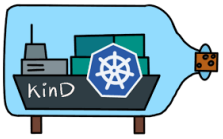


# KIND CLUSTER
# (KUBERNETES IN DOCKER)

## Kind Cluster

- Also known as (Kubernetes in Docker)
- Like Minikube
- It a tool that runs Kubernetes clusters entirely inside Docker containers.

## When to Use Which?

- Minikube – Best for beginners, local development with persistent data, or simulating a "real" single-node cluster.

- Kind – Best for testing multi-node scenarios, CI/CD, contributing to Kubernetes, or rapid cluster experimentation.

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## Difference between Minikube and kind

| Feature | Minikube | Kind |
|---|---|---|
| Purpose | Runs a single-node Kubernetes cluster locally | Runs multi-node Kubernetes clusters in Docker |
| Underlying Tech | Uses Virtual Machines (VMs) or containers | Uses Docker containers |
| Installation Complexity | Requires a hypervisor (if using VMs) | Requires only Docker |
| Cluster Type | Primarily single node | Supports multi-node clusters |

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| | | |
|---|---|---|
| Performance | Slightly heavier due to VM support | Lightweight since it runs fully in containers |
| Use Case | Best for local Kubernetes development and testing | Ideal for CI/CD and testing Kubernetes in containers |
| Networking | Creates its own VM or containerized network | Uses Docker's built-in networking |
| Resource Consumption | Higher (especially with VM-based setups) | Lower, as it runs entirely in containers |
| Preferred By | Developers testing full Kubernetes environments | CI/CD pipelines and quick Kubernetes testing |

## Prerequisites for Kind installation

| Prerequisites | Details |
|---|---|
| Operating System | Linux, macOS, or Windows (with WSL2/Docker Desktop). |
| Docker | Installed and running (docker --version). |
| Kind CLI | Installed (kind --version). |
| kubectl | Installed (kubectl version --client). |
| System Resources | Minimum 2 CPU cores, 4 GB RAM, and 10 GB disk space. |
| Internet Connectivity | Required for downloading Kubernetes images and dependencies. |

## Kind installation in ubuntu (linux)

### *STEP 1 – Install Docker in ubuntu*

1.1 Create a folder name docker

```
root@DELLG-15:/home/lili# mkdir docker
root@DELLG-15:/home/lili# ls
docker
root@DELLG-15:/home/lili# cd docker
root@DELLG-15:/home/lili/docker#
```

1.2 To check the current user

```
lili@DELLG-15:~/docker$ echo "Current user: $USER"
Current user: lili
lili@DELLG-15:~/docker$ ls
```

1.3 Then do

```
lili@DELLG-15:~$ sudo su
[sudo] password for lili:
root@DELLG-15:/home/lili#
```

1.4 Create a file name install_docker.sh in docker folder

```
root@DELLG-15:/home/lili/docker# vim install_docker.sh
root@DELLG-15:/home/lili/docker# cat install_docker.sh
#!/bin/bash

# Update package list
sudo apt-get update

# Install prerequisites
sudo apt-get install -y \
    ca-certificates \
    curl \
    gnupg \
    lsb-release

# Add Docker's official GPG key
sudo mkdir -p /etc/apt/keyrings
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo
gpg --dearmor -o /etc/apt/keyrings/docker.gpg

# Set up the Docker repository
echo \
  "deb [arch=$(dpkg --print-architecture) signed-
by=/etc/apt/keyrings/docker.gpg]
https://download.docker.com/linux/ubuntu \
  $(lsb_release -cs) stable" | sudo tee
/etc/apt/sources.list.d/docker.list > /dev/null

# Update package index again
sudo apt-get update

# Install Docker Engine
```

```
sudo apt-get install -y \
    docker-ce \
    docker-ce-cli \
    containerd.io \
    docker-compose-plugin

# Verify Docker installation
sudo docker run hello-world

echo "Docker installed successfully! Please log out and back
in for group changes to take effect."
```

Change $USER based on your user as for me its lili

1.5 Make it executable

```
root@DELLG-15:/home/lili/docker# chmod +x install_docker.sh
```

1.6 Run it:

```
root@DELLG-15:/home/lili/docker# ./install_docker.sh
```

1.7 Verify Installation

```
root@DELLG-15:/home/lili/docker# docker ps
CONTAINER ID   IMAGE     COMMAND   CREATED   STATUS    PORTS     NAMES
```

1.8 Now exit from root privileges then try “docker ps”

You will find this error

```
lili@DELLG-15:~$ docker ps permission denied while trying to
connect to the Docker daemon socket at
unix:///var/run/docker.sock: Get
"http://%2Fvar%2Frun%2Fdocker.sock/v1.47/containers/json":
dial unix /var/run/docker.sock: connect: permission denied
```

To resolve this

```
sudo usermod -aG docker $USER
```

then

```
newgrp docker
```

now try running

```
docker ps
```

without sudo

## *STEP 2 – Installing KIND and kubectl*

2.1 Create a new folder name kind_kubectl

```
mkdir kind_kubectl
```

2.2 Create a file in folder kind_kubectl name install_kind_kubernetes.sh

```
vim install_kind_kubernetes.sh
```

2.3 Install KIND and kubectl using the provided script:

```
#!/bin/bash

[ $(uname -m) = x86_64 ] && curl -Lo ./kind
https://kind.sigs.k8s.io/dl/v0.20.0/kind-linux-amd64
chmod +x ./kind
sudo cp ./kind /usr/local/bin/kind

VERSION="v1.30.0"
URL="https://dl.k8s.io/release/${VERSION}/bin/linux/amd64/kube
ctl"
INSTALL_DIR="/usr/local/bin"

curl -LO "$URL"
chmod +x kubectl
sudo mv kubectl $INSTALL_DIR/
kubectl version --client

rm -f kubectl
rm -rf kind

echo "kind & kubectl installation complete."
```

VERSION – give the latest version

2.4 Make it executable

```
lili@DELLG-15:~/kind_kubectl$ chmod +x install_kind_kubernetes.sh
```

2.5 Run it:

```
lili@DELLG-15:~/kind_kubectl$ ./install_kind_kubernetes.sh
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100    97  100    97    0     0    116      0 --:--:-- --:--:-- --:--:--   116
  0     0    0     0    0     0      0      0 --:--:--  0:00:01 --:--:--     0
100 6304k  100 6304k    0     0   929k      0  0:00:06  0:00:06 --:--:-- 1493k
[sudo] password for lili:
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100   138  100   138    0     0    202      0 --:--:-- --:--:-- --:--:--   202
100 49.0M  100 49.0M    0     0  1986k      0  0:00:25  0:00:25 --:--:-- 3034k
Client Version: v1.30.0
Kustomize Version: v5.0.4-0.20230601165947-6ce0bf390ce3
kind & kubectl installation complete.
```

## *STEP 3 – Setting Up the KIND Cluster*

3.1 Create a kind-cluster-config.yaml files in kind_kubectl:

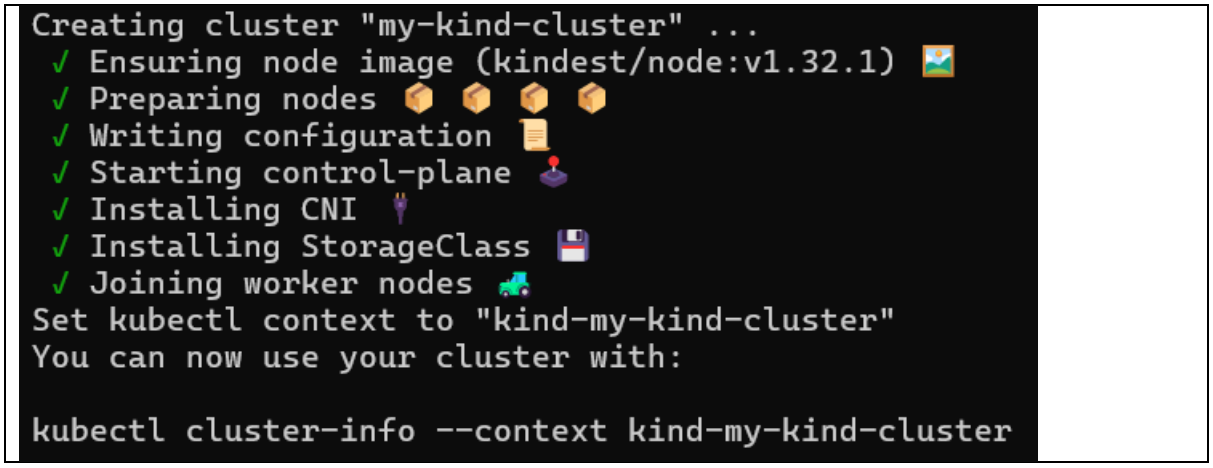
```
kind: Cluster
apiVersion: kind.x-k8s.io/v1alpha4

nodes:
- role: control-plane
  image: kindest/node:v1.32.1
- role: worker
  image: kindest/node:v1.32.1
- role: worker
  image: kindest/node:v1.32.1
  extraPortMappings:
  - containerPort: 80
    hostPort: 80
    protocol: TCP
  - containerPort: 443
    hostPort: 443
    protocol: TCP
```

kindest/node:v1.32.1 – Go to DockerHub and search for latest image of kindest/node

3.2 Create the cluster using the configuration file:

```
kind create cluster --config kind-cluster-config.yaml --name
my-kind-cluster
```




in place of my-kind-cluster you can give any name as you want

3.3 Verify the cluster:

```
kubectl get nodes
kubectl cluster-info
```