《 Kubernetes 原理剖析与实战应用》

正范

07 | 有状态应用：Kubernetes 如何通过 StatefulSet 支持有状态应用

Kubernetes 中的另外一种工作负载 **StatefulSet**

主要**用于有状态的服务发布**

在 kubectl 命令行中，一般将 StatefulSet 简写为 sts

在部署一个 StatefulSet 的时候，有个前置依赖对象，即 Service（服务）

```
$ cat nginx-svc.yaml
apiVersion: v1
kind: Service
metadata:
 name: nginx-demo
 namespace: demo
 labels:
  app: nginx
spec:
 clusterIP: None
 ports:
 - port: 80
  name: web
 selector:
  app: nginx
```

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```
$ kubectl create ns demo
$ kubectl create -f nginx-svc.yaml
service/nginx-demo created
$ kubectl get svc -n demo
NAME        TYPE      CLUSTER-IP      EXTERNAL-IP  PORT(S)  AGE
nginx-demo  ClusterIP  None           <none>       80/TCP   5s
```

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```
$ cat web-sts.yaml
apiVersion: apps/v1
kind: StatefulSet
metadata:
 name: web-demo
 namespace: demo
spec:
 serviceName: "nginx-demo"
 replicas: 2
 selector:
  matchLabels:
   app: nginx
 template:
  metadata:
   labels:
    app: nginx
  spec:
   containers:
   - name: nginx
```

```
    replicas: 2
    selector:
     matchLabels:
      app: nginx
    template:
     metadata:
      labels:
       app: nginx
     spec:
      containers:
      - name: nginx
        image: nginx:1.19.2-alpine
        ports:
        - containerPort: 80
          name: web
$ kubectl create -f web-sts.yaml
$ kubectl get sts -n demo
NAME      READY  AGE
web-demo  0/2    9s
```

StatefulSet 的特性

```
$ kubectl get pod -n demo -w
NAME           READY    STATUS              RESTARTS    AGE
web-demo-0     0/1      ContainerCreating   0           18s
web-demo-0     1/1      Running             0           20s
web-demo-1     0/1      Pending             0           0s
web-demo-1     0/1      Pending             0           0s
web-demo-1     0/1      ContainerCreating   0           0s
web-demo-1     1/1      Running             0           2s
```

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$ kubectl get pod -n demo -w -l app=nginx

StatefulSet 的特性

```
$ kubectl get pod -n demo -w -l app=nginx
```

```
$ kubectl get event -n demo -w
```

StatefulSet 的特性

```
$ kubectl get event -n demo -w
```

```
$ kubectl scale sts web-demo -n demo --replicas=5
statefulset.apps/web-demo scaled
```

StatefulSet 的特性

```
$ kubectl get pod -n demo -w
NAME          READY  STATUS             RESTARTS    AGE
web-demo-0    1/1    Running            0           20m
web-demo-1    1/1    Running            0           20m
web-demo-2    0/1    Pending            0           0s
web-demo-2    0/1    Pending            0           0s
web-demo-2    0/1    ContainerCreating  0           0s
web-demo-2    1/1    Running            0           2s
web-demo-3    0/1    Pending            0           0s
web-demo-3    0/1    Pending            0           0s
web-demo-3    0/1    ContainerCreating  0           0s
web-demo-3    1/1    Running            0           3s
web-demo-4    0/1    Pending            0           0s
web-demo-4    0/1    Pending            0           0s
web-demo-4    0/1    ContainerCreating  0           0s
web-demo-4    1/1    Running            0           3s
```

StatefulSet 的特性

```
$ kubectl get event -n demo -w
LAST SEEN   TYPE    REASON          OBJECT          MESSAGE
20m         Normal  Scheduled           pod/web-demo-0      Successfully assigned demo/web-
demo-0 to kraken
20m         Normal  Pulling         pod/web-demo-0      Pulling image "nginx:1.19.2-alpine"
20m         Normal  Pulled          pod/web-demo-0      Successfully pulled image
"nginx:1.19.2-alpine"
20m         Normal  Created             pod/web-demo-0       Created container nginx
20m         Normal  Started             pod/web-demo-0       Started container nginx
20m         Normal  Scheduled           pod/web-demo-1       Successfully assigned demo/web-
demo-1 to kraken
20m         Normal  Pulled          pod/web-demo-1      Container image "nginx:1.19.2-
alpine" already present on machine
20m         Normal  Created             pod/web-demo-1       Created container nginx
20m         Normal  Started             pod/web-demo-1       Started container nginx
20m         Normal  SuccessfulCreate  statefulset/web-demo  create Pod web-demo-0 in
StatefulSet web-demo successful
20m         Normal  SuccessfulCreate  statefulset/web-demo  create Pod web-demo-1 in
StatefulSet web-demo successful
0s          Normal  SuccessfulCreate  statefulset/web-demo  create Pod web-demo-2 in
StatefulSet web-demo successful
0s          Normal  Scheduled       pod/web-demo-2      Successfully assigned demo/web-
demo-2 to kraken
0s          Normal  Pulled          pod/web-demo-2      Container image "nginx:1.19.2-alpine"
```

StatefulSet 的特性

0s   Normal SuccessfulCreate statefulset/web-demo create Pod web-demo-2 in
StatefulSet web-demo successful
0s   Normal Scheduled   pod/web-demo-2   Successfully assigned demo/web-
demo-2 to kraken
0s   Normal Pulled   pod/web-demo-2   Container image "nginx:1.19.2-alpine"
already present on machine
0s   Normal Created   pod/web-demo-2   Created container nginx
0s   Normal Started   pod/web-demo-2   Started container nginx
0s   Normal SuccessfulCreate statefulset/web-demo create Pod web-demo-3 in
StatefulSet web-demo successful
0s   Normal Scheduled   pod/web-demo-3   Successfully assigned demo/web-
demo-3 to kraken
0s   Normal Pulled   pod/web-demo-3   Container image "nginx:1.19.2-alpine"
already present on machine
0s   Normal Created   pod/web-demo-3   Created container nginx
0s   Normal Started   pod/web-demo-3   Started container nginx
0s   Normal SuccessfulCreate statefulset/web-demo create Pod web-demo-4 in
StatefulSet web-demo successful
0s   Normal Scheduled   pod/web-demo-4   Successfully assigned demo/web-
demo-4 to kraken
0s   Normal Pulled   pod/web-demo-4   Container image "nginx:1.19.2-alpine"
already present on machine
0s   Normal Created   pod/web-demo-4   Created container nginx
0s   Normal Started   pod/web-demo-4   Started container nginx

```
$ kubectl scale sts web-demo -n demo --replicas=5

statefulset.apps/web-demo scaled
```

StatefulSet 的特性

```
web-demo-4  1/1   Terminating 0      11m
web-demo-4  0/1   Terminating 0      11m
web-demo-4  0/1   Terminating 0      11m
web-demo-4  0/1   Terminating 0      11m
web-demo-3  1/1   Terminating 0      12m
web-demo-3  0/1   Terminating 0      12m
web-demo-3  0/1   Terminating 0      12m
web-demo-3  0/1   Terminating 0      12m
web-demo-2  1/1   Terminating 0      12m
web-demo-2  0/1   Terminating 0      12m
web-demo-2  0/1   Terminating 0      12m
web-demo-2  0/1   Terminating 0      12m
```

StatefulSet 的特性

```
0s      Normal  SuccessfulDelete  statefulset/web-demo  delete Pod web-demo-4 in
StatefulSet web-demo successful
0s      Normal  Killing           pod/web-demo-4        Stopping container nginx
0s      Normal  Killing           pod/web-demo-3        Stopping container nginx
0s      Normal  SuccessfulDelete  statefulset/web-demo  delete Pod web-demo-3 in
StatefulSet web-demo successful
0s      Normal  SuccessfulDelete  statefulset/web-demo  delete Pod web-demo-2 in
StatefulSet web-demo successful
0s      Normal  Killing           pod/web-demo-2        Stopping container nginx
```

StatefulSet 的特性

```
$ for i in 0 1; do kubectl exec web-demo-$i -n demo -- sh -c 'hostname'; done

web-demo-0

web-demo-1
```

StatefulSet 的特性

```
$ kubectl get pod -n demo -l app=nginx -o wide
NAME       READY  STATUS   RESTARTS  AGE    IP          NODE    NOMINATED NODE
READINESS GATES
web-demo-0 1/1    Running  0         3h17m  10.244.0.39 kraken  <none>          <none>
web-demo-1 1/1    Running  0         3h17m  10.244.0.40 kraken  <none>          <none>
```

StatefulSet 的特性

```
$ kubectl run -it --rm --image busybox:1.28 dns-test -n demo
If you don't see a command prompt, try pressing enter.
/ # nslookup web-demo-0.nginx-demo
Server:    10.96.0.10
Address 1: 10.96.0.10 kube-dns.kube-system.svc.cluster.local

Name:     web-demo-0.nginx-demo
Address 1: 10.244.0.39 web-demo-0.nginx-demo.demo.svc.cluster.local
/ # nslookup web-demo-1.nginx-demo
Server:    10.96.0.10
Address 1: 10.96.0.10 kube-dns.kube-system.svc.cluster.local

Name:     web-demo-1.nginx-demo
Address 1: 10.244.0.40 web-demo-1.nginx-demo.demo.svc.cluster.local
```

StatefulSet 的特性

```
$ kubectl delete pod -l app=nginx -n demo
pod "web-demo-0" deleted
pod "web-demo-1" deleted
$ kubectl get pod -l app=nginx -n demo -o wide
NAME       READY  STATUS   RESTARTS  AGE  IP          NODE    NOMINATED NODE
READINESS GATES
web-demo-0  1/1    Running  0        15s  10.244.0.50  kraken  <none>          <none>
web-demo-1  1/1    Running  0        13s  10.244.0.51  kraken  <none>          <none>
```

StatefulSet 的特性

```
$ kubectl run -it --rm --image busybox:1.28 dns-test -n demo
If you don't see a command prompt, try pressing enter.
/ # nslookup web-demo-0.nginx-demo
Server:    10.96.0.10
Address 1: 10.96.0.10 kube-dns.kube-system.svc.cluster.local


Name:     web-demo-0.nginx-demo
Address 1: 10.244.0.50 web-demo-0.nginx-demo.demo.svc.cluster.local
/ # nslookup web-demo-1.nginx-demo
Server:    10.96.0.10
Address 1: 10.96.0.10 kube-dns.kube-system.svc.cluster.local


Name:     web-demo-1.nginx-demo
Address 1: 10.244.0.51 web-demo-1.nginx-demo.demo.svc.cluster.local
```

RollingUpdate

是默认的更新策略

OnDelete

当更新策略设置为 OnDelete 时
必须手动先删除 Pod
才能触发新的 Pod 更新

StatefulSet 中

支持两种更新升级策略

StatefulSet 的特点：

- 具备固定的网络标记，比如主机名，域名等

- 支持持久化存储，而且最好能够跟实例一一绑定

- 可以按照顺序来部署和扩展

- 可以按照顺序进行终止和删除操作

- 在进行滚动升级的时候，也会按照一定顺序

Next：《08 | 配置管理：Kubernetes 管理业务配置方式有哪些？》

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