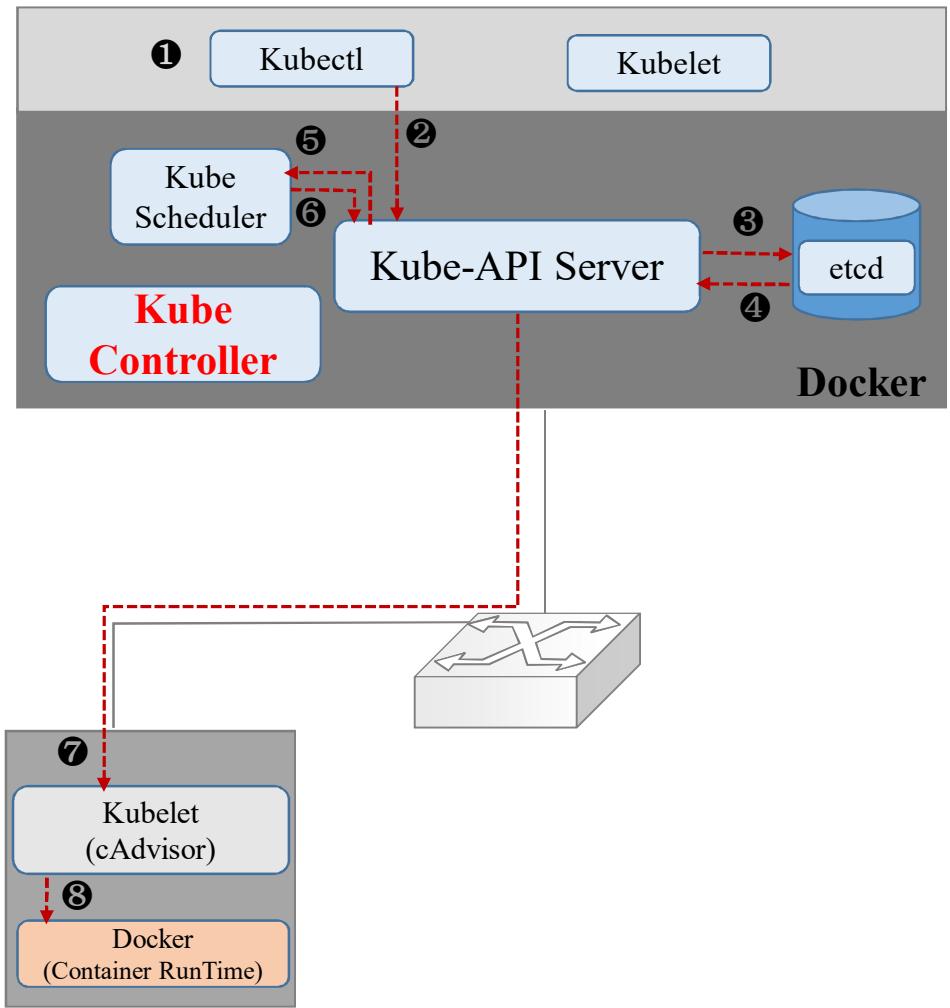


K8s Controller

- Pod 개수 보장
- 파드들을 관리하는 역할
 - 장시간 실행되는 파드 관리
 - 파드들의 주기적인 배치



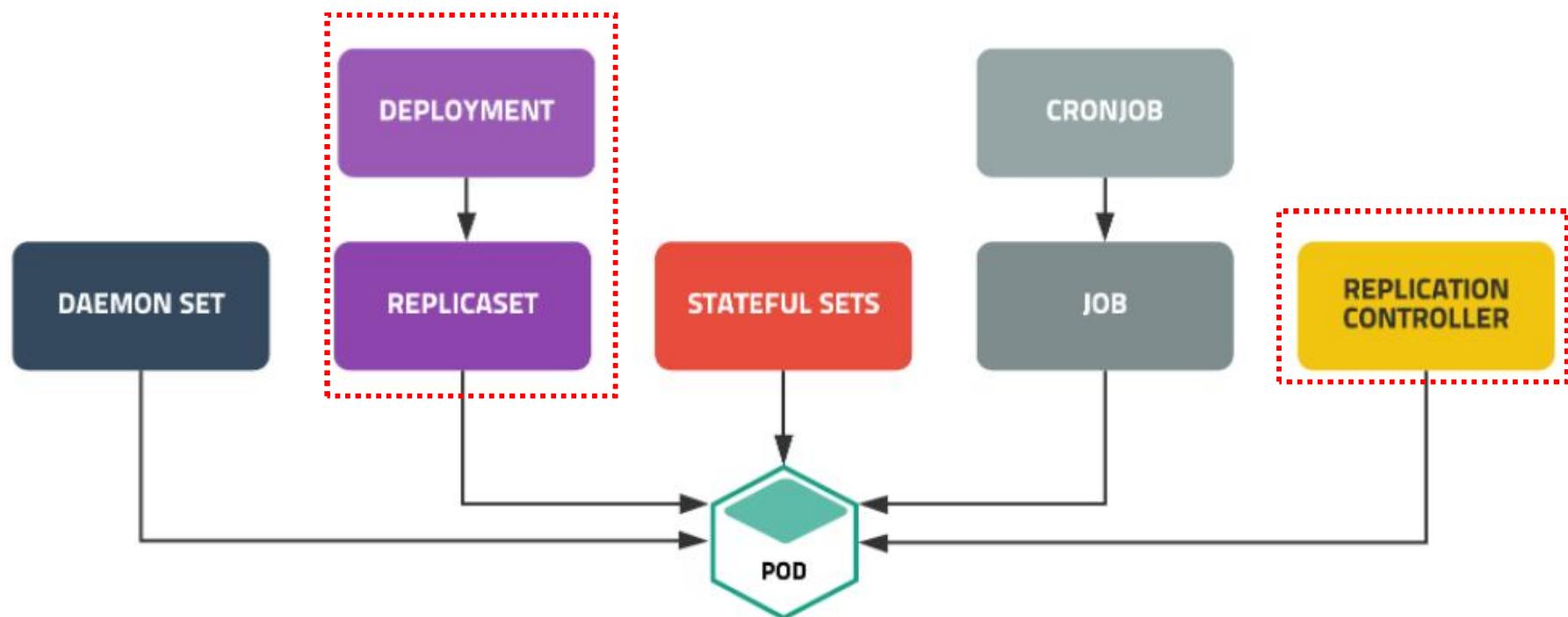
Controller 주요 기능

- 서비스를 관리하고 운영하는데 도움을 줌

Auto Healing	Node 또는 Node 위의 Pod에 이상이 발생할 경우 k8s에서 장애를 인지, 다른 Node에 새로운 Pod 생성
Auto Scaling	리소스가 Limit상태일때 인지하고 Pod를 추가하여 부하를 분산 (안정적인 상태 유지 가능)
Software Update (rolling update)	여러 Pod에 대해 버전 업그레이드 경우, Controller로 한번에 쉽게 가능하며 Rollback 가능 지원
Job	일시적인 작업이 필요한 경우, Controller가 새로운 Pod를 만들어 필요한 경우에만 작업을 수행하고 Pod를 삭제

Controller Type

- Replication Controller
- ReplicaSet
- Deployment



```
apiVersion: v1
kind: Pod
metadata:
  name: test-pod
  labels:
    app: test
spec:
  containers:
    - name: nginx-container
      image: nginx:1.14
```

```
apiVersion: v1
kind: ReplicationController
metadata:
  name: rc-main
spec:
  replicas: 2
  selector:
    app: main
    name: apache
    rel: stable
  template:
    metadata:
      labels:
        app: main
        name: apache
        rel: stable
    spec:
      containers:
        - name: webui
          image: httpd:2.2
          ports:
            - containerPort: 80
```

```
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: nginx-replicaset
spec:
  template:
    metadata:
      name: nginx-replicaset
      labels:
        app: nginx-replicaset
    spec:
      containers:
        - name: nginx-replicaset
          image: nginx
          ports:
            - containerPort: 80
  replicas: 3
  selector:
    matchLabels:
      app: nginx-replicaset
```

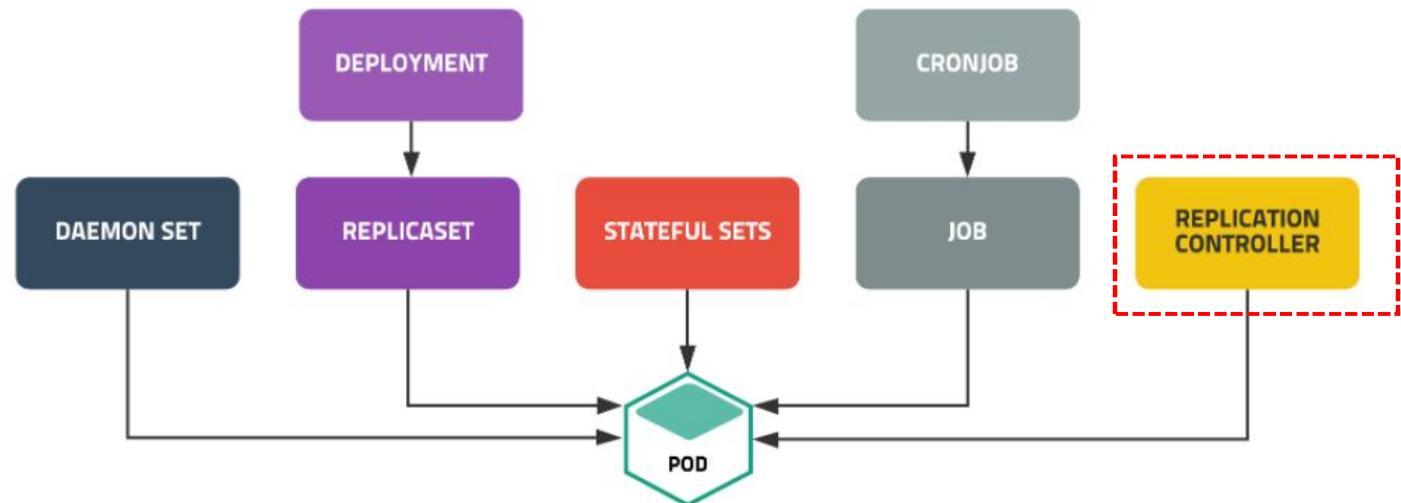
K8s Object 정의 시 apiVersion 필요

- Pod : v1
- ReplicationController : v1
- ReplicaSet : apps/v1
- Deployment : apps/v1
- Service : v1
- PersistentVolume : v1

<<object version 확인 명령어>>
kubectl explain object

1. Replication controller

- 지정한 숫자만큼의 pod가 항상 클러스터 안에서 실행되도록 관리
 - 요구하는 Pod 개수 보장
 - 파드 집합의 실행을 항상 안정적으로 유지하는 것을 목표
 - 요구하는 pod 개수가 부족하면 template을 이용해 pod 추가
 - 요구하는 pod 수보다 많으면 최근에 생성된 pod 삭제



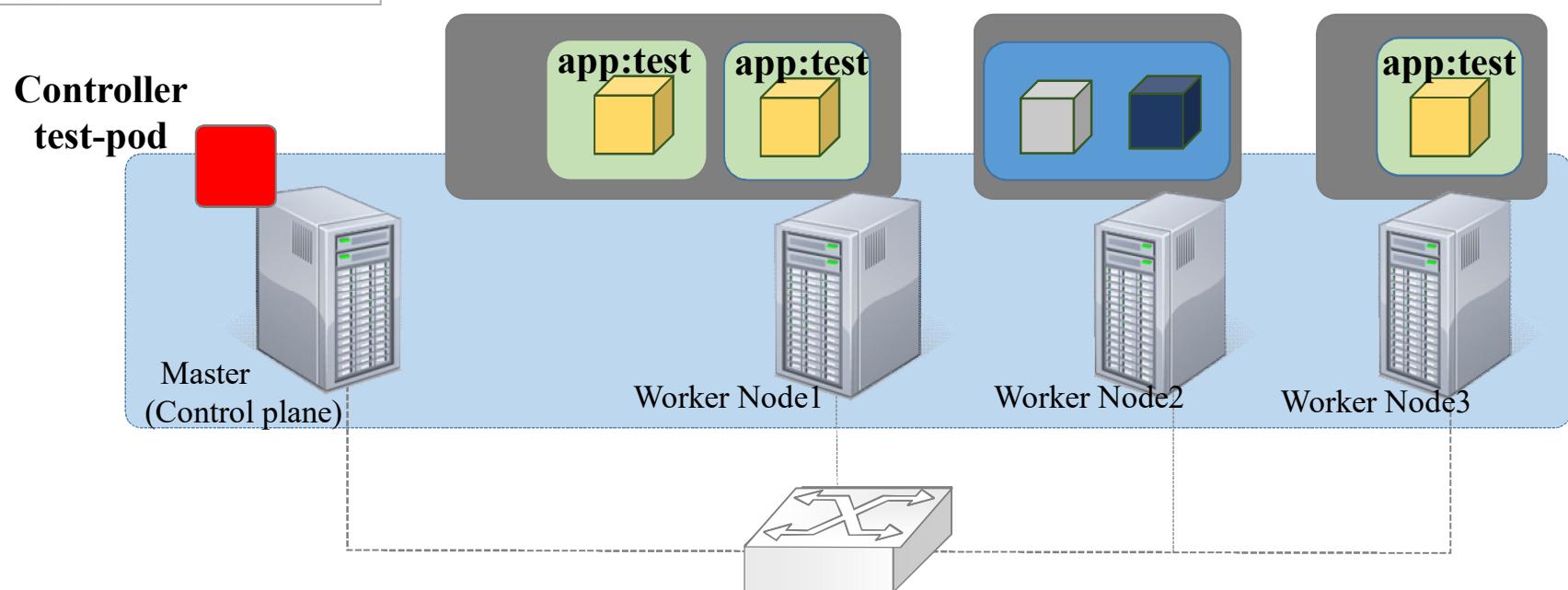
<< 기본 구성 >>

- replicas
- selector
- template

```
apiVersion: apps/v1
kind: ReplicationController
metadata:
  name: <RC_name>
spec:
  replicas: <배포 개수>
  selector:
    key: value
  template:
    <컨테이너 템플릿>
```

```
apiVersion: apps/v1
kind: ReplicationController
metadata:
  name: rc_test
spec:
  replicas: 3
  selector:
    app: test
  template:
    <컨테이너 템플릿>
```

```
apiVersion: v1
kind: ReplicationController
metadata:
  name: test-pod
spec:
  replicas: 3
  selector:
    app: test
  template:
```



```
apiVersion: v1
kind: Pod
metadata:
  name: test-pod
  labels:
    app: test
spec:
  containers:
    - name: nginx-container
      image: nginx:1.14
```

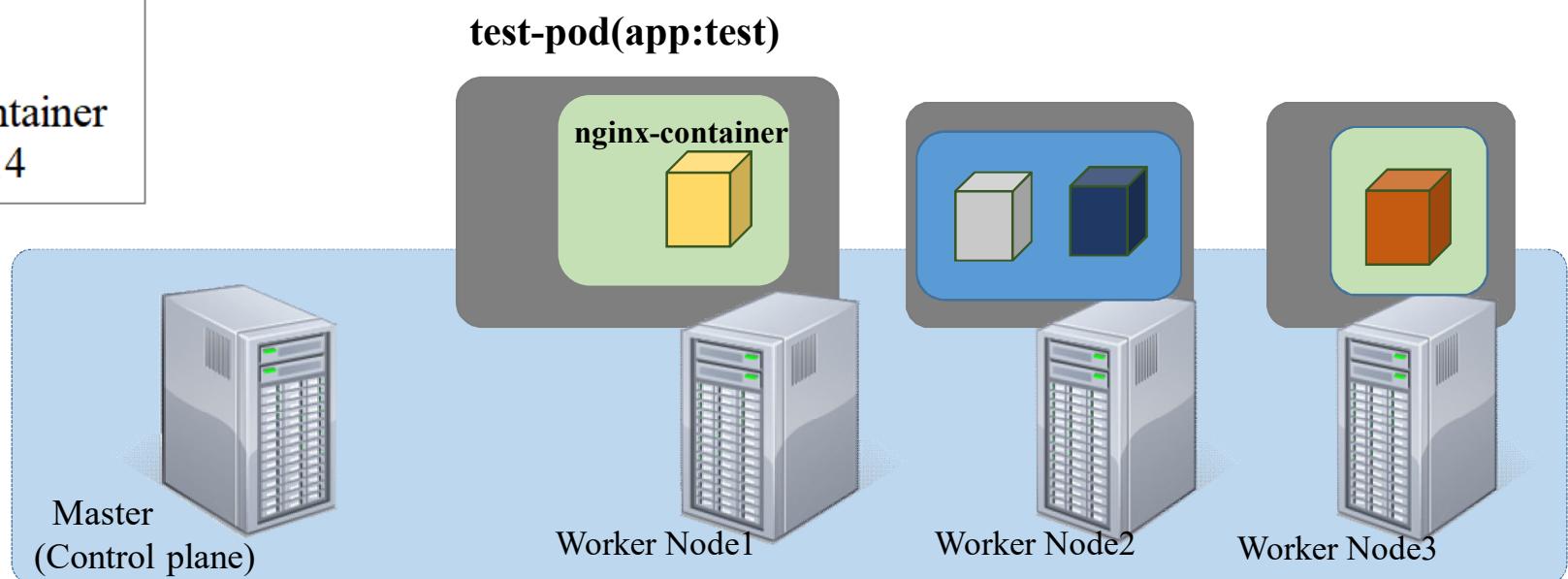
<<rc-exam.yaml>>

kubectl create –f rc_exam.yaml

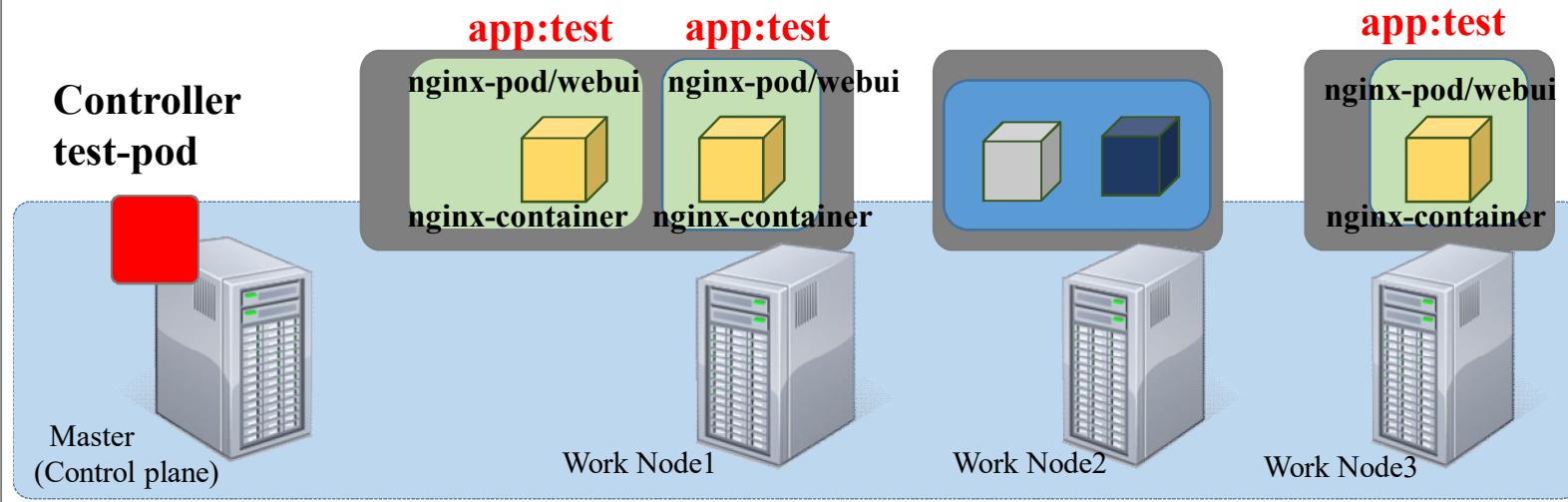
```
apiVersion: v1
kind: ReplicationController
metadata:
  name: test-pod
spec:
  replicas: 3
  selector:
    app: test
  template:
    metadata:
      name: nginx-pod
      labels:
        app: webui
    spec:
      containers:
        - name: nginx-container
          image: nginx:1.14
```

<<rc_exam.yaml>>

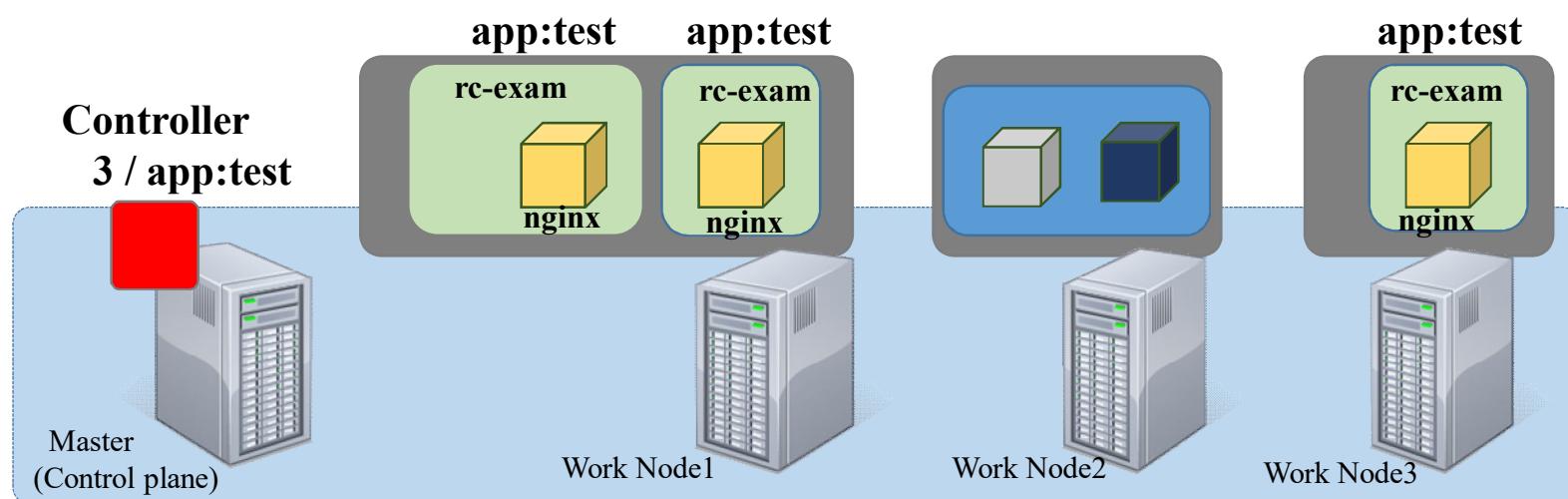
```
apiVersion: v1
kind: Pod
metadata:
  name: test-pod
  labels:
    app: test
spec:
  containers:
    - name: nginx-container
      image: nginx:1.14
```



```
apiVersion: v1
kind: ReplicationController
metadata:
  name: test-pod
spec:
  replicas: 3
  selector:
    app: test
  template:
    metadata:
      name: nginx-pod
      labels:
        app: webui
    spec:
      containers:
      - name: nginx-container
        image: nginx:1.14
```



```
kubectl create rc_exam --image=nginx --replica=3 --selector=app=test
```



```
kubectl get nodes
```

```
kubectl get nodes -o wide
```

```
[node1 ~] $ kubectl get nodes
NAME      STATUS    ROLES
node1     Ready     control-plane,master
node2     Ready     <none>
node3     Ready     <none>
node4     NotReady <none>

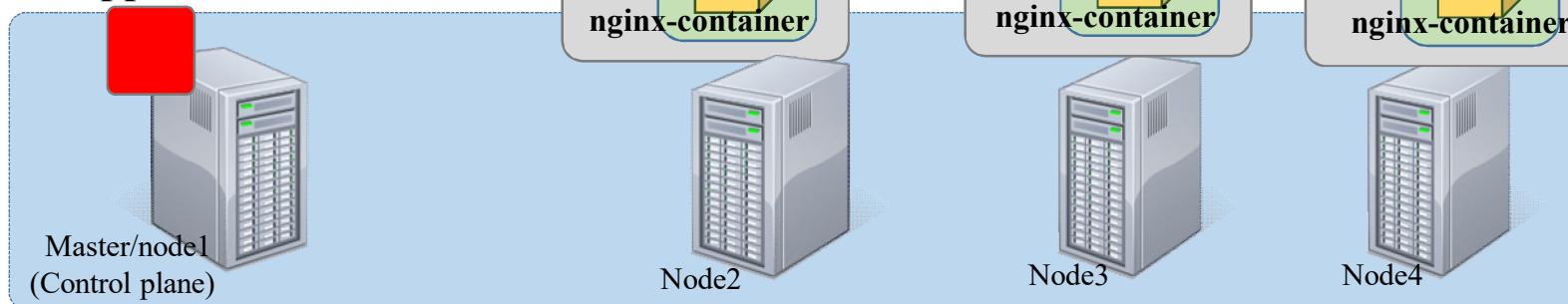
[node1 ~] $
[node1 ~] $ kubectl get nodes -o wide
NAME      STATUS    ROLES          AGE      VERSION   INTERNAL-IP
node1     Ready     control-plane,master 2m53s   v1.20.1   192.168.0.8
node2     Ready     <none>        86s     v1.20.1   192.168.0.7
node3     Ready     <none>        53s     v1.20.1   192.168.0.6
node4     Ready     <none>        26s     v1.20.1   192.168.0.5
```

```

apiVersion: v1
kind: ReplicationController
metadata:
  name: rc-nginx
spec:
  replicas: 3
  selector:
    app: webui
  template:
    metadata:
      name: nginx-pod
      labels:
        app: webui
    spec:
      containers:
        - name: nginx-container
          image: nginx:1.14

```

Controller(rc-nginx)
3 / app:webui



LAB 1. Replication controller (rc-nginx.yaml)

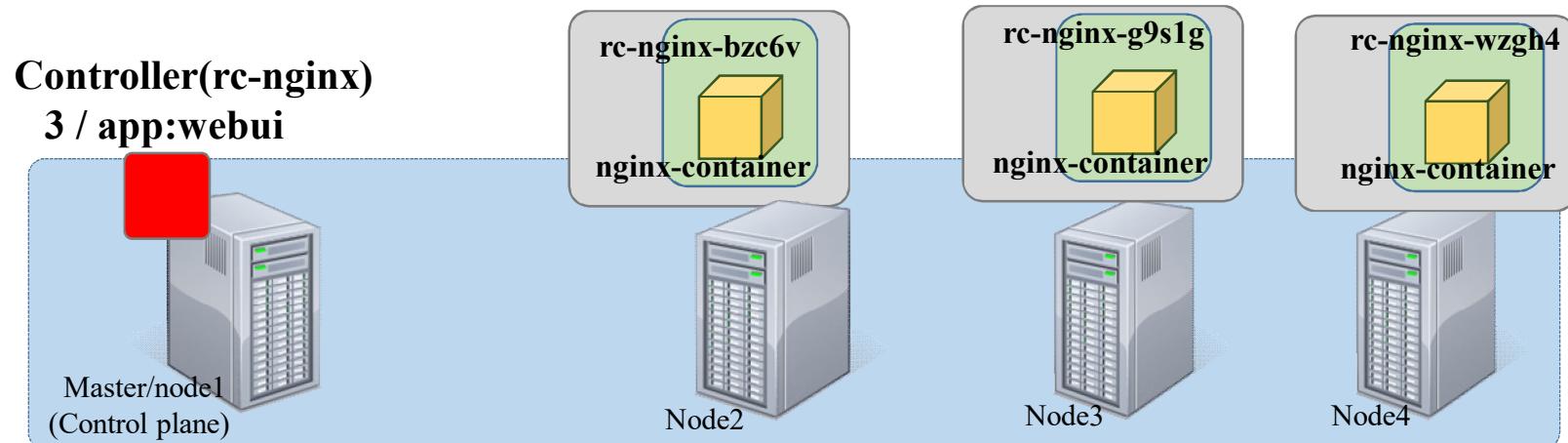
kubectl create -f rc.nginx.yaml

```

[node1 ~]$ kubectl create -f rc-nginx.yaml
replicationcontroller/rc-nginx created
[node1 ~]$ kubectl get pods -o wide
NAME           READY   STATUS    RESTARTS   AGE     IP          NODE
rc-nginx-bzc6v 1/1     Running   0          2m24s  10.5.1.2   node2
rc-nginx-g9s1g  1/1     Running   0          2m24s  10.5.3.2   node3
rc-nginx-wzgh4  1/1     Running   0          2m24s  10.5.4.2   node4
[node1 ~]$

```

```
[node1 ~]$ kubectl get pods
NAME          READY   STATUS    RESTARTS   AGE
rc-nginx-bzc6v 1/1     Running   0          10m
rc-nginx-g9s1g 1/1     Running   0          10m
rc-nginx-wzgh4 1/1     Running   0          10m
[node1 ~]$
[node1 ~]$ kubectl get pods --show-labels
NAME          READY   STATUS    RESTARTS   AGE   LABELS
rc-nginx-bzc6v 1/1     Running   0          11m   app=webui
rc-nginx-g9s1g 1/1     Running   0          11m   app=webui
rc-nginx-wzgh4 1/1     Running   0          11m   app=webui
[node1 ~]$
[node1 ~]$ kubectl get rc
NAME      DESIRED   CURRENT   READY   AGE
rc-nginx  3         3         3       11m
```



kubectl describe rc rc-nginx

```
[node1 ~] $ kubectl describe rc rc-nginx
Name:           rc-nginx
Namespace:      default
Selector:       app=webui
Labels:         app=webui
Annotations:    <none>
Replicas:       3 current / 3 desired
Pods Status:   3 Running / 0 Waiting / 0 Succeeded / 0 Failed
Pod Template:
  Labels:  app=webui
  Containers:
    nginx-container:
      Image:      nginx:1.14
      Port:       <none>
      Host Port: <none>
      Environment: <none>
      Mounts:     <none>
      Volumes:    <none>
  Events:
    Type  Reason          Age    From            Message
    ----  ----          ----   ----           -----
    Normal SuccessfulCreate 4m58s  replication-controller  Created pod: rc-nginx-wzgh4
    Normal SuccessfulCreate 4m58s  replication-controller  Created pod: rc-nginx-g9s1g
    Normal SuccessfulCreate 4m58s  replication-controller  Created pod: rc-nginx-bzc6v
```

Scale-out

kubectl edit rc rc-nginx

```
# Please edit the object below. Lines beginning
# and an empty file will abort the edit. If an
# reopened with the relevant failures.
#
apiVersion: v1
kind: ReplicationController
metadata:
  creationTimestamp: "2022-05-05T01:37:34Z"
  generation: 1
  labels:
    app: webui
    name: rc-nginx
  namespace: default
  resourceVersion: "1606"
  uid: 6574e3ad-bf27-454d-87fc-8c8ad4359873
spec:
  replicas: 3
  selector:
    app: webui
  template:
    metadata:
      creationTimestamp: null
      labels:
        app: webui
        name: nginx-pod
```

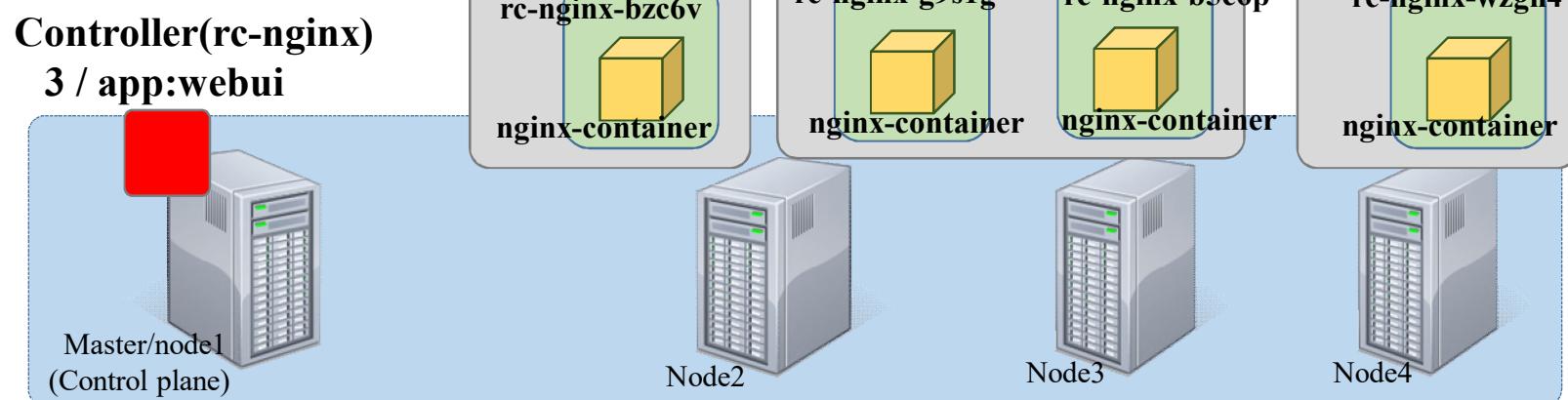
```
# Please edit the object below. Lines beginning
# and an empty file will abort the edit. If an
# reopened with the relevant failures.
#
apiVersion: v1
kind: ReplicationController
metadata:
  creationTimestamp: "2022-05-05T01:37:34Z"
  generation: 1
  labels:
    app: webui
    name: rc-nginx
  namespace: default
  resourceVersion: "1606"
  uid: 6574e3ad-bf27-454d-87fc-8c8ad4359873
spec:
  replicas: 4
  selector:
    app: webui
  template:
    metadata:
      creationTimestamp: null
      labels:
        app: webui
        name: nginx-pod
```

```
[node1 ~]$ kubectl edit rc rc-nginx  
replicationcontroller/rc-nginx edited  
[node1 ~]$ kubectl get pods
```

NAME	READY	STATUS	RESTARTS	AGE
rc-nginx-b5c6p	1/1	Running	0	11s
rc-nginx-bzc6v	1/1	Running	0	18m
rc-nginx-g9s1g	1/1	Running	0	18m
rc-nginx-wzgh4	1/1	Running	0	18m

```
[node1 ~]$ kubectl get pods -o wide
```

NAME	READY	STATUS	RESTARTS	AGE	IP	NODE
rc-nginx-b5c6p	1/1	Running	0	25s	10.5.3.3	node3
rc-nginx-bzc6v	1/1	Running	0	18m	10.5.1.2	node2
rc-nginx-g9s1g	1/1	Running	0	18m	10.5.3.2	node3
rc-nginx-wzgh4	1/1	Running	0	18m	10.5.4.2	node4



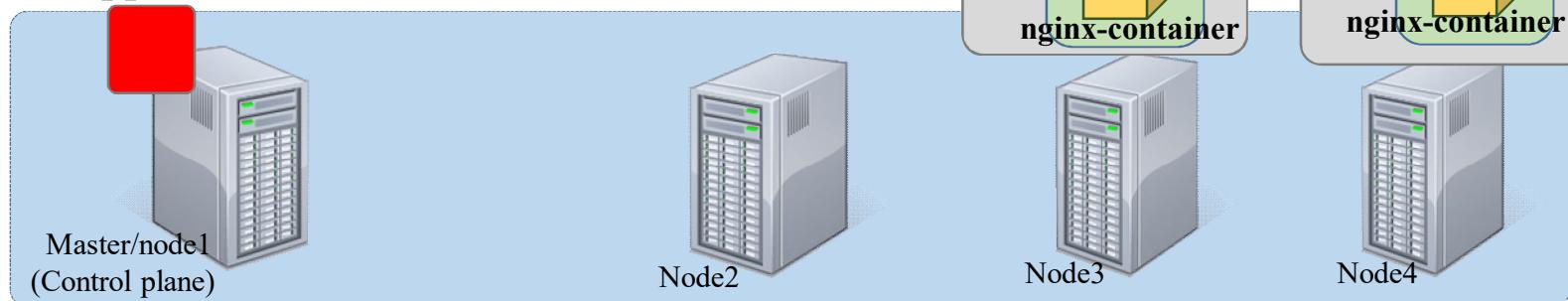
Scale-down

```
kubectl scale rc rc-nginx --replicas=2  
kubectl get pods -o wide
```

```
[node1 ~]$ kubectl get pods -o wide  
NAME          READY   STATUS    RESTARTS   AGE     IP           NODE   NOMINATED NODE  
rc-nginx-b5c6p 1/1     Running   0          25s    10.5.3.3    node3  <none>  
rc-nginx-bzc6v 1/1     Running   0          18m    10.5.1.2    node2  <none>  
rc-nginx-g9s1g  1/1     Running   0          18m    10.5.3.2    node3  <none>  
rc-nginx-wzgh4  1/1     Running   0          18m    10.5.4.2    node4  <none>  
[node1 ~]$  
[node1 ~]$ kubectl scale rc rc-nginx --replicas=2  
replicationcontroller/rc-nginx scaled  
[node1 ~]$ kubectl get pods -o wide  
NAME          READY   STATUS    RESTARTS   AGE     IP           NODE   NOMINATED NODE  
rc-nginx-g9s1g 1/1     Running   0          20m    10.5.3.2    node3  <none>  
rc-nginx-wzgh4  1/1     Running   0          20m    10.5.4.2    node4  <none>  
[node1 ~]$
```

Controller(rc-nginx)

3 / app:webui



Rolling-update(1)

```
kubectl edit rc rc-nginx
```

```
spec:  
  containers:  
    - image: nginx:1.14  
      imagePullPolicy: IfNotPresent  
      name: nginx-container  
      resources: {}  
      terminationMessagePath: /dev/termination-log  
      terminationMessagePolicy: File  
      dnsPolicy: ClusterFirst  
      restartPolicy: Always  
      schedulerName: default-scheduler  
      securityContext: {}  
      terminationGracePeriodSeconds: 30
```

```
spec:  
  containers:  
    - image: nginx:1.15  
      imagePullPolicy: IfNotPresent  
      name: nginx-container  
      resources: {}  
      terminationMessagePath: /dev/termination-log  
      terminationMessagePolicy: File  
      dnsPolicy: ClusterFirst  
      restartPolicy: Always  
      schedulerName: default-scheduler  
      securityContext: {}  
      terminationGracePeriodSeconds: 30
```

Rolling-update(2)

kubectl describe pods rc-nginx-XXXX

```
[node1 ~]$ kubectl get pods
NAME           READY   STATUS    RESTARTS   AGE
rc-nginx-g9slg 1/1     Running   0          31m
rc-nginx-wzgh4 1/1     Running   0          31m
[node1 ~]$ kubectl describe pods rc-nginx-g9slg
Name:         rc-nginx-g9slg
Namespace:    default
Priority:    0
Node:        node3/192.168.0.6
Start Time:  Thu, 05 May 2022 01:37:34 +0000
Labels:      app=webui
Annotations: <none>
Status:      Running
IP:          10.5.3.2
IPs:
  IP:          10.5.3.2
Controlled By: ReplicationController/rc-nginx
Containers:
  nginx-container:
    Container ID: docker://0bc6a40c0b228bd8816fdb60c41
    Image:        nginx:1.14
    Image ID:    docker-pullable://nginx@sha256:f798e
```

Rolling-update(3)

```
kubectl delete pod rc-nginx-XXXX  
kubectl get pods -o wide  
kubectl describe pods rc-nginx-XXXX
```

```
[node1 ~]$ kubectl delete pod rc-nginx-g9s1g  
pod "rc-nginx-g9s1g" deleted  
[node1 ~]$ kubectl get pods -o wide  
NAME           READY   STATUS    RESTARTS   AGE   IP  
rc-nginx-jq6sc 1/1     Running   0          62s   10.5.1.3  
rc-nginx-wzgh4 1/1     Running   0          38m   10.5.4.2  
[node1 ~]$  
[node1 ~]$ kubectl describe pods rc-nginx-jq6sc  
Name:         rc-nginx-jq6sc  
Namespace:    default  
Priority:    0  
Node:        node2/192.168.0.7  
Start Time:  Thu, 05 May 2022 02:14:36 +0000  
Labels:      app=webui  
Annotations: <none>  
Status:      Running  
IP:          10.5.1.3  
IPs:  
  IP:          10.5.1.3  
Controlled By: ReplicationController/rc-nginx
```

Replication controller

<<Controller Pod 생성>>

kubectl create -f rc-nginx.yaml → kubectl get pods -o wide

<<scale-out>>

kubectl edit rc rc-nginx → kubectl get pods -o wide

<<scale-down>>

kubectl scale rc rc-nginx --replicas=2

kubectl get pods -o wide

<<rolling-update>>

kubectl edit rc rc-nginx

kubectl describe pods rc-nginx-XXXX

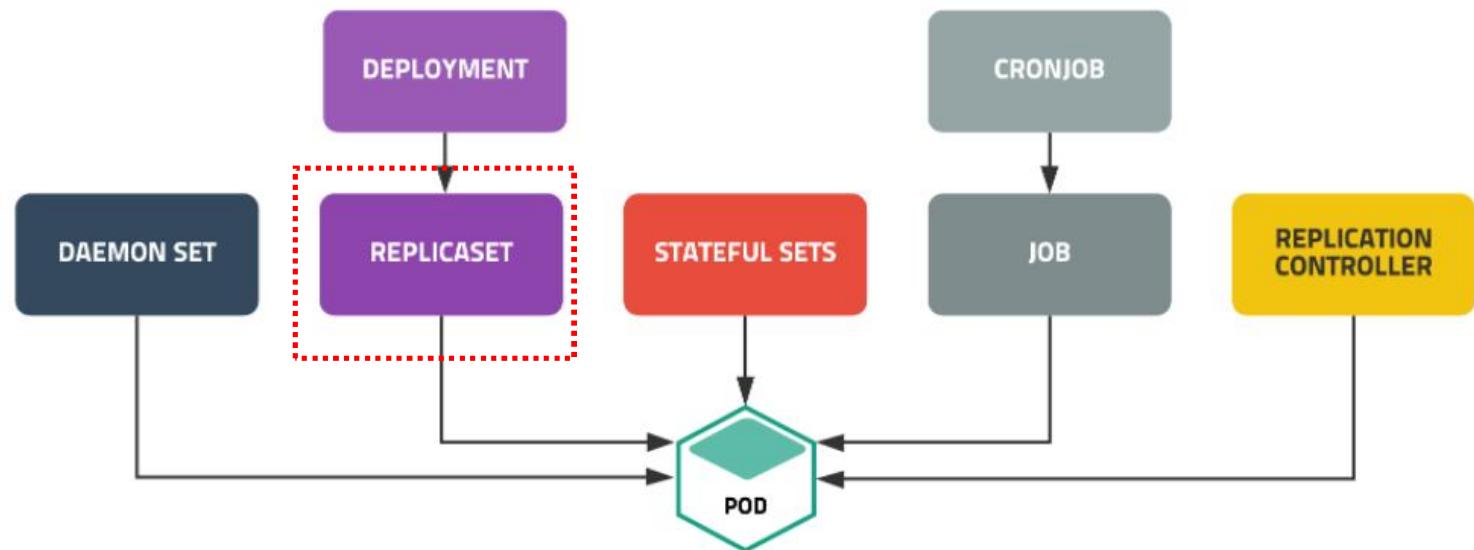
kubectl delete pod rc-nginx-XXXX

kubectl get pods -o wide

kubectl describe pods rc-nginx-XXXX

2. Replicaset

- Replication controller의 발전형으로 Replication controller와 같은 동작 수행
- Replication controller보다 풍부한 selector 지원
 - 집합기반(set-based)의 selector 지원
- Rolling-update 시 deployment 사용

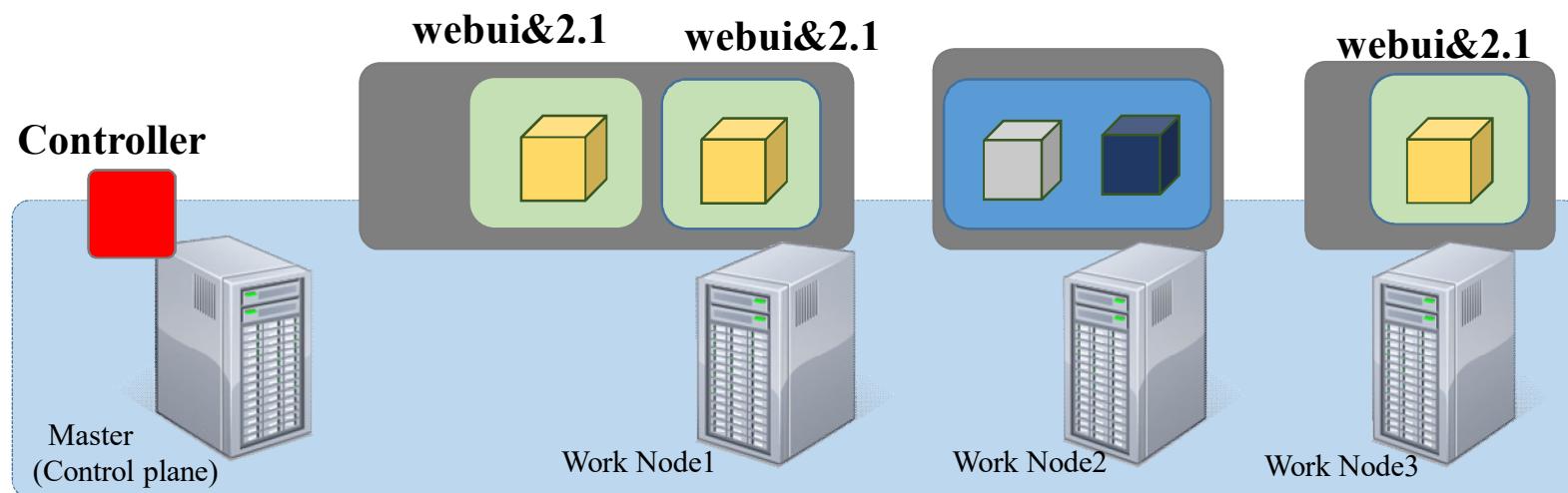


```
apiVersion: v1
kind: ReplicationController
metadata:
  name: rc-nginx
spec:
  replicas: 3
  selector:
    app: webui
  template:
    metadata:
      name: nginx-pod
      labels:
        app: webui
    spec:
      containers:
        - name: nginx-container
          image: nginx:1.14
```

```
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: rs-nginx
spec:
  replicas: 3
  selector:
    matchLabels:
      app: webui
  template:
    metadata:
      name: nginx-pod
      labels:
        app: webui
    spec:
      containers:
        - name: nginx-container
          image: nginx:1.14
```

```
replicas: 3  
selector:  
  app: webui  
  version: "2.1"
```

```
replicas: 3  
selector:  
  matchLabels:  
    app:webui  
  matchExpressions:  
    - {key: version, operator: In, value: ["2.1" ]}
```



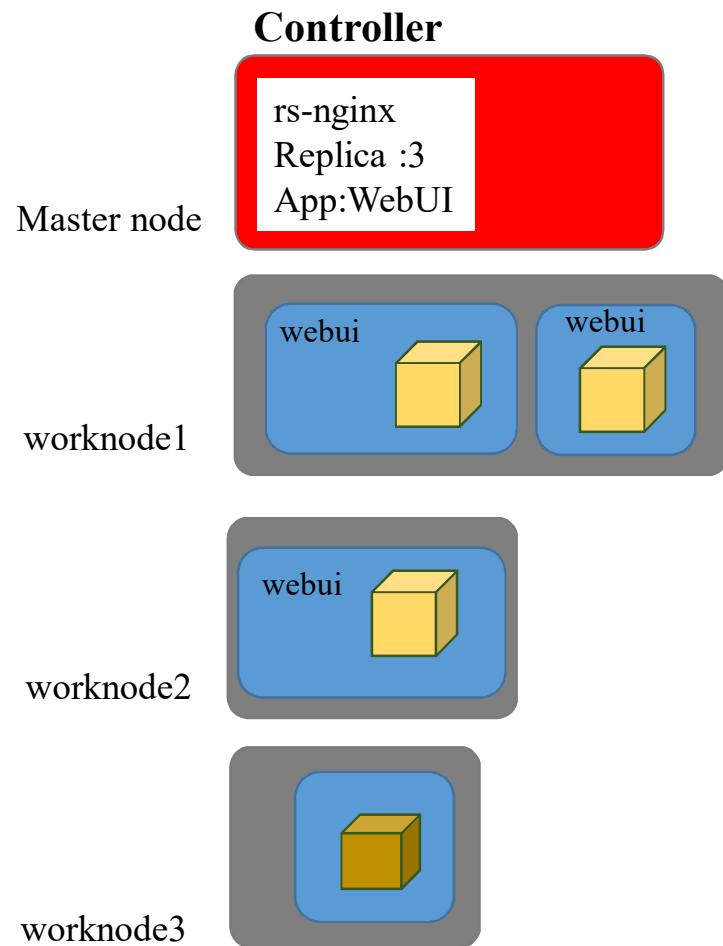
matchExpression

연산자(operator)

In	Key와 values를 지정하여 key, value가 일치하는 pod만 연결
NotIn	Key는 일치하고 values는 일치하지 않는 pod에 연결
Exists	key에 맞는 label의 pod를 연결

```
replicas: 3  
selector:  
  matchLabels:  
    app:webui  
  matchExpressions:  
    - {key: version, operator: In, value: ["2.1","2.2"]}  
  
2.1버전 또는 2.2버전 존재  
  
replicas: 3  
selector:  
  matchLabels:  
    app:webui  
  matchExpressions:  
    - {key: version, operator: NotIn, value: ["2.1","2.2"]}  
  
버전이 존재해서는 안됨  
  
replicas: 3  
selector:  
  matchLabels:  
    app:webui  
  matchExpressions:  
    - {key: version, operator: Exists}  
  
버전이 존재만하면 됨
```

1) Replicaset 사용하기



```
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: rs-nginx
spec:
  replicas: 3
  selector:
    matchLabels:
      app: webui
  template:
    metadata:
      name: nginx-pod
      labels:
        app: webui
    spec:
      containers:
        - name: nginx-container
          image: nginx:1.14
```

<<rs-nginx.yaml>>

<<ReplicaSet Controller와 Pod 생성>>

kubectl delete rc rc-nginx //controller를 삭제하면 pod 삭제

kubectl get pods -o -wide

kubectl create -f rs-nginx.yaml 또는 kubectl apply -f rs-nginx

kubectl get pods --show-labels

kubectl get rs

```
kubectl create -f rs-nginx.yaml 또는 kubectl apply -f rs-nginx  
kubectl get pods --show-labels  
kubectl get rs
```

```
❶ [node1 ~]$ kubectl delete rc rc-nginx  
replicationcontroller "rc-nginx" deleted  
❷ [node1 ~]$ kubectl get pods -o wide  
No resources found in default namespace.  
[node1 ~]$  
❸ [node1 ~]$ vi rs-nginx.yaml  
❹ [node1 ~]$ kubectl create -f rs-nginx.yaml  
replicaset.apps/rs-nginx created  
❺ [node1 ~]$ kubectl get pods --show-labels  
NAME READY STATUS RESTARTS AGE LABELS  
rs-nginx-df9ns 1/1 Running 0 14s app=webui  
rs-nginx-15gwy 1/1 Running 0 14s app=webui  
rs-nginx-xfb4b 1/1 Running 0 14s app=webui  
[node1 ~]$  
❻ [node1 ~]$ kubectl get replicaset  
NAME DESIRED CURRENT READY AGE  
rs-nginx 3 3 3 37s  
[node1 ~]$  
❼ [node1 ~]$ kubectl get rs  
NAME DESIRED CURRENT READY AGE  
rs-nginx 3 3 3 44s
```

```
kubectl delete pods rs-nginx-XXXXXX
```

```
kubectl get pods --show-labels
```

```
❶ [node1 ~]$ kubectl delete pods rs-nginx-df9ns
pod "rs-nginx-df9ns" deleted
❷ [node1 ~]$ kubectl get pods --show-labels
NAME           READY   STATUS    RESTARTS   AGE   LABELS
rs-nginx-15gwj 1/1     Running   0          91s   app=webui
rs-nginx-lvn54  1/1     Running   0          15s   app=webui
rs-nginx-xfb4b  1/1     Running   0          91s   app=webui
```

```
kubectl scale rs rs-nginx --replicas=2
```

```
kubectl get pods --show-labels
```

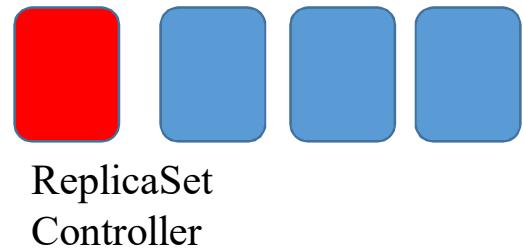
```
❶ [node1 ~]$ kubectl scale rs rs-nginx --replicas=2
replicaset.apps/rs-nginx scaled
❷ [node1 ~]$ kubectl get pods --show-labels
NAME           READY   STATUS    RESTARTS   AGE   LABELS
rs-nginx-15gwj 1/1     Running   0          2m52s  app=webui
rs-nginx-lvn54  0/1     Terminating   0          96s   app=webui
rs-nginx-xfb4b  1/1     Running   0          2m52s  app=webui
❸ [node1 ~]$ kubectl get pods --show-labels
NAME           READY   STATUS    RESTARTS   AGE   LABELS
rs-nginx-15gwj 1/1     Running   0          3m3s   app=webui
rs-nginx-xfb4b  1/1     Running   0          3m3s   app=webui
```

2) Replicaset와 Pod와의 연관 관계

Pod는 남겨두고 controller만 삭제

kubectl delete rs rs-nginx --cascade=orphan

kubectl delete replicaset rs-nginx --cascade=orphan



```
[node1 ~]$ kubectl delete rs rs-nginx --cascade=false
warning: --cascade=false is deprecated (boolean value) and can be replaced with --cascade=orphan.
replicaset.apps "rs-nginx" deleted
[node1 ~]$ kubectl get rs
No resources found in default namespace.
[node1 ~]$ kubectl get pods --show-labels
NAME           READY   STATUS    RESTARTS   AGE    LABELS
rs-nginx-15gwj 1/1     Running   0          13m    app=webui
rs-nginx-xfb4b 1/1     Running   0          13m    app=webui
[node1 ~]$
```

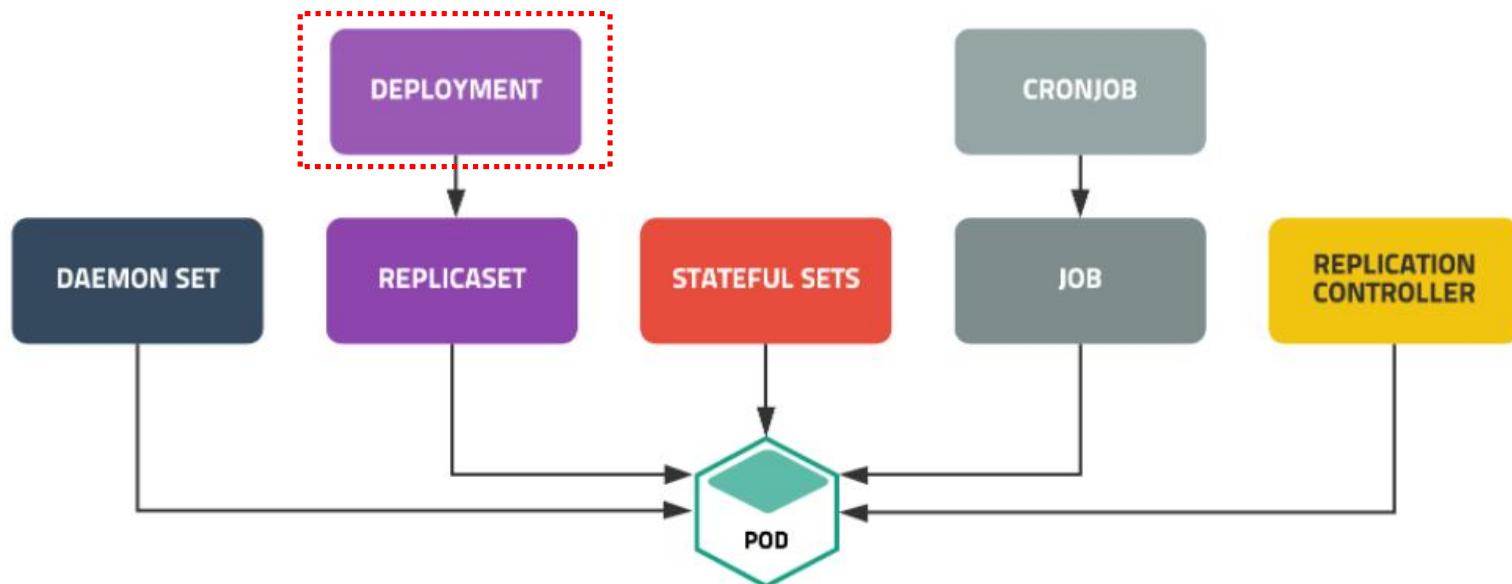
* kubectl delete rs rs-nginx

3. Deployment

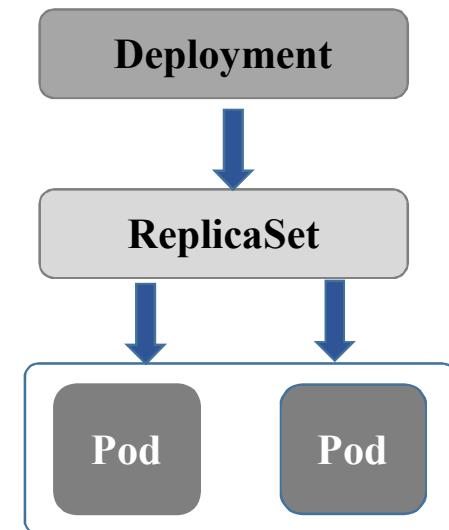
- ReplicaSet을 제어해주는 부모 역할
- ReplicaSet을 컨트롤해서 Pod 수를 조절
- Rolling update & Rolling Back

Rolling Update

점진적으로 서비스 중단 없이 새로운 버전으로 업데이트

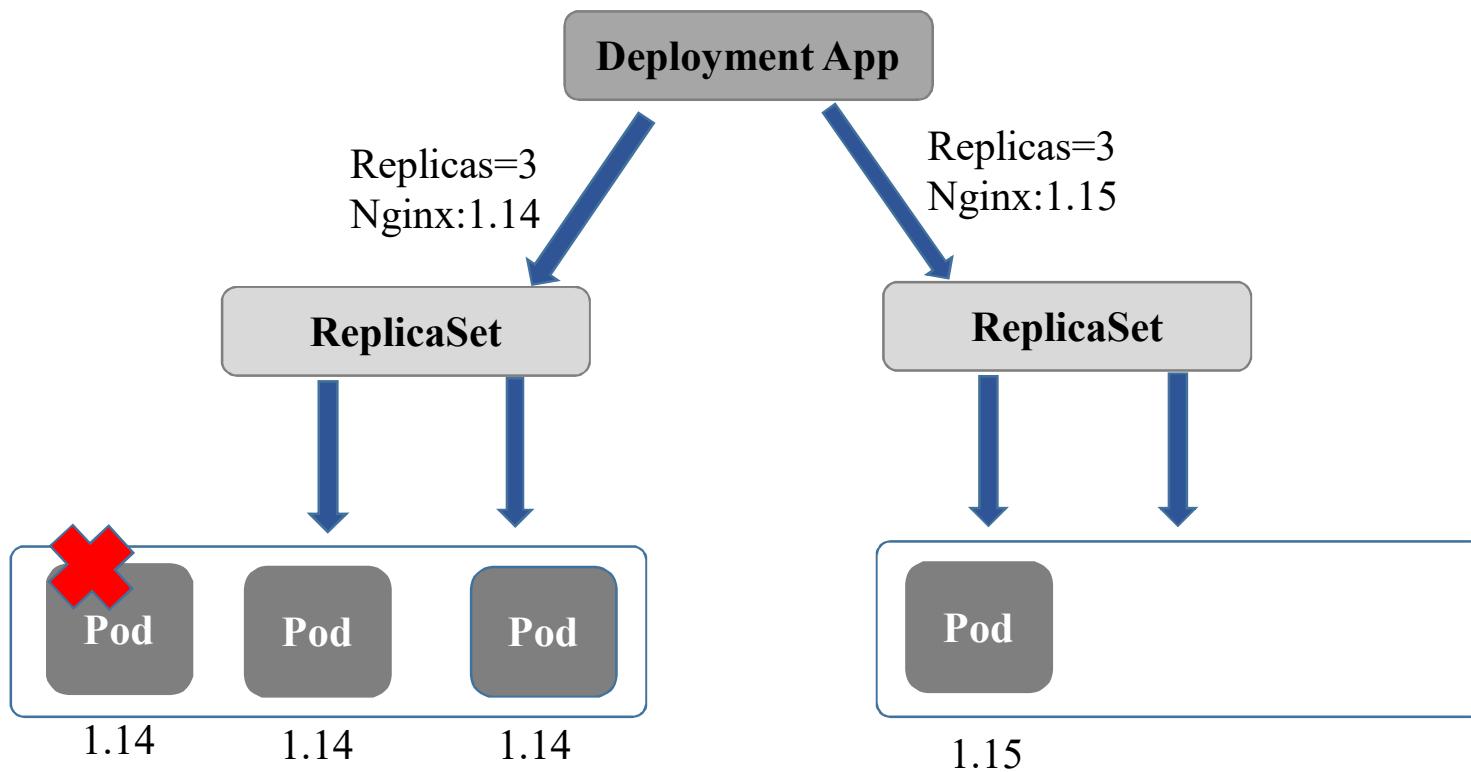


- ReplicaSet을 컨트롤해서 Pod수를 조절 실행시켜야 할 pod 개수를 유지
- Replicaset를 관리하면서 App 배포를 더 세밀하게 관리
 - App을 배포 시 rolling update
 - App 배포 도중 잠시 멈추거나 다시 배포 가능
 - App 배포 이후 이전 버전으로 rolling back 가능

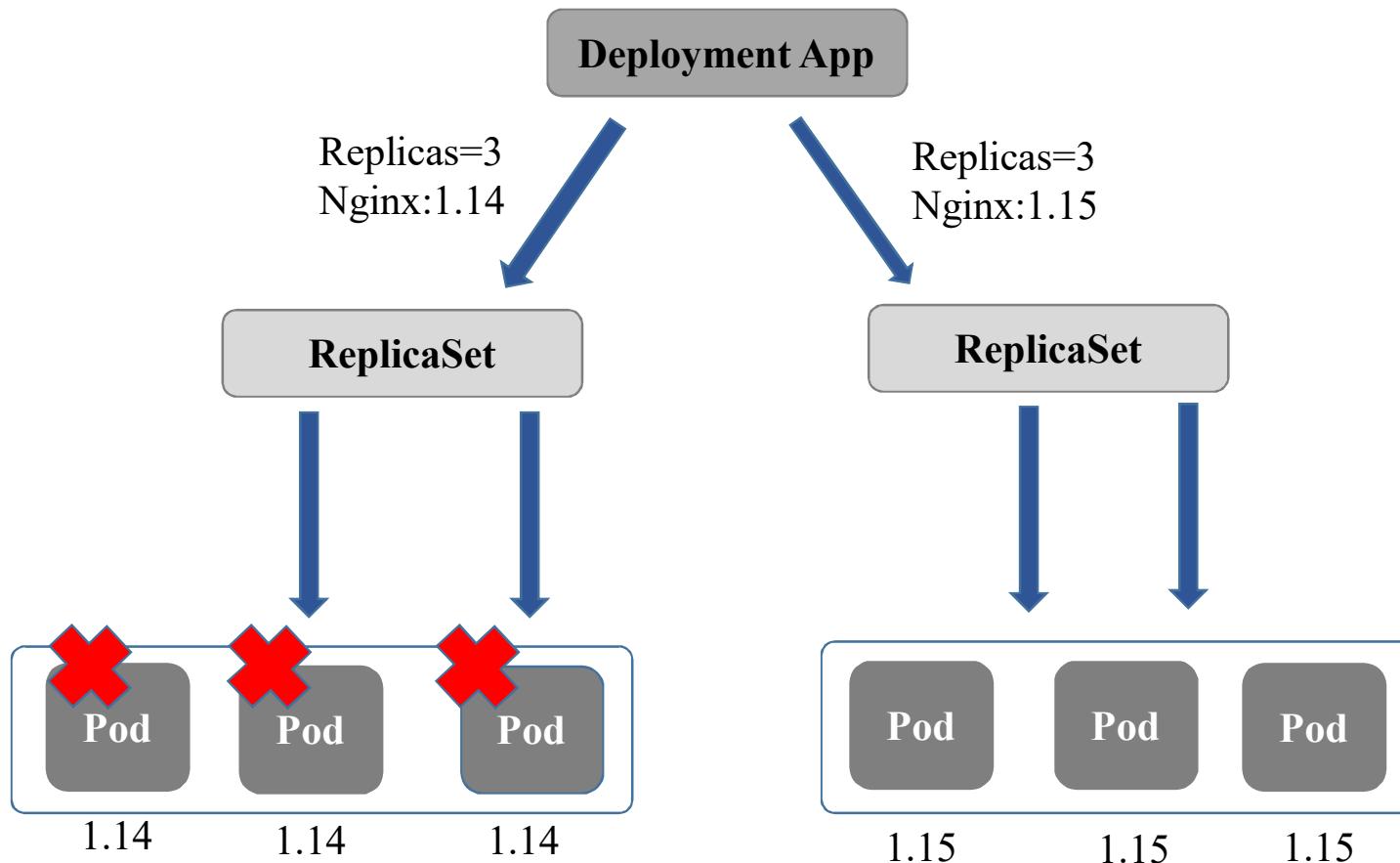


Rolling Update : 점진적으로 서비스 중단 없이 새로운 버전으로 업데이트

```
kubectl set image deployment app-deploy app=nginx:1.15 --record
```



```
kubectl set image deployment app-deploy app=nginx:1.15 --record
```

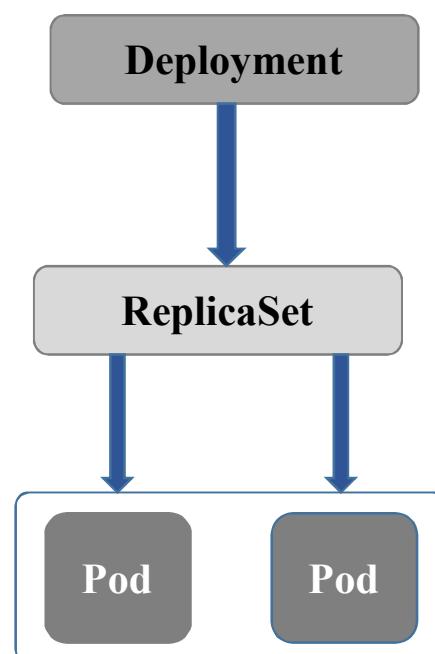


<< rs-nginx.yaml >>

```
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: rs-nginx
spec:
  replicas: 3
  selector:
    matchLabels:
      app: webui
  template:
    metadata:
      name: nginx-pod
      labels:
        app: webui
    spec:
      containers:
        - name: nginx-container
          image: nginx:1.14
```

<< deploy-nginx.yaml >>

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: deploy-nginx
spec:
  replicas: 3
  selector:
    matchLabels:
      app: webui
  template:
    metadata:
      name: nginx-pod
      labels:
        app: webui
    spec:
      containers:
        - name: nginx-container
          image: nginx:1.14
```



<< deploy-nginx.yaml >>

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: deploy-nginx
spec:
  replicas: 3
  selector:
    matchLabels:
      app: webui
  template:
    metadata:
      name: nginx-pod
      labels:
        app: webui
    spec:
      containers:
        - name: nginx-container
          image: nginx:1.14
```

Deployment를 이용한 Pod 생성/유지

```
kubectl create -f deploy-nginx.yaml
```

```
kubectl get pods -o wide
```

```
kubectl get deploy,rs,pod
```

```
[node1 ~]$ vi deploy-nginx.yaml
[node1 ~]$ kubectl create -f deploy-nginx.yaml
deployment.apps/deploy-nginx created
[node1 ~]$ kubectl get pods -o wide
NAME                      READY   STATUS    RESTARTS   AGE     IP          NODE
deploy-nginx-6d4c4cc4b8-4mjrg  1/1    Running   0          31s    10.5.3.2   node4
deploy-nginx-6d4c4cc4b8-dnlcc  1/1    Running   0          31s    10.5.2.2   node3
deploy-nginx-6d4c4cc4b8-xz2s9  1/1    Running   0          31s    10.5.1.2   node2
[node1 ~]$
[node1 ~]$ kubectl get deploy,rs,pod
NAME                      READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/deploy-nginx  3/3      3           3           45s
NAME                      DESIRED  CURRENT   READY   AGE
replicaset.apps/deploy-nginx-6d4c4cc4b8  3        3         3       45s
NAME                      READY   STATUS    RESTARTS   AGE
pod/deploy-nginx-6d4c4cc4b8-4mjrg  1/1    Running   0          45s
pod/deploy-nginx-6d4c4cc4b8-dnlcc  1/1    Running   0          45s
pod/deploy-nginx-6d4c4cc4b8-xz2s9  1/1    Running   0          45s
[node1 ~]$
```

```
kubectl delete pods deploy-nginx-XXXXXX-XXXXXXX
```

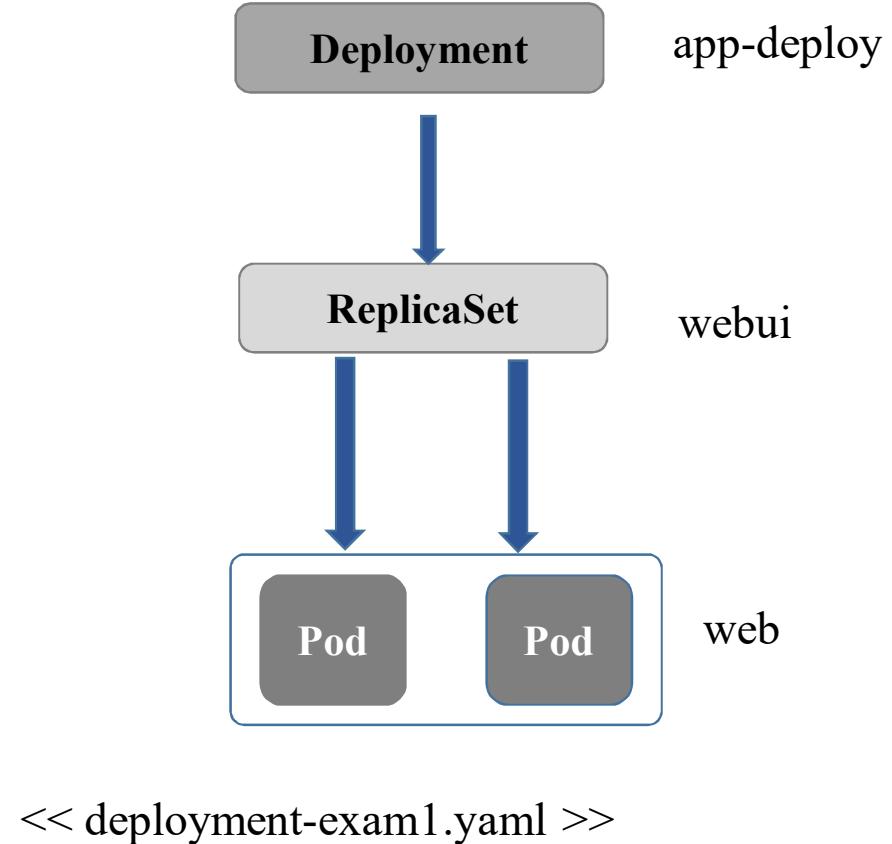
```
kubectl get pods
```

```
kubectl get rs deploy-nginx-XXXX
```

```
[node1 ~]$ kubectl delete pods deploy-nginx-6d4c4cc4b8-4mjrg
pod "deploy-nginx-6d4c4cc4b8-4mjrg" deleted
[node1 ~]$ kubectl get pods
NAME                      READY   STATUS    RESTARTS   AGE
deploy-nginx-6d4c4cc4b8-dn1cc  1/1     Running   0          5m44s
deploy-nginx-6d4c4cc4b8-q4dft  1/1     Running   0          41s
deploy-nginx-6d4c4cc4b8-xz2s9  1/1     Running   0          5m44s
[node1 ~]$ kubectl get rs deploy-nginx-6d4c4cc4b8
NAME        DESIRED   CURRENT   READY   AGE
deploy-nginx-6d4c4cc4b8     3         3         3       7m9s
[node1 ~]$
```

Deployment Rolling Update

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: app-deploy
spec:
  selector:
    matchLabels:
      app: webui
  replicas: 3
  template:
    metadata:
      labels:
        app: webui
    spec:
      containers:
        - image: nginx:1.14
          name: web
      ports:
        - containerPort: 80
```



```
kubectl create -f deployment-exam1.yaml --record
```

```
Kubectl get deployment,rs,pod
```

```
controlplane $ vi deployment-exam1.yaml
controlplane $ kubectl create -f deployment-exam1.yaml --record
deployment.apps/app-deploy created
controlplane $ kubectl get deployment,rs,pod
NAME                      READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/app-deploy 0/3     3            0           14s

NAME                           DESIRED   CURRENT   READY   AGE
replicaset.apps/app-deploy-7f6ffffdcdd 3         3         0       14s

NAME          READY   STATUS             RESTARTS   AGE
pod/app-deploy-7f6ffffdcdd-55vmx  0/1     ContainerCreating  0       14s
pod/app-deploy-7f6ffffdcdd-6hh55   0/1     ContainerCreating  0       14s
pod/app-deploy-7f6ffffdcdd-1ql4w   0/1     ContainerCreating  0       14s
controlplane $
```

NAME	READY	STATUS	RESTARTS	AGE
pod/app-deploy-7f6ffffdcdd-55vmx	0/1	ContainerCreating	0	14s
pod/app-deploy-7f6ffffdcdd-6hh55	0/1	ContainerCreating	0	14s
pod/app-deploy-7f6ffffdcdd-1ql14w	0/1	ContainerCreating	0	14s

kubectl describe pods app-deploy-XXXXXX-XXXX

```
controlplane $ kubectl describe pods app-deploy-7f6ffffdcdd-55vmx
Name:           app-deploy-7f6ffffdcdd-55vmx
Namespace:      default
Priority:       0
Node:          node01/10.0.0.10
Start Time:    Wed, 11 May 2022 11:32:13 +0000
Labels:         app=webui
                pod-template-hash=7f6ffffdcdd
Annotations:   <none>
Status:        Running
IP:            10.244.1.3
IPs:
  IP:          10.244.1.3
Controlled By: ReplicaSet/app-deploy-7f6ffffdcdd
Containers:
  web:
    Container ID:  docker://4d318941b1917aaacbe3d3a5aa6a9ab7a45656db96c16792754
    Image:        nginx:1.14
    Image ID:    docker-pullable://nginx@sha256:f7988fb6c02e0ce69257d9bd9cf37
```

```
kubectl set image deployment app-deploy web=nginx:1.15 --record
```

```
controlplane $ kubectl set image deployment app-deploy web=nginx:1.15 --record  
deployment.apps/app-deploy image updated
```

```
controlplane $ kubectl get pods
```

NAME	READY	STATUS	RESTARTS	AGE
app-deploy-67777997f5-6891v	1/1	Running	0	9s
app-deploy-7f6ffffdcdd-55vmx	1/1	Running	0	3m2s
app-deploy-7f6ffffdcdd-6hh55	1/1	Running	0	3m2s
app-deploy-7f6ffffdcdd-1ql4w	1/1	Running	0	3m2s

```
controlplane $ kubectl get pods
```

NAME	READY	STATUS	RESTARTS	AGE
app-deploy-67777997f5-6891v	1/1	Running	0	11s
app-deploy-67777997f5-15wwm	0/1	ContainerCreating	0	2s
app-deploy-7f6ffffdcdd-55vmx	1/1	Running	0	3m4s
app-deploy-7f6ffffdcdd-6hh55	1/1	Running	0	3m4s
app-deploy-7f6ffffdcdd-1ql4w	1/1	Terminating	0	3m4s

```
kubectl get pods
```

```
controlplane $ kubectl get pods
```

NAME	READY	STATUS	RESTARTS	AGE
app-deploy-67777997f5-6891v	1/1	Running	0	46s
app-deploy-67777997f5-h9fmd	1/1	Running	0	34s
app-deploy-67777997f5-15wwm	1/1	Running	0	37s

```
controlplane $
```

```
controlplane $ kubectl get pods
NAME                               READY   STATUS    RESTARTS   AGE
app-deploy-67777997f5-6891v     1/1    Running   0          46s
app-deploy-67777997f5-h9fmd     1/1    Running   0          34s
app-deploy-67777997f5-15wwm     1/1    Running   0          37s
controlplane $
```

```
controlplane $ kubectl describe pods app-deploy-67777997f5-6891v
Name:           app-deploy-67777997f5-6891v
Namespace:      default
Priority:       0
Node:           node01/10.0.0.10
Start Time:     Wed, 11 May 2022 11:35:06 +0000
Labels:         app=webui
                pod-template-hash=67777997f5
Annotations:    <none>
Status:         Running
IP:             10.244.1.6
IPs:
  IP:           10.244.1.6
Controlled By: ReplicaSet/app-deploy-67777997f5
Containers:
  web:
    Container ID:  docker://1000a6255b6986d395a1de9f2a724ac3ea26d8bb6b290d31ee6
    Image:         nginx:1.15
    Image ID:      docker-pullable://nginx@sha256:23b4dcdf0d34d4a129755fc6f52e1
```

Deployment Rolling Update

```
kubectl set image deploy app-deploy web=nginx:1.16 --record  
kubectl set image deploy app-deploy web=nginx:1.17 --record  
kubectl set image deploy app-deploy web=nginx:1.15 --record
```

kubectl rollout history deploy *app-deploy*

```
controlplane $ kubectl rollout history deploy app-deploy  
deployment.apps/app-deploy  
REVISION  CHANGE-CAUSE  
7        kubectl create --filename=deployment-exam1.yaml --record=true  
10       kubectl set image deployment app-deploy web=nginx:1.16 --record=true  
11       kubectl set image deployment app-deploy web=nginx:1.17 --record=true  
12       kubectl set image deployment app-deploy web=nginx:1.15 --record=true
```