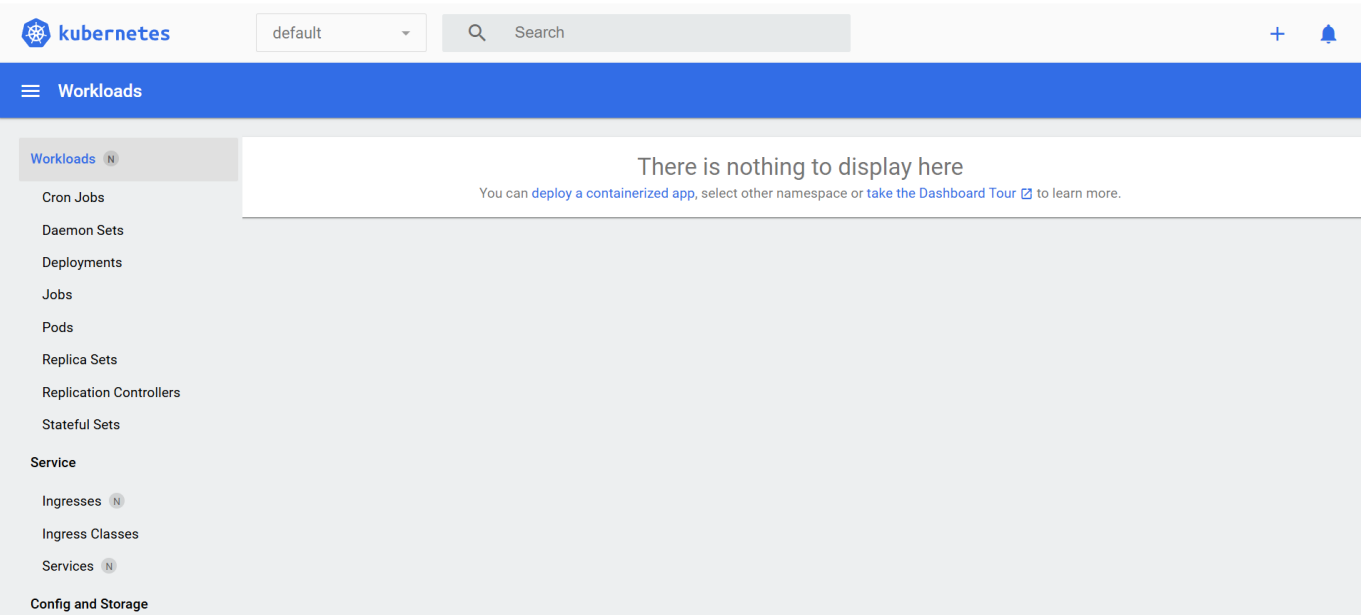# Lab Report: Kubernetes

Student information

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- Student code: 202292316

Assignment description

Er werkt gewerkt met Kubernetes voor meerdere container op te zetten in een minikube cluster. Het meeste werk gebeurde via de command line en via .yaml bestanden. We hebben geleerd hoe je containers deployed en labeled. Ook hebben we gezien hoe je jobs en cronjobs kunt uitvoeren. Hoe je parameters kunt aanpassen via de Yaml of de command line. Op het einde werd een webserver van kubernetes online gezet. Het doel was om te leren werken met kubernetes en hier wat containers mee op te zetten.

Proof of work done

Top editor — 04-kubernetes.md

assignments > 04-kubernetes.md > ☰ # Lab 4: Container orchestration with Kubernetes > ☰ ## 4.2. Basic operation

```
1   # Lab 4: Container orchestration with Kubernetes
83  ## 4.2. Basic operation
    kubectl is configured to communicate with that instance.
86
87  Before you begin, a quick tip: the command `kubectl get all` is very useful to show you everything that is running
    on your Kubernetes cluster. Whenever you're changing the state of the cluster by creating new objects, you should
    check the changes with `kubectl get <object-type>` or just `kubectl get all`.
88
89  You can get an near real-time view on what happens on your cluster by issuing the following command in a separate
    Bash terminal:
90
91  ```console
92  watch -n1 kubectl get all
93  ```
94
```

Terminal (top)

```
minikube    Ready    control-plane    22h    v1.31.0
PS C:\Users\Xander\mlops-2425-xvanderlinden> kubectl get all
NAME                              READY    STATUS     RESTARTS    AGE
pod/hello-node-66d457cb86-k45gr   1/1      Running    0           46s

NAME                 TYPE         CLUSTER-IP    EXTERNAL-IP    PORT(S)     AGE
service/kubernetes   ClusterIP    10.96.0.1     <none>         443/TCP     22h

NAME                        READY    UP-TO-DATE    AVAILABLE    AGE
deployment.apps/hello-node  1/1      1             1            46s

NAME                                  DESIRED    CURRENT    READY    AGE
replicaset.apps/hello-node-66d457cb86 1          1          1        46s
PS C:\Users\Xander\mlops-2425-xvanderlinden> kubectl get deployments
NAME        READY    UP-TO-DATE    AVAILABLE    AGE
hello-node  1/1      1             1            4m44s
PS C:\Users\Xander\mlops-2425-xvanderlinden>
```

Bottom editor — cheat-sheet.md

reports > cheat-sheet.md > ☰ # Cheat sheets and checklists > ☰ ## Labo 4 - Kubernetes

```
1    # Cheat sheets and checklists
100
101  ## Labo 4 - Kubernetes
102
103  | Taak                                  | Commando                                      |
104  | Real time (zo goed als) service opvragen | `while (1) { kubectl get all; sleep 1 } `   |
105  kubectl get deployments
106  kubectl get all
107  kubectl get nodes
108  kubectl get pods          You, 1 hour ago • Uncommitted changes
109  kubectl create deployment hello-node --image=registry.k8s.io/e2e-test-images/agnhost:2.39 -- /agnhost netexec
     --http-port=8080
110  minikube start
111  minikube dashboard        ⚠ MD047/single-trailing-newline: Files should end with a single newline character (markdown)
```

Terminal (bottom)

```
NAME        READY    UP-TO-DATE    AVAILABLE    AGE
hello-node  1/1      1             1            4m44s
PS C:\Users\Xander\mlops-2425-xvanderlinden> kubectl get events
LAST SEEN    TYPE      REASON             OBJECT                             MESSAGE
7m25s        Normal    Scheduled          pod/hello-node-66d457cb86-k45gr    Successfully assigned default/hello-node-66d457cb86-k45gr to miniku
                                                                             be
7m25s        Normal    Pulling            pod/hello-node-66d457cb86-k45gr    Pulling image "registry.k8s.io/e2e-test-images/agnhost:2.39"
7m20s        Normal    Pulled             pod/hello-node-66d457cb86-k45gr    Successfully pulled image "registry.k8s.io/e2e-test-images/agnhost:
2.39" in 5.439s (5.439s including waiting). Image size: 126872991 bytes.
7m19s        Normal    Created            pod/hello-node-66d457cb86-k45gr    Created container agnhost
7m19s        Normal    Started            pod/hello-node-66d457cb86-k45gr    Started container agnhost
7m26s        Normal    SuccessfulCreate   replicaset/hello-node-66d457cb86   Created pod: hello-node-66d457cb86-k45gr
7m26s        Normal    ScalingReplicaSet  deployment/hello-node              Scaled up replica set hello-node-66d457cb86 to 1
PS C:\Users\Xander\mlops-2425-xvanderlinden> kubectl get pods
NAME                            READY    STATUS     RESTARTS    AGE
hello-node-66d457cb86-k45gr     1/1      Running    0           7m35s
PS C:\Users\Xander\mlops-2425-xvanderlinden>
```

Cheat sheets and checklists

Labo 4 - Kubernetes

Taak	Commando
Real time (zo goed als) service opvragen	`while (1) { kubectl get all; sleep 1 } `

```
kubectl get deployments
kubectl get all
kubectl get nodes
kubectl get pods
kubectl create deployment hello-node --image=registry.k8s.io/e2e-test-images/agnhost:2.39 -- /agnhost netexec
--http-port=8080
minikube start
minikube dashboard
```

MD047/single-trailing-newline: Files should end with a single newline character (markdown...)

PROBLEMS 4   OUTPUT   DEBUG CONSOLE   TERMINAL   PORTS   GITLENS

```
NAME       READY   UP-TO-DATE   AVAILABLE   AGE
hello-node 1/1     1            1           4m44s
PS C:\Users\Xander\mlops-2425-xvanderlinden> kubectl get events
LAST SEEN   TYPE     REASON            OBJECT                        MESSAGE
7m25s       Normal   Scheduled         pod/hello-node-66d457cb86-k45gr   Successfully assigned default/hello-node-66d457cb86-k45gr to miniku
be
7m25s       Normal   Pulling           pod/hello-node-66d457cb86-k45gr   Pulling image "registry.k8s.io/e2e-test-images/agnhost:2.39"
7m20s       Normal   Pulled            pod/hello-node-66d457cb86-k45gr   Successfully pulled image "registry.k8s.io/e2e-test-images/agnhost:
2.39" in 5.439s (5.439s including waiting). Image size: 126872991 bytes.
7m19s       Normal   Created           pod/hello-node-66d457cb86-k45gr   Created container agnhost
7m19s       Normal   Started           pod/hello-node-66d457cb86-k45gr   Started container agnhost
7m26s       Normal   SuccessfulCreate  replicaset/hello-node-66d457cb86   Created pod: hello-node-66d457cb86-k45gr
7m26s       Normal   ScalingReplicaSet deployment/hello-node          Scaled up replica set hello-node-66d457cb86 to 1
PS C:\Users\Xander\mlops-2425-xvanderlinden> kubectl get pods
NAME                       READY   STATUS    RESTARTS   AGE
hello-node-66d457cb86-k45gr 1/1    Running   0          7m35s
PS C:\Users\Xander\mlops-2425-xvanderlinden>
```

NOW: 2024-11-25 12:09:04.323176888 +0000 UTC m=+924.980637842

Cheat sheets and checklists

Labo 4 - Kubernetes

```
kubectl get pods
kubectl config view
kubectl create deployment hello-node --image=registry.k8s.io/e2e-test-images/agnhost:2.39 -- /agnhost netexec
--http-port=8080
kubectl expose deployment hello-node --type=LoadBalancer --port=8080
kubectl get services
minikube service hello-node
minikube start
minikube dashboard
kubectl logs hello-node-66d457cb86-k45gr
```

PROBLEMS 1   OUTPUT   DEBUG CONSOLE   TERMINAL   PORTS   GITLENS

```
kubernetes   ClusterIP   10.96.0.1   <none>   443/TCP
22h
PS C:\Users\Xander\mlops-2425-xvanderlinden> minikube service hello-no
  Starting tunnel for service hello-node.
|-----------|-----------|-------------|------------------------|
| NAMESPACE |    NAME   | TARGET PORT |          URL           |
|-----------|-----------|-------------|------------------------|
| default   | hello-node|             | http://127.0.0.1:57916 |
|-----------|-----------|-------------|------------------------|
  Opening service default/hello-node in default browser...
! Because you are using a Docker driver on windows, the terminal nee
ds to be open to run it.
```

```
File  Edit  Selection  View  Go  Run  Terminal  Help          ←  →            mlops-2425-xvanderlinden

EXPLORER                      ···       _workflow.ipynb    ml_workflow.ipynb    .gitignore    cheat-sheet.md 3, M    04-kubernetes.md    ! echo-all.yml M  ×
∨ OPEN EDITORS                                  resources > 04-kubernetes > 4.2 > ! echo-all.yml
    ml_workflow.ipynb  resources\03-ml-workflow
    ml_workflow.ipynb  resources\03-ml-workflow    PROBLEMS 5   OUTPUT   DEBUG CONSOLE   TERMINAL   PORTS   GITLENS                                           minikube 4.2
    .gitignore                                                                                                                                               minikube
    cheat-sheet.md  reports          3, M         NAME                                   READY    UP-TO-DATE   AVAILABLE   AGE                                pow... 
    04-kubernetes.md  assignments                 deployment.apps/echo-all-deployment    2/3      3            2           2m13s
 ×  ! echo-all.yml  resources\04-kubernetes\4.2  M  deployment.apps/echo-deployment        1/1      1            1           6m40s
    ml_workflow.py  resources\03-ml-workflow    2  deployment.apps/hello-node             1/1      1            1           31m
    predict_image.py  resources\03-ml-workflow
    predict_image.py  resources\03-ml-workflow     NAME                                              DESIRED   CURRENT   READY   AGE
∨ MLOPS-2425-XVANDERLINDEN                         replicaset.apps/echo-all-deployment-78cdcd9dbf    3         3         2       2m13s
  ∨ reports                              ●         replicaset.apps/echo-deployment-78cdcd9dbf        1         1         1       6m40s
    image-13.png                                   replicaset.apps/hello-node-66d457cb86             1         1         1       31m
    image.png                                      NAME                                       READY    STATUS     RESTARTS   AGE
    README.md                                      pod/echo-all-deployment-78cdcd9dbf-5p76z   1/1      Running    0          2m14s
    report-template.md                             pod/echo-all-deployment-78cdcd9dbf-6d55c   1/1      Running    0          2s
  ∨ resources                           ●         pod/echo-all-deployment-78cdcd9dbf-nm4b5   1/1      Running    0          2m14s
    > 00-dummy                                     pod/echo-deployment-78cdcd9dbf-9q6s7       1/1      Running    0          6m41s
    > 02-dockerlab                                 pod/hello-node-66d457cb86-k45gr            1/1      Running    0          31m
    > 03-ml-workflow                     ●
    ∨ 04-kubernetes                      ●         NAME                      TYPE           CLUSTER-IP     EXTERNAL-IP   PORT(S)           AGE
      ∨ 4.2                              ●         service/echo-all-service  LoadBalancer   10.105.3.57    <pending>     8080:32204/TCP    2m14s
        ! echo-all.yml                   M         service/echo-service      NodePort       10.110.79.156  <none>        8080:31472/TCP    6m41s
        ! echo-deployment.yml                      service/hello-node        LoadBalancer   10.99.91.60    <pending>     8080:30213/TCP    16m
        ! echo-service.yml                         service/kubernetes        ClusterIP      10.96.0.1      <none>        443/TCP           22h
      > 4.3
      > 4.4                                         NAME                                   READY    UP-TO-DATE   AVAILABLE   AGE
    > 05-quantization-and-pruning                  deployment.apps/echo-all-deployment    3/3      3            3           2m14s
    > 07-monitoring                                deployment.apps/echo-deployment        1/1      1            1           6m41s
    ml_workflow.py                                 deployment.apps/hello-node             1/1      1            1           31m
    predict_image.py                               NAME                                              DESIRED   CURRENT   READY   AGE
  > TIMELINE                                       replicaset.apps/echo-all-deployment-78cdcd9dbf    3         3         3       2m14s
                                                   replicaset.apps/echo-deployment-78cdcd9dbf        1         1         1       6m41s
                                                   replicaset.apps/hello-node-66d457cb86             1         1         1       31m
                                                   NAME                                       READY    STATUS     RESTARTS   AGE
                                                   pod/echo-all-deployment-78cdcd9dbf-5p76z   1/1      Running    0          2m15s
 main*                    Launchpad  0  5  0       You, 42 seconds ago    Not Committed Yet   1 slide   Ln 10, Col 14   Spaces: 2   UTF-8   LF   {} YAML   Go Live   Prettier
```

```
PS C:\Users\Xander\mlops-2425-xvanderlinden> for ($i = 1; $i -le 10; $i++) { curl http://127.0.0.1:59584/ }
>>


StatusCode        : 200
StatusDescription : OK
Content           : NOW: 2024-11-25 12:40:13.773902183 +0000 UTC m=+2794.521454199
RawContent        : HTTP/1.1 200 OK
                    Content-Length: 62
                    Content-Type: text/plain; charset=utf-8
                    Date: Mon, 25 Nov 2024 12:40:13 GMT

                    NOW: 2024-11-25 12:40:13.773902183 +0000 UTC m=+2794.521454199
Forms             : {}
Headers           : {[Content-Length, 62], [Content-Type, text/plain; charset=utf-8], [Date, Mon, 25 Nov 2024
                    12:40:13 GMT]}
Images            : {}
InputFields       : {}
Links             : {}
ParsedHtml        : mshtml.HTMLDocumentClass
RawContentLength  : 62
```

```
 10.244.0.1:46984 | GET /
 10.244.0.1:46984 | GET /
 PS C:\Users\Xander\mlops-2425-xvanderlinden> kubectl logs hello-node-66d457cb86-k45gr
 I1125 11:53:39.392446       1 log.go:195] Started HTTP server on port 8080
 I1125 11:53:39.392830       1 log.go:195] Started UDP server on port  8081
 I1125 12:09:04.323097       1 log.go:195] GET /
 I1125 12:09:04.397813       1 log.go:195] GET /
 I1125 12:39:41.260163       1 log.go:195] GET /
 I1125 12:39:41.333491       1 log.go:195] GET /
 I1125 12:40:13.773864       1 log.go:195] GET /
 I1125 12:40:14.122540       1 log.go:195] GET /
 I1125 12:40:14.180488       1 log.go:195] GET /
 I1125 12:40:14.233176       1 log.go:195] GET /
 I1125 12:40:14.284948       1 log.go:195] GET /
 I1125 12:40:14.336854       1 log.go:195] GET /
 I1125 12:40:14.426800       1 log.go:195] GET /
 I1125 12:40:14.505854       1 log.go:195] GET /
 I1125 12:40:14.580111       1 log.go:195] GET /
 I1125 12:40:14.660117       1 log.go:195] GET /
 PS C:\Users\Xander\mlops-2425-xvanderlinden>
```

Evaluation criteria

☑ Demonstrate that your Kubernetes cluster is running and that you are able to manage it: ☑ Open the dashboard to show what's running on the cluster: nodes, pods, services, deployments, etc. ☑ Also show these from the command line (using `kubectl`) ☑ Show that all applications from this assignment are running on the cluster. ☑ Show the resources for each application using the dashboard or the command line. ☑ If possible, open the application in a web browser and show it works. ☑ Show that you can scale up and down the number of replicas of an application. ☑ Show that you can add, remove or change labels and selectors. ☑ Show that you can manipulate Kubernetes resources using labels and selectors. ☑ Show that you wrote an elaborate lab report in Markdown and pushed it to the repository. ☑ Show that you updated the cheat sheet with the commands you need to remember.

Issues

Reflection

Deze opdracht heeft mijn begrip van kubernetes vergroot. Dit gaat nuttig zijn voor de volgende labo's en op de werkvloer. Het was allemaal nog wat nieuw maar door de cheatsheet zal ik hopelijk de commando's onthouden voor verder gebruik.

4.4 vragen

- Select pods in the production environment `kubectl get pods -l env=production`
- Select pods *not* in the production environment `kubectl get pods -l 'env!=production'`
- Select pods in the development and acceptance environment (remark that logically, this is the same as the previous question, but you need to formulate your selector query differently) `kubectl get pods -l 'env in (development, acceptance)'`
- Select pods with release version 2.0 `kubectl get pods -l release_version=2.0`
- Select pods owned by the API-team with release version 2.0 `kubectl get pods -l team=api,release_version=2.0`
- Delete all pods in the development environment `kubectl delete pods -l env=development`
- What is the quickest way to launch the pods you just deleted? `kubectl apply -f 4.3/example-pods-with-labels.yml`

Resources

https://kubernetes.io/docs/concepts/overview/working-with-objects/labels/
https://kubernetes.io/docs/concepts/configuration/overview/