# Kubernetes Report

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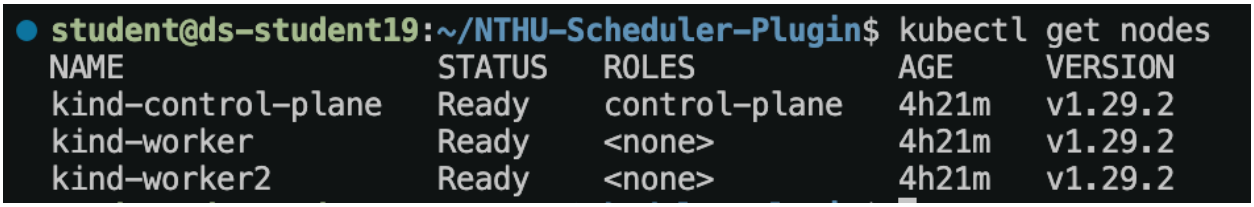
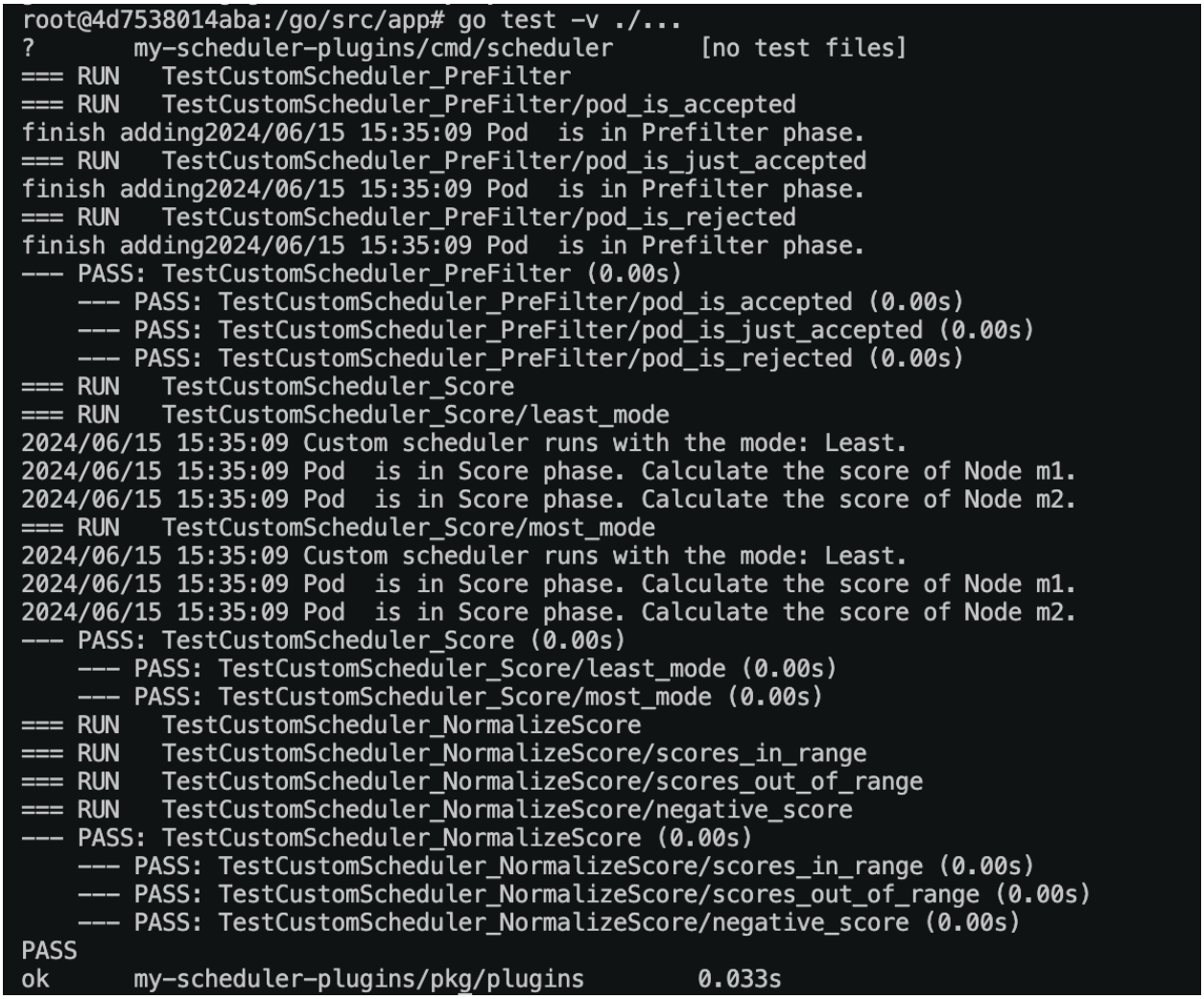
## The screenshot of `kubectl get nodes`



```
student@ds-student19:~/NTHU-Scheduler-Plugin$ kubectl get nodes
NAME                 STATUS   ROLES           AGE     VERSION
kind-control-plane   Ready    control-plane   4h21m   v1.29.2
kind-worker          Ready    <none>          4h21m   v1.29.2
kind-worker2         Ready    <none>          4h21m   v1.29.2
```

## The screenshot of passing all the unit tests



```
root@4d7538014aba:/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 15:35:09 Pod  is in Prefilter phase.
=== RUN   TestCustomScheduler_PreFilter/pod_is_just_accepted
finish adding2024/06/15 15:35:09 Pod  is in Prefilter phase.
=== RUN   TestCustomScheduler_PreFilter/pod_is_rejected
finish adding2024/06/15 15:35:09 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 15:35:09 Custom scheduler runs with the mode: Least.
2024/06/15 15:35:09 Pod  is in Score phase. Calculate the score of Node m1.
2024/06/15 15:35:09 Pod  is in Score phase. Calculate the score of Node m2.
=== RUN   TestCustomScheduler_Score/most_mode
2024/06/15 15:35:09 Custom scheduler runs with the mode: Least.
2024/06/15 15:35:09 Pod  is in Score phase. Calculate the score of Node m1.
2024/06/15 15:35:09 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        0.033s
```

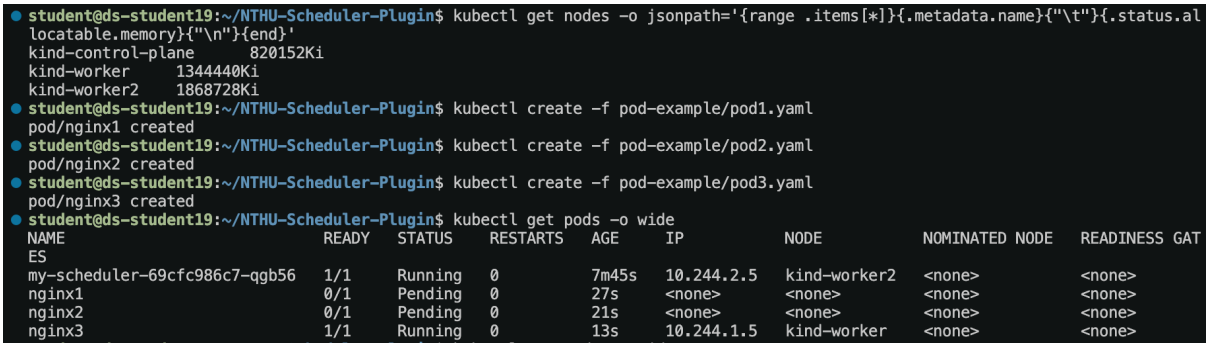
## Explain the 3 scenarios you design to validate your implementation by describing
## the expected results and showing the screenshots of the results.

- `PreFilter()`

1. First, I created 3 pods with identical configurations, except for the pod names. They belong to the same `podGroup` "A" and have a `minAvailable` value of 3.
2. From the logs, we can see that the first and second pods are unable to be scheduled since the available pods are less than 3. The third pod, however, is successfully bound to a node because there are a total of 3 pods, meeting the minimum availability requirement.
3. Using the `kubectl get pods -o wide` command, we can see that the status of the first and second pods is pending. After some time, they are rescheduled, and we can use the same command to confirm that all three pods are now running.
4. Additionally, we can check the logs to validate the correctness of the `PreFilter` function.

```
student@ds-student19:~/NTHU-Scheduler-Plugin$ kubectl create -f pod-example/pod1.yaml
pod/nginx1 created
student@ds-student19:~/NTHU-Scheduler-Plugin$ kubectl create -f pod-example/pod2.yaml
pod/nginx2 created
student@ds-student19:~/NTHU-Scheduler-Plugin$ kubectl create -f pod-example/pod3.yaml
pod/nginx3 created
student@ds-student19:~/NTHU-Scheduler-Plugin$ kubectl logs my-scheduler-69cfc986c7-krbh6 | tail -n10
I0615 15:42:50.626972       1 tlsconfig.go:200] "Loaded serving cert" certName="Generated self signed cert" certDetail="\"local
host@1718466170\" [serving] validServingFor=[127.0.0.1,localhost,localhost] issuer=\"localhost-ca@1718466169\" (2024-06-15 14:4
2:49 +0000 UTC to 2025-06-15 14:42:49 +0000 UTC (now=2024-06-15 15:42:50.62694945 +0000 UTC))"
I0615 15:42:50.627328       1 named_certificates.go:53] "Loaded SNI cert" index=0 certName="self-signed loopback" certDetail="\
"apiserver-loopback-client@1718466170\" [serving] validServingFor=[apiserver-loopback-client] issuer=\"apiserver-loopback-clien
t-ca@1718466170\" (2024-06-15 14:42:50 +0000 UTC to 2025-06-15 14:42:50 +0000 UTC (now=2024-06-15 15:42:50.627291647 +0000 UTC)
)"
I0615 15:43:25.684960       1 log.go:194] Pod nginx1 is in Prefilter phase.
I0615 15:43:25.685995       1 schedule_one.go:867] "Unable to schedule pod; no fit; waiting" pod="default/nginx1" err="0/3 node
s are available: Not enough pods in the group.. preemption: 0/3 nodes are available: 3 No preemption victims found for incoming
 pod.."
I0615 15:43:31.948671       1 log.go:194] Pod nginx2 is in Prefilter phase.
I0615 15:43:31.948938       1 schedule_one.go:867] "Unable to schedule pod; no fit; waiting" pod="default/nginx2" err="0/3 node
s are available: Not enough pods in the group.. preemption: 0/3 nodes are available: 3 No preemption victims found for incoming
 pod.."
I0615 15:43:38.846619       1 log.go:194] Pod nginx3 is in Prefilter phase.
I0615 15:43:38.847553       1 log.go:194] Pod nginx3 is in Score phase. Calculate the score of Node kind-worker2.
I0615 15:43:38.847583       1 log.go:194] Pod nginx3 is in Score phase. Calculate the score of Node kind-worker.
I0615 15:43:38.854702       1 schedule_one.go:252] "Successfully bound pod to node" pod="default/nginx3" node="kind-worker" eva
luatedNodes=3 feasibleNodes=2
student@ds-student19:~/NTHU-Scheduler-Plugin$ kubectl get pods -o wide
NAME                           READY   STATUS    RESTARTS   AGE     IP           NODE           NOMINATED NODE   READINESS GAT
ES
my-scheduler-69cfc986c7-krbh6   1/1     Running   0          2m23s   10.244.2.3   kind-worker2   <none>           <none>
nginx1                         0/1     Pending   0          106s    <none>       <none>         <none>           <none>
nginx2                         0/1     Pending   0          100s    <none>       <none>         <none>           <none>
nginx3                         1/1     Running   0          93s     10.244.1.2   kind-worker    <none>           <none>
student@ds-student19:~/NTHU-Scheduler-Plugin$ kubectl get pods -o wide
NAME                           READY   STATUS    RESTARTS   AGE     IP           NODE           NOMINATED NODE   READINESS GAT
ES
my-scheduler-69cfc986c7-krbh6   1/1     Running   0          6m42s   10.244.2.3   kind-worker2   <none>           <none>
nginx1                         1/1     Running   0          6m5s    10.244.1.4   kind-worker    <none>           <none>
nginx2                         1/1     Running   0          5m59s   10.244.1.3   kind-worker    <none>           <none>
nginx3                         1/1     Running   0          5m52s   10.244.1.2   kind-worker    <none>           <none>
student@ds-student19:~/NTHU-Scheduler-Plugin$ kubectl logs my-scheduler-69cfc986c7-krbh6 | tail -n10
I0615 15:43:38.847583       1 log.go:194] Pod nginx3 is in Score phase. Calculate the score of Node kind-worker.
I0615 15:43:38.854702       1 schedule_one.go:252] "Successfully bound pod to node" pod="default/nginx3" node="kind-worker" eva
luatedNodes=3 feasibleNodes=2
I0615 15:48:50.635566       1 log.go:194] Pod nginx1 is in Prefilter phase.
I0615 15:48:50.636739       1 log.go:194] Pod nginx1 is in Score phase. Calculate the score of Node kind-worker.
I0615 15:48:50.636799       1 log.go:194] Pod nginx1 is in Score phase. Calculate the score of Node kind-worker2.
I0615 15:48:50.637315       1 log.go:194] Pod nginx2 is in Prefilter phase.
I0615 15:48:50.637671       1 log.go:194] Pod nginx2 is in Score phase. Calculate the score of Node kind-worker.
I0615 15:48:50.637713       1 log.go:194] Pod nginx2 is in Score phase. Calculate the score of Node kind-worker2.
I0615 15:48:50.644632       1 schedule_one.go:252] "Successfully bound pod to node" pod="default/nginx2" node="kind-worker" eva
luatedNodes=3 feasibleNodes=2
I0615 15:48:50.647018       1 schedule_one.go:252] "Successfully bound pod to node" pod="default/nginx1" node="kind-worker" eva
luatedNodes=3 feasibleNodes=2
```

- `Score()` under “Least mode”
  1. Set the value of `pluginConfig.args.mode` to “Least” in the `charts/values.yaml` file.
  2. I use the `kubectl` command to display the allocatable memory of all nodes.
  3. We can see that the memory in `kind-worker` is less than that in `kind-worker2`, so we expect the pod to be bound to `kind-worker`.
  4. After creating the pods, we can see that the pod is indeed bound to `kind-worker`.




- `Score()` under “Most mode”
  1. Set the value of `pluginConfig.args.mode` to “Most” in the `charts/values.yaml` file.
  2. Similar to the previous example, we expect the pod to be bound to `kind-worker2` since its memory is larger than that in `kind-worker`.
  3. The pod is indeed bound to kind-worker2.