Placement - OpenFaaS - Kubernetes

- Adding a nodeselector field with specific node labels of a node to be matched
- Adding affinity and anti-affinity constraints, specifying required and preferred rules to be satisfied
- Adding a nodeName field, specifying the exact node to be selected
- Pod topology spread constraints, creating zones of nodes

Placement with nodeName

First, checking if kubernetes cluster is running properly:

kubectl cluster-info

```
root@kube-master:/home/barbara# kubectl cluster-info
Kubernetes control plane is running at https://127.0.0.1:6443
CoreDNS is running at https://127.0.0.1:6443/api/v1/namespaces/kube-system/services/kube-dns:dns/proxy
Metrics-server is running at https://127.0.0.1:6443/api/v1/namespaces/kube-system/services/https:metrics-server:https/proxy
```

kubectl get nodes

```
root@kube-master:/home/barbara# kubectl get nodes
NAME           STATUS   ROLES                  AGE   VERSION
kube-worker1   Ready    worker                 8d    v1.25.3+k3s1
kube-master    Ready    control-plane,master   8d    v1.25.3+k3s1
kube-worker2   Ready    worker                 8d    v1.25.3+k3s1
```

kubectl get pods -n kube-system

```
root@kube-master:/home/barbara# kubectl get pods -n kube-system
NAME                                   READY   STATUS      RESTARTS        AGE
helm-install-traefik-crd-krgh5         0/1     Completed   0               8d
helm-install-traefik-rb5d4             0/1     Completed   1               8d
svclb-traefik-b650ac6a-5jntr           2/2     Running     6 (6d5h ago)    8d
coredns-75fc8f8fff-dp5h8               1/1     Running     3 (6d5h ago)    8d
local-path-provisioner-5b5579c644-d4tfm 1/1    Running     4 (6d5h ago)    8d
traefik-9c6dc6686-645sh                1/1     Running     3 (6d5h ago)    8d
metrics-server-5c8978b444-pvxs6        1/1     Running     4 (6d5h ago)    8d
svclb-traefik-b650ac6a-k9ngp           2/2     Running     2 (4d19h ago)   8d
svclb-traefik-b650ac6a-z8sds           2/2     Running     2 (4d18h ago)   8d
```

1) Creating and modifying Pod Manifest - nodeName

kubectl run nginx --image=nginx --dry-run=client -o yaml > placement_using_nodename.yaml

```
root@kube-master:/home/barbara# kubectl run nginx --image=nginx --dry-run=client -o yaml > placement_using_nodename.yaml
root@kube-master:/home/barbara#
```

Modifying:

```
apiVersion: v1
kind: Pod
metadata:
  labels:
    run: nginx
  name: nginx
spec:
  nodeName: kube-worker2
  containers:
  - image: nginx:1.14.2
    name: nginx
```

kubectl apply --dry-run=client -f placement_using_nodename.yaml

kubectl apply -f placement_using_nodename.yaml

kubectl get pods

kubectl get pods -o wide

```
root@kube-master:/home/barbara# kubectl apply --dry-run=client -f placement_using_nodename.yaml
pod/nginx created (dry run)
root@kube-master:/home/barbara# kubectl apply -f placement_using_nodename.yaml
pod/nginx created
root@kube-master:/home/barbara# kubectl get pods
NAME    READY   STATUS               RESTARTS   AGE
nginx   0/1     ContainerCreating    0          11s
root@kube-master:/home/barbara# kubectl get pods -o wide
NAME    READY   STATUS    RESTARTS   AGE    IP           NODE           NOMINATED NODE   READINESS GATES
nginx   1/1     Running   0          24s    10.42.2.8    kube-worker2   <none>           <none>
```

Placement with nodeSelector

1) Adding custom labels to the worker node:

kubectl label nodes kube-worker1 workertype=green

```
root@kube-master:/home/barbara# kubectl label nodes kube-worker1  workertype=green

node/kube-worker1 labeled
```

Verifying:

kubectl get nodes –show-labels

```
root@kube-master:/home/barbara# kubectl get nodes --show-labels
NAME           STATUS   ROLES               AGE    VERSION       LABELS
kube-worker1   Ready    worker              9d     v1.25.3+k3s1   beta.kubernetes.io/arch=amd64,beta.kubernetes.io/insta
nce-type=k3s,beta.kubernetes.io/os=linux,egress.k3s.io/cluster=true,kubernetes.io/arch=amd64,kubernetes.io/hostname=kube-w
orker1,kubernetes.io/os=linux,node-role.kubernetes.io/worker=worker,node.kubernetes.io/instance-type=k3s,workertype=green
kube-master    Ready    control-plane,master  10d    v1.25.3+k3s1   beta.kubernetes.io/arch=amd64,beta.kubernetes.io/insta
nce-type=k3s,beta.kubernetes.io/os=linux,egress.k3s.io/cluster=true,kubernetes.io/arch=amd64,kubernetes.io/hostname=kube-m
aster,kubernetes.io/os=linux,node-role.kubernetes.io/control-plane=true,node-role.kubernetes.io/master=true,node.kubernete
s.io/instance-type=k3s
kube-worker2   Ready    worker              9d     v1.25.3+k3s1   beta.kubernetes.io/arch=amd64,beta.kubernetes.io/insta
nce-type=k3s,beta.kubernetes.io/os=linux,egress.k3s.io/cluster=true,kubernetes.io/arch=amd64,kubernetes.io/hostname=kube-w
orker2,kubernetes.io/os=linux,node-role.kubernetes.io/worker=worker,node.kubernetes.io/instance-type=k3s
```

2) Creating and modifying Pod Manifest

kubectl run nginx --image=nginx --dry-run=client -o yaml > placement_using_nodeSelector.yaml

```
root@kube-master:/home/barbara# kubectl run nginx --image=nginx --dry-run=client -o yaml > placement_using_nodeSelector.ya
ml
root@kube-master:/home/barbara# vi placement_using_nodeSelector.yaml
```

```
apiVersion: v1
kind: Pod
metadata:
  labels:
    run: nginx
  name: nginx
spec:
  nodeSelector:
      workertype: green
  containers:
    - image: nginx:1.14.2
      name: nginx
```

```
root@kube-master:/home/barbara# kubectl apply --dry-run=client -f placement_using_nodeSelector.yaml
pod/nginx created (dry run)
root@kube-master:/home/barbara# kubectl apply -f placement_using_nodeSelector.yaml
pod/nginx created
```

```
root@kube-master:/home/barbara# kubectl get pods -o wide
NAME    READY   STATUS    RESTARTS   AGE   IP           NODE           NOMINATED NODE   READINESS GATES
nginx   1/1     Running   0          36s   10.42.1.10   kube-worker1   <none>           <none>
```

Placement with nodeAffinity

1) Adding labels to the Nodes:

kubectl label nodes kube-worker1 webserver=nginx workertype=python size=small

```
root@kube-master:/home/barbara# kubectl label nodes kube-worker1 webserver=nginx workertype=python size=small
node/kube-worker1 labeled
```

kubectl label nodes kube-worker2 webserver=apache workertype=python size=large

```
root@kube-master:/home/barbara# kubectl label nodes kube-worker2 webserver=apache workertype=python size=large
node/kube-worker2 labeled
```

2) Creating the file

kubectl run nginx --image=nginx --dry-run=client -o yaml > placement_using_required.yaml

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: nginx
spec:
  containers:
  - image: nginx
    name: nginx
  affinity:
    nodeAffinity:
      requiredDuringSchedulingIgnoredDuringExecution:
        nodeSelectorTerms:
        - matchExpressions:
          - key: webserver
            operator: In
            values:
            - nginx
```

kubectl apply -f placement_using_required.yaml

```
root@kube-master:/home/barbara# vi placement_using_required.yaml
root@kube-master:/home/barbara# kubectl apply -f placement_using_required.yaml
pod/nginx created
```

kubectl get pods -o wide

```
root@kube-master:/home/barbara# kubectl get pods -o wide
NAME    READY   STATUS    RESTARTS   AGE   IP           NODE          NOMINATED NODE   READINESS GATES
nginx   1/1     Running   0          53s   10.42.1.11   kube-worker1  <none>           <none>
```

kubectl apply -f placement_using_preferred.yaml

```
apiVersion: v1
kind: Pod
metadata:
  name: nginx
spec:
  containers:
  - image: nginx
    name: nginx
  affinity:
    nodeAffinity:
      preferredDuringSchedulingIgnoredDuringExecution:
      - weight: 10
        preference:
          matchExpressions:
          - key: size
            operator: In
            values:
            - large
~
```

```
root@kube-master:/home/barbara# kubectl apply -f placement_using_preferred.yaml
pod/nginx created
```

kubectl get pods -o wide

NAME	READY	STATUS	RESTARTS	AGE	IP	NODE	NOMINATED NODE	READINESS GATES
nginx	0/1	ContainerCreating	0	6s	<none>	kube-worker2	<none>	<none>

root@kube-master:/home/barbara# kubectl get pods -o wide

Using function manifest

```
root@kube-master:/home/barbara# faas-cli new --lang go fn1
Folder: fn1 created.



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Function created in folder: fn1
Stack file written: fn1.yml

Notes:
Warning: this classic Go template has been DEPRECATED and
is being maintained for backwards compatibility reasons only.

Use the golang-middleware template instead, learn more at:

See more: https://docs.openfaas.com/cli/templates

root@kube-master:/home/barbara# faas-cli new --lang go fn2 --append=fn1.yml
Folder: fn2 created.



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Function created in folder: fn2
Stack file updated: fn1.yml
```

```
root@kube-master:/home/barbara# kubectl label node kube-worker1 --overwrite lowmem=true
node/kube-worker1 labeled
```

```
root@kube-master:/home/barbara# vi stack.yml
root@kube-master:/home/barbara# faas-cli up
[0] > Building fn1.
Clearing temporary build folder:  /build/fn1/
```

```
root@kube-master:/home/barbara# faas-cli deploy
Deploying: fn1.

Deployed. 202 Accepted.
URL: http://127.0.0.1:8080/function/fn1
```

```
root@kube-master:/home/barbara# kubectl get event -n openfaas-fn -w
LAST SEEN   TYPE     REASON              OBJECT                       MESSAGE
53s         Normal   ScalingReplicaSet   deployment/fn1               Scaled up replica set fn1-58fc68cbc7 to 1
53s         Normal   SuccessfulCreate    replicaset/fn1-58fc68cbc7    Created pod: fn1-58fc68cbc7-kgc2v
52s         Normal   Scheduled           pod/fn1-58fc68cbc7-kgc2v     Successfully assigned openfaas-fn/fn1-58fc68cbc7-kgc2v to kube-worker1
52s         Normal   Pulling             pod/fn1-58fc68cbc7-kgc2v     Pulling image "barbaraazeitona/fn1:latest"
46s         Normal   Pulled              pod/fn1-58fc68cbc7-kgc2v     Successfully pulled image "barbaraazeitona/fn1:latest" in 5.588472736s
46s         Normal   Created             pod/fn1-58fc68cbc7-kgc2v     Created container fn1
46s         Normal   Started             pod/fn1-58fc68cbc7-kgc2v     Started container fn1
```