

## Lab: Kubernetes (done by: 鍾鎮嶸, 109006281)

### Part I: Creating the cluster

```
● student@ds-student2:~/NTHU-K8S/training$ kubectl get nodes
NAME                STATUS    ROLES    AGE   VERSION
kind-control-plane  Ready    control-plane  41m   v1.29.2
kind-worker          Ready    <none>      41m   v1.29.2
kind-worker2         Ready    <none>      41m   v1.29.2
```

Picture 1.1: screenshot of kubectl get nodes.

### Part II: Unit Test result

```
root@960c78e97128:/go/src/app# go test -v ./...
?      my-scheduler-plugins/cmd/scheduler      [no test files]
=== RUN   TestCustomScheduler_PreFilter
=== RUN   TestCustomScheduler_PreFilter/pod_is_accepted
finish adding2024/06/15 08:49:46 Pod  is in Prefilter phase.
=== RUN   TestCustomScheduler_PreFilter/pod_is_just_accepted
finish adding2024/06/15 08:49:46 Pod  is in Prefilter phase.
=== RUN   TestCustomScheduler_PreFilter/pod_is_rejected
finish adding2024/06/15 08:49:46 Pod  is in Prefilter phase.
--- PASS: TestCustomScheduler_PreFilter (0.00s)
    --- PASS: TestCustomScheduler_PreFilter/pod_is_accepted (0.00s)
    --- PASS: TestCustomScheduler_PreFilter/pod_is_just_accepted (0.00s)
    --- PASS: TestCustomScheduler_PreFilter/pod_is_rejected (0.00s)
=== RUN   TestCustomScheduler_Score
=== RUN   TestCustomScheduler_Score/least_mode
2024/06/15 08:49:46 Custom scheduler runs with the mode: Least.
2024/06/15 08:49:46 Pod  is in Score phase. Calculate the score of Node m1.
2024/06/15 08:49:46 Pod  is in Score phase. Calculate the score of Node m2.
=== RUN   TestCustomScheduler_Score/most_mode
2024/06/15 08:49:46 Custom scheduler runs with the mode: Least.
2024/06/15 08:49:46 Pod  is in Score phase. Calculate the score of Node m1.
2024/06/15 08:49:46 Pod  is in Score phase. Calculate the score of Node m2.
--- PASS: TestCustomScheduler_Score (0.00s)
    --- PASS: TestCustomScheduler_Score/least_mode (0.00s)
    --- PASS: TestCustomScheduler_Score/most_mode (0.00s)
=== RUN   TestCustomScheduler_NormalizeScore
=== RUN   TestCustomScheduler_NormalizeScore/scores_in_range
=== RUN   TestCustomScheduler_NormalizeScore/scores_out_of_range
=== RUN   TestCustomScheduler_NormalizeScore/negative_score
--- PASS: TestCustomScheduler_NormalizeScore (0.00s)
    --- PASS: TestCustomScheduler_NormalizeScore/scores_in_range (0.00s)
    --- PASS: TestCustomScheduler_NormalizeScore/scores_out_of_range (0.00s)
    --- PASS: TestCustomScheduler_NormalizeScore/negative_score (0.00s)
PASS
ok      my-scheduler-plugins/pkg/plugins      0.029s
root@960c78e97128:/go/src/app# exit
exit
```

Picture 2.1: screenshot of passing Unit Test.

### Part III:

#### Scene-1 (checking Prefilter):

```
NTHU-Scheduler-Plugin > ! test_scene_1.yaml
1  apiVersion: v1
2  kind: Pod
3  metadata:
4    name: nginx-a
5    labels:
6      podGroup: "A"
7      minAvailable: "3"
8  spec:
9    schedulerName: my-scheduler
10   containers:
11   - name: nginx
12     image: nginx:1.14.2
13     ports:
14     - containerPort: 80
15     resources:
16       requests:
17         memory: "100Mi"
18       limits:
19         memory: "100Mi"
```

Picture 3.1.1: Configuration of Pod nginx-a (similar for the other two pods).

```
● student@ds-student2:~/NTHU-Scheduler-Plugin$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
my-scheduler-69cfc986c7-mwfc5      1/1     Running   0           20s
nginx-a                             0/1     Pending   0           17s
nginx-b                             0/1     Pending   0           17s
nginx-c                             1/1     Running   0           17s
```

Picture 3.1.2: Initial status of scheduler and pods.

```
● student@ds-student2:~/NTHU-Scheduler-Plugin$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
my-scheduler-69cfc986c7-v2jcz      1/1     Running   0           6m32s
nginx                               1/1     Running   0           6m25s
nginx1                              1/1     Running   0           6m25s
nginx2                              1/1     Running   0           6m25s
```

Picture 3.1.3: Final status of scheduler and pods.

#### Description:

Three similar pods of the same group are created with **minAvailable = 3**. Initially, Pods **nginx-a** and **nginx-b** are **not scheduled** and **remains pending**. During the check for the third pod of the same group, **nginx-c**, it **meets the minAvailable condition** hence it is selected and scheduled. After some time, the pending pods get reevaluated and are now eligible to get scheduled.

## Scene-2 (checking Least mode):

```
NTHU-Scheduler-Plugin > charts > ! values.yaml
1  scheduler:
2    name: my-scheduler
3    image: my-scheduler:local
4    imagePullPolicy: Never
5    replicaCount: 1
6    leaderElect: false
7
8  plugins:
9    enabled: ["CustomScheduler"]
10
11 pluginConfig:
12 - name: CustomScheduler
13   args:
14     mode: Least
```

Picture 3.2.1: Configurations of scheduler.

```
Addresses:
  InternalIP: 172.21.0.4
  Hostname:   kind-worker
Capacity:
  cpu:          6
  ephemeral-storage: 50620216Ki
  hugepages-2Mi: 0
  memory:       6063024Ki
  pods:        110
Allocatable:
  cpu:          6
  ephemeral-storage: 50620216Ki
  hugepages-2Mi: 0
  memory:       1344432Ki
  pods:        110
```

```
Addresses:
  InternalIP: 172.21.0.3
  Hostname:   kind-worker2
Capacity:
  cpu:          6
  ephemeral-storage: 50620216Ki
  hugepages-2Mi: 0
  memory:       6063024Ki
  pods:        110
Allocatable:
  cpu:          6
  ephemeral-storage: 50620216Ki
  hugepages-2Mi: 0
  memory:       1868720Ki
  pods:        110
```

Pictures 3.2.2: Information of workers 1 and 2.

```
● student@ds-student2:~/NTHU-Scheduler-Plugin$ kubectl get pods -o wide
NAME                                READY   STATUS    RESTARTS   AGE   IP             NODE
my-scheduler-69cfc986c7-mwfcs      1/1     Running   0           10m   10.244.2.11    kind-worker2
nginx-a                             1/1     Running   0           10m   10.244.1.13    kind-worker
nginx-b                             1/1     Running   0           10m   10.244.1.14    kind-worker
nginx-c                             1/1     Running   0           10m   10.244.1.12    kind-worker
```

Pictures 3.2.3: Final status of scheduler and pods.

## Description:

Results confirms that under **Least mode**, the scheduler schedules pods to worker (kind-worker) with **lower allocatable memory**, proving that implementation is correct.

### Scene-3 (checking Most mode):

```
NTHU-Scheduler-Plugin > charts > ! values.yaml
1  scheduler:
2  |   name: my-scheduler
3  |   image: my-scheduler:local
4  |   imagePullPolicy: Never
5  |   replicaCount: 1
6  |   leaderElect: false
7
8  plugins:
9  |   enabled: ["CustomScheduler"]
10
11 pluginConfig:
12 - name: CustomScheduler
13   args:
14 |   mode: Most
```

Picture 3.3.1: Configurations of scheduler.

```
Addresses:
  InternalIP: 172.21.0.4
  Hostname:   kind-worker
Capacity:
  cpu:                6
  ephemeral-storage:  50620216Ki
  hugepages-2Mi:      0
  memory:              6063024Ki
  pods:               110
Allocatable:
  cpu:                6
  ephemeral-storage:  50620216Ki
  hugepages-2Mi:      0
  memory:              1344432Ki
  pods:               110
```

```
Addresses:
  InternalIP: 172.21.0.3
  Hostname:   kind-worker2
Capacity:
  cpu:                6
  ephemeral-storage:  50620216Ki
  hugepages-2Mi:      0
  memory:              6063024Ki
  pods:               110
Allocatable:
  cpu:                6
  ephemeral-storage:  50620216Ki
  hugepages-2Mi:      0
  memory:              1868720Ki
  pods:               110
```

Pictures 3.3.2: Information of workers 1 and 2.

```
● student@ds-student2:~/NTHU-Scheduler-Plugin$ kubectl get pods -o wide
NAME                                READY   STATUS    RESTARTS   AGE   IP             NODE
my-scheduler-69cfc986c7-hqnln      1/1     Running   0           18m   10.244.2.13    kind-worker2
nginx-a                             1/1     Running   0           17m   10.244.2.15    kind-worker2
nginx-b                             1/1     Running   0           17m   10.244.2.16    kind-worker2
nginx-c                             1/1     Running   0           17m   10.244.2.14    kind-worker2
```

Pictures 3.3.3: Final status of scheduler and pods.

### Description:

Results confirms that under **Most mode**, the scheduler schedules pods to worker with **higher allocatable memory**, proving that implementation is correct.