CS542600 Distributed System

Lab: Kubernetes

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- The screenshot of `kubectl get nodes`

```
student@ds-student13:~/NTHU-Scheduler-Plugin$ kubectl get nodes
 NAME                STATUS   ROLES           AGE   VERSION
 kind-control-plane  Ready    control-plane   15h   v1.29.2
 kind-worker         Ready    <none>          15h   v1.29.2
 kind-worker2        Ready    <none>          15h   v1.29.2
```

- The screenshot of passing all the unit tests

```
root@580af0e8cf11:/go/src/app# go test -v ./...
?       my-scheduler-plugins/cmd/scheduler      [no test files]
=== RUN   TestCustomScheduler_PreFilter
=== RUN   TestCustomScheduler_PreFilter/pod_is_accepted
finish adding2024/06/14 06:25:17 Pod  is in Prefilter phase.
=== RUN   TestCustomScheduler_PreFilter/pod_is_just_accepted
finish adding2024/06/14 06:25:17 Pod  is in Prefilter phase.
=== RUN   TestCustomScheduler_PreFilter/pod_is_rejected
finish adding2024/06/14 06:25:17 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
2024/06/14 06:25:17 Custom scheduler runs with the mode: Least.
2024/06/14 06:25:17 Pod  is in Score phase. Calculate the score of Node m1.
2024/06/14 06:25:17 Pod  is in Score phase. Calculate the score of Node m2.
=== RUN   TestCustomScheduler_Score/most_mode
2024/06/14 06:25:17 Custom scheduler runs with the mode: Least.
2024/06/14 06:25:17 Pod  is in Score phase. Calculate the score of Node m1.
2024/06/14 06:25:17 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        0.032s
```

- Explain the 3 scenarios you design to validate your implementation by describing the expected results and showing the screenshots of the results. (You have to explain them during the demo.)
  - The correctness of **prefilter()**

  - The correctness of "**Least mode**"

```
Addresses:                                    Addresses:
  InternalIP:  172.19.0.3                        InternalIP:  172.19.0.2
  Hostname:    kind-worker                        Hostname:    kind-worker2
Capacity:                                      Capacity:
  cpu:                6                            cpu:                6
  ephemeral-storage:  50620216Ki                  ephemeral-storage:  50620216Ki
  hugepages-2Mi:      0                            hugepages-2Mi:      0
  memory:             6063024Ki                    memory:             6063024Ki
  pods:               110                          pods:               110
Allocatable:                                   Allocatable:
  cpu:                6                            cpu:                6
  ephemeral-storage:  50620216Ki                  ephemeral-storage:  50620216Ki
  hugepages-2Mi:      0                            hugepages-2Mi:      0
  memory:             1344432Ki                    memory:             1868720Ki
  pods:               110                          pods:               110
```

kind-worker has less allocatable memory than kind-worker2, so the pod should be bound to **kind-worker**.

values.yaml

```
11    pluginConfig:
12    - name: CustomScheduler
13      args:
14        mode: Least
```

LeastMode.yaml (Same as pod-example.yaml, only change the name.)

```
! LeastMode.yaml
 1    apiVersion: v1
 2    kind: Pod
 3    metadata:
 4      name: least-mode
 5      labels:
 6        podGroup: "A"
 7        minAvailable: "1"
 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"
```

```
student@ds-student13:~/NTHU-Scheduler-Plugin$ kubectl create -f LeastMode.yaml
pod/least-mode created
```

```
I0616 12:12:04.334314      1 log.go:194] Pod least-mode is in Prefilter phase.
I0616 12:12:04.335326      1 log.go:194] Pod least-mode is in Score phase. Calculate the score of Node kind-worker.
I0616 12:12:04.335348      1 log.go:194] Pod least-mode is in Score phase. Calculate the score of Node kind-worker2.
I0616 12:12:04.342756      1 schedule_one.go:252] "Successfully bound pod to node" pod="default/least-mode" node="kind-worker" evaluatedNodes=3 feasibleNodes=2
```

```
student@ds-student13:~/NTHU-Scheduler-Plugin$ kubectl get pods -o wide
NAME                           READY   STATUS    RESTARTS   AGE     IP           NODE          NOMINATED NODE   READINESS GATES
least-mode                     1/1     Running   0          4m51s   10.244.2.2   kind-worker   <none>           <none>
my-scheduler-69cfc986c7-gc62b  1/1     Running   0          2d5h    10.244.1.2   kind-worker2  <none>           <none>
```

- The correctness of "**Most mode**"

  kind-worker has less allocatable memory than kind-worker2, so the

  pod should be bound to **kind-worker2**.

  values.yaml

  Change from Least mode to Most mode.

```
11      pluginConfig:
12      - name: CustomScheduler
13        args:
14          mode: Most
```

  Remove the scheduler and deploy it again.

```
student@ds-student13:~/NTHU-Scheduler-Plugin$ make remove
helm uninstall scheduler-plugins
release "scheduler-plugins" uninstalled
student@ds-student13:~/NTHU-Scheduler-Plugin$ make deploy
helm install scheduler-plugins charts/
NAME: scheduler-plugins
LAST DEPLOYED: Sun Jun 16 12:25:42 2024
NAMESPACE: default
STATUS: deployed
REVISION: 1
TEST SUITE: None
```

  MostMode.yaml (Same as pod-example.yaml, only change the name.)

```
! MostMode.yaml
1    apiVersion: v1
2    kind: Pod
3    metadata:
4      name: most-mode
5      labels:
6        podGroup: "A"
7        minAvailable: "1"
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"
```

```
student@ds-student13:~/NTHU-Scheduler-Plugin$ kubectl create -f MostMode.yaml
  pod/most-mode created
```

```
I0616 12:28:21.760463       1 log.go:194] Pod most-mode is in Prefilter phase.
I0616 12:28:21.761675       1 log.go:194] Pod most-mode is in Score phase. Calculate the score of Node kind-worker.
I0616 12:28:21.761742       1 log.go:194] Pod most-mode is in Score phase. Calculate the score of Node kind-worker2.
I0616 12:28:21.769142       1 schedule_one.go:252] "Successfully bound pod to node" pod="default/most-mode" node="kind-worker2" evaluatedNodes=3 feasibleNodes=2
```

```
student@ds-student13:~/NTHU-Scheduler-Plugin$ kubectl get pods -o wide
NAME                            READY   STATUS    RESTARTS   AGE     IP           NODE          NOMINATED NODE   READINESS GATES
most-mode                       1/1     Running   0          15s     10.244.1.4   kind-worker2   <none>           <none>
my-scheduler-69cfc986c7-kszdw   1/1     Running   0          2m54s   10.244.1.3   kind-worker2   <none>           <none>
```