

# Debugging in Kubernetes



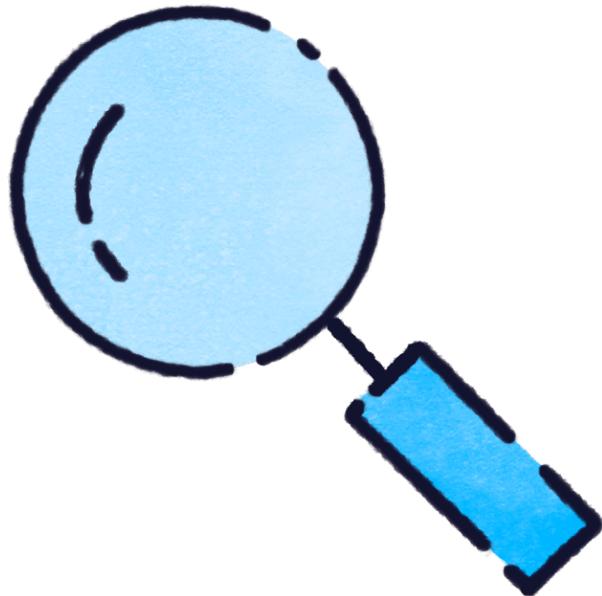
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# The Debugging Process



# Step 1: Identify



**Discover which component is failing**

**Notice:**

- Is the pod running?
- Are any probes failing?
- Are there admission control errors?

**Consider how components relate to each other**



## Step 2: Gather Information



**Check logs**

**Use diagnostic commands**

**Review resource restraints**



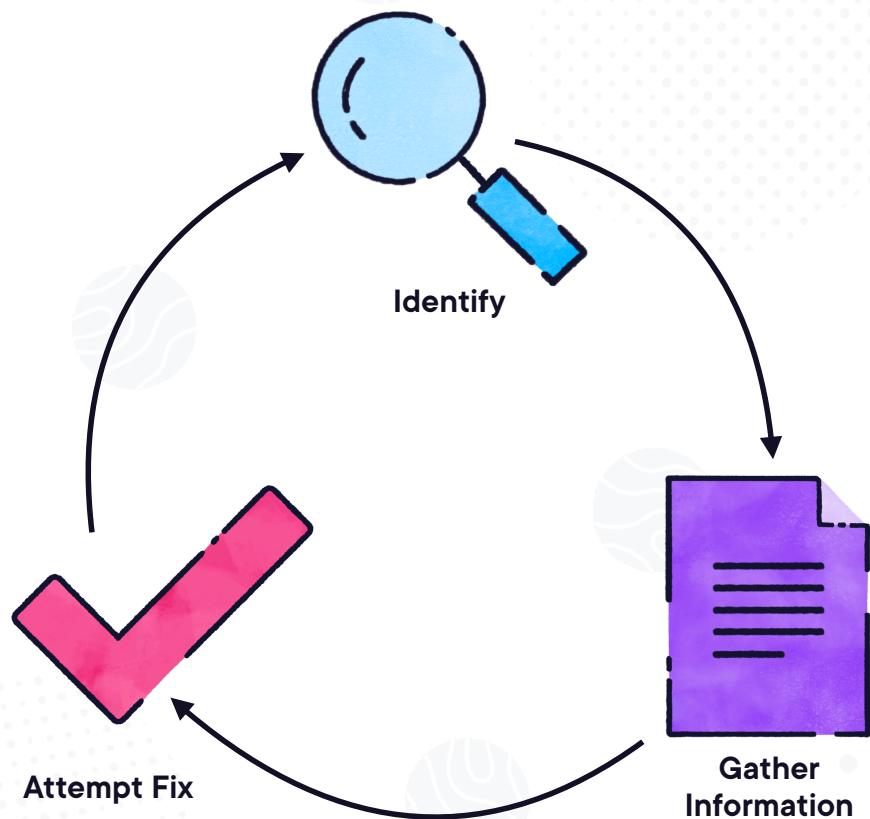
## Step 3: (Attempt to) Fix



- Modify necessary components
- Update probes (as needed)
- Redeploy or restart



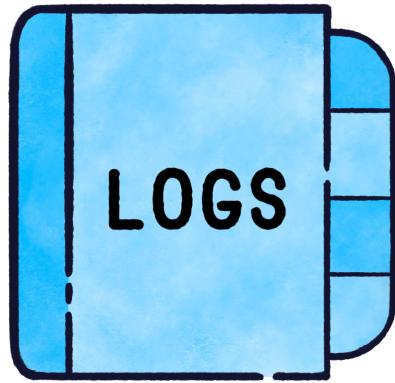
# Repeat as Needed



# **Viewing Kubernetes Status with Events and Describe**

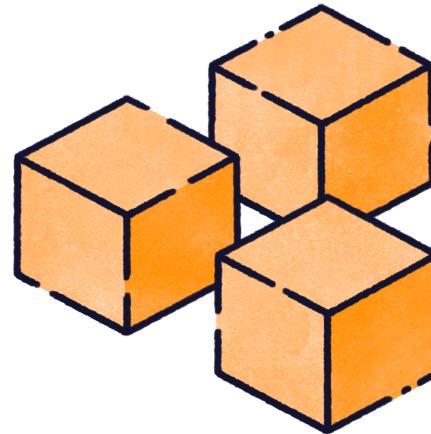


# Data Gathering Refresher



**Review Logs**

```
kubectl logs <pod_name>
```



**Review Pod Status**

```
kubectl get pods
```



# View Pod Information and Events

```
> kubectl describe pod <pod_name>
```

```
Name:           startup-app
Namespace:      default
Priority:       0
Service Account: default
Node:           worker1/172.31.114.162
Start Time:     Mon, 21 Jul 2025 08:57:07 -0400
Labels:          <none>
Annotations:    <none>
Status:          Running
IP:             10.244.1.53
IPs:
  IP: 10.244.1.53
Containers:
  main:
```



# View Pod Information and Events

```
> kubectl describe pod <pod_name>
```

Events:

Type	Reason	Age	From	Message
Normal	Scheduled	54m	default-scheduler	Successfully assigned default/startup-app to worker1
Normal	Pulling	54m	kubelet	Pulling image "busybox"
Normal	Pulled	54m	kubelet	Successfully pulled image "busybox" in 303ms (303ms including waiting). Image size: 2156518 bytes.
Normal	Created	54m	kubelet	Created container: main
Normal	Started	54m	kubelet	Started container main
Warning	FailedMount	4s (x5 over 11s)	kubelet	MountVolume.SetUp failed for volume "script-volume" : configmap "app-startup-scripts" not found



# View All Pod Events

```
> kubectl get events
```

LAST SEEN	TYPE	REASON	OBJECT	MESSAGE
60m	Normal	Scheduled	pod/startup-app	Successfully assigned default/startup-app to worker1
3m32s	Normal	Killing	pod/startup-app	Stopping container main
2m55s	Normal	Scheduled	pod/startup-app	Successfully assigned default/startup-app to worker1
47s	Warning	FailedMount	pod/startup-app	MountVolume.SetUp failed for volume "script-volume" : configmap "app-startup-scripts" not found
73s	Warning	FailedMount	pod/test-shell	MountVolume.SetUp failed for volume "script-volume" : configmap "app-startup-scripts" not found



# View All Pod Events (Specific Namespace)

```
> kubectl get events -n <namespace>
```

LAST SEEN	TYPE	REASON	OBJECT	MESSAGE
60m	Normal	Scheduled	pod/startup-app	Successfully assigned default/ startup-app to worker1
3m32s	Normal	Killing	pod/startup-app	Stopping container main
2m55s	Normal	Scheduled	pod/startup-app	Successfully assigned default/ startup-app to worker1
47s	Warning	FailedMount	pod/startup-app	MountVolume.SetUp failed for volume "script-volume" : configmap "app-startup-scripts" not found
73s	Warning	FailedMount	pod/test-shell	MountVolume.SetUp failed for volume "script-volume" : configmap "app-startup-scripts" not found



# View All Pod Events (All Namespaces)

```
> kubectl get events --all-namespaces
```

LAST SEEN	TYPE	REASON	OBJECT	MESSAGE
60m	Normal	Scheduled	pod/startup-app	Successfully assigned default/ startup-app to worker1
3m32s	Normal	Killing	pod/startup-app	Stopping container main
2m55s	Normal	Scheduled	pod/startup-app	Successfully assigned default/ startup-app to worker1
47s	Warning	FailedMount	pod/startup-app	MountVolume.SetUp failed for volume "script-volume" : configmap "app-startup-scripts" not found
73s	Warning	FailedMount	pod/test-shell	MountVolume.SetUp failed for volume "script-volume" : configmap "app-startup-scripts" not found



# View All Pod Events By Type

```
> kubectl get events --field-selector type=Warning
```

LAST SEEN	TYPE	REASON	OBJECT	MESSAGE
111s	Warning	FailedMount	pod/startup-app	MountVolume.SetUp failed for volume "script-volume" : configmap "app-startup-scripts" not found
14s	Warning	FailedMount	pod/test-shell	MountVolume.SetUp failed for volume "script-volume" : configmap "app-startup-scripts" not found



# View All Pod Events (Sorted)

```
> kubectl get events --sort-by=.metadata.creationTimestamp'
```

LAST SEEN	TYPE	REASON	OBJECT	MESSAGE
7m5s	Normal	Killing	pod/startup-app	Stopping container main
41s	Warning	FailedMount	pod/test-shell	MountVolume.SetUp failed for volume "script-volume" : configmap "app-startup-scripts" not found
6m28s	Normal	Scheduled	pod/startup-app	Successfully assigned default/startup-app to worker1
16s	Warning	FailedMount	pod/startup-app	MountVolume.SetUp failed for volume "script-volume" : configmap "app-startup-scripts" not found

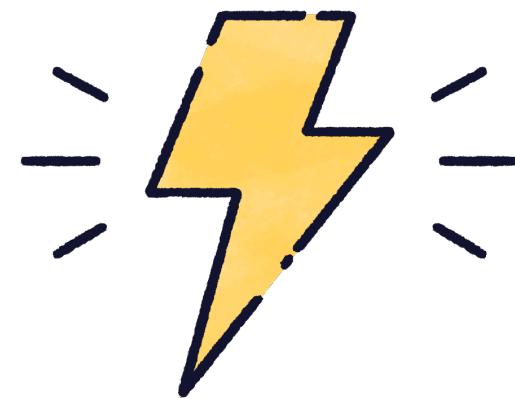


# **Events are ephemeral and expire.**





**kubectl describe**



**kubectl get events**



# Interactive Pod Inspection



# Access Underlying Container

```
> kubectl exec -it <pod_name> -c <container_name> -- /bin/sh

/ # ls
bin      home      lib64      scripts   usr
dev      init      proc      sys        var
etc      lib       root      tmp
/ # cd scripts && ls
start.sh
```



# Access Underlying Container (One-off Commands)

```
> kubectl exec -it <pod_name> -- <command>
```

```
> kubectl exec -it <pod_name> -- ls /app
```

```
index.js  index.html  style.css
```



# Run Temporary Interactive Pod

```
> kubectl run debug --image=busybox -it --rm -- sh  
  
/ # ls  
bin      home      lib64      scripts   usr  
dev      init      proc       sys       var  
etc      lib       root       tmp  
/ # cd scripts && ls  
start.sh
```



# Exec Requirements

Pod must be  
running

Pod must be in a  
non-error state

Pod must have a  
shell



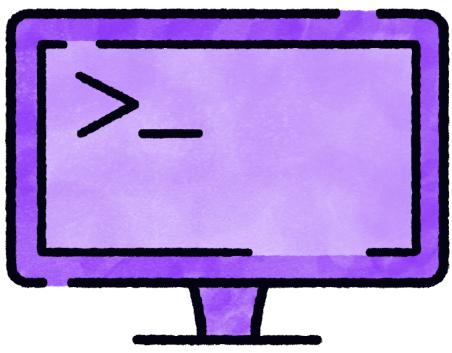
# Attach to Running Process in Pod

```
> kubectl attach -it <pod_name> -c <container_name>  
  
>>> 2 + 3  
5  
>>> exit()
```



**To attach to a pod, the pod  
needs a foreground,  
interactive process**





**kubectl exec**



**kubectl attach**



## **CrashLoopBackOffs, Previous Logs, and Ephemeral Debug Containers**



# **How do you troubleshoot a pod in a failed state?**



**Created pod based on  
target container**

**Pod is ephemeral**

**Removed upon exit**

**kubectl debug -it  
<pod\_name> --image=busybox  
-target=<target\_container>**



Share network, storage,  
namespaces with original  
container

Pod is NOT ephemeral

```
kubectl debug -it  
<pod_name> --image=busybox  
--share-processes --copy-  
to=web-app-debug
```



# Demo: Debugging a Failing Kubernetes Pod



# Exam Scenario



The application deployed via the startup-app.yaml manifest fails to properly deploy. Deploy the pod, then troubleshoot the issue

Once finished troubleshooting, confirm the source of the issue has been resolved by accessing the container and verifying the fix

