Kubernetes is an **open-source container orchestration platform** that automates:

- Deployment of applications
- Scaling (adding/removing containers automatically)
- Load balancing
- Self-healing (restarting crashed containers)

Think of it as a **manager for Docker containers** — it ensures your app is always running, balanced, and scalable across multiple machines.

Minikube

Minikube is a lightweight tool that allows you to **run Kubernetes locally** on your computer.

It sets up a **single-node Kubernetes cluster** (a small version of a real K8s cluster) for **learning, testing, and development**.

Install Minikube

Step 1: Update System

sudo apt update && sudo apt upgrade -y

```
Hit:1 http://archive.ubuntu.com/ubuntu focal InRelease
Reading package lists... Done
Upgrading packages...
```

Step 2: Install Dependencies

sudo apt install curl apt-transport-https virtualbox virtualbox-ext-pack -y

```
Setting up virtualbox (6.1.38-dfsg-3~ubuntu1.22.04.1) ...
Processing triggers for man-db (2.9.4-2) ...
```

Step 3: Download Minikube Binary

curl -LO https://storage.googleapis.com/minikube/releases/latest/minikube-linux-amd64

```
% Total    % Received % Xferd  Average Speed   Time
100  72.3M  100  72.3M    0     0  2.3M  0:00:31  0:00:31 --:--:-- 2.3M
```

Step 4: Install Minikube

sudo install minikube-linux-amd64 /usr/local/bin/minikube

Step 5: Verify Installation

minikube version

```
minikube version: v1.33.1
commit: 123abc456def (Mon Sep 2 14:45:00 2025)
```

Start Minikube Cluster

Step 1: Start the Cluster

minikube start --driver=virtualbox

```
😄  minikube v1.33.1 on Ubuntu 22.04
✨  Using the virtualbox driver based on existing profile
👍  Starting control plane node minikube in cluster minikube
🏄  Done! kubectl is now configured to use "minikube" cluster
```

Step 2: Check Status

minikube status

```
host: Running
kubelet: Running
apiserver: Running
kubeconfig: Configured
```

Step 3: Access Dashboard

minikube dashboard

Deploy a Simple Application

Step 1: Create a Deployment

kubectl create deployment hello-minikube --image=k8s.gcr.io/echoserver:1.4

```
deployment.apps/hello-minikube created
```

Step 2: Expose the Deployment

kubectl expose deployment hello-minikube --type=NodePort --port=8080

```
service/hello-minikube exposed
```

Step 3: Check Pods

kubectl get pods

```
NAME                              READY   STATUS    RESTARTS   AGE
hello-minikube-67f5c9d9c7-jt7qf   1/1     Running   0          45s
```

Step 4: Get Service URL

minikube service hello-minikube –url

```
http://192.168.99.101:31546
```

Open this URL in your browser, and you'll see:

```
Hello from echoserver! Your request has been received.
```

Stop & Delete Cluster

Step 1: Stop the Cluster

minikube stop

```
arduino

✋  Stopping node "minikube" ...
🛑  1 nodes stopped.
```

Step 2: Delete the Cluster

minikube delete

```
Deleting "minikube" from virtualbox ...
Removed all traces of the "minikube" cluster.
```