Kubernetes Workshop

Abdullahi Egal | 1 juni 2016

Part 3: Kubernetes Basics

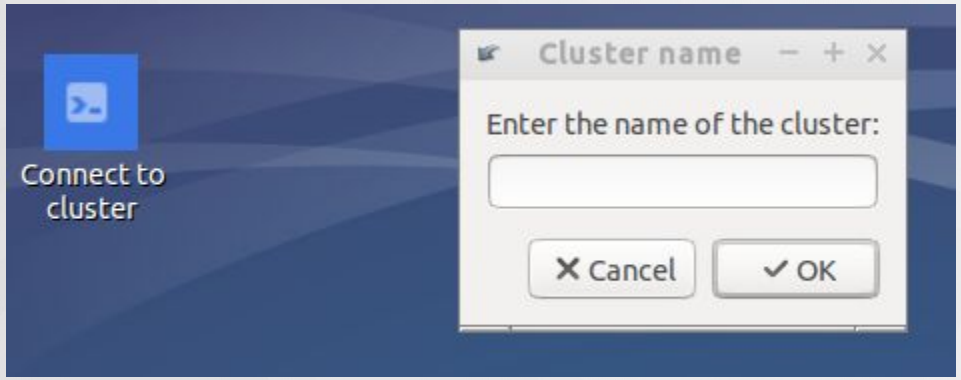
What will we do for the next hour?

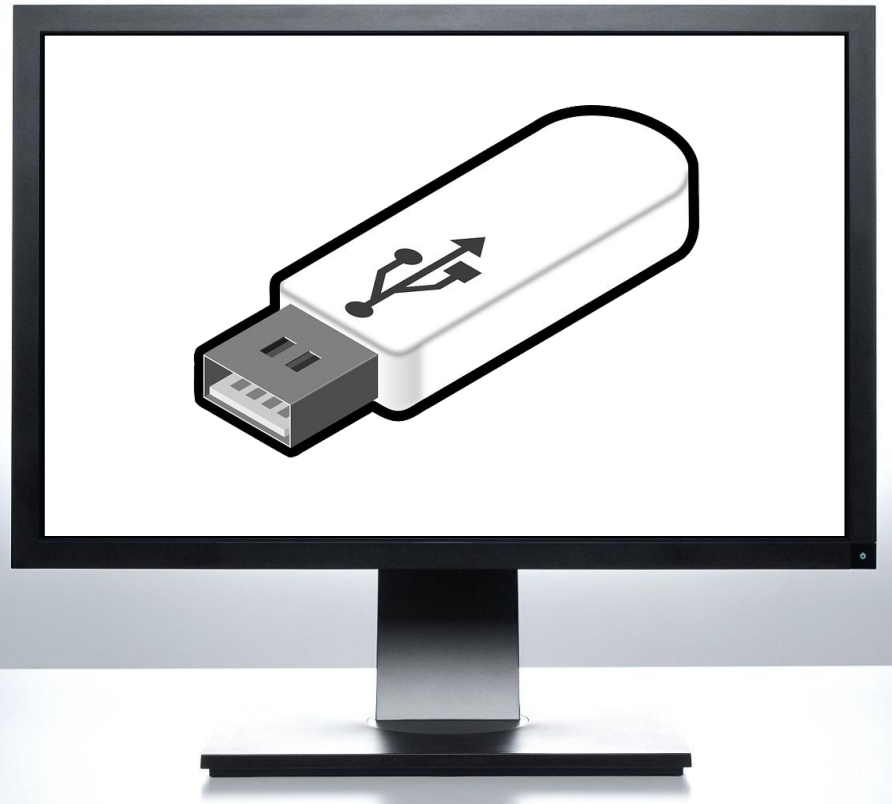
- Getting started with Kubernetes
  - Using Kubernetes in your own cluster
- Learn the basic features:
  - Deploying, Scheduling, Scaling and Discovering and more.
- After this, you will know enough to use Kubernetes as a software developer.

Make sure your virtual machine is ready

- Copy the contents of the USB to your local machine.
- Import the image in Virtualbox.

- Click on the desktop Icon and enter your cluster id.





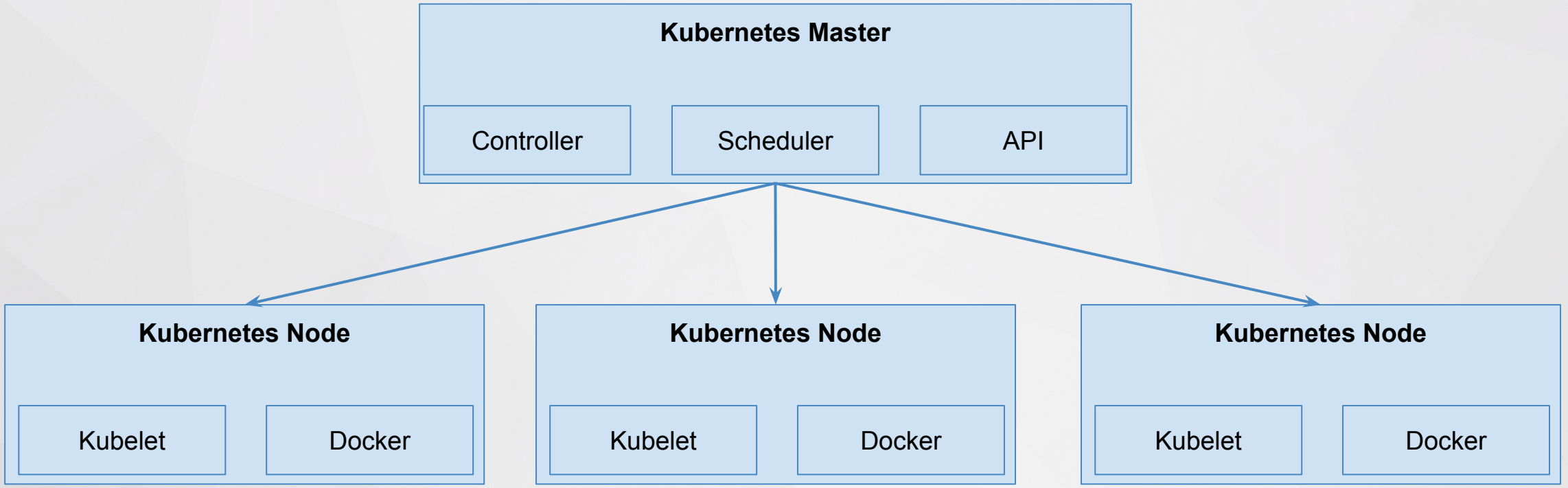
Check if your kubernetes cluster is available

```
$ kubectl get nodes
NAME                                          STATUS    AGE
gke-cluster-1-default-pool-1cf4645c-9fa5      Ready     2h
gke-cluster-1-default-pool-1cf4645c-equw      Ready     2h
```

Shows the nodes of your cluster

```
$ kubectl version
Client Version: version.Info{Major:"1", Minor:"2", GitVersion:"v1.2.4", GitTreeState:"clean"}
Server Version: version.Info{Major:"1", Minor:"2", GitVersion:"v1.2.4", GitTreeState:"clean"}
```

Your cluster



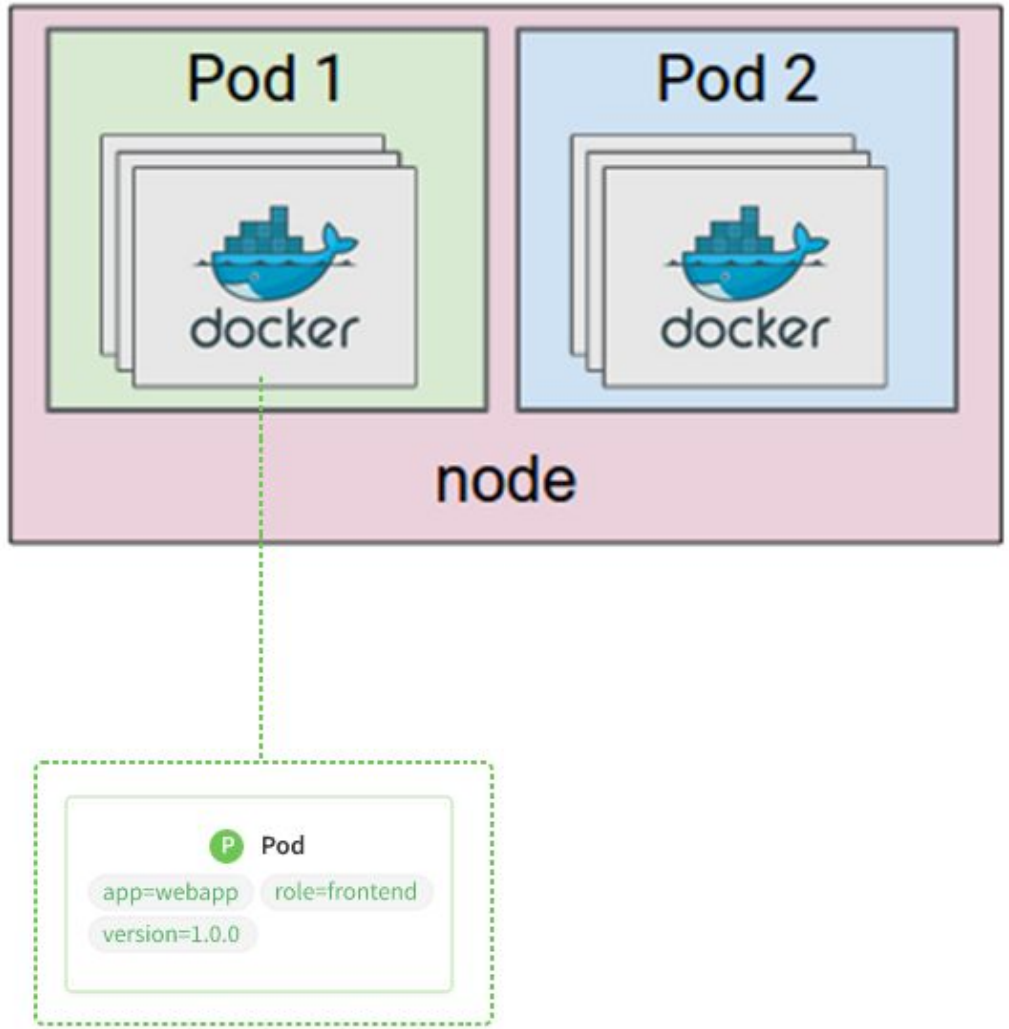
Next up

We will start with the 3 basic kubernetes concepts:

- Pods
- Replication controllers
- Services

Kubernetes Pods

- A pods is the smallest deployable unit in Kubernetes.
- A pod can contain one or more Docker containers.
- Every Pod had an own IP address, and containers in a Pod can access each other through localhost



Pod commands

```
$ cd examples
$ kubectl create -f nginx.pod.yaml
pod "nginx" created
```

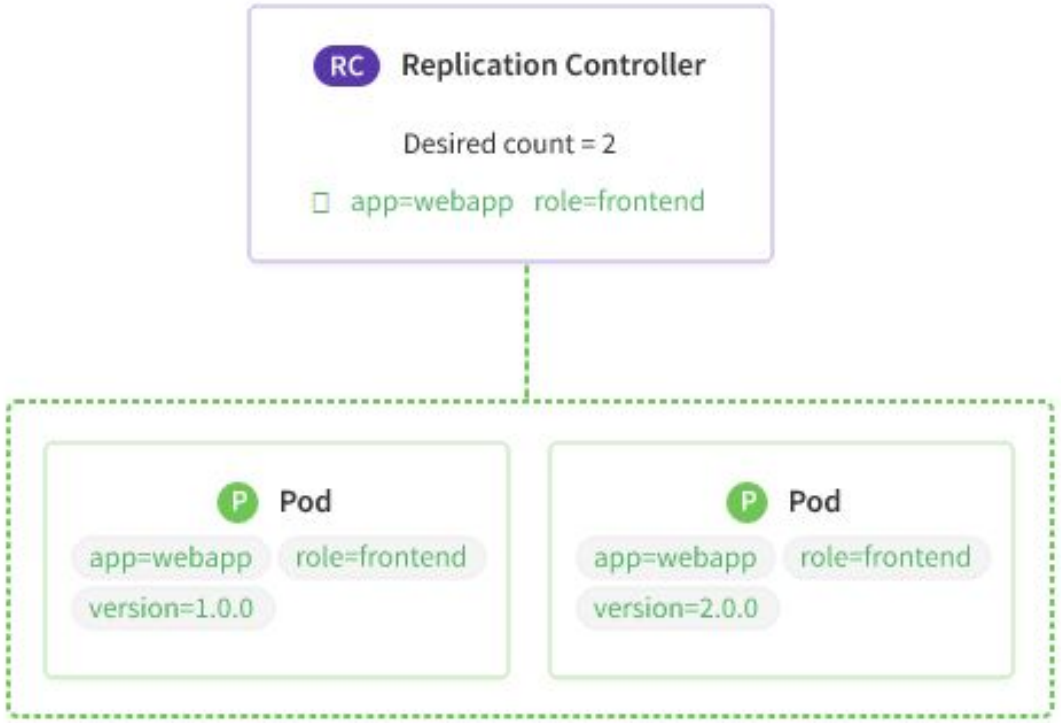
```
$ kubectl get pods
NAME      READY     STATUS              RESTARTS   AGE
nginx     0/1       ContainerCreating   0          4s
```

```
$ kubectl describe pod nginx
Name:        nginx
Namespace:   default
Node:        gke-cluster-1-default-pool-1cf4645c-9fa5/10.
132.0.2
Start Time:  Mon, 23 May 2016 23:44:50 +0200
...
```

```
$ cat nginx.pod.yaml
apiVersion: v1
kind: Pod
metadata:
  name: nginx
  labels:
    app: nginx
spec:
  containers:
  - name: nginx
    image: nginx
    ports:
    - containerPort: 80
```

Kubernetes Replication controllers

- Replication controllers can create, scale control pods.
- Creating a replication controller is almost similar as creating a pod, except that you can chose the replication count.
- Kubernetes will do its best to maintain the desired replication count.



Replication controller commands

```
$ cd examples
$ kubectl create -f nginx.rc.yaml
replicationcontroller "nginx" created
```

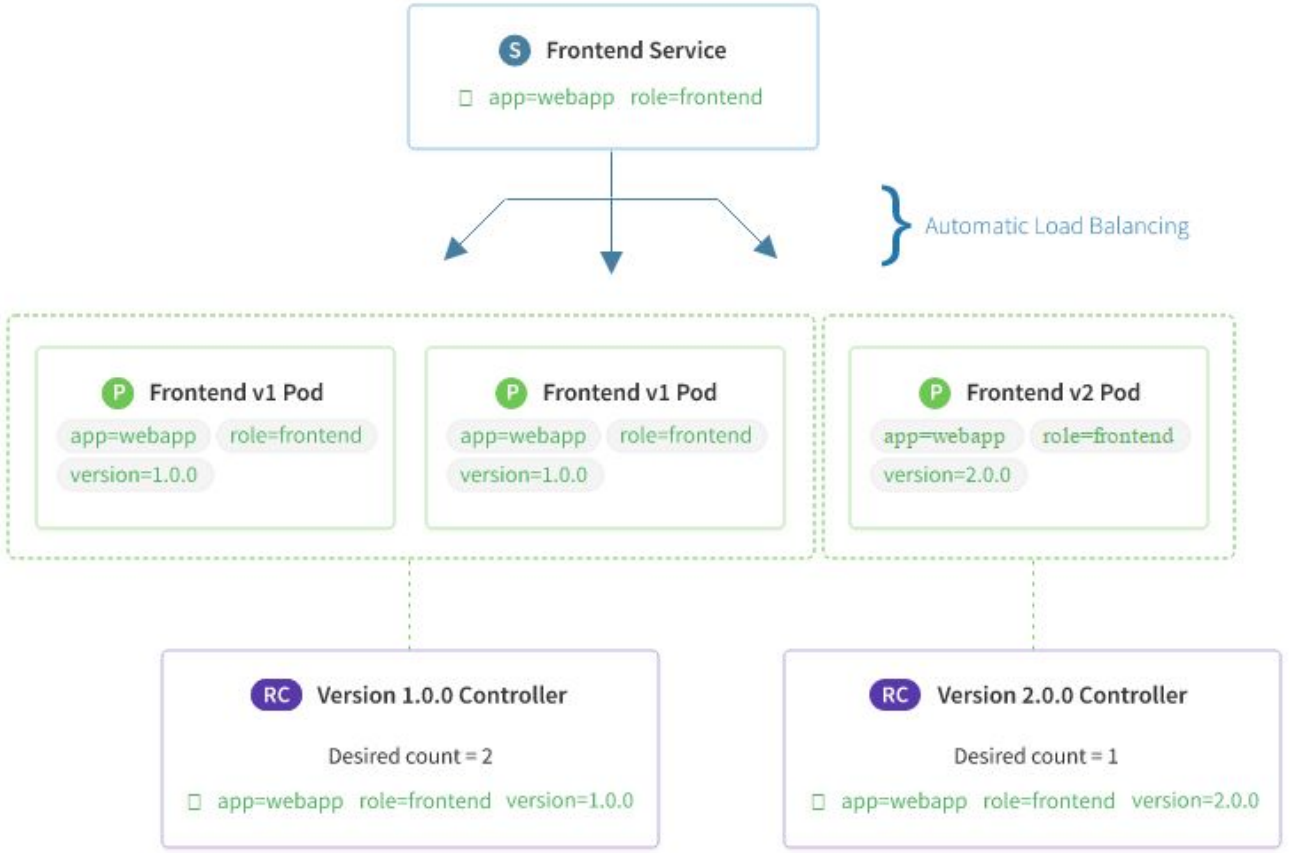
```
$ kubectl get rc
NAME      DESIRED   CURRENT   AGE
nginx     2         2         25s
```

```
$ kubectl get pods
NAME          READY     STATUS    RESTARTS   AGE
nginx         1/1       Running   0          15m
nginx-szq0g   1/1       Running   0          55s
```

```
$ cat nginx.rc.yaml
apiVersion: v1
kind: ReplicationController
metadata:
  name: nginx
spec:
  replicas: 2
  selector:
    app: nginx
  template:
    metadata:
      name: nginx
      labels:
        app: nginx
    spec:
      containers:
      - name: nginx
        image: nginx
        ports:
        - containerPort: 80
```

Kubernetes services

- Kubernetes services provide a stable IP address to reach the pods.
- A Kubernetes service serves as a load balancer, traffic shifter and/or service discovery.
- The kubernetes service is connected to pods with the use of selectors.
- Kubernetes services can also be accessed with DNS (by using the plug-in)



Kubernetes services commands

```
$ cd examples
$ kubectl create -f nginx.service.json
service "nginx" created
```

```
$ kubectl get service
NAME            CLUSTER-IP      EXTERNAL-IP     PORT(S)   AGE
nginx-service   10.15.245.215   104.155.2.94    80/TCP    2m
```

```
$ kubectl get endpoints
NAME            ENDPOINTS                       AGE
nginx-service   10.12.1.4:80,10.12.2.4:80       1m
```

★ The Info Support network only allows access to port 80 and 443. So make sure to only pick those ports.

```
$ cat nginx.service.json
{
    "kind": "Service",
    "apiVersion": "v1",
    "metadata": {
        "name": "nginx-service"
    },
    "spec": {
        "selector": {
            "app": "nginx"
        },
        "type": "LoadBalancer",
        "ports": [
            {
                "protocol": "TCP",
                "port": 80,
                "targetPort": 80
            }
        ]
    }
}
```

Exercise: Deploy **Jenkins** in Kubernetes

To summarize:

```
$ kubectl create -f <filename>
```

```
$ kubectl get pod                       / $ kubectl get po
$ kubectl get replicationcontroller / $ kubectl get rc
$ kubectl get service
$ kubectl get endpoints                 / $ kubectl get ep
```

```
$ kubectl describe pod ...
$ kubectl describe rc ...
$ kubectl describe service ...
```

```
$ kubectl delete pod ...
$ kubectl delete rc ...
$ kubectl delete service ...
```

For more information:

- `$ kubectl --help`
- http://kubernetes.io/docs/user-guide/

★ The Info Support network only allows access to port 80 and 443. So make sure to only pick those ports.

★ There are examples available in the examples directory on the Desktop.

Solution: Deploy **Jenkins** in Kubernetes

$ cat jenkins.rc.yaml

```
apiVersion: v1
kind: ReplicationController
metadata:
  name: jenkins
spec:
  replicas: 2
  selector:
    app: jenkins
  template:
    metadata:
      name: jenkins
      labels:
        app: jenkins
    spec:
      containers:
      - name: jenkins
        image: jenkins
        ports:
        - containerPort: 80
```

$ cat jenkins.service.json

```
{
    "kind": "Service",
    "apiVersion": "v1",
    "metadata": {
        "name": "jenkins-service"
    },
    "spec": {
        "selector": {
            "app": "jenkins"
        },
        "type": "LoadBalancer",
        "ports": [
            {
                "protocol": "TCP",
                "port": 80,
                "targetPort": 8080
            }
        ]
    }
}
```

Next up

- Deployment
- Container properties
- DNS

Kubernetes Deployments

- Kubernetes Deployments are a declarative way of deploying your pods.
- Instead of running the **`kubectl create -f`** command, you can also deploy pods through Kubernetes deployments.
- Kubernetes Deployments can be rolled back, paused and resumed.

```
# to create a deployment
$ kubectl create -f nginxv1.deployment.yaml --record
```

```
$ cat nginxv1.deployment.yaml
apiVersion: extensions/v1beta1
kind: Deployment
metadata:
  name: nginx-deployment
spec:
  replicas: 3
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
      - name: nginx
        image: nginx:1.7.9
        ports:
        - containerPort: 80
```

Updating Kubernetes deployments

```
# to update a deployment
$ kubectl apply -f nginxv2.deployment.yaml --record
```

```
# to view the deployment status
$ kubectl get deployment
```

```
# to check the deployment history
$ kubectl rollout history deployment nginx-deployment
deployments "nginx-deployment":
REVISION  CHANGE-CAUSE
1         kubectl create -f nginxv1.deployment.yaml --record
2         kubectl apply -f nginxv2.deployment.yaml
```

```
# to rollback
$ kubectl rollout undo deployment/nginx-deployment --to-revision=1
```

```
$ cat nginxv2.deployment.yaml
apiVersion: extensions/v1beta1
kind: Deployment
metadata:
  name: nginx-deployment
spec:
  replicas: 3
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
      - name: nginx
        image: nginx:1.9.1
        ports:
        - containerPort: 80
```

Container properties

- The container field in the pod configuration supports a lot of properties, for example:
  - args - Container arguments
  - ports - Container ports
  - env - Environment variables
  - imagePullPolicy - Defines which strategy to use to pull an image
  - volumeMounts - To mount volumes

A full list can be found at: http://kubernetes.io/docs/api-reference/v1/definitions/#_v1_container

```
$ cat nginx.pod.yaml
apiVersion: v1
kind: Pod
metadata:
  name: nginx
  labels:
    app: nginx
spec:
  containers:
  - name: nginx
    image: nginx
    ports:
    - containerPort: 80
```

DNS

- Your Kubernetes cluster is configured with DNS support
- The default configuration for DNS is: <servicename>.<namespace>.svc.cluster.local
- So you can access nginx with: nginx-service.default.svc.cluster.local
- To find out which DNS records exists, use the following command:

```
$ kubectl get endpoints
```

Exercise: Deploy MySQL + PhpMyAdmin in Kubernetes

To summarize:

```
# to create a deployment
$ kubectl create -f nginxv1.deployment.yaml --record
```

```
# to update a deployment
$ kubectl apply -f nginxv2.deployment.yaml --record
```

```
# to view the deployment status
$ kubectl get deployment
```

- The default configuration for DNS is: <servicename>.<namespace>.svc.cluster.local

For more information:

- `$ kubectl --help`
- http://kubernetes.io/docs/user-guide/
- http://kubernetes.io/docs/api-reference/v1/definitions/#_v1_container

★ The container field in the pod configuration supports a lot of properties, for example:
  - args - Container arguments
  - ports - Container ports
  - env - Environment variables
  - volumeMounts - To mount volumes

★ The Info Support network only allows access to port 80 and 443. So make sure to only pick those ports.

Next up

We've finished the basics for Kubernetes, but we still have advanced topics to cover:

- High availability
- Liveness probes / Readiness probes (health checks)
- Resource Quotas
- Automatic scaling
- Node selectors
- Static pods / daemon sets
- Volumes / Secrets
- Debugging
- Namespaces
- Identity / Authorization