",
  "buildDate": "2023-10-18T11:33:18Z",
  "goVersion": "go1.20.10",
  "compiler": "gc",
  "platform": "linux/amd64"
}
C:\Users\Darigan>
```

- The API server automatically creates an endpoint for each pod that is accessible through the proxy

  Getting the list of endpoints (in Bash)

```
Darigan@Cocoon MINGW64 ~
$ export POD_NAME=$(kubectl get pods -o go-template --template '{{range .items}}{{.metadata.name}}{{"\n"}}{{end}}')

Darigan@Cocoon MINGW64 ~
$ echo Name of the Pod: $POD_NAME
Name of the Pod: kubernetes-bootcamp-f95c5b745-mpsmh
```

Using the name, we can make a request to that particular pod

```
C:\Users\Darigan>curl http://localhost:8001/api/v1/namespaces/default/pods/kubernetes-bootcamp-f95c5b745-mpsmh/
{
  "kind": "Pod",
  "apiVersion": "v1",
  "metadata": {
    "name": "kubernetes-bootcamp-f95c5b745-mpsmh",
    "generateName": "kubernetes-bootcamp-f95c5b745-",
    "namespace": "default",
    "uid": "06f4ba58-44d8-4778-98b3-70b683b7a83a",
    "resourceVersion": "3828",
    "creationTimestamp": "2024-02-10T22:13:19Z",
    "labels": {
      "app": "kubernetes-bootcamp",
      "pod-template-hash": "f95c5b745"
    },
```

Exploring your App

Check application configuration

```
PS C:\Users\Darigan> kubectl get pods
NAME                                   READY   STATUS    RESTARTS   AGE
kubernetes-bootcamp-f95c5b745-mpsmh   1/1     Running   0          15m
PS C:\Users\Darigan>
```

Inspect what containers (and from what images) exist in a pod

```
PS C:\Users\Darigan> kubectl describe pods
Name:             kubernetes-bootcamp-f95c5b745-mpsmh
Namespace:        default
Priority:         0
Service Account:  default
Node:             minikube/192.168.49.2
Start Time:       Sat, 10 Feb 2024 22:13:19 +0000
Labels:           app=kubernetes-bootcamp
                  pod-template-hash=f95c5b745
Annotations:      <none>
Status:           Running
IP:               10.244.0.33
IPs:
  IP:           10.244.0.33
Controlled By:  ReplicaSet/kubernetes-bootcamp-f95c5b745
```

Querying the pod directly through a proxy

```
Darigan@Cocoon MINGW64 ~
$ curl http://localhost:8001/api/v1/namespaces/default/pods/$POD_NAME:8080/proxy/
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-f95c5b745-mpsmh | v=1
```

Retrieving logs of the container (taken from the standard output of the app)

```
$ kubectl logs "$POD_NAME"
Kubernetes Bootcamp App Started At: 2024-02-10T22:13:27.938Z | Running On:  kubernetes-bootcamp-f95c5b745-mpsmh

Running On: kubernetes-bootcamp-f95c5b745-mpsmh | Total Requests: 1 | App Uptime: 1046.682 seconds | Log Time: 2024-02-1
0T22:30:54.620Z
```

Executing commands from within the Pod

```
$ kubectl exec "$POD_NAME" -- env
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin
HOSTNAME=kubernetes-bootcamp-f95c5b745-mpsmh
KUBERNETES_PORT_443_TCP=tcp://10.96.0.1:443
KUBERNETES_PORT_443_TCP_PROTO=tcp
KUBERNETES_PORT_443_TCP_PORT=443
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
NPM_CONFIG_LOGLEVEL=info
NODE_VERSION=6.3.1
HOME=/root
```

Executing a bash shell inside the pod where we run a nodeJS server.

```
Darigan@Cocoon MINGW64 ~
$ kubectl exec -ti $POD_NAME -- bash
root@kubernetes-bootcamp-f95c5b745-mpsmh:/# 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 , "sec
onds", "| Log Time:",new Date());
}
var www = http.createServer(handleRequest);
www.listen(8080,function () {
    startTime = new Date();;
    host = process.env.HOSTNAME;
    console.log ("Kubernetes Bootcamp App Started At:",startTime, "| Running On: " ,host, "\n" );
});
root@kubernetes-bootcamp-f95c5b745-mpsmh:/#
```

Checking the app is running (from within the pod context)

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

Quit using ‘exit’

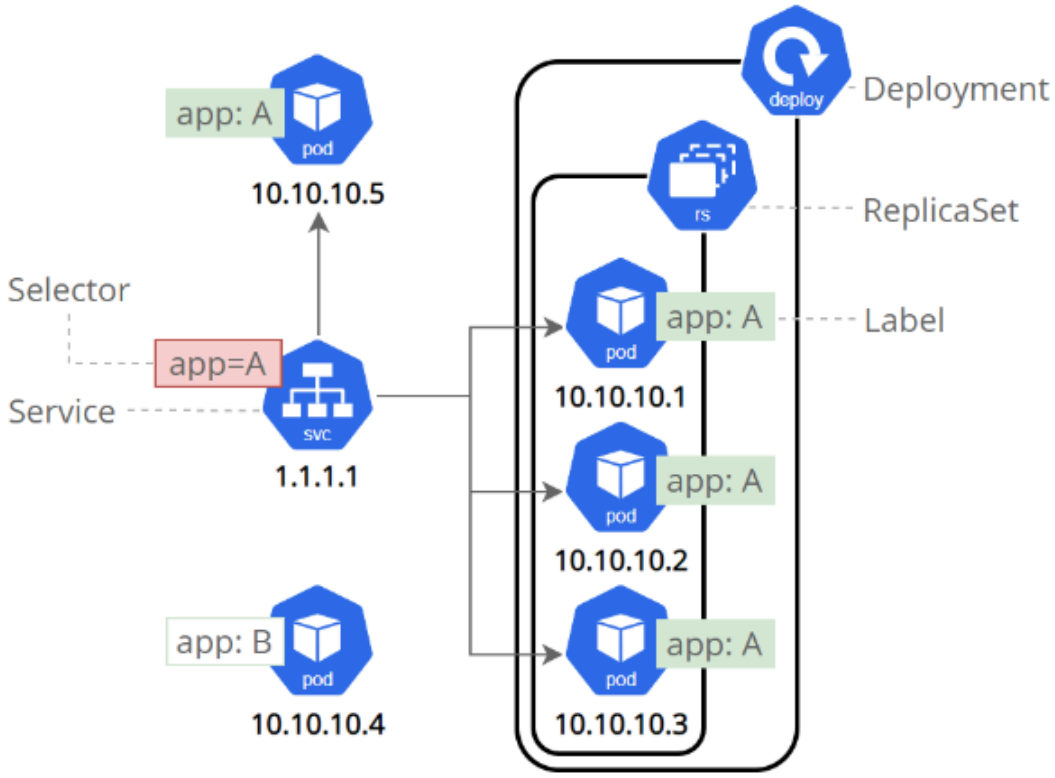
```
root@kubernetes-bootcamp-f95c5b745-mpsmh:/# exit
exit

Darigan@Cocoon MINGW64 ~
$
```

Exposing your App Publically.

- Each pod has a unique IP Address
    - These IPs are not exposed without a service
- Services can be exposed depending on their type
    - ClusterIP (default) - Expose service on internal IP
    - NodePort - Exposes service on the same port for each Node in the cluster using NAT. Makes service accessible outside cluster using NodeIP:NodePort
    - LoadBalancer - Creates external load balancer and assigns a fixed external IP to Service (superset of Node)
    - ExternalName - Maps the service to the contents of the externalName field (e.g a domain) by returning a CNAME record. No proxying involved.

Services match a set of Pods using labels (key-value pairs) and selectors which allows logical operation on objects in Kubernetes.

- Designate objects for development, test, and production
- Embed version tags
- Classify an object using tags



Verify the application is running

```
C:\Users\Darigan>kubectl get pods
NAME                                   READY   STATUS    RESTARTS   AGE
kubernetes-bootcamp-f95c5b745-mpsmh   1/1     Running   0          39m
```

List the current services

```
C:\Users\Darigan>kubectl get services
NAME         TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
kubernetes   ClusterIP   10.96.0.1    <none>        443/TCP   106m
```

Create a new exposed service and check it exists

```
C:\Users\Darigan>kubectl expose deployment/kubernetes-bootcamp --type="NodePort" --port 8080
service/kubernetes-bootcamp exposed

C:\Users\Darigan>kubectl get services
NAME                  TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)          AGE
kubernetes            ClusterIP   10.96.0.1       <none>        443/TCP          106m
kubernetes-bootcamp   NodePort    10.103.89.132   <none>        8080:30918/TCP   7s
```

Check port

Use "`kubectl describe services/kubernetes-bootcamp`" to check which port it was exposed on (30918 in this case)

```
C:\Users\Darigan>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:                       10.103.89.132
IPs:                      10.103.89.132
Port:                     <unset>  8080/TCP
TargetPort:               8080/TCP
NodePort:                 <unset>  30918/TCP
Endpoints:                10.244.0.33:8080
Session Affinity:         None
External Traffic Policy:  Cluster
Events:                   <none>
```

Using docker-desktop on windows requires a tunnel to be open

```
PS C:\Users\Darigan> minikube service kubernetes-bootcamp --url
http://127.0.0.1:12605
!  Because you are using a Docker driver on windows, the terminal needs to be open to run it.
```

Use curl to check that the app was exposed

```
C:\Users\Darigan>curl http://127.0.0.1:12605
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-f95c5b745-mpsmh | v=1
```

Using Labels

Deployments create labels automatically. We can see labels by using describe.

```
PS C:\Users\Darigan> kubectl describe deployment
Name:                   kubernetes-bootcamp
Namespace:              default
CreationTimestamp:      Sat, 10 Feb 2024 22:13:19 +0000
Labels:                 app=kubernetes-bootcamp
Annotations:            deployment.kubernetes.io/revision: 1
Selector:               app=kubernetes-bootcamp
```

Query apps & services by labels

```
PS C:\Users\Darigan> kubectl get pods -l app=kubernetes-bootcamp
NAME                                  READY   STATUS    RESTARTS   AGE
kubernetes-bootcamp-f95c5b745-mpsmh   1/1     Running   0          51m
PS C:\Users\Darigan> kubectl get services -l app=kubernetes-bootcamp
NAME                  TYPE       CLUSTER-IP      EXTERNAL-IP   PORT(S)          AGE
kubernetes-bootcamp   NodePort   10.103.89.132   <none>        8080:30918/TCP   11m
PS C:\Users\Darigan>
```

Add Labels to the Pod

```
Darigan@Cocoon MINGW64 ~
$ export POD_NAME="$(kubectl get pods -o go-template --template '{{range .items}}{{.metadata.name}}{{"\n"}}{{end}}')"
echo "Name of the Pod: $POD_NAME"
Name of the Pod: kubernetes-bootcamp-f95c5b745-mpsmh

Darigan@Cocoon MINGW64 ~
$ kubectl label pods "$POD_NAME" version=v1
pod/kubernetes-bootcamp-f95c5b745-mpsmh labeled

Darigan@Cocoon MINGW64 ~
$ kubectl describe pods "$POD_NAME"
Name:             kubernetes-bootcamp-f95c5b745-mpsmh
Namespace:        default
Priority:         0
Service Account:  default
Node:             minikube/192.168.49.2
Start Time:       Sat, 10 Feb 2024 22:13:19 +0000
Labels:           app=kubernetes-bootcamp
                  pod-template-hash=f95c5b745
                  version=v1
Annotations:      <none>
Status:           Running
IP:               10.244.0.33
IPs:
```

Querying our new label by the Pod

```
PS C:\Users\Darigan> kubectl get pods -l version=v1
NAME                                  READY   STATUS    RESTARTS   AGE
kubernetes-bootcamp-f95c5b745-mpsmh   1/1     Running   0          53m
PS C:\Users\Darigan>
```

Deleting Services

Delete a service

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

Confirm the service is deleted

```
PS C:\Users\Darigan> kubectl get services
NAME         TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
kubernetes   ClusterIP   10.96.0.1    <none>        443/TCP   121m
PS C:\Users\Darigan>
```

Pod is now inaccessible from outside cluster

```
C:\Users\Darigan>curl https://127.0.0.1:12605
curl: (35) Recv failure: Connection was reset
```

Pod is still accessible within the cluster

```
Darigan@Cocoon MINGW64 ~
$ kubectl exec -ti $POD_NAME -- curl http://localhost:8080
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-f95c5b745-mpsmh | v=1
```

SCALE YOUR APP

- *Scaling* is accomplished by changing the number of replicas in a Deployment

Expose the service

```
PS C:\Users\Darigan> kubectl expose deployment/kubernetes-bootcamp --type="NodePort" --port 8080
service/kubernetes-bootcamp exposed
PS C:\Users\Darigan>
```

Notice only one Pod currently running

```
C:\Users\Darigan>kubectl get deployments
NAME                  READY   UP-TO-DATE   AVAILABLE   AGE
kubernetes-bootcamp   1/1     1            1           63m
```

See the replica set

```
C:\Users\Darigan>kubectl get rs
NAME                            DESIRED   CURRENT   READY   AGE
kubernetes-bootcamp-f95c5b745   1         1         1       64m
```

- Desired is the desired number of replicas
- Current is the current number of replicas

Scaling the current number of replicas to 4 (and confirming)

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

C:\Users\Darigan>kubectl get rs
NAME                                DESIRED   CURRENT   READY   AGE
kubernetes-bootcamp-f95c5b745   4         4         4       66m

C:\Users\Darigan>kubectl get deployments
NAME                  READY   UP-TO-DATE   AVAILABLE   AGE
kubernetes-bootcamp   4/4     4            4           66m
```

Use the -o wide flag to get info about the replicas

```
C:\Users\Darigan>kubectl get pods -o wide
NAME                                READY   STATUS    RESTARTS   AGE   IP            NODE       NOMINATED NODE   READINESS GATES
kubernetes-bootcamp-f95c5b745-9g9v5   1/1     Running   0          49s   10.244.0.35   minikube   <none>           <none>
kubernetes-bootcamp-f95c5b745-kwcpx   1/1     Running   0          49s   10.244.0.34   minikube   <none>           <none>
kubernetes-bootcamp-f95c5b745-mpsmh   1/1     Running   0          66m   10.244.0.33   minikube   <none>           <none>
kubernetes-bootcamp-f95c5b745-prgtc   1/1     Running   0          49s   10.244.0.36   minikube   <none>           <none>
```

Use describe to check the change in the logs

```
C:\Users\Darigan>kubectl describe deployments/kubernetes-bootcamp
Name:                   kubernetes-bootcamp
Namespace:              default
CreationTimestamp:      Sat, 10 Feb 2024 22:13:19 +0000
Labels:                 app=kubernetes-bootcamp
Annotations:            deployment.kubernetes.io/revision: 1
Selector:               app=kubernetes-bootcamp
Replicas:               4 desired | 4 updated | 4 total | 4 available | 0 unavailable
StrategyType:           RollingUpdate
MinReadySeconds:        0
RollingUpdateStrategy:  25% max unavailable, 25% max surge
Pod Template:
  Labels:  app=kubernetes-bootcamp
  Containers:
   kubernetes-bootcamp:
    Image:        gcr.io/google-samples/kubernetes-bootcamp:v1
    Port:         <none>
    Host Port:    <none>
    Environment:  <none>
    Mounts:       <none>
  Volumes:        <none>
Conditions:
  Type           Status  Reason
  ----           ------  ------
  Progressing    True    NewReplicaSetAvailable
  Available      True    MinimumReplicasAvailable
OldReplicaSets:  <none>
NewReplicaSet:   kubernetes-bootcamp-f95c5b745 (4/4 replicas created)
Events:
  Type    Reason             Age   From                   Message
  ----    ------             ----  ----                   -------
  Normal  ScalingReplicaSet  99s   deployment-controller  Scaled up replica set kubernetes-bootcamp-f95c5b745 to 4 from 1
```

Load Balancing

Check that service is load balancing traffic

On docker for windows, open a tunnel

```
PS C:\Users\Darigan> minikube service kubernetes-bootcamp --url
http://127.0.0.1:12809
 !  Because you are using a Docker driver on windows, the terminal needs to be open to run it.
```

```
C:\Users\Darigan>curl http://127.0.0.1:12809
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-f95c5b745-prgtc | v=1
```

We're hitting different end points on each request indicating that the load-balancing is working

```
C:\Users\Darigan>curl http://127.0.0.1:12809
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-f95c5b745-prgtc | v=1

C:\Users\Darigan>curl http://127.0.0.1:12809
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-f95c5b745-9g9v5 | v=1

C:\Users\Darigan>curl http://127.0.0.1:12809
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-f95c5b745-kwcpx | v=1
```

Scaling Down

We can scale down by lowering the replica count

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

C:\Users\Darigan>kubectl get deployments
NAME                  READY   UP-TO-DATE   AVAILABLE   AGE
kubernetes-bootcamp   2/2     2            2           75m

C:\Users\Darigan>kubectl get pods -o wide
NAME                                  READY   STATUS        RESTARTS   AGE     IP            NODE       NOMINATED NODE   READINESS GATES
kubernetes-bootcamp-f95c5b745-9g9v5   1/1     Terminating   0          9m31s   10.244.0.35   minikube   <none>
 <none>
kubernetes-bootcamp-f95c5b745-kwcpx   1/1     Running       0          9m31s   10.244.0.34   minikube   <none>
 <none>
kubernetes-bootcamp-f95c5b745-mpsmh   1/1     Running       0          75m     10.244.0.33   minikube   <none>
 <none>
kubernetes-bootcamp-f95c5b745-prgtc   1/1     Terminating   0          9m31s   10.244.0.36   minikube   <none>
 <none>
```

UPDATE YOUR APP

Use describe pods to check image version

```
C:\Users\Darigan>kubectl describe pods
Name:             kubernetes-bootcamp-f95c5b745-mpsmh
Namespace:        default
Priority:         0
Service Account:  default
Node:             minikube/192.168.49.2
Start Time:       Sat, 10 Feb 2024 22:13:19 +0000
Labels:           app=kubernetes-bootcamp
                  pod-template-hash=f95c5b745
                  version=v1
Annotations:      <none>
Status:           Running
IP:               10.244.0.33
IPs:
  IP:           10.244.0.33
Controlled By:  ReplicaSet/kubernetes-bootcamp-f95c5b745
Containers:
  kubernetes-bootcamp:
    Container ID:   docker://f953ea34b784e3a1683ac33bb464fd4e48880e4c8cd5f2cc8ebfa2988f6328cc
    Image:          gcr.io/google-samples/kubernetes-bootcamp:v1
    Image ID:       docker-pullable://gcr.io/google-samples/kubernetes-bootcamp@sha256:0d6b8ee63bb57c5f5b6156f446b3bc3b3c143d233037f3a2f00e279c8fcc64af
    Port:           <none>
```

Use set-image to update image version

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

Older version is automatically terminated for newer version

```
C:\Users\Darigan>kubectl get pods
NAME                                   READY   STATUS        RESTARTS   AGE
kubernetes-bootcamp-65df967b7f-2qsbr   1/1     Running       0          28s
kubernetes-bootcamp-f95c5b745-mpsmh    1/1     Terminating   0          83m
```

Versions can be rolled back

```
C:\Users\Darigan>kubectl rollout undo deployments/kubernetes-bootcamp
deployment.apps/kubernetes-bootcamp rolled back

C:\Users\Darigan>kubectl get pods
NAME                                   READY   STATUS        RESTARTS   AGE
kubernetes-bootcamp-65df967b7f-2qsbr   1/1     Terminating   0          92s
kubernetes-bootcamp-f95c5b745-h956j    1/1     Running       0          3s
```