TROUBLESHOOTING TECHNIQUES IN K8S

CRASHLOOPBACKOFF: it error indicates that will automatically starting, crash and then restart the pod again repeatedly.

1. check the logs of the pods : kubectl logs pod-name
2. describe the pod : kubectl describe pod pod-name
3. ENSURE THAT THE POD CONFIGURATIONS AND ENVIRONMENT VARIABLES ARE CORRECTLY SET.
4. Verify the entrypoint of a container
5. Ensure that there are no resource limitations preventing the pod from running.

IMAGEPULLBACKOFF: this error occurs when k8s cant able to pull image from registry (Dockerhub, ECR)

1. describe the pod : kubectl describe pod pod-name
2. Check The imagename of pod config file (YAML)
3. Check the secrets : kubectl get secret

PENDINGPODS: This error will occurs when a pod is in pending state when it is unable to schedule on to a node

10 pods (worker : t2.micro)

11th pod pending

if any pod was deleted from that 10 pods, then 11th pod will be created

1. describe the pod : kubectl describe pod pod-name
2. check the nodes : kubectl get no

NODENOTREADY: A node is in a NoTReady State when its unable to participate in the cluster

1. describe the node : kubectl describe node node-name
2. Review the node logs : kubectl logs node node-id

UNAUTHORIZED ERROR: This error indicates a failure in API Authentication

1. Check your credentials
2. describe the resource : kubectl describe resource resource-name
3. Check the RBAC policies
4. Check the service account tokens are valid or not
5. check the kubeconfig file configured correctly or not

FailedScheduling: This error occurs when the scheduler cant find any suitable node for a pod.

1. describe the pod : kubectl describe pod pod-name
2. check the resources of a pod (CPU, Memory)

OOMKILLED : This error will occur when a pod was killed itself because it exceeds the memory limits.

1. check the resources of pods
2. describe the pod
3. increase the pod memory limit
4. optimising the app to use less memory

ERROR CREATING LOADBALANCER: it error will occurs when k8s cant communicate with cloud provider.

1. describe the service : kubectl describe service service-name
2. check the IAM permissions on AWS account
3. Check the cloud provider integration configuration is successfully configured or not
4. Verify the service file annotations (YAML)

ContainerCreatingerror: this error will occurs when we didnt pass correct container configurations on yaml file

1. describe the pod : kubectl describe pod pod-name
2. check the container configurations on YAML file
3. Imagepull Issue check
4. Verify the node has sumcient resources or not
5. Ensure that there are no networking issues.

DEPLOYMENT STRATEGY IN K8S

WHAT IS DEPLOYMENT STRATEGY

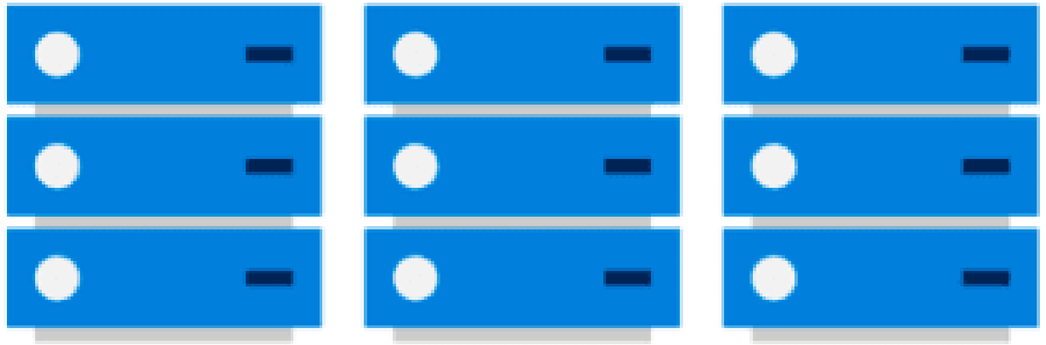
These are the techniques which are used to manage the rollout and scaling of applications within a Kubernetes cluster

1. Canary Deployment
2. Recreate Deployment.
3. Rolling update
4. Blue-Green Deployment

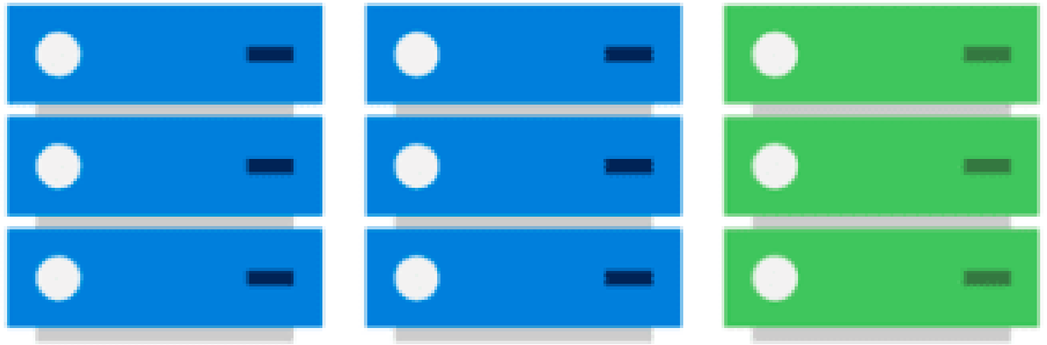
1. CANARY DEPLOYMENT

A Canary Deployment involves rolling out a new version of your application to a subset of your pods or a percentage of your traffic to test it before deploying it to the entire application in production.

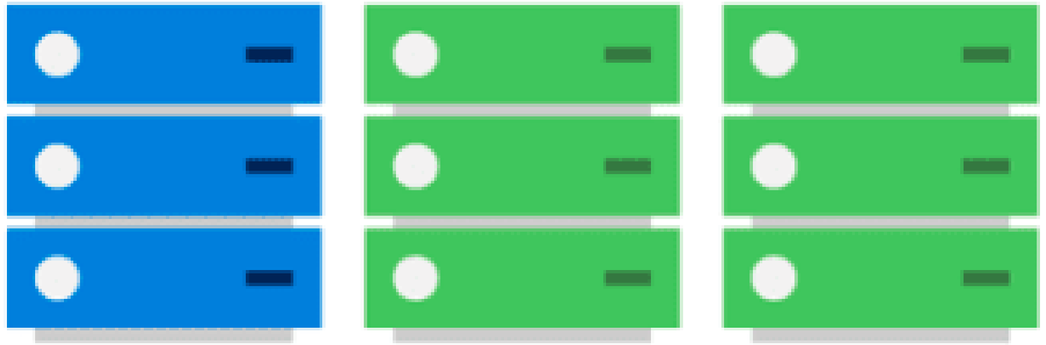
State 0



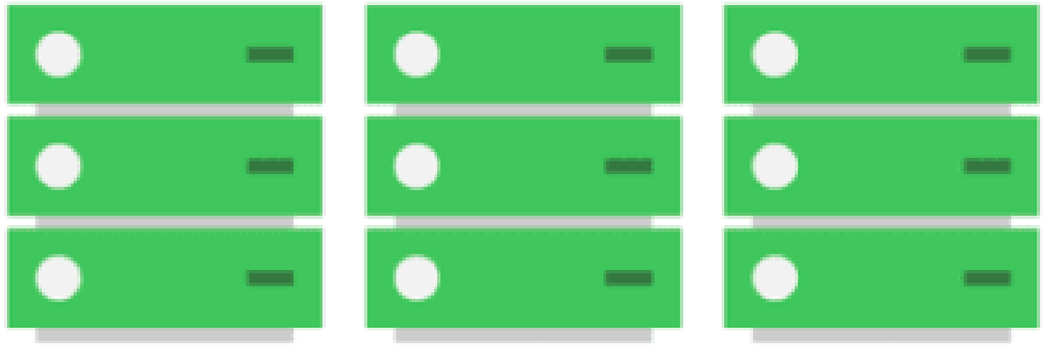
State 1



State 2



Final State



2. RECREATE DEPLOYMENT:

In this strategy, the existing version of the application is terminated completely, and a new version is deployed in its place. This approach is simple but may cause downtime during the update.

3. Rolling Update

pod

create new pods

It starts by creating a few pods of the new version

Monitor Pods

It monitors the new pods to make sure they are healthy and working well.

Route traffic

If the new pods are working fine, Kubernetes gradually increases their number while reducing the old pods.

pod

Delete old pods

This process continues until all pods are running the new version, and the old version has been phased out.

create a deployment file

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-deployment
  labels:
    app: nginx
spec:
  replicas: 3
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
      - name: nginx
        image: nginx:1.21.1
        ports:
        - containerPort: 80
```

execute this file : kubectl create -f deployment.yml

Check the deployments now : kubectl get deployment

Check the RS : kubectl get rs

```
root@ip-172-31-7-191:~/myfiles# kubectl get deployment
NAME                READY   UP-TO-DATE   AVAILABLE   AGE
nginx-deployment    3/3     3            3           12s
```

```
root@ip-172-31-7-191:~/myfiles# kubectl get rs
NAME                          DESIRED   CURRENT   READY   AGE
nginx-deployment-7d5bb7fdcc   3         3         3       33s
```

Now update the image: kubectl set image deployment/nginx-deployment nginx=shaikmustafa/cycle
Check the RS : kubectl get rs

```
root@ip-172-31-7-191:~/myfiles# kubectl set image deployment/nginx-deployment nginx=shaikmustafa/cycle
deployment.apps/nginx-deployment image updated
```

```
root@ip-172-31-7-191:~/myfiles# kubectl get rs
NAME                          DESIRED   CURRENT   READY   AGE
nginx-deployment-7d5bb7fdcc   0         0         0       2m58s
nginx-deployment-855cf4d748   3         3         3       12s
```

Now we can observe, old pods from RS-1 was completely deleted and RS-2 created new pods for version-2 it contains some downtime, To avoid this we will use Rolling Updates

create a deployment file with strategy:

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-deployment
  labels:
    app: nginx
spec:
  replicas: 3
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
      - name: nginx
        image: nginx:1.21.1
        ports:
        - containerPort: 80
  strategy:
    type: RollingUpdate
    rollingUpdate:
      maxSurge: 1
      maxUnavailable: 1
```

execute this file : kubectl create -f deployment.yml

Check the deployments now : kubectl get deployment

Check the RS : kubectl get rs

```
root@ip-172-31-7-191:~/myfiles# kubectl get deployment
NAME                READY   UP-TO-DATE   AVAILABLE   AGE
nginx-deployment    3/3     3            3           12s
```

```
root@ip-172-31-7-191:~/myfiles# kubectl get rs
NAME                          DESIRED   CURRENT   READY   AGE
nginx-deployment-7d5bb7fdcc   3         3         3       33s
```

- **maxSurge** specifies how many new Pods can be created by the Deployment controller in a “roll” in addition to the number of DESIRED
- **maxUnavailable** refers to how many old Pods can be deleted by the Deployment controller in a “rolling”

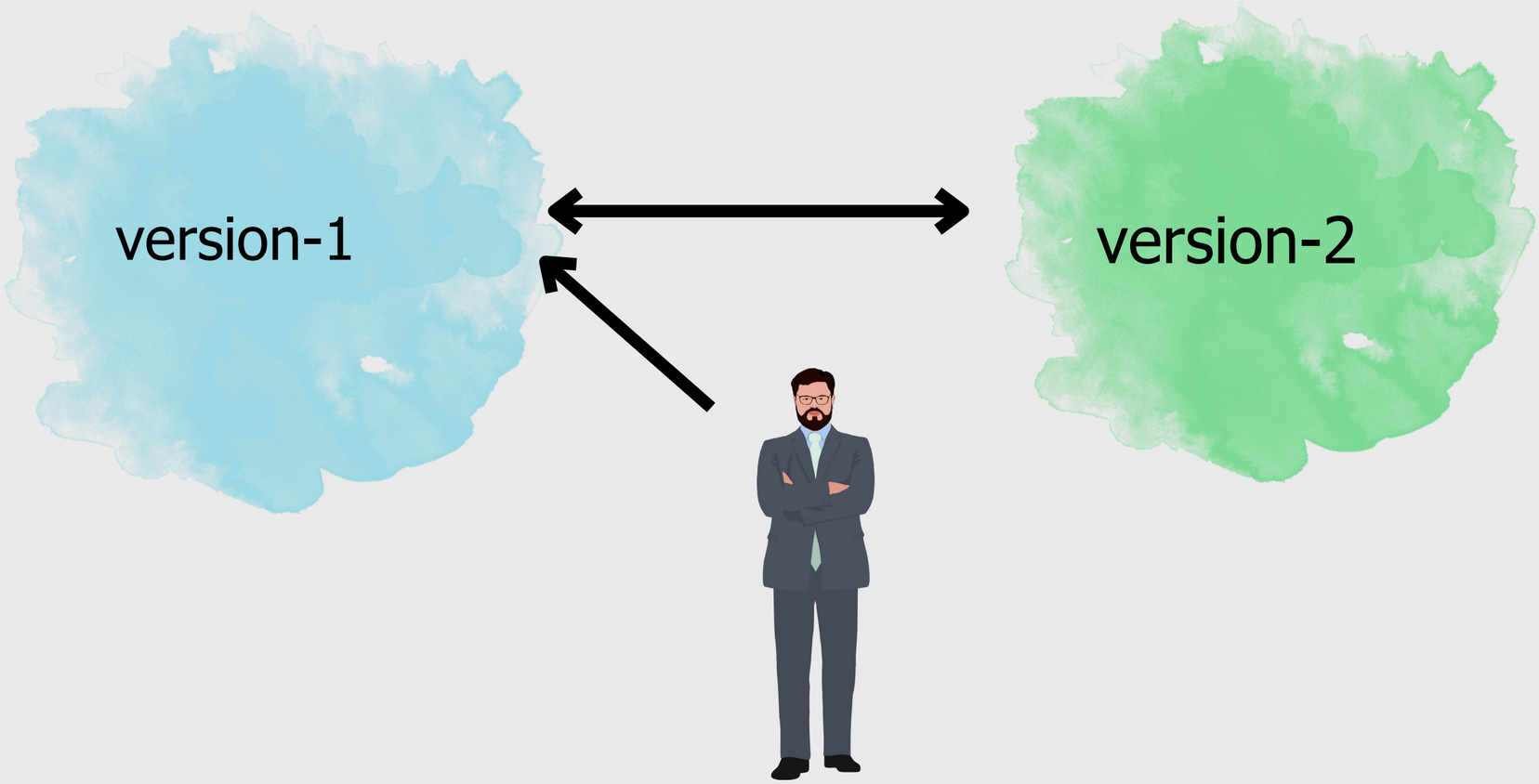
Now update the image: kubectl set image deployment/nginx-deployment nginx=shaikmustafa/cycle
Check the RS : kubectl get rs

```
root@ip-172-31-7-191:~/myfiles# kubectl set image deployment/nginx-deployment nginx=shaikmustafa/cycle
deployment.apps/nginx-deployment image updated
```

```
nginx-deployment-8449945bc4   2         2         0       1s
nginx-deployment-855cf4d748   2         2         2       51s
```

So we have 3 Pod copies, then the controller will always ensure that at least 2 Pods are available during the “rolling update” process, and at most only 4 Pods exist in the cluster at the same time. This strategy is a field of the Deployment object, named RollingUpdateStrategy

4. BLUE-GREEN DEPLOYMENT



A Blue/Green deployment is a way of accomplishing a zero-downtime upgrade to an existing application. The “Blue” version is the currently running copy of the application and the “Green” version is the new version. Once the green version is ready, traffic is rerouted to the new version

Step 1: Create Blue Deployment

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: demoapp-blue
  labels:
    app: demoapp
    env: blue
spec:
  replicas: 3
  selector:
    matchLabels:
      app: demoapp
      env: blue
  template:
    metadata:
      labels:
        app: demoapp
        env: blue
    spec:
      containers:
      - name: demo
        image: nginx
        ports:
        - containerPort: 80
```

create same deployment with same image but change names and env of the deployment.

Now execute both the deployments

kubectl create -f blue.yml
kubectl create -f green.yml

Step 2: Create Green Deployment

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: demoapp-green
  labels:
    app: demoapp
    env: green
spec:
  replicas: 3
  selector:
    matchLabels:
      app: demoapp
      env: green
  template:
    metadata:
      labels:
        app: demoapp
        env: green
    spec:
      containers:
      - name: demo
        image: nginx
        ports:
        - containerPort: 80
```

Step 3: Create a Service

```
apiVersion: v1
kind: Service
metadata:
  name: demoappp-service
spec:
  selector:
    app: demoapp
  ports:
  - name: http
    port: 80
    targetPort: 80
  type: LoadBalancer
~
```

Now execute the service file

kubectl create -f svc.yml

Now verify that nginx image is running in the browser or not. That means we can see the application running in the blue environment.

Step 5: Perform Blue-Green Deployment

Now that we have both blue and green deployments running, we can perform the Blue-Green Deployment by routing traffic from the blue deployment to the green deployment.

Now update the image in green-deployment file
from nginx to httpd

```
  spec:
    containers:
    - name: demo
      image: httpd
      ports:
      - containerPort: 80
```

kubectl apply -f green.yml

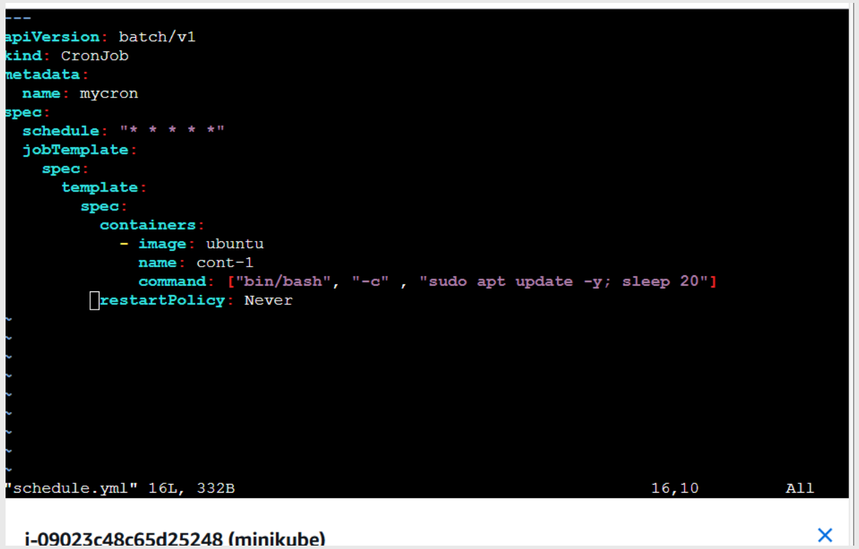
Now update the service - to route traffic to the green deployment. To do this, update the label selector in the service manifest to select the green deployment.

kubectl apply -f svc.yml

```
root@ip-172-31-26-250:~# ll
total 56064
drwx------  6 root root     4096 Dec 15 14:46 ./
drwxr-xr-x 22 root root     4096 Dec 15 13:56 ../
-rw-r--r--  1 root root     3106 Apr 22  2024 .bashrc
drwxr-xr-x  3 root root     4096 Dec 15 14:01 .kube/
drwxr-xr-x 10 root root     4096 Dec 15 13:59 .minikube/
-rw-r--r--  1 root root      161 Apr 22  2024 .profile
drwx------  2 root root     4096 Dec 15 13:56 .ssh/
-rw-------  1 root root     7020 Dec 15 14:46 .viminfo
-rw-r--r--  1 root root    22115 Dec 15 13:58 get-docker.sh
-rw-r--r--  1 root root      329 Dec 15 14:44 job.yml
-rw-r--r--  1 root root 57323672 Dec 15 13:58 kubectl
-rw-r--r--  1 root root       64 Dec 15 13:58 kubectl.sha256
-rw-r--r--  1 root root      778 Dec 15 13:57 minikube.sh
-rw-r--r--  1 root root      332 Dec 15 14:46 schedule.yml
drwx------  3 root root     4096 Dec 15 13:56 snap/
root@ip-172-31-26-250:~#
```

```yaml
---
apiVersion: batch/v1
kind: Job
metadata:
  name: myjob
spec:
  parallelism: 3
  activeDeadlineSeconds: 20
  template:
    metadata:
      name: testjob
    spec:
      containers:
        - image: ubuntu
          name: cont-1
          command: ["/bin/bash", "-c", "sudo apt update -y; sleep 20"]
      restartPolicy: Never
~
~
~
~
~
~
~
~
"job.yml" 17L, 329B                                           8,26          All
```

```
root@ip-172-31-26-250:~# kubectl create -f job.yml
job.batch/myjob created
root@ip-172-31-26-250:~# kubectl get po
NAME                    READY   STATUS      RESTARTS   AGE
mycron-28904562-kqvww   0/1     Completed   0          2m53s
mycron-28904563-vq627   0/1     Completed   0          113s
mycron-28904564-6xnf8   0/1     Completed   0          53s
myjob-4xnl7             1/1     Running     0          5s
myjob-fztn7             1/1     Running     0          5s
myjob-q4576             1/1     Running     0          5s
```



Finally, we need to verify that the deployment was successful