
KODEKLOUD

Course Objectives

- Scheduling
  - Manual Scheduling
  - Labels & Selectors
  - Resource Limits
  - daemon Sets
  - Multiple Schedulers
  - Scheduler Events
  - Configure Kubernetes Scheduler
- Logging Monitoring
- Application Lifecycle Management
- Cluster Maintenance
- Security
- Storage
- Troubleshooting

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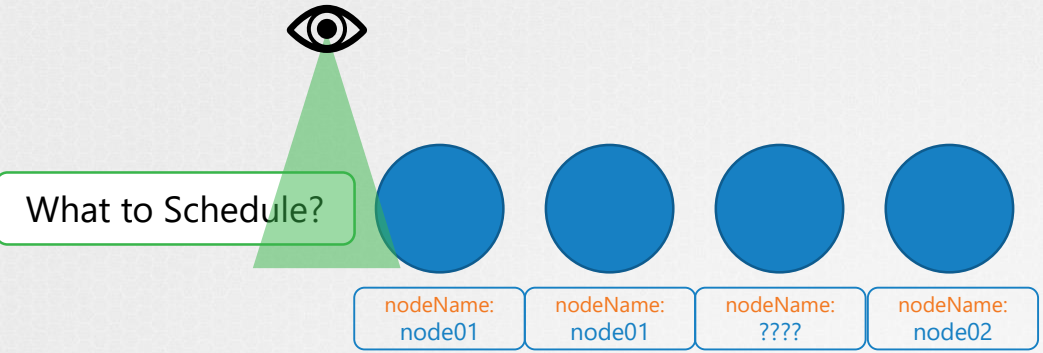
MANUAL SCHEDULING

How scheduling works



Which node to schedule?

(Schedule)Bind Pod to Node

nodeName:
node02

pod-definition.yaml

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: nginx
  labels:
    name: nginx
spec:
  containers:
  - name: nginx
    image: nginx
    ports:
      - containerPort: 8080

  nodeName: node02
```

No Scheduler!

```
kubectl get pods
```

```
NAME      READY     STATUS              RESTARTS   AGE
nginx     0/1       Pending             0          3s
```

```
kubectl get pods
```

```
NAME      READY     STATUS    RESTARTS   AGE       IP           NODE
nginx     1/1       Running   0          9s        10.40.0.4    node02
```

pod-definition.yaml

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: nginx
  labels:
    name: nginx
spec:
  containers:
  - name: nginx
    image: nginx
    ports:
      - containerPort: 8080

  nodeName: node02
```

No Scheduler!

Pod-bind-definition.yaml

```yaml
apiVersion: v1
kind: Binding
metadata:
  name: nginx
target:
  apiVersion: v1
  kind: Node
  name:
```

'{"apiVersion":"v1", "kind": "Binding" …. }

pod-definition.yaml

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: nginx
  labels:
    name: nginx
spec:
  containers:
  - name: nginx
    image: nginx
    ports:
      - containerPort: 8080

  nodeName: node02
```

Manual Scheduling of the Pods

```
curl --header "Content-Type:application/json" --request POST --data
http://$SERVER/api/v1/namespaces/default/pods/$PODNAME/binding/
```

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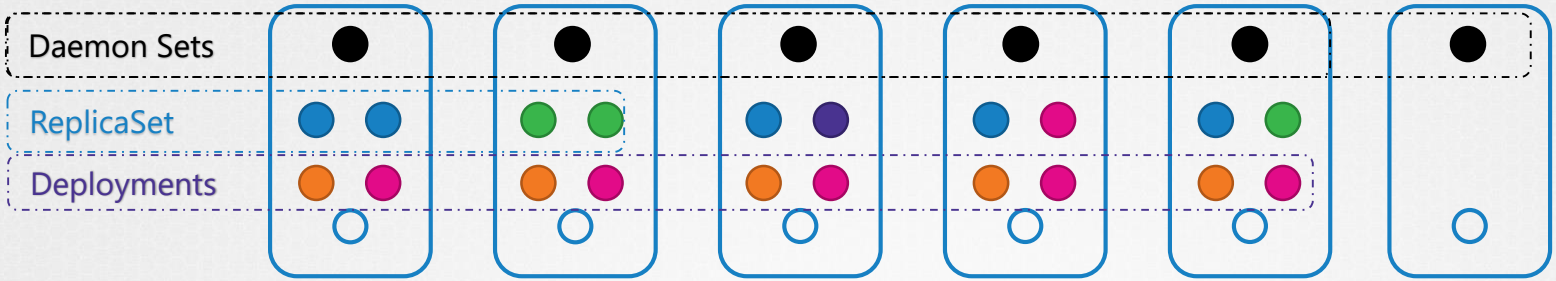
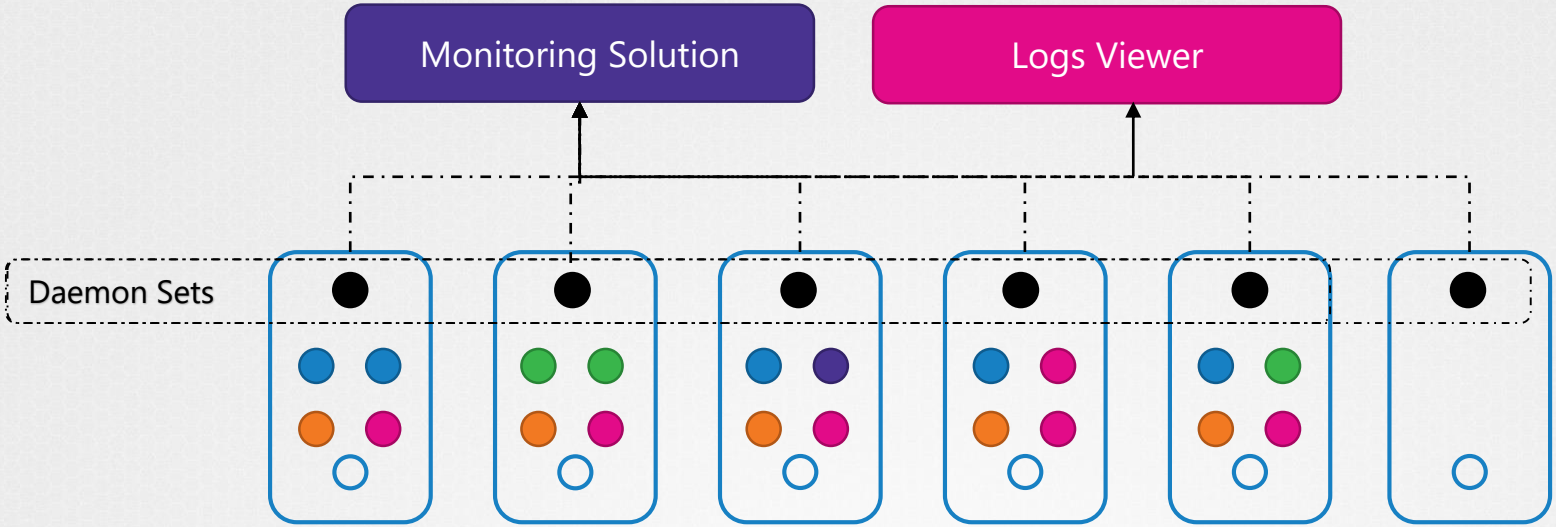
Daemon Sets

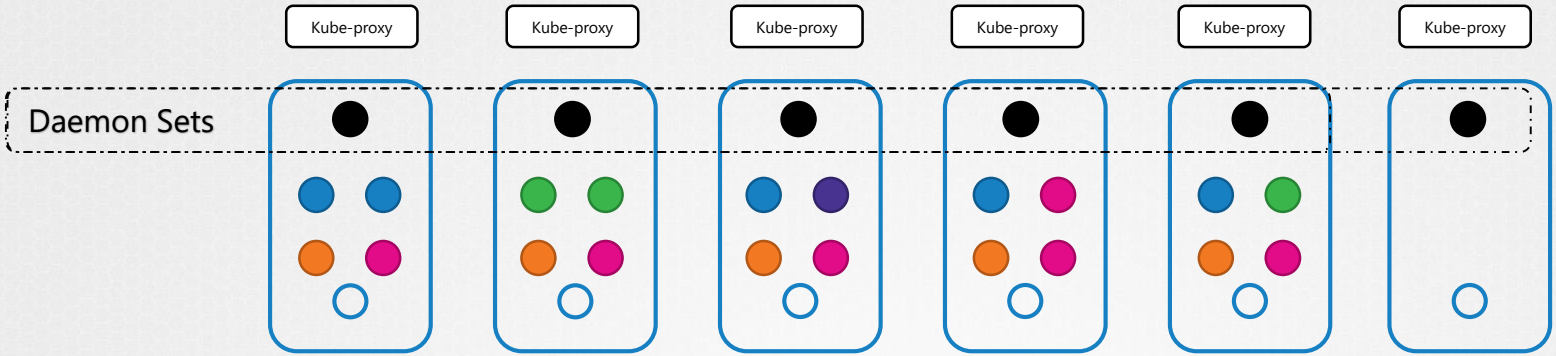
Daemon Sets



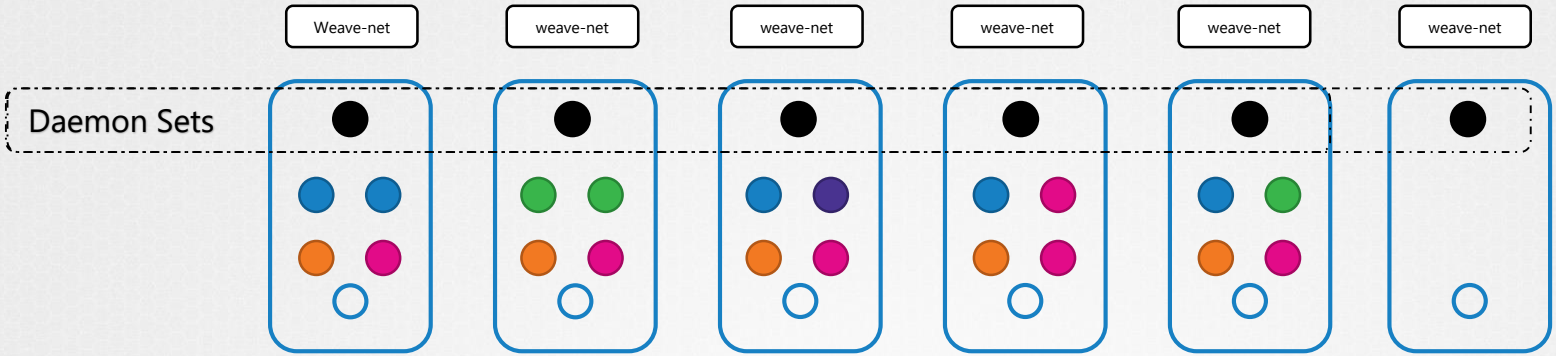
Daemon Sets – UseCase



Daemon Sets – UseCase – kube-proxy



Daemon Sets – UseCase – Networking



DaemonSet Definition

daemon-set-definition.yaml

```yaml
apiVersion: apps/v1
kind: DaemonSet
metadata:
  name: monitoring-daemon
spec:
  selector:
    matchLabels:
      app: monitoring-agent
  template:
    metadata:
      labels:
        app: monitoring-agent
    spec:
      containers:
      - name: monitoring-agent
        image: monitoring-agent
```

replicaset-definition.yaml

```yaml
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: monitoring-daemon
spec:
  selector:
    matchLabels:
      app: monitoring-agent
  template:
    metadata:
      labels:
        app: monitoring-agent
    spec:
      containers:
      - name: monitoring-agent
        image: monitoring-agent
```

```
kubectl create -f daemon-set-definition.yaml
```

```
daemon-set Created
```

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View DaemonSets

```
kubectl get daemonsets
```

```
      NAME         DESIRED   CURRENT   READY     UP-TO-DATE   AVAILABLE   AGE
monitoring-daemon   1         1         1         1            1           41
```

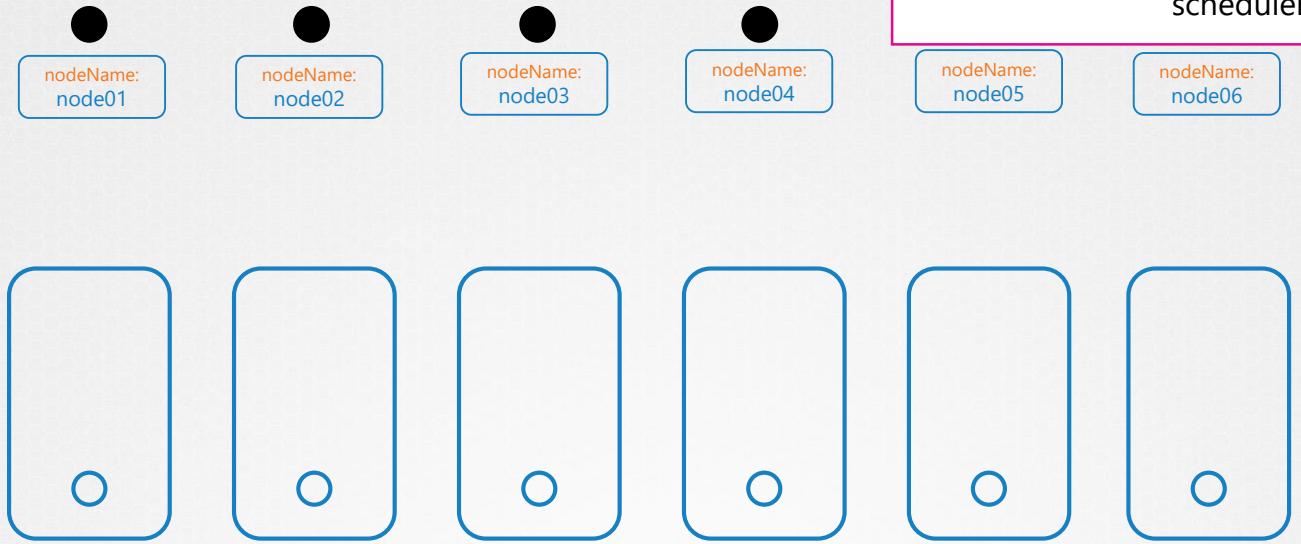
```
kubectl describe daemonsets monitoring-daemon
```

```
Name:           monitoring-daemon
Selector:       name=monitoring-daemon
Node-Selector:  <none>
Labels:         name=monitoring-daemon
Desired Number of Nodes Scheduled: 2
Current Number of Nodes Scheduled: 2
Number of Nodes Scheduled with Up-to-date Pods: 2
Number of Nodes Scheduled with Available Pods: 1
Number of Nodes Misscheduled: 0
Pods Status:  2 Running / 0 Waiting / 0 Succeeded / 0 Failed
Pod Template:
  Labels:           app=monitoring-agent
  Containers:
```

How does it work?

Default Behavior till v1.12

From v1.12 - uses NodeAffinity and default scheduler

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  - Resource Limits
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- Logging Monitoring
- Application Lifecycle Management
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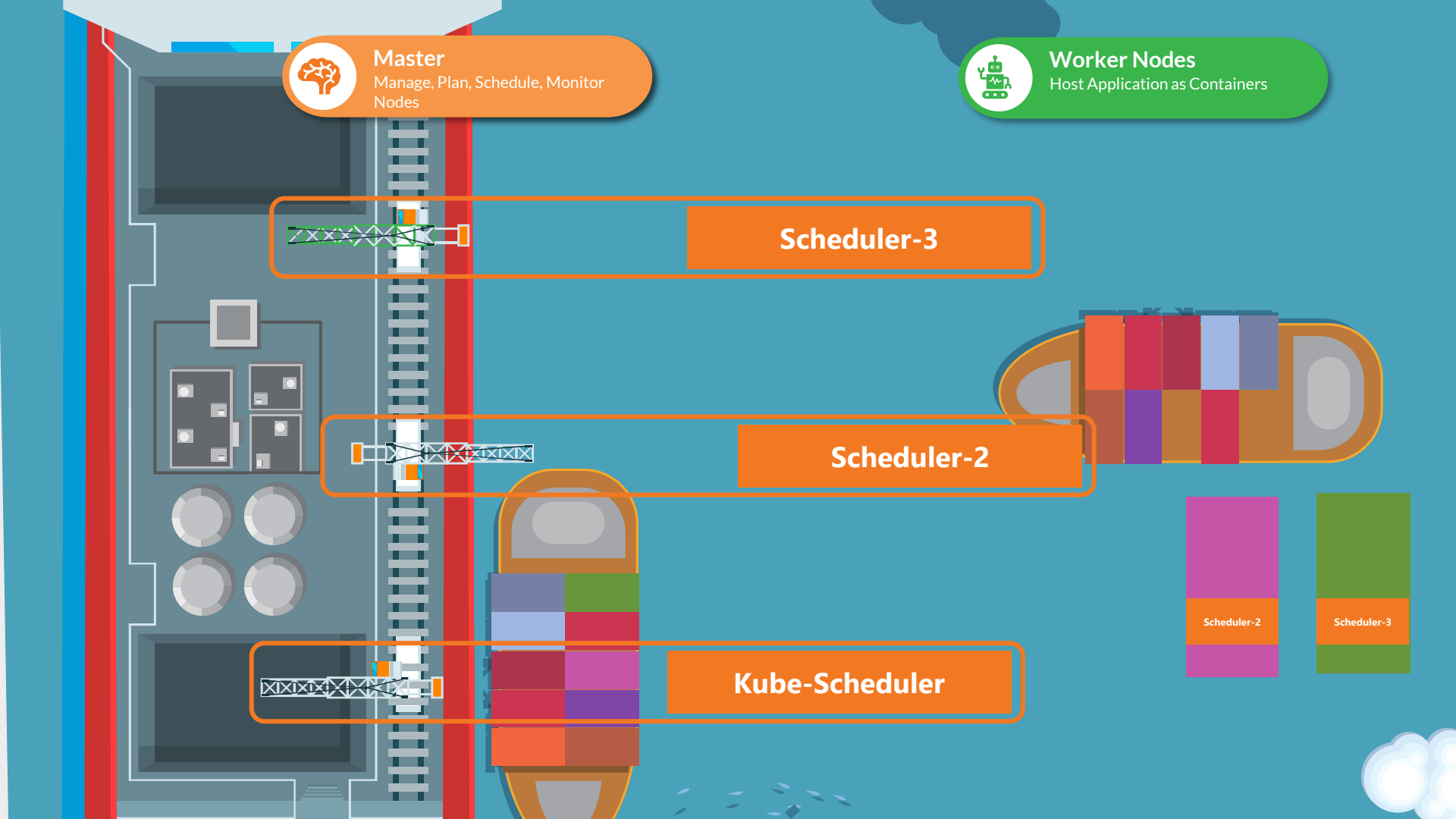
MULTIPLE SCHEDULERS


Master
Manage, Plan, Schedule, Monitor Nodes
Worker Nodes
Host Application as Containers
Scheduler-3
Scheduler-2
Kube-Scheduler
Scheduler-2
Scheduler-3

Deploy Additional Scheduler

```
wget https://storage.googleapis.com/kubernetes-release/release/v1.12.0/bin/linux/amd64/kube-scheduler
```

kube-scheduler.service

```
ExecStart=/usr/local/bin/kube-scheduler \\
  --config=/etc/kubernetes/config/kube-scheduler.yaml \\
  --scheduler-name= default-scheduler
```

my-custom-scheduler.service

```
ExecStart=/usr/local/bin/kube-scheduler \\
  --config=/etc/kubernetes/config/kube-scheduler.yaml \\
  --scheduler-name= my-custom-scheduler
```

Deploy Additional Scheduler - kubeadm

/etc/kubernetes/manifests/kube-scheduler.yaml

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: kube-scheduler
  namespace: kube-system
spec:
  containers:
  - command:
    - kube-scheduler
    - --address=127.0.0.1
    - --kubeconfig=/etc/kubernetes/scheduler.conf
    - --leader-elect=true
    image: k8s.gcr.io/kube-scheduler-amd64:v1.11.3
    name: kube-scheduler
```

my-custom-scheduler.yaml

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: my-custom-scheduler
  namespace: kube-system
spec:
  containers:
  - command:
    - kube-scheduler
    - --address=127.0.0.1
    - --kubeconfig=/etc/kubernetes/scheduler.conf
    - --leader-elect=true
    image: k8s.gcr.io/kube-scheduler-amd64:v1.11.3
    name: kube-scheduler
```

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View Schedulers

```
kubectl get pods --namespace=kube-system
```

```
NAME                              READY     STATUS    RESTARTS   AGE
coredns-78fcdf6894-bk4ml          1/1       Running   0          1h
coredns-78fcdf6894-ppr6m          1/1       Running   0          1h
etcd-master                       1/1       Running   0          1h
kube-apiserver-master             1/1       Running   0          1h
kube-controller-manager-master    1/1       Running   0          1h
kube-proxy-dgbgv                  1/1       Running   0          1h
kube-proxy-fptbr                  1/1       Running   0          1h
kube-scheduler-master             1/1       Running   0          1h
my-custom-scheduler               1/1       Running   0          9s
weave-net-4tfpt                   2/2       Running   1          1h
weave-net-6j6zs                   2/2       Running   1          1h
```

Use Custom Scheduler

```
kubectl get pods --namespace=kube-system
```

```
NAME                                READY     STATUS    RESTARTS   AGE
coredns-78fcdf6894-bk4ml            1/1       Running   0          1h
coredns-78fcdf6894-ppr6m            1/1       Running   0          1h
etcd-master                         1/1       Running   0          1h
kube-apiserver-master               1/1       Running   0          1h
kube-controller-manager-master      1/1       Running   0          1h
kube-proxy-dgbgv                    1/1       Running   0          1h
kube-proxy-fptbr                    1/1       Running   0          1h
kube-scheduler-master               1/1       Running   0          1h
my-custom-scheduler                 1/1       Running   0          9s
weave-net-4tfpt                     2/2       Running   1          1h
weave-net-6j6zs                     2/2       Running   1          1h
```

pod-definition.yaml

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: nginx
spec:
  containers:
  -   image: nginx
      name: nginx

   schedulerName:
```

```
kubectl create -f pod-definition.yaml
```

```
kubectl get pods
```

```
NAME      READY     STATUS    RESTARTS   AGE
nginx     0/1       Pending   0          6s
```

```
kubectl get pods
```

```
NAME      READY     STATUS    RESTARTS   AGE
nginx     1/1       Running   0          6s
```

View Events

```
kubectl get events
```

```
LAST SEEN   COUNT     NAME          KIND  TYPE      REASON      SOURCE                 MESSAGE
9s          1         nginx.15      Pod   Normal    Scheduled   my-custom-scheduler    Successfully assigned default/nginx to node01
8s          1         nginx.15      Pod   Normal    Pulling     kubelet, node01        pulling image "nginx"
2s          1         nginx.15      Pod   Normal    Pulled      kubelet, node01        Successfully pulled image "nginx"
2s          1         nginx.15      Pod   Normal    Created     kubelet, node01        Created container
2s          1         nginx.15      Pod   Normal    Started     kubelet, node01        Started container
```

View Scheduler Logs

```
kubectl logs my-custom-scheduler --name-space=kube-system
```

```
I0204 09:42:25.819338       1 server.go:126] Version: v1.11.3
W0204 09:42:25.822720       1 authorization.go:47] Authorization is disabled
W0204 09:42:25.822745       1 authentication.go:55] Authentication is disabled
I0204 09:42:25.822801       1 insecure_serving.go:47] Serving healthz insecurely on 127.0.0.1:10251
I0204 09:45:14.725407       1 controller_utils.go:1025] Waiting for caches to sync for scheduler controller
I0204 09:45:14.825634       1 controller_utils.go:1032] Caches are synced for scheduler controller
I0204 09:45:14.825814       1 leaderelection.go:185] attempting to acquire leader lease  kube-system/my-custom-scheduler...
I0204 09:45:14.834953       1 leaderelection.go:194] successfully acquired lease kube-system/my-custom-scheduler
```


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CONFIGURING SCHEDULER

Deploy Additional Scheduler

```
wget https://storage.googleapis.com/kubernetes-release/release/v1.12.0/bin/linux/amd64/kube-scheduler
```

kube-scheduler.service

```
ExecStart=/usr/local/bin/kube-scheduler \\
  --config=/etc/kubernetes/config/kube-scheduler.yaml \\
  --scheduler-name= default-scheduler
```

my-custom-scheduler.service

```
ExecStart=/usr/local/bin/kube-scheduler \\
  --config=/etc/kubernetes/config/kube-scheduler.yaml \\
  --scheduler-name= my-custom-scheduler
```

Deploy Additional Scheduler - kubeadm

/etc/kubernetes/manifests/kube-scheduler.yaml

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: kube-scheduler
  namespace: kube-system
spec:
  containers:
  - command:
    - kube-scheduler
    - --address=127.0.0.1
    - --kubeconfig=/etc/kubernetes/scheduler.conf
    - --leader-elect=true
    image: k8s.gcr.io/kube-scheduler-amd64:v1.11.3
    name: kube-scheduler
```

my-custom-scheduler.yaml

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: my-custom-scheduler
  namespace: kube-system
spec:
  containers:
  - command:
    - kube-scheduler
    - --address=127.0.0.1
    - --kubeconfig=/etc/kubernetes/scheduler.conf
    - --leader-elect=true
    image: k8s.gcr.io/kube-scheduler-amd64:v1.11.3
    name: kube-scheduler
    - --lock-object-name=my-custom-scheduler
```

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- Scheduling
- Logging Monitoring
- Application Lifecycle Management
- Cluster Maintenance
- Security
  - Authentication & Authorization
  - Kubernetes Security
  - Network Policies
- Storage
- Troubleshooting

Secrets

- TLS Certificates for Cluster Components
- Images Securely
- Security Contexts
- Secure Persistent Key Value Store

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AUTHENTICATION