IST 615 Cloud Management
Steffen Tim Knoedler
sknodler@syr.edu

10/19/2019

Homework 4 : Docker & Kubernetes

1. Docker

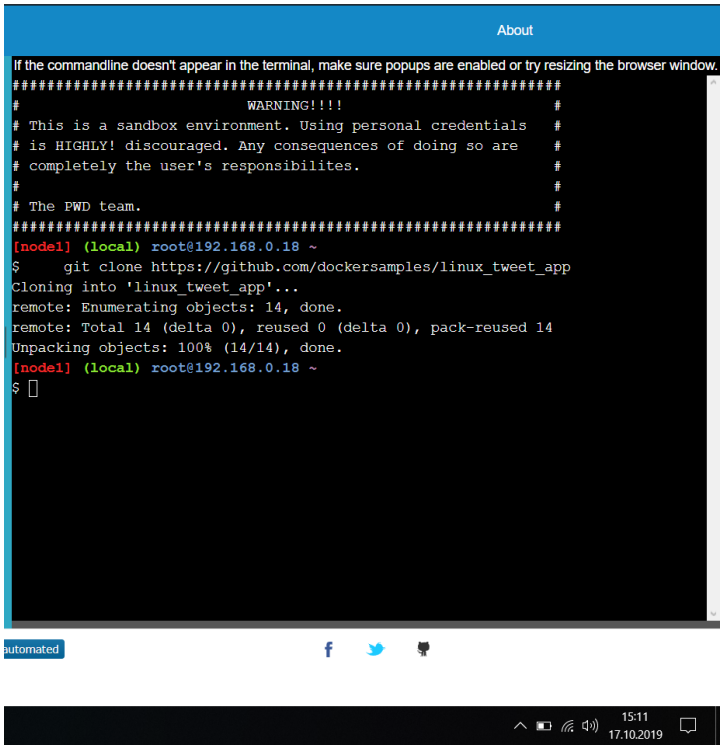
Section 2: Getting Started Walk-through for Developers

STAGE 1 - The Basics

Sub-Module 1 - Docker for Beginners - Linux

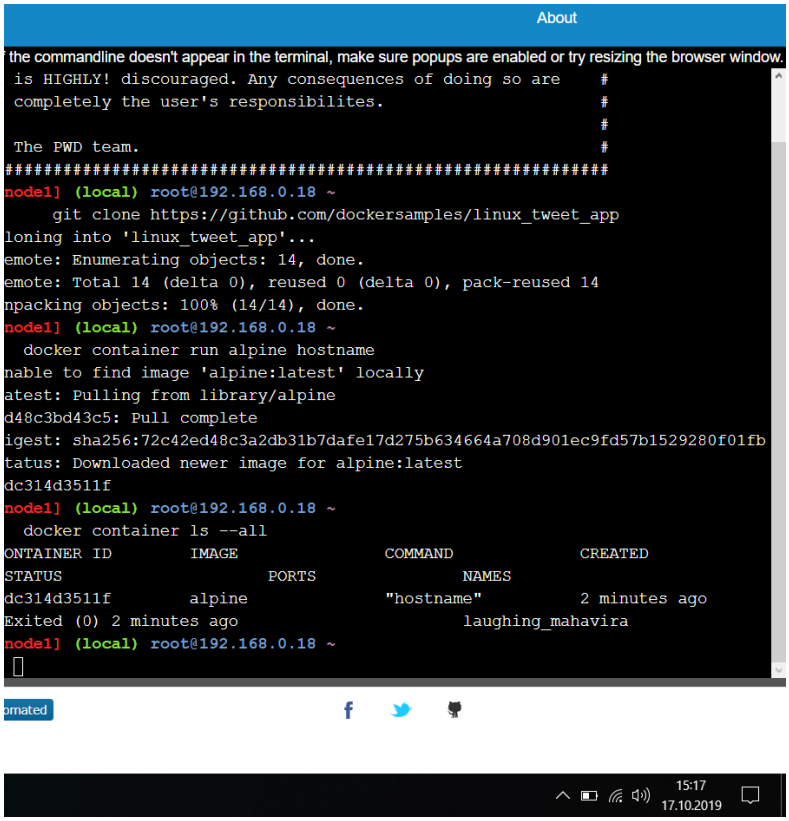
https://training.play-with-docker.com/beginner-linux/

- Follow the on-screen instructions and complete all the four tasks mentioned below –
  - **Task 0: Prerequisites**
    First, I cloned the lab's repo from GitHub. This created a copy of the lab's repo in a new sub-directory called linux_tweet_app.



  - **Task 1: Run some simple Docker containers**
    Run a single task in an Alpine Linux container
    Next, I started a new container and told the contained run the hostname command. It is looking on my local machine whether an image is available and if not, an image is automatically pulled from docker hub. After it got pulled, Docker is able to display the hostname. However, Docker only keeps the

container running as long as a process is running. When the hostname is displayed, the process ended and docker closes the container automatically. However, the resource is not deleted and can be displayed



Sometimes, I only want to execute a script. In this case, docker can keep the container open as long as the script is running. When I share this script and it will be executed on another machine, the code can run in the same container environment and will not complain about a missing packages and/or libraries.

Run an interactive Ubuntu container

It is also possible to run a container based on a different version of Linux than is running on your Docker host. Next, I will run an Ubuntu Linux container on top of an Alpine Linux Docker host. So, I tell Docker to start a container in an interactive session and remove the container when it is stopped. Moreover, I include a bash statement to be able to run commands in the container: First, I look into the contents of the root directory of the container, next, I list all running processes and then request which on which linux distro, the container is running – here: ubuntu. With the command ‘exit’, I leave the shell session of the docker.

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Steffen Tim Knoedler
sknodler@syr.edu

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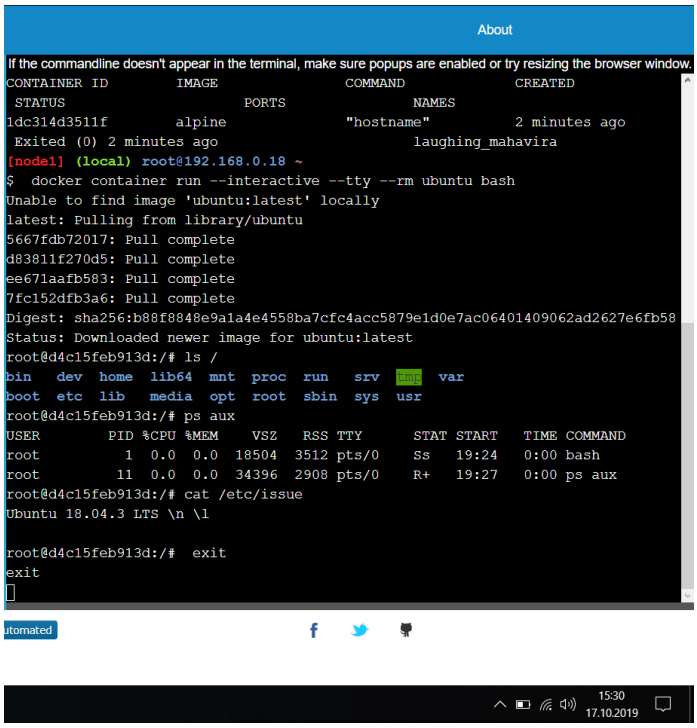

With ‘cat /etc/issue’ I can check the version of the VM. It becomes clear that the host VM is running Alpine Linux and I was able to tun a Ubuntu container. It shows that the distribution of linux in VM and Docker do not need to match. However, it is important that both run on the same linux kernel. So, linux containers cannot run on windows hosts and windows containers cannot run on linux hosts.

Run a background MySQL container

I can background containers to run an application in the container. So I create a MySQL container with the name mydb. Again, as I do not have any associated image stored, it pulls one from Docker Hub again. This MySQL process is running on the background, so as long as the process is running, the container will keep being open. With ‘docker container ls’, I can list all running containers.

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Steffen Tim Knoedler
sknodler@syr.edu

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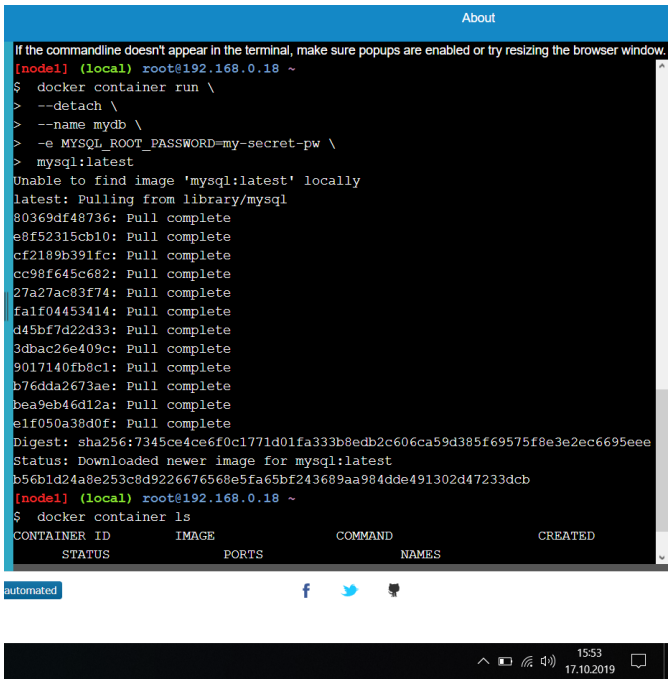
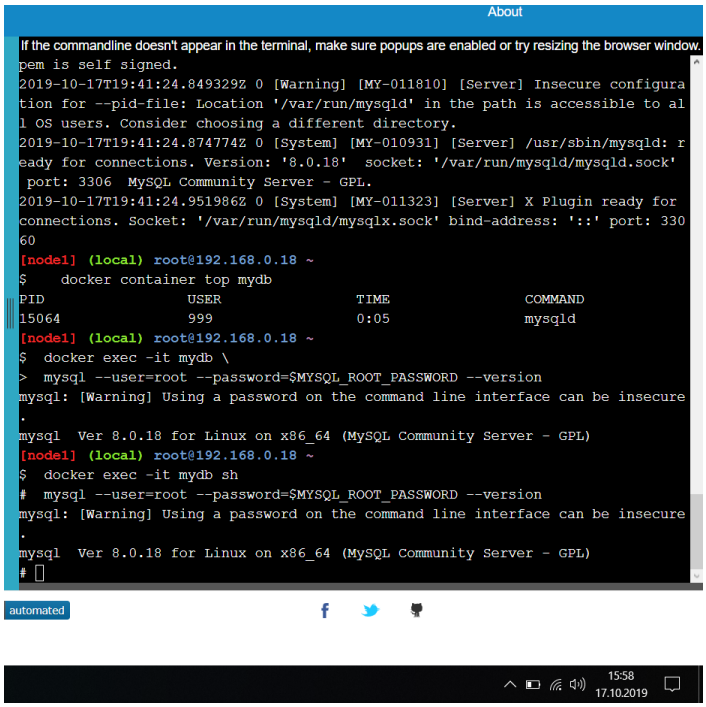


I can check the log of the running container, check the processes in the container and use ‘docker container exec’ to run commands within the container. This way, we can check the version of our application for instance. Moreover, I can connect to a new shell process within the container.



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sknodler@syr.edu

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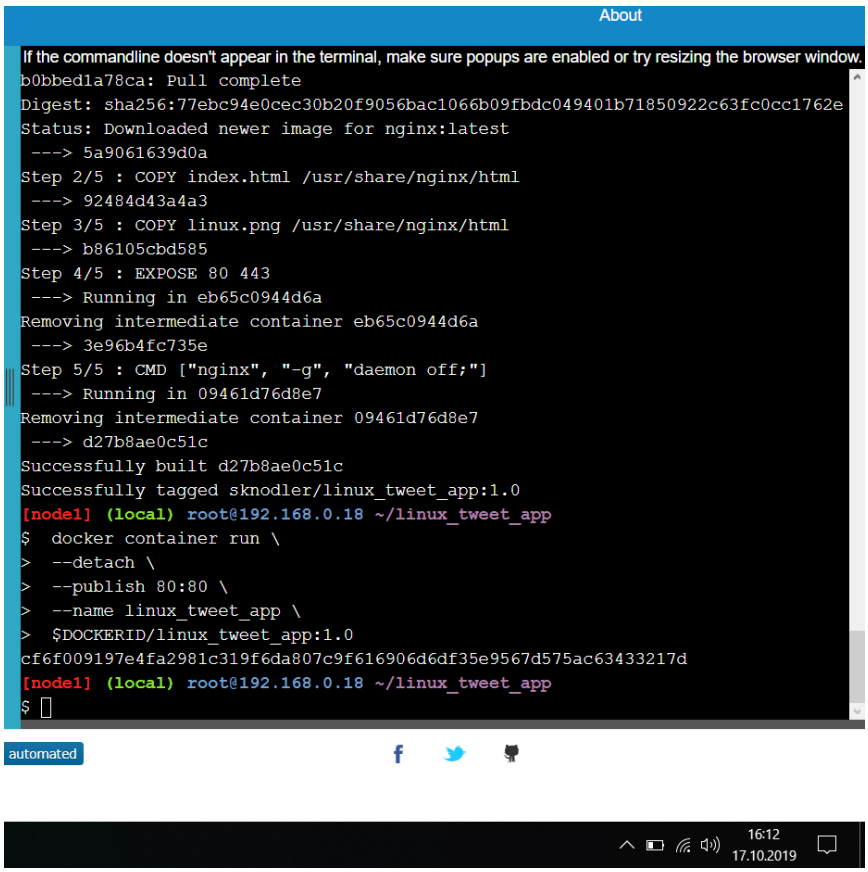
- **Task 2: Package and run a custom app using Docker**
  I can also run a custom app using Docker. Therefore, I need to package my application and then run it in a docker container: I will use an existing docker_file “linux_tweet_app”. So, I build docker image with the file and then I use the created image to create the tweet app container. As the container will be running a web server, I also need to specify port where I want to publish and allow traffic.



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sknodler@syr.edu

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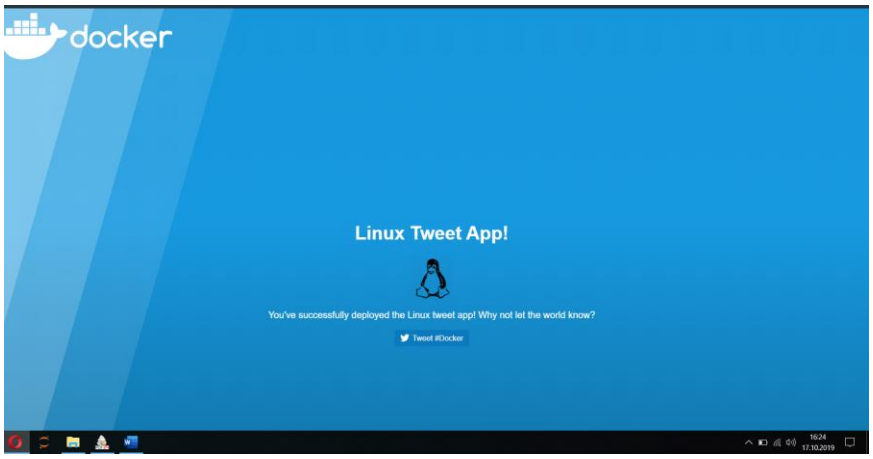
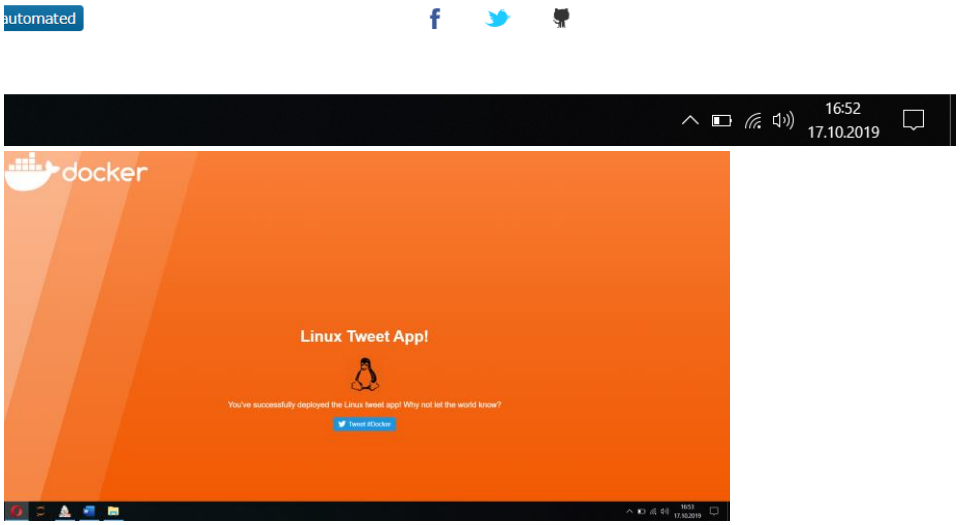


- **Task 3: Modify a Running Website**
  When I work on the code of an application, it is very inconvenient to stop the container, rebuild a new image and run a new version. To avoid this, I can mount the source code directory on the local machine into the running container. Any changes I will make to the source code, can than be directly reflected in the container.
  I can start a web app and mount the current directory in the container. I mount the directory on the host inside the container.

```
[node1] (local) root@192.168.0.53 ~/linux_tweet_app
$ docker container run \
> --detach \
> --publish 80:80 \
> --name linux_tweet_app \
> --mount type=bind,source="$(pwd)",target=/usr/share/nginx/html \
> $DOCKERID/linux_tweet_app:1.0
55d33c57e48bec5551b28ef2ca58bb45e1244ecd9101fe0ab01afe266463bb69
[node1] (local) root@192.168.0.53 ~/linux_tweet_app
$
```



So, I have just replaced the html file with another html file but I did not need to stop, rebuild, and rerun a container.

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Steffen Tim Knoedler
sknodler@syr.edu

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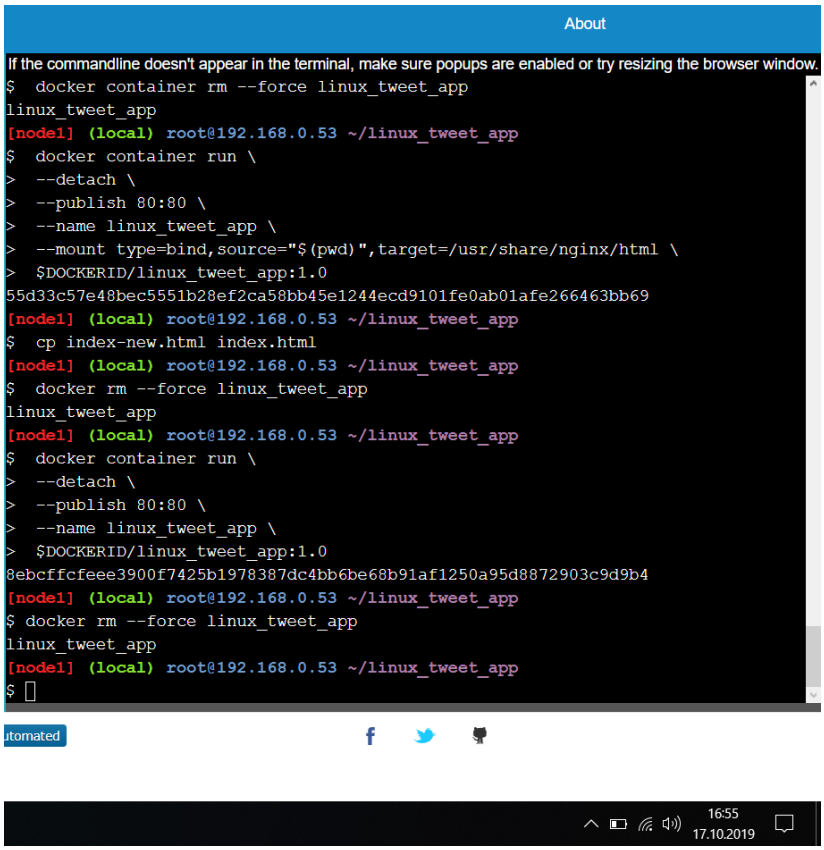
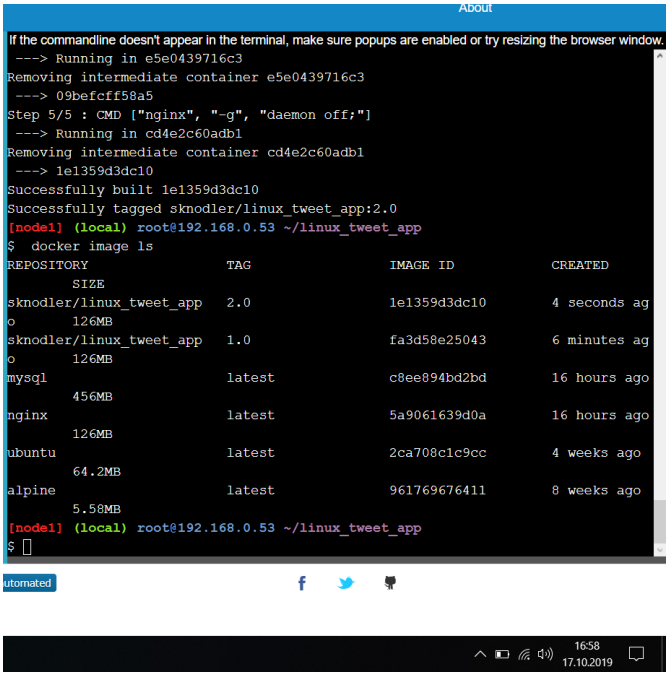


Now, I need to build a new version of the image to be able to use the image later again to have the latest version of the application. So, I create another image:



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sknodler@syr.edu

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I am now able to run two web app containers side by side on two different ports.

```
[node1] (local) root@192.168.0.53 ~/linux_tweet_app
$  docker container run \
>  --detach \
>  --publish 8080:80 \
>  --name old_linux_tweet_app \
>  $DOCKERID/linux_tweet_app:1.0
ce9693256afd91f1354d63c4b91f0a2300820ee3a924975c81f3163ddd259b05
[node1] (local) root@192.168.0.53 ~/linux_tweet_app
$  docker container run \
>  --detach \
>  --publish 80:80 \
>  --name linux_tweet_app \
>  $DOCKERID/linux_tweet_app:2.0
```

automated

17:00
17.10.2019

I can list the containers that are associated to my docker id and stored in my docker hosts local repository. So, these images are not yet available to any other users. However, I can push them to a private or public repository, such as the default public repository Docker Hub.

About

If the commandline doesn't appear in the terminal, make sure popups are enabled or try resizing the browser window.

```
WARNING! Your password will be stored unencrypted in /root/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
[node1] (local) root@192.168.0.53 ~/linux_tweet_app
$  docker image push $DOCKERID/linux_tweet_app:1.0
The push refers to repository [docker.io/sknodler/linux_tweet_app]
64a3b09851aa: Pushed
72198baa5e84: Pushed
cf2436e84ea8: Mounted from library/nginx
ed4a4820ee08: Mounted from library/nginx
b67d19e65ef6: Mounted from library/nginx
1.0: digest: sha256:2bf676ed3c31d0681733f41ea76c4a0dcaf59a7c4f96c30db2f55f971d7
d04fd size: 1363
[node1] (local) root@192.168.0.53 ~/linux_tweet_app
$  docker image push $DOCKERID/linux_tweet_app:2.0
The push refers to repository [docker.io/sknodler/linux_tweet_app]
eedf8a53bc88: Pushed
fc80a04baf04: Pushed
cf2436e84ea8: Layer already exists
ed4a4820ee08: Layer already exists
b67d19e65ef6: Layer already exists
2.0: digest: sha256:250f5a4612f32965c94b6d335fadf6ee4539641a983bac123d3830b45e0
90795 size: 1363
[node1] (local) root@192.168.0.53 ~/linux_tweet_app
$
```

automated

17:06
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Steffen Tim Knoedler
sknodler@syr.edu

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Sub-Module 2 - Swarm Stack Introduction

https://training.play-with-docker.com/swarm-stack-intro/#

In this part of the lab, I will deploy a stack (multi services application) against a Swarm using a docker compose file. To do so, I will work with two terminals, namely the swarm manager node and the swarm worker.

- Init your swarm

```
About
If the commandline doesn't appear in the terminal, make sure popups are enabled or try resizing the browser window.
##################################################################
[node1] (local) root@192.168.0.18 ~
$ docker swarm init --advertise-addr $(hostname -i)
Swarm initialized: current node (a75k3soju7d57nve45ub2cmko) is now a manager.

To add a worker to this swarm, run the following command:

    docker swarm join --token SWMTKN-1-3yhdr3a9w6hxse3vv6uuo5yo4zlk7svoyn86n1bk
y81r6a5g34-3xzeuvegzklwolww2i6wf3obg 192.168.0.18:2377

To add a manager to this swarm, run 'docker swarm join-token manager' and follo
w the instructions.
```

- Show members of swarm

```
[node1] (local) root@192.168.0.18 ~
$ docker node ls
ID                            HOSTNAME            STATUS              AVAILABIL
ITY         MANAGER STATUS      ENGINE VERSION
a75k3soju7d57nve45ub2cmko *   node1               Ready               Active
            Leader              19.03.1
[node1] (local) root@192.168.0.18 ~
$
```

- Clone the voting-app

  I can clone voting app code from Github into the application folder

```
$ git clone https://github.com/docker/example-voting-app
Cloning into 'example-voting-app'...
remote: Enumerating objects: 832, done.
remote: Total 832 (delta 0), reused 0 (delta 0), pack-reused 832
Receiving objects: 100% (832/832), 950.41 KiB | 19.01 MiB/s, done.
Resolving deltas: 100% (293/293), done.
[node1] (local) root@192.168.0.18 ~
$ cd example-voting-app
[node1] (local) root@192.168.0.18 ~/example-voting-app
$
##################################################################
#                          WARNING!!!!                           #
```

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Steffen Tim Knoedler
sknodler@syr.edu

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- Deploy a stack
  A stack is a group of services that I can deploy together. I used the docker-stack.yml file to deploy the voring app as a stack. Next, I listed the deployed services as well as the tasks of the vote service.

```
If the commandline doesn't appear in the terminal, make sure popups are enabled or try resizing the browser window.
[node1] (local) root@192.168.0.18 ~/example-voting-app
$ docker service ps voting_stack_vote
ID                  NAME                    IMAGE
        NODE                DESIRED STATE       CURRENT STATE           ERROR
             PORTS
ftxmtlippxa3        voting_stack_vote.1     dockersamples/examplevotingapp_vote:b
efore   node1               Running             Running 4 seconds ago

kbvq8lhn5ctu        voting_stack_vote.2     dockersamples/examplevotingapp_vote:b
efore   node1               Running             Running 4 seconds ago
```

STAGE 2 - Digging Deeper

https://training.play-with-docker.com/dev-stage2/

Sub-Module 1 - Windows Container Setup

https://training.play-with-docker.com/windows-containers-setup/

- Out of the four setup environments, select the following one to set-up Windows Container
  - Windows Server 2016 on AWS - https://training.play-with-docker.com/windows-containers-setup/#aws

I created a VM on AWS, based on a Microsoft Windows Server 2016 Base with Containers AMI and accessed the VM via remote desktop. Next, I opened powershell with admin rights and ran:

```
Install-Module -Name DockerMsftProvider -Force

Install-Package -Name docker -ProviderName DockerMsftProvider -Force

Restart-Computer -Force
```

To install docker and restart the computer.

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Steffen Tim Knoedler
sknodler@syr.edu

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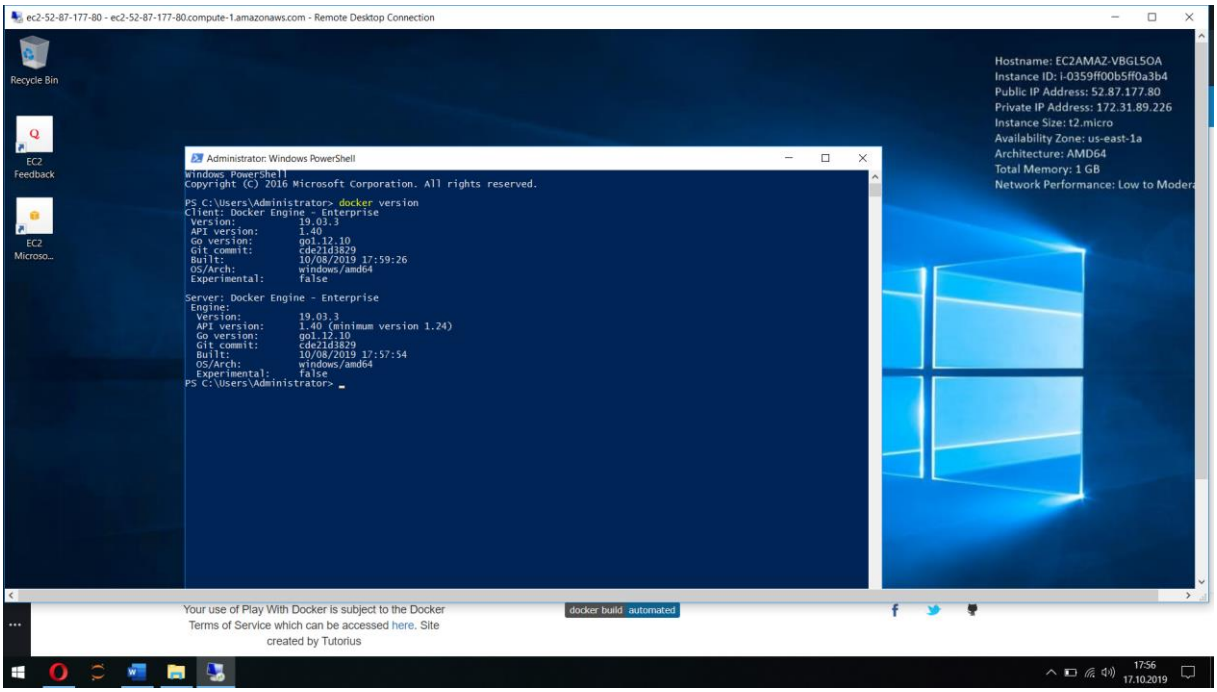
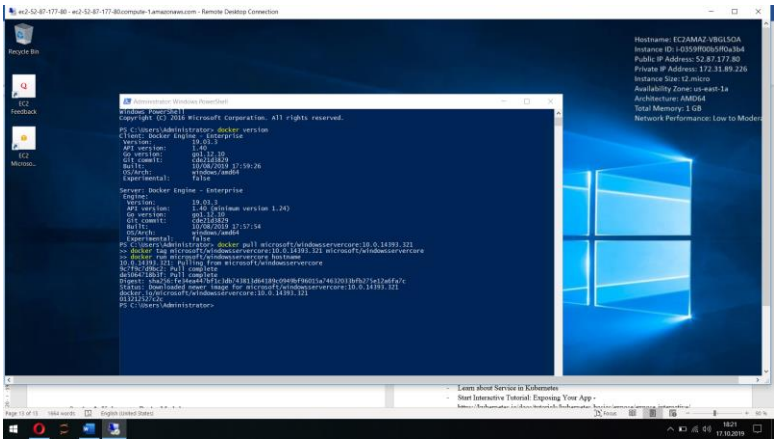


Sub-Module 2 - Windows Container Basics

https://training.play-with-docker.com/windows-containers-basics/

- Follow the on-screen instructions and complete all the two parts with the respective steps mentioned below
    - Getting Started with Windows Containers
        - make sure the Docker installation is working
        - pull a base image that's compatible with the evaluation build
        - re-tag the base image
        - do a test-run



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Steffen Tim Knoedler
sknodler@syr.edu

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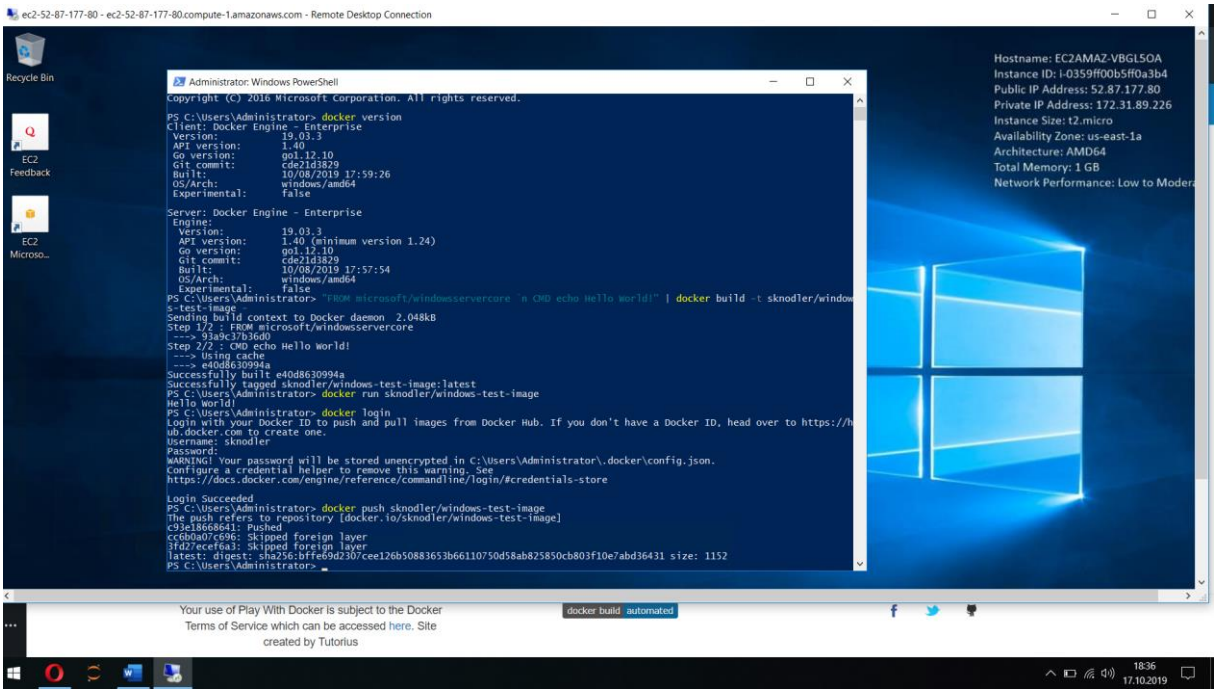
- Building and pushing Windows container images
  - create an image on the fly in PowerShell
  - test the image
  - push the image

I created the image, logged in to my docker account and pushed the image to store it online.



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Steffen Tim Knoedler
sknodler@syr.edu

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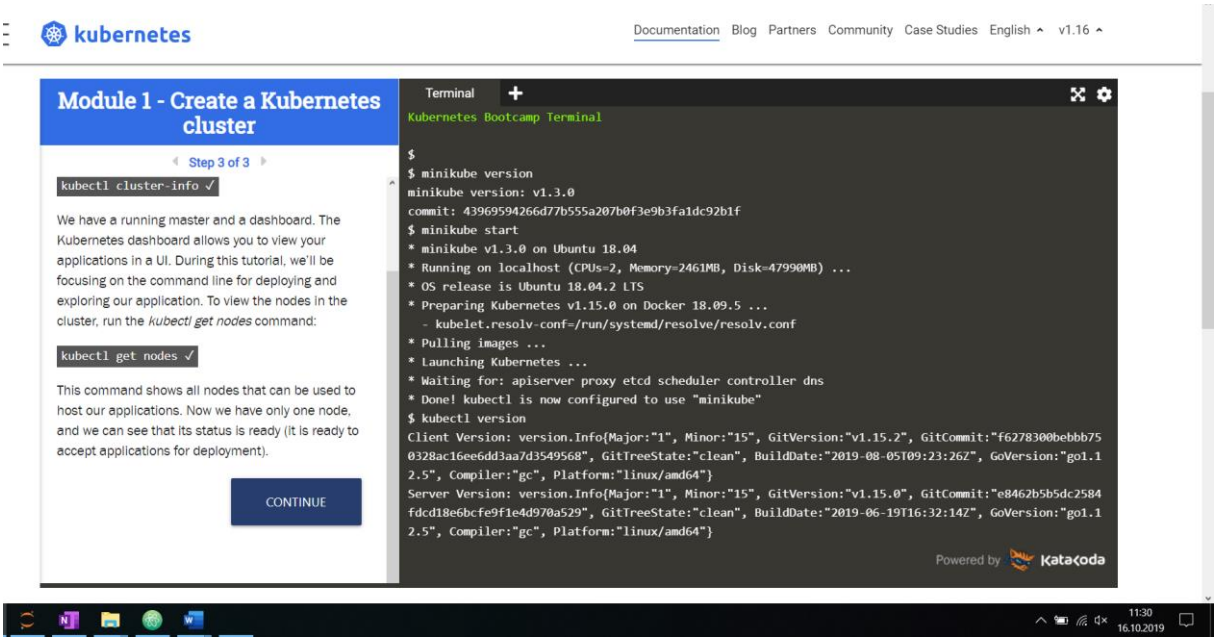
1. **Kubernetes**

Section 1: Getting Started

Go to https://kubernetes.io/docs/tutorials/kubernetes-basics/#kubernetes-basics

Complete all the six Kubernetes Basics Modules

Kubernetes supports to manage containerized applications. It makes sure that the applications run where and when they need to. I can deploy containerized applications to a cluster without attaching them individually to individual machines. Kubernetes automates the distribution and scheduling of the used containers within my cluster. Therefore, the master coordinates the cluster and the nodes are the workers that run applications. That means that the master is a coordinator and the node is either a VM or a physical computer. Each node runs a Kubelet which is an agent that manages the node and communicates to the Kubernetes master. When I deploy an application on Kubernetes, I advise the master to start an application container. So, the master will schedule the container on a certain node



First, I checked that minikube is properly installed, by running the *minikube version* command. Minikube is a lightweight Kubernetes implementation which creates a VM on my local machine and deploys a simple cluster containing only one node.

a. **Create a Kubernetes Cluster - Using Minikube to Create a Cluster Interactive Tutorial**
   I created the cluster by running *minikube start.* So, I managed to run a Kubernetes cluster. Minikube started a virtual machine with the specified that are presented in the online terminal. The Kubernetes cluster is now running in that VM. To deploy an app,

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Steffen Tim Knoedler
sknodler@syr.edu

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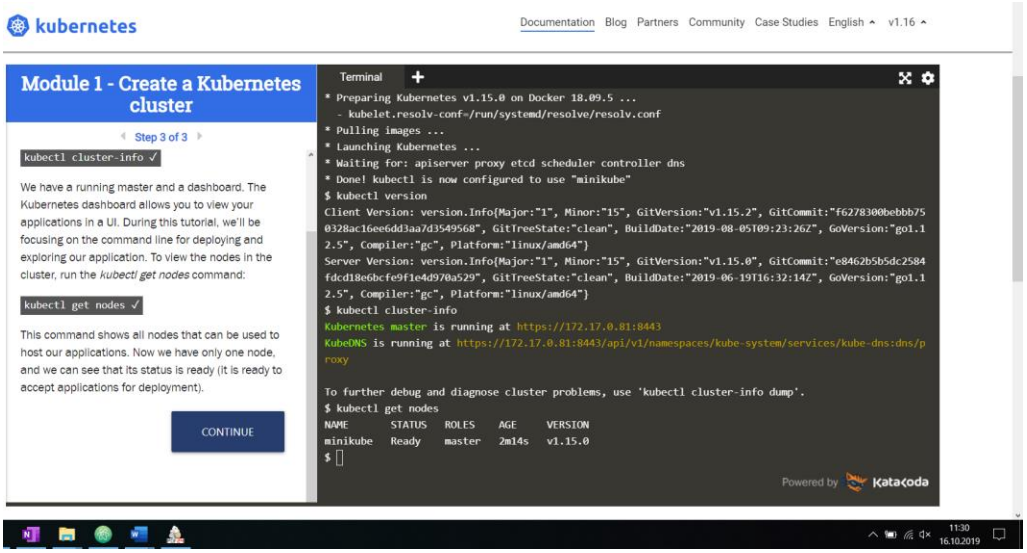
I first need to to identify available nodes that I can use to host an application. I run the kubectl get nodes command in order to view the nodes in the cluster. It shows only one node, and we can see that its status is ready to accept applications for deployment.



b. Deploy an App - Using kubectl to Create a Deployment Interactive Tutorial #

Once the Kubernetes cluster is running, I can deploy my containerized applications on top of it. Therefore, I need to create a Kubernetes Deployment configuration that instructs Kubernetes how to create and update application instances. The Kubernetes command line interface Kubectl allows me to create and manage a Deployment.

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Steffen Tim Knoedler
sknodler@syr.edu

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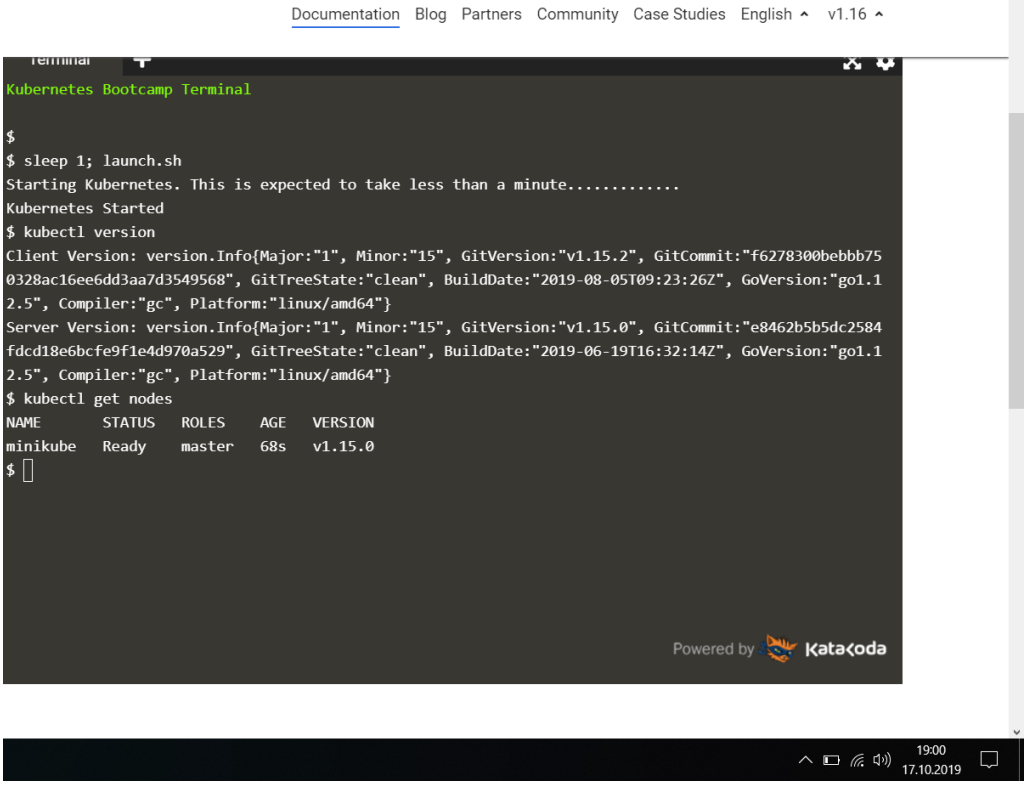
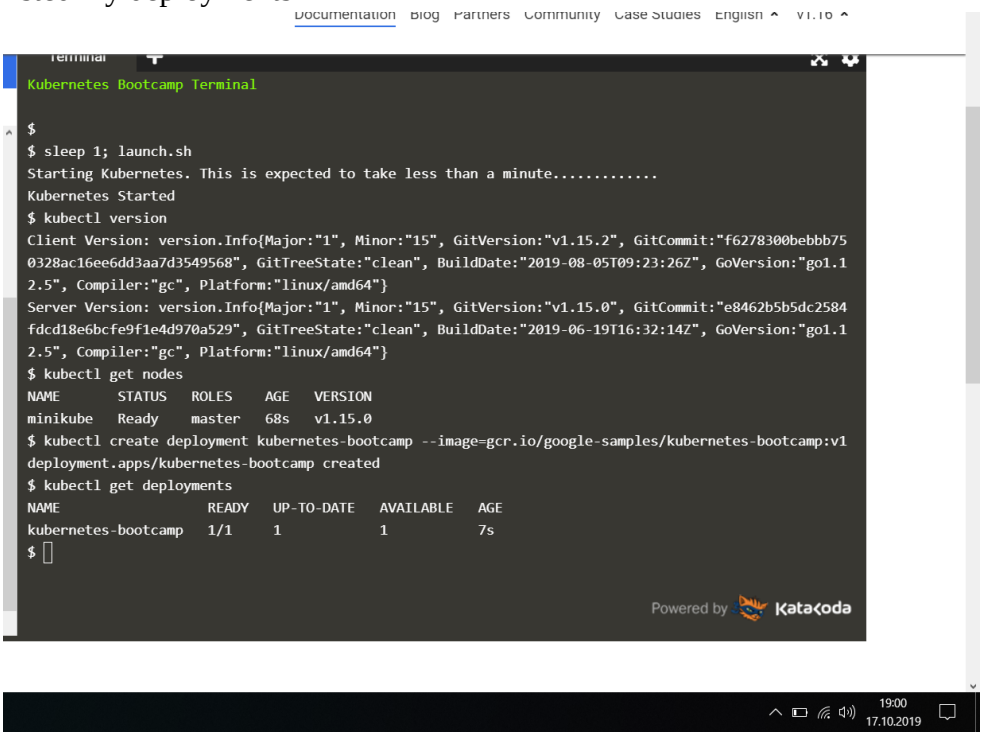


I listed my node to see that I have one running. Next, I deployed my first app and listed my deployments



Now, the instance is running inside the docker container on my node.

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sknodler@syr.edu

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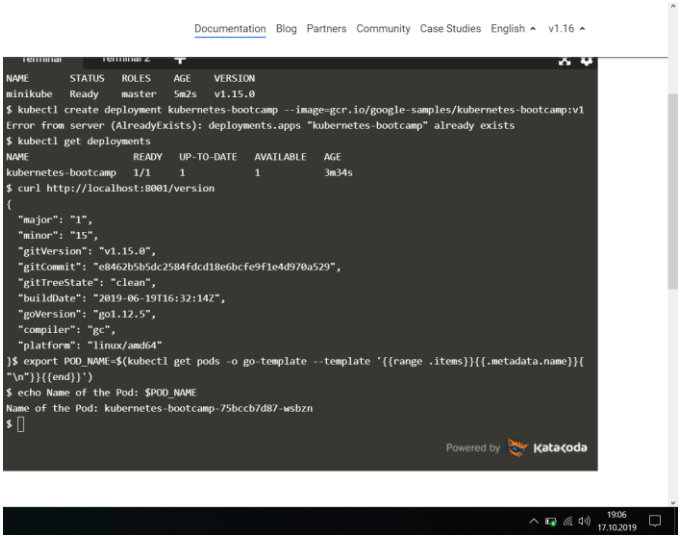
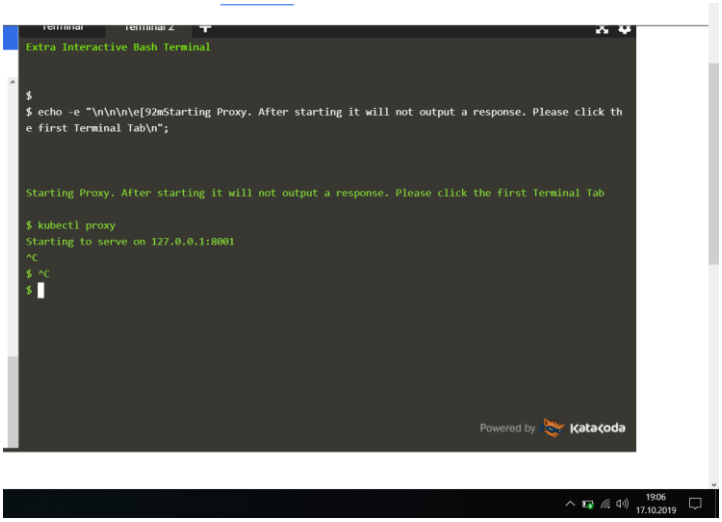
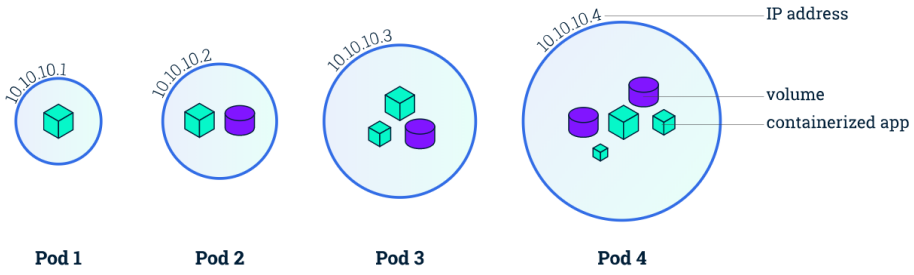
But it is not visible from outside yet. Consequently, I create a proxy that can forward the communication and make it accessible via port 8001





To host my application instance, Kubernetes created a Pod. A Pod is a Kubernetes abstraction that stands for group of one or more application containers as well as some shared resources for those containers.



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Steffen Tim Knoedler
sknodler@syr.edu

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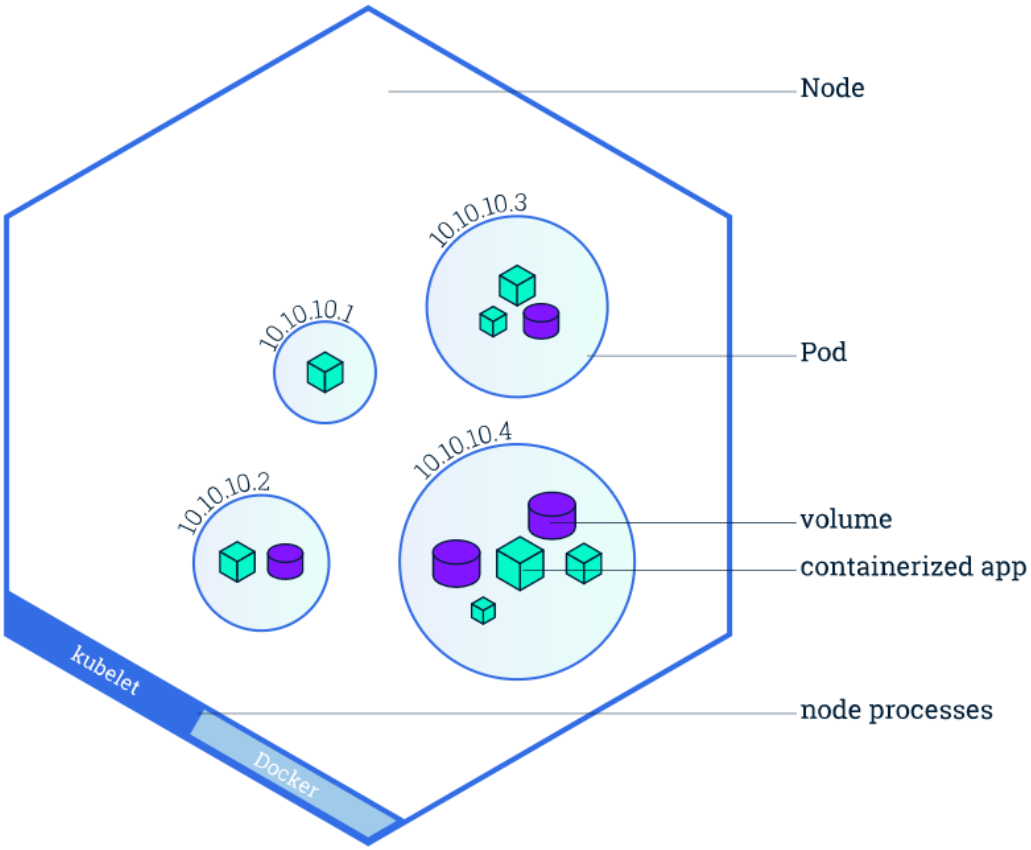
Node overview



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sknodler@syr.edu

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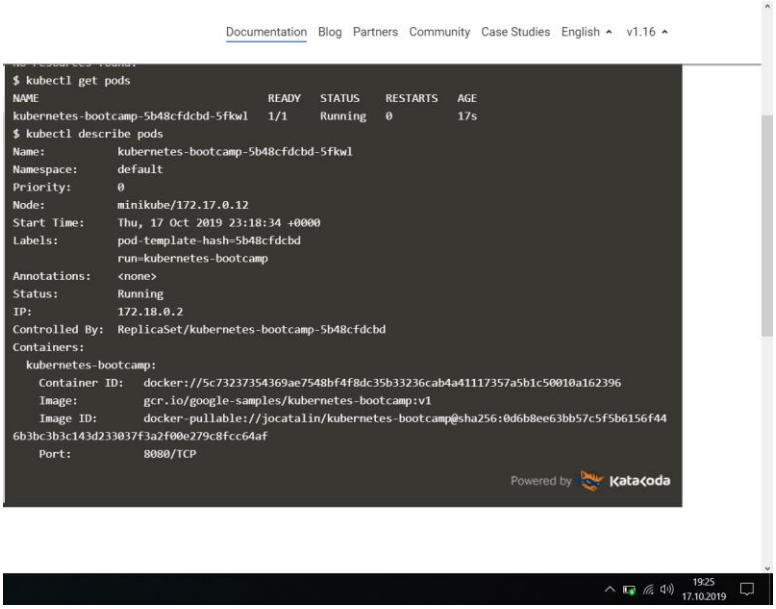
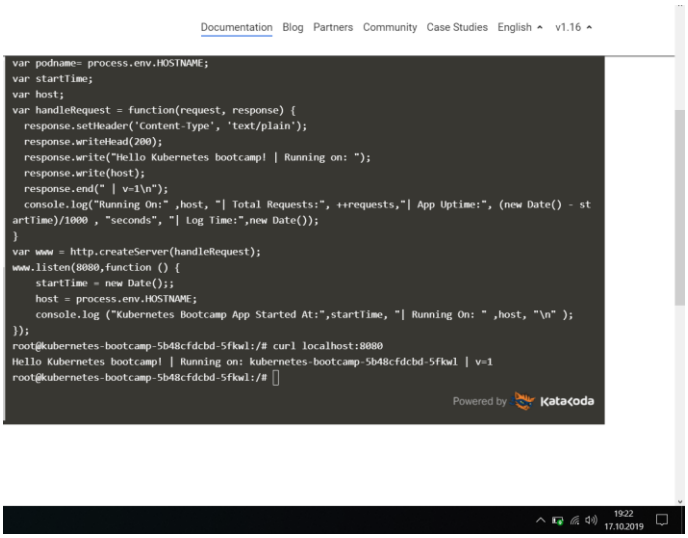
c. Explore Your App - Viewing Pods and Nodes Interactive Tutorial

I started by showing the app in the terminal, viewed container logs and executed command on one container. Therefore, I started a bash session in the Pod's container and ran a NodeJS application.





d. Expose Your App Publicly - Using a Service to Expose Your App Interactive Tutorial

To expose my app publicly, I first looked for existing pods and services. Only the default service Kubernetes is running. I am creating a new service and expose it to external traffic

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Steffen Tim Knoedler
sknodler@syr.edu

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```
$
$ sleep 1; launch.sh
Starting Kubernetes. This is expected to take less than a minute.kubectl get pods
.................
Kubernetes Started
$ kubectl get pods
No resources found.
$ kubectl get pods
NAME                                   READY   STATUS              RESTARTS   AGE
kubernetes-bootcamp-5b48cfdcbd-5q9s6   0/1     ContainerCreating   0          8s
$ kubectl get services
NAME         TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
kubernetes   ClusterIP   10.96.0.1    <none>        443/TCP   18s
$ kubectl expose deployment/kubernetes-bootcamp --type="NodePort" --port 8080
service/kubernetes-bootcamp exposed
$ kubectl get services
NAME                  TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)          AGE
kubernetes            ClusterIP   10.96.0.1       <none>        443/TCP          90s
kubernetes-bootcamp   NodePort    10.107.95.235   <none>        8080:31008/TCP   4s
$
```

Powered by Katacoda

19:31
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Steffen Tim Knoedler
sknodler@syr.edu

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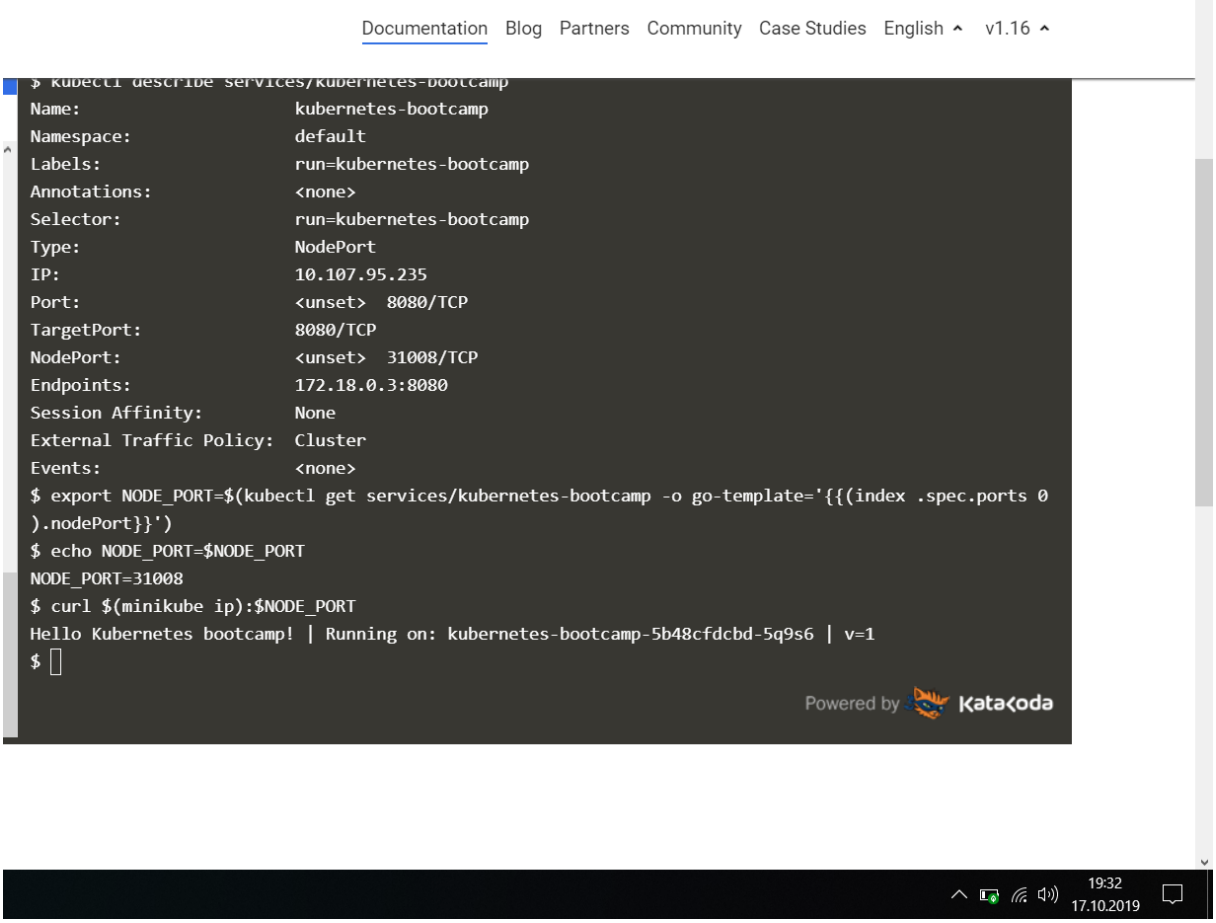

As you can see, I created an environment variable that has the value of the Node port assigned and made sure that the app is exposed to the outside. The Deployment created automatically a label for the pod. I got the name of the Pod and stored it in the pod environment variable. Next, I applied a new label and made sure the label is attached to the pod.

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Steffen Tim Knoedler
sknodler@syr.edu

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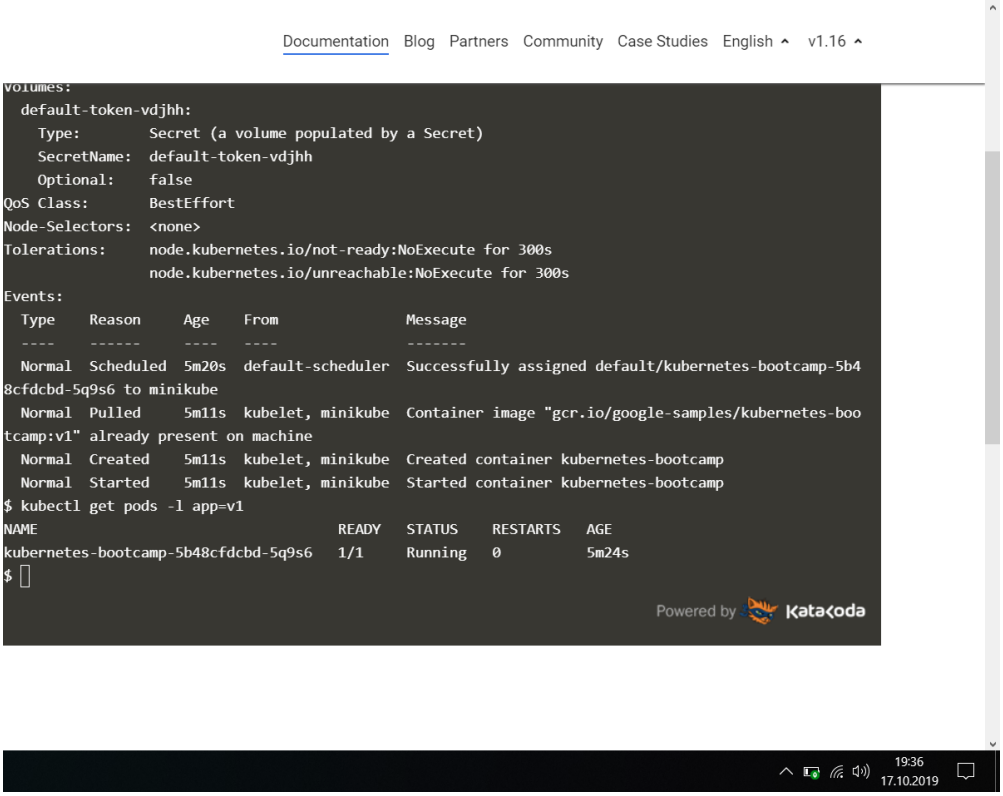

Afterwards, I deleted the service again and made sure its not accessible anymore

IST 615 Cloud Management
Steffen Tim Knoedler
sknodler@syr.edu

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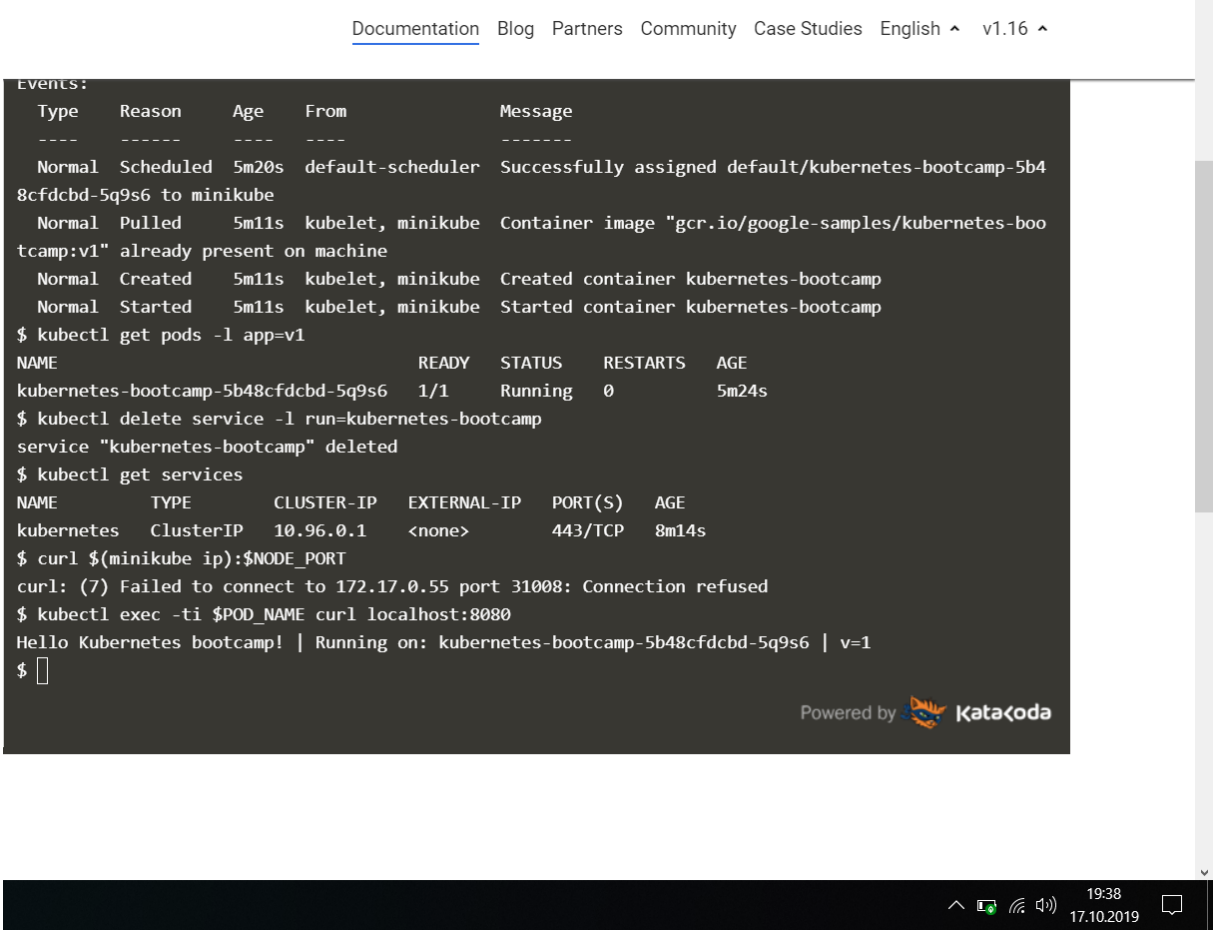

e. **Scale Your App - Running Multiple Instances of Your App Interactive Tutorial**
In case of increased traffic, we need to be able to scale the App. Scaling is achieved by increasing and decreasing the number of replicas in a deployment.
First, I list the deployments and then increase the number of replicas to 4.

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Steffen Tim Knoedler
sknodler@syr.edu

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```
$
$ sleep 1; launch.sh
Starting Kubernetes. This is expected to take less than a minute.kubectl get deployments
............
Kubernetes Started
$ kubectl get deployments
NAME                   READY   UP-TO-DATE   AVAILABLE   AGE
kubernetes-bootcamp    0/1     0            0           3s
$ kubectl scale deployments/kubernetes-bootcamp --replicas=4
deployment.extensions/kubernetes-bootcamp scaled
$ kubectl get deployments
NAME                   READY   UP-TO-DATE   AVAILABLE   AGE
kubernetes-bootcamp    4/4     4            4           21s
$
```

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I can also display the current number of pods and list the deployment logs. Here, I can see the change I have just triggered.

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```
$ kubectl get deployments
NAME                   READY   UP-TO-DATE   AVAILABLE   AGE
kubernetes-bootcamp    4/4     4            4           21s
$ kubectl get pods -o wide
NAME                                   READY   STATUS    RESTARTS   AGE   IP           NODE       NO
MINATED NODE   READINESS GATES
kubernetes-bootcamp-5b48cfdcbd-fpt2p   1/1     Running   0          40s   172.18.0.4   minikube   <n
one>           <none>
kubernetes-bootcamp-5b48cfdcbd-hdflb   1/1     Running   0          30s   172.18.0.7   minikube   <n
one>           <none>
kubernetes-bootcamp-5b48cfdcbd-mtx9g   1/1     Running   0          30s   172.18.0.8   minikube   <n
one>           <none>
kubernetes-bootcamp-5b48cfdcbd-qtns9   1/1     Running   0          30s   172.18.0.6   minikube   <n
one>           <none>
$ kubectl describe deployments/kubernetes-bootcamp
Name:                   kubernetes-bootcamp
Namespace:              default
CreationTimestamp:      Sat, 19 Oct 2019 14:18:12 +0000
Labels:                 run=kubernetes-bootcamp
Annotations:            deployment.kubernetes.io/revision: 1
Selector:               run=kubernetes-bootcamp
```

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Steffen Tim Knoedler
sknodler@syr.edu

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```
  Type    Reason             Age   From                   Message
  ----    ------             ----  ----                   -------
  Normal  ScalingReplicaSet  65s   deployment-controller  Scaled up replica set kubernetes-bootcamp-
5b48cfdcbd to 1
  Normal  ScalingReplicaSet  54s   deployment-controller  Scaled up replica set kubernetes-bootcamp-
5b48cfdcbd to 4
$
```

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Next, I can make use of load balancing. Therefore, I identify the exposed IP and Port and create an environment variable. When communicating through the exposed ip and port, we will get an answers from different pods. This shows that load balancing is working

```
$ kubectl describe services/kubernetes-bootcamp
Name:                     kubernetes-bootcamp
Namespace:                default
Labels:                   run=kubernetes-bootcamp
Annotations:              <none>
Selector:                 run=kubernetes-bootcamp
Type:                     NodePort
IP:                       10.107.215.157
Port:                     <unset>  8080/TCP
TargetPort:               8080/TCP
NodePort:                 <unset>  31407/TCP
Endpoints:                172.18.0.4:8080,172.18.0.6:8080,172.18.0.7:8080 + 1 more...
Session Affinity:         None
External Traffic Policy:  Cluster
Events:                   <none>
$ export NODE_PORT=$(kubectl get services/kubernetes-bootcamp -o go-template='{{(index .spec.ports 0
).nodePort}}')
$ echo NODE_PORT=$NODE_PORT
NODE_PORT=31407
$ curl $(minikube ip):$NODE_PORT
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-5b48cfdcbd-hdflb | v=1
```

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Steffen Tim Knoedler
sknodler@syr.edu

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```
$ curl $(minikube ip):$NODE_PORT
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-5b48cfdcbd-hdflb | v=1
$ curl $(minikube ip):$NODE_PORT
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-5b48cfdcbd-qtns9 | v=1
$ curl $(minikube ip):$NODE_PORT
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-5b48cfdcbd-mtx9g | v=1
$ curl $(minikube ip):$NODE_PORT
Hello Kubernetes bootcamp! | Running on: kubernetes-bootcamp-5b48cfdcbd-fpt2p | v=1
$
```

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The same way we scaled up, we can also scale down:

```
$ kubectl scale deployments/kubernetes-bootcamp --replicas=2
deployment.extensions/kubernetes-bootcamp scaled
$ kubectl get deployments
NAME                  READY   UP-TO-DATE   AVAILABLE   AGE
kubernetes-bootcamp   2/2     2            2           8m58s
$ kubectl get pods -o wide
NAME                                   READY   STATUS        RESTARTS   AGE     IP           NODE
    NOMINATED NODE   READINESS GATES
kubernetes-bootcamp-5b48cfdcbd-fpt2p   1/1     Running       0          8m52s   172.18.0.4   minikub
e   <none>           <none>
kubernetes-bootcamp-5b48cfdcbd-hdflb   1/1     Running       0          8m42s   172.18.0.7   minikub
e   <none>           <none>
kubernetes-bootcamp-5b48cfdcbd-mtx9g   1/1     Terminating   0          8m42s   172.18.0.8   minikub
e   <none>           <none>
kubernetes-bootcamp-5b48cfdcbd-qtns9   1/1     Terminating   0          8m42s   172.18.0.6   minikub
e   <none>           <none>
$
```

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f. Update Your App - Performing a Rolling Update Interactive Tutorial

Users expect to be able to use the application all the time and developers want to update the app whenever needed. To avoid downtime, Kubernetes uses Rolling updates. It allows to update the application without downtime. Multiple pods can be updated incrementally and we make sure that always enough pods are available.

Therefore, I can list the running pods and the installed current images on each of them

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Steffen Tim Knoedler
sknodler@syr.edu

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```
$
$ sleep 1; launch.sh
Starting Kubernetes. This is expected to take less than a minute.kubectl get deployments
..............
Kubernetes Started
$ kubectl get deployments
NAME                   READY   UP-TO-DATE   AVAILABLE   AGE
kubernetes-bootcamp    0/4     0            0           2s
$ kubectl get pods
NAME                                   READY   STATUS    RESTARTS   AGE
kubernetes-bootcamp-5b48cfdcbd-8sddw   1/1     Running   0          21s
kubernetes-bootcamp-5b48cfdcbd-q8xvz   1/1     Running   0          21s
kubernetes-bootcamp-5b48cfdcbd-t992j   1/1     Running   0          21s
kubernetes-bootcamp-5b48cfdcbd-v7jk7   1/1     Running   0          21s
$ kubectl describe pods
Name:           kubernetes-bootcamp-5b48cfdcbd-8sddw
Namespace:      default
Priority:       0
Node:           minikube/172.17.0.29
Start Time:     Sat, 19 Oct 2019 14:33:49 +0000
Labels:         pod-template-hash=5b48cfdcbd
```

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I can initiate a rolling update by set the image to another version. I can also verify the update by running a rollout status command

```
NAME                                   READY   STATUS        RESTARTS   AGE
kubernetes-bootcamp-5b48cfdcbd-8sddw   1/1     Terminating   0          2m
kubernetes-bootcamp-5b48cfdcbd-q8xvz   1/1     Terminating   0          2m
kubernetes-bootcamp-5b48cfdcbd-t992j   1/1     Terminating   0          2m
kubernetes-bootcamp-5b48cfdcbd-v7jk7   1/1     Terminating   0          2m
kubernetes-bootcamp-cfc74666-9mn7v     1/1     Running       0          9s
kubernetes-bootcamp-cfc74666-b2jwd     1/1     Running       0          7s
kubernetes-bootcamp-cfc74666-dzkbq     1/1     Running       0          7s
kubernetes-bootcamp-cfc74666-trd7p     1/1     Running       0          9s
$ kubectl get pods
NAME                                   READY   STATUS    RESTARTS   AGE
kubernetes-bootcamp-cfc74666-9mn7v     1/1     Running   0          2m10s
kubernetes-bootcamp-cfc74666-b2jwd     1/1     Running   0          2m8s
kubernetes-bootcamp-cfc74666-dzkbq     1/1     Running   0          2m8s
kubernetes-bootcamp-cfc74666-trd7p     1/1     Running   0          2m10s
$
```

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Steffen Tim Knoedler
sknodler@syr.edu

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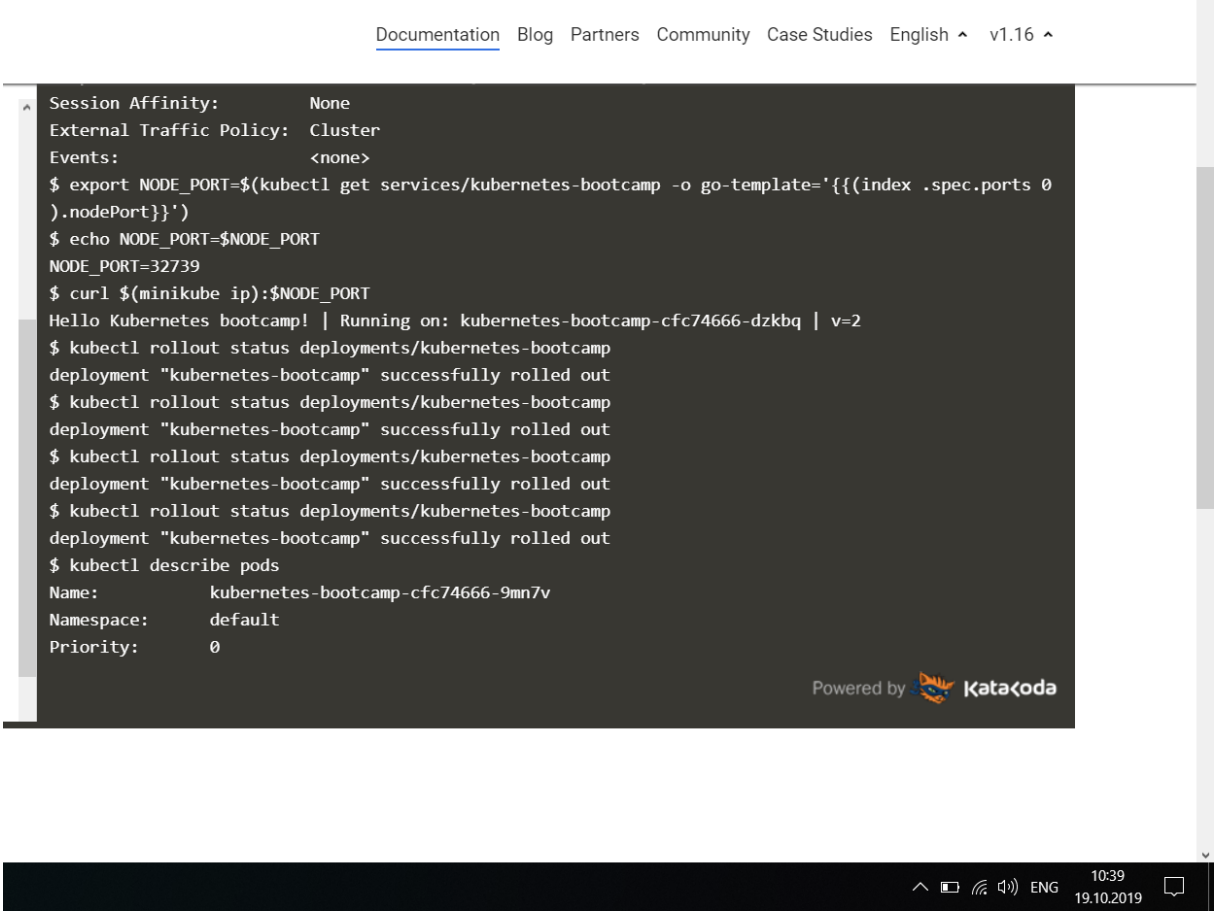

I can also rollback an update. To demonstrate this I update to v10 and rollback the update to the stable v2

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Steffen Tim Knoedler
sknodler@syr.edu

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```
    Type:        Secret (a volume populated by a Secret)
    SecretName:  default-token-lxbr4
    Optional:    false
QoS Class:       BestEffort
Node-Selectors:  <none>
Tolerations:     node.kubernetes.io/not-ready:NoExecute for 300s
                 node.kubernetes.io/unreachable:NoExecute for 300s
Events:
  Type     Reason     Age                From               Message
  ----     ------     ----               ----               -------
  Normal   Scheduled  17s                default-scheduler  Successfully assigned default/kubernetes
-bootcamp-547469f5dd-jqc52 to minikube
  Normal   Pulling    16s                kubelet, minikube  Pulling image "gcr.io/google-samples/kub
ernetes-bootcamp:v10"
  Warning  Failed     15s                kubelet, minikube  Failed to pull image "gcr.io/google-samp
les/kubernetes-bootcamp:v10": rpc error: code = Unknown desc = Error response from daemon: manifest
for gcr.io/google-samples/kubernetes-bootcamp:v10 not found
  Warning  Failed     15s                kubelet, minikube  Error: ErrImagePull
  Normal   BackOff    14s (x2 over 15s)  kubelet, minikube  Back-off pulling image "gcr.io/google-sa
mples/kubernetes-bootcamp:v10"
  Warning  Failed     14s (x2 over 15s)  kubelet, minikube  Error: ImagePullBackOff
```

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As you can see something went wrong when updating to v10. So, I can roll back the update:

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```
  Normal  Started    4m55s  kubelet, minikube  Started container kubernetes-bootcamp
$ kubectl rollout undo deployments/kubernetes-bootcamp
deployment.extensions/kubernetes-bootcamp rolled back
$ kubectl get pods
NAME                                   READY   STATUS        RESTARTS   AGE
kubernetes-bootcamp-547469f5dd-jqc52   0/1     Terminating   0          24s
kubernetes-bootcamp-cfc74666-9f7f9     1/1     Running       0          5s
kubernetes-bootcamp-cfc74666-9mn7v     1/1     Running       0          5m3s
kubernetes-bootcamp-cfc74666-b2jwd     1/1     Terminating   0          5m1s
kubernetes-bootcamp-cfc74666-dzkbq     1/1     Running       0          5m1s
kubernetes-bootcamp-cfc74666-trd7p     1/1     Running       0          5m3s
$ kubectl describe pods
Name:           kubernetes-bootcamp-cfc74666-9f7f9
Namespace:      default
Priority:       0
Node:           minikube/172.17.0.29
Start Time:     Sat, 19 Oct 2019 14:40:38 +0000
Labels:         pod-template-hash=cfc74666
                run=kubernetes-bootcamp
Annotations:    <none>
Status:         Running
```

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Steffen Tim Knoedler
sknodler@syr.edu

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```
Events:
  Type    Reason     Age    From               Message
  ----    ------     ----   ----               -------
  Normal  Scheduled  5m10s  default-scheduler  Successfully assigned default/kubernetes-bootcamp-cfc
74666-trd7p to minikube
  Normal  Pulled     5m9s   kubelet, minikube  Container image "jocatalin/kubernetes-bootcamp:v2" al
ready present on machine
  Normal  Created    5m9s   kubelet, minikube  Created container kubernetes-bootcamp
  Normal  Started    5m9s   kubelet, minikube  Started container kubernetes-bootcamp
$
```

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