

Kubernetes (K8s) Basics + Kubectl Cheatsheet

What is Kubernetes?

Kubernetes is a tool to manage and deploy containerized applications (like Docker containers).

It takes care of scaling, load balancing, rolling updates, and even auto-healing.

Originally built by Google, now managed by the Cloud Native Computing Foundation (CNCF).

Why use Kubernetes?

Here's what makes Kubernetes so popular in the industry:

- **Auto-scaling:** Handles traffic spikes smoothly.
- **Self-healing:** Crashed containers restart automatically.
- **Load balancing:** Routes traffic smartly to different pods.
- **Rolling updates:** Updates without downtime.
- **Portability:** Runs on cloud, on-premise, or hybrid environments.
- **Declarative setup:** Everything is written in YAML, so easy to version control.

Core Concepts

Pod – The smallest deployable unit in Kubernetes. It wraps around one or more containers (usually just one).

Node – A virtual or physical machine that runs your pods.

Cluster – A group of nodes managed by Kubernetes.

Deployment – Defines how many replicas (copies) of a pod to run. Handles rolling updates too.

ReplicaSet – Maintains a set number of pod replicas. Usually auto-managed by Deployments.

Service – Exposes your pods to the network. Can be internal or external.

Namespace – Used to isolate resources (e.g., dev, staging, prod).

ConfigMap – Stores config data in key-value format (non-sensitive values).

Secret – Stores sensitive data (passwords, API keys).

Volume – Used to store persistent data.

PersistentVolume (PV) – A piece of storage in the cluster provided by an admin.

PersistentVolumeClaim (PVC) – A user's request for storage.

StatefulSet – Manages stateful applications like DBs, Kafka, etc.

Ingress – Manages external HTTP/S access to services.

DaemonSet – Ensures a pod runs on every (or selected) node.

Job – Runs a one-time task to completion.

CronJob – Runs tasks on a schedule like cron.

Horizontal Pod Autoscaler (HPA) – Scales pods based on CPU/memory usage.

Kubectl Cheatsheet (Commands You'll Actually Use)

Cluster and Nodes

Show cluster endpoint and master details

```
kubectl cluster-info
```

List all nodes in the cluster

```
kubectl get nodes
```

Show details for a node

```
kubectl describe node <node-name>
```

View CPU and memory usage for nodes

```
kubectl top node
```

Pods

List all pods

```
kubectl get pods
```

Show extra pod info

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

Describe pod

```
kubectl describe pod <pod-name>
```

View logs of a pod

```
kubectl logs <pod-name>
```

Logs from specific container

```
kubectl logs <pod-name> -c <container-name>
```

Follow logs

```
kubectl logs -f <pod-name>
```

Open terminal in pod

```
kubectl exec -it <pod-name> -- bash
```

Delete a pod

```
kubectl delete pod <pod-name>
```

Copy files from pod

```
kubectl cp <pod-name>:/path/in/pod /local/path
```

Deployments and Rollouts

List deployments

```
kubectl get deployments
```

Create deployment

```
kubectl create deployment nginx --image=nginx
```

Scale deployment

```
kubectl scale deployment nginx --replicas=3
```

Rollout status

```
kubectl rollout status deployment nginx
```

Restart deployment

```
kubectl rollout restart deployment nginx
```

Rollback

```
kubectl rollout undo deployment nginx
```

Delete deployment

```
kubectl delete deployment nginx
```

Services and Networking

List services

```
kubectl get svc
```

Expose deployment

```
kubectl expose deployment nginx --type=NodePort --port=80
```

Get service endpoints

```
kubectl get endpoints
```

Port forward

```
kubectl port-forward svc/nginx 8080:80
```

ConfigMaps and Secrets

Create configmap

```
kubectl create configmap my-config --from-literal=key=value
```

Get configmaps

```
kubectl get configmaps
```

Describe configmap

```
kubectl describe configmap my-config
```

Create secret

```
kubectl create secret generic my-secret --from-literal=password=1234
```

Get secrets

```
kubectl get secrets
```

Describe secret

```
kubectl describe secret my-secret
```

YAML and Resource Management

Apply YAML

```
kubectl apply -f app.yaml
```

Delete YAML

```
kubectl delete -f app.yaml
```

Diff changes

```
kubectl diff -f app.yaml
```

Get all resources

```
kubectl get all
```

Namespaces

List namespaces

```
kubectl get namespaces
```

Create namespace

```
kubectl create namespace dev-env
```

Set default namespace

```
kubectl config set-context --current --namespace=dev-env
```

Debugging and Troubleshooting

Describe pod

```
kubectl describe pod <pod-name>
```

View events

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

Pod YAML

```
kubectl get pod <pod-name> -o yaml
```

Get all pods in all namespaces

```
kubectl get pods -A
```

Metrics

Pod resource usage

```
kubectl top pod
```

Container resource usage

```
kubectl top pod -containers
```

Free Resources to Practice Kubernetes

- Play with Kubernetes: <https://labs.play-with-k8s.com/>
- Official Docs: <https://kubernetes.io/docs/>
- Lens GUI: <https://k8slens.dev/>