

Kubecttl get nodes:

```
student@ds-student14:~/NTHU-Scheduler-Plugin$ kubectl get nodes
NAME                 STATUS    ROLES    AGE   VERSION
kind-control-plane   Ready    control-plane   16d   v1.29.2
kind-worker           Ready    <none>         16d   v1.29.2
kind-worker2          Ready    <none>         16d   v1.29.2
```

Unit tests:

```
get downloading golang.org/x/mod/.../modinfo v0.0.0-20240611170712-...
?      my-scheduler-plugins/cmd/scheduler      [no test files]
=== RUN   TestCustomScheduler_PreFilter
=== RUN   TestCustomScheduler_PreFilter/pod_is_accepted
finish adding2024/06/14 08:36:29 Pod  is in Prefilter phase.
=== RUN   TestCustomScheduler_PreFilter/pod_is_just_accepted
finish adding2024/06/14 08:36:29 Pod  is in Prefilter phase.
=== RUN   TestCustomScheduler_PreFilter/pod_is_rejected
finish adding2024/06/14 08:36:29 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 08:36:29 Custom scheduler runs with the mode: Least.
2024/06/14 08:36:29 Pod  is in Score phase. Calculate the score of Node m1.
2024/06/14 08:36:29 Node m1's score: -100
2024/06/14 08:36:29 Pod  is in Score phase. Calculate the score of Node m2.
2024/06/14 08:36:29 Node m2's score: -200
=== RUN   TestCustomScheduler_Score/most_mode
2024/06/14 08:36:29 Custom scheduler runs with the mode: Least.
2024/06/14 08:36:29 Pod  is in Score phase. Calculate the score of Node m1.
2024/06/14 08:36:29 Node m1's score: 100
2024/06/14 08:36:29 Pod  is in Score phase. Calculate the score of Node m2.
2024/06/14 08:36:29 Node m2's score: 200
--- 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      0.036s
```

Scenarios

Spec1: 測試 prefilter

```

apiVersion: v1
kind: Pod
metadata:
  name: nginxa1
  labels:
    podGroup: "A"
    minAvailable: "3"
spec:
  schedulerName: my-scheduler
  containers:
  - name: nginx
    image: nginx:1.14.2
    ports:
    - containerPort: 80
    resources:
      requests:
        memory: "100Mi"
      limits:
        memory: "100Mi"

apiVersion: v1
kind: Pod
metadata:
  name: nginxa2
  labels:
    podGroup: "A"
    minAvailable: "3"
spec:
  schedulerName: my-scheduler
  containers:
  - name: nginx
    image: nginx:1.14.2
    ports:
    - containerPort: 80
    resources:
      requests:
        memory: "100Mi"
      limits:
        memory: "100Mi"

apiVersion: v1
kind: Pod
metadata:
  name: nginxa3
  labels:
    podGroup: "A"
    minAvailable: "3"
spec:
  schedulerName: my-scheduler
  containers:
  - name: nginx
    image: nginx:1.14.2
    ports:
    - containerPort: 80
    resources:
      requests:
        memory: "100Mi"
      limits:
        memory: "100Mi"

apiVersion: v1
kind: Pod
metadata:
  name: nginxb1
  labels:
    podGroup: "B"
    minAvailable: "3"
spec:
  schedulerName: my-scheduler
  containers:
  - name: nginx
    image: nginx:1.14.2
    ports:
    - containerPort: 80
    resources:
      requests:
        memory: "100Mi"
      limits:
        memory: "100Mi"

```

裡面有四個 pods，每個都是設 minAvailable 為 3，故 nginxa1, nginxa2 會沒辦法分配：

```

I0614 09:19:54.594294 1 log.go:194] Pod nginxa1 is in Prefilter phase.
I0614 09:19:54.595106 1 schedule_one.go:867] "Unable to schedule pod; no fit; waiting" pod="default/nginxa1" err="0/3 nodes are available: Not enough pods in the group. preemption: 0/3 nodes are available: 3 No preemption victims found for incoming pod.."
I0614 09:19:54.643178 1 log.go:194] Pod nginxa2 is in Prefilter phase.
I0614 09:19:54.643628 1 schedule_one.go:867] "Unable to schedule pod; no fit; waiting" pod="default/nginxa2" err="0/3 nodes are available: Not enough pods in the group. preemption: 0/3 nodes are available: 3 No preemption victims found for incoming pod.."

```

而 nginxa3 可以分配，因為 podGroup 為 A 的已經有三個 pod 了：

```

I0614 09:19:54.690744 1 log.go:194] Pod nginxa3 is in Prefilter phase.
I0614 09:19:54.691583 1 log.go:194] Pod nginxa3 is in Score phase. Calculate the score of Node kind-worker.
I0614 09:19:54.691614 1 log.go:194] Node kind-worker's remaining memory: 1293252KB, score: 1324290048
I0614 09:19:54.691665 1 log.go:194] Pod nginxa3 is in Score phase. Calculate the score of Node kind-worker2.
I0614 09:19:54.691678 1 log.go:194] Node kind-worker2's remaining memory: 1817540KB, score: 1861160960
I0614 09:19:54.697447 1 schedule_one.go:252] "Successfully bound pod to node" pod="default/nginxa3" node="kind-worker2" evaluatedNodes=3 feasibleNodes=2

```

最後 nginxb1 沒辦法分配，因為 podGroup 為 B 的數量沒超過 minAvailable：

```

I0614 09:19:54.737665 1 log.go:194] Pod nginxb1 is in Prefilter phase.
I0614 09:19:54.738035 1 schedule_one.go:867] "Unable to schedule pod; no fit; waiting" pod="default/nginxb1" err="0/3 nodes are available: Not enough pods in the group. preemption: 0/3 nodes are available: 3 No preemption victims found for incoming pod.."

```

最後結果：

Pod Name	QoS Class	Running	Pending	Terminated	Restart Count	Age
my-scheduler-69cfc986c7-wrb94	1/1	Running	0	0	0	9m22s
nginxa1	0/1	Pending	0	0	0	12s
nginxa2	0/1	Pending	0	0	0	12s
nginxa3	1/1	Running	0	0	0	12s
nginxb1	0/1	Pending	0	0	0	12s

Spec2: 測試 Most mode

用 grep 中在 log 中可以看到現在的 mode 是 Most:

```

I0614 09:44:23.425989 1 log.go:194] Custom scheduler runs with the mode: Most.
mode: Most

```

再來創建 pods:

```

apiVersion: v1
kind: Pod
metadata:
  name: nginxa4
  labels:
    podGroup: "A"
    minAvailable: "1"
spec:
  schedulerName: my-scheduler
  containers:
  - name: nginx
    image: nginx:1.14.2
    ports:
    - containerPort: 80
    resources:
      requests:
        memory: "1000Mi"
      limits:
        memory: "1000Mi"

```

```

apiVersion: v1
kind: Pod
metadata:
  name: nginxa5
  labels:
    podGroup: "A"
    minAvailable: "1"
spec:
  schedulerName: my-scheduler
  containers:
  - name: nginx
    image: nginx:1.14.2
    ports:
    - containerPort: 80
    resources:
      requests:
        memory: "500Mi"
      limits:
        memory: "500Mi"

```

```

apiVersion: v1
kind: Pod
metadata:
  name: nginxa6
  labels:
    podGroup: "A"
    minAvailable: "1"
spec:
  schedulerName: my-scheduler
  containers:
  - name: nginx
    image: nginx:1.14.2
    ports:
    - containerPort: 80
    resources:
      requests:
        memory: "500Mi"
      limits:
        memory: "500Mi"

```

Nginxa4 計算分數時，kind-worker2 剩餘 memory 比較多，即分數比較高，故會被分配到 kind-worker2

```

I0614 09:45:01.525584 1 log.go:194] Pod nginxa4 is in Prefilter phase.
I0614 09:45:01.526469 1 log.go:194] Pod nginxa4 is in Score phase. Calculate the score of Node kind-worker.
I0614 09:45:01.526499 1 log.go:194] Node kind-worker's remaining memory: 1293252KB, score: 1324290048
I0614 09:45:01.526528 1 log.go:194] Pod nginxa4 is in Score phase. Calculate the score of Node kind-worker2.
I0614 09:45:01.526537 1 log.go:194] Node kind-worker2's remaining memory: 1817540KB, score: 1861160960
I0614 09:45:01.533496 1 schedule_one.go:252] "Successfully bound pod to node" pod="default/nginxa4" node="kind-worker2" evaluatedNodes=3
feasibleNodes=2

```

接著 Nginxa5 計算分數時，kind-worker 剩餘 memory 比較多分數比較高，故會被分配到 kind-worker

```

I0614 09:45:01.570744 1 log.go:194] Pod nginxa5 is in Prefilter phase.
I0614 09:45:01.571274 1 log.go:194] Pod nginxa5 is in Score phase. Calculate the score of Node kind-worker.
I0614 09:45:01.571345 1 log.go:194] Node kind-worker's remaining memory: 1293252KB, score: 1324290048
I0614 09:45:01.571367 1 log.go:194] Pod nginxa5 is in Score phase. Calculate the score of Node kind-worker2.
I0614 09:45:01.571374 1 log.go:194] Node kind-worker2's remaining memory: 793540KB, score: 812584960
I0614 09:45:01.579158 1 schedule_one.go:252] "Successfully bound pod to node" pod="default/nginxa5" node="kind-worker" evaluatedNodes=3
feasibleNodes=2

```

接著 Nginxa6 計算分數時，kind-worker2 剩餘 memory 比較多分數比較高，故會被分配到 kind-worker2

```

I0614 09:45:01.616383 1 log.go:194] Pod nginxa6 is in Prefilter phase.
I0614 09:45:01.616746 1 log.go:194] Pod nginxa6 is in Score phase. Calculate the score of Node kind-worker.
I0614 09:45:01.616793 1 log.go:194] Node kind-worker's remaining memory: 781252KB, score: 800002048
I0614 09:45:01.616812 1 log.go:194] Pod nginxa6 is in Score phase. Calculate the score of Node kind-worker2.
I0614 09:45:01.616822 1 log.go:194] Node kind-worker2's remaining memory: 793540KB, score: 812584960
I0614 09:45:01.621449 1 schedule_one.go:252] "Successfully bound pod to node" pod="default/nginxa6" node="kind-worker2" evaluatedNodes=3
feasibleNodes=2

```

Spec3: 測試 least mode

```

I0614 09:36:19.142950 1 log.go:194] Custom scheduler runs with the mode: Least.
mode: Least

```

Pod Spec:

```

apiVersion: v1
kind: Pod
metadata:
  name: nginxa7
  labels:
    podGroup: "A"
    minAvailable: "1"
spec:
  schedulerName: my-scheduler
  containers:
  - name: nginx
    image: nginx:1.14.2
    ports:
    - containerPort: 80
    resources:
      requests:
        memory: "500Mi"
      limits:
        memory: "500Mi"

```

```

apiVersion: v1
kind: Pod
metadata:
  name: nginxa8
  labels:
    podGroup: "A"
    minAvailable: "1"
spec:
  schedulerName: my-scheduler
  containers:
  - name: nginx
    image: nginx:1.14.2
    ports:
    - containerPort: 80
    resources:
      requests:
        memory: "100Mi"
      limits:
        memory: "100Mi"

```

```

apiVersion: v1
kind: Pod
metadata:
  name: nginxa9
  labels:
    podGroup: "A"
    minAvailable: "1"
spec:
  schedulerName: my-scheduler
  containers:
  - name: nginx
    image: nginx:1.14.2
    ports:
    - containerPort: 80
    resources:
      requests:
        memory: "100Mi"
      limits:
        memory: "100Mi"

```

Nginxa7 計算分數時，kind-worker 剩餘 memory 比較少，即分數比較高，故會被分配到 kind-worker

```

I0614 10:04:12.728831 1 log.go:194] Pod nginxa7 is in Prefilter phase.
I0614 10:04:12.729842 1 log.go:194] Pod nginxa7 is in Score phase. Calculate the score of Node kind-worker.
I0614 10:04:12.729865 1 log.go:194] Node kind-worker's remaining memory: 1293252KB, score: -1324290048
I0614 10:04:12.729873 1 log.go:194] Pod nginxa7 is in Score phase. Calculate the score of Node kind-worker2.
I0614 10:04:12.729877 1 log.go:194] Node kind-worker2's remaining memory: 1817540KB, score: -1861160960
I0614 10:04:12.736121 1 schedule_one.go:252] "Successfully bound pod to node" pod="default/nginxa7" node="kind-worker" evaluatedNodes=3
feasibleNodes=2

```

接著 Nginxa8 計算分數時，kind-worker 剩餘 memory 比較少分數比較高，故會被分配到 kind-worker

```

I0614 10:04:12.781366 1 log.go:194] Pod nginxa8 is in Prefilter phase.
I0614 10:04:12.781728 1 log.go:194] Pod nginxa8 is in Score phase. Calculate the score of Node kind-worker.
I0614 10:04:12.781749 1 log.go:194] Node kind-worker's remaining memory: 781252KB, score: -800002048
I0614 10:04:12.781758 1 log.go:194] Pod nginxa8 is in Score phase. Calculate the score of Node kind-worker2.
I0614 10:04:12.781762 1 log.go:194] Node kind-worker2's remaining memory: 1817540KB, score: -1861160960
I0614 10:04:12.787825 1 schedule_one.go:252] "Successfully bound pod to node" pod="default/nginxa8" node="kind-worker" evaluatedNodes=3
feasibleNodes=2

```

接著 Nginxa9 計算分數時，kind-worker 剩餘 memory 比較少分數比較高，故會被分配到 kind-worker

```

I0614 10:04:12.834523 1 log.go:194] Pod nginxa9 is in Prefilter phase.
I0614 10:04:12.835421 1 log.go:194] Pod nginxa9 is in Score phase. Calculate the score of Node kind-worker2.
I0614 10:04:12.835449 1 log.go:194] Node kind-worker2's remaining memory: 1817540KB, score: -1861160960
I0614 10:04:12.835465 1 log.go:194] Pod nginxa9 is in Score phase. Calculate the score of Node kind-worker.
I0614 10:04:12.835473 1 log.go:194] Node kind-worker's remaining memory: 678852KB, score: -695144448
I0614 10:04:12.841182 1 schedule_one.go:252] "Successfully bound pod to node" pod="default/nginxa9" node="kind-worker" evaluatedNodes=3
feasibleNodes=2

```