Complete Notes: Installing & Using Kind Kubernetes Cluster (CKA 2024 Series #6) 🚀 🐳

🎯 Video Goal

Learn how to install Kubernetes **locally** using **kind** (Kubernetes IN Docker), setup clusters for Kubernetes CKA hands-on practice, and manage contexts to switch between clusters.

1️⃣ Why NOT Use Managed Kubernetes Cloud Providers?

- Managed services like **AKS, EKS, GKE** abstract away the control plane – no access to troubleshoot/control master nodes → less learning opportunity.
- For deep understanding and troubleshooting, **local Kubernetes installation** is preferred.
- Hence, learn Kubernetes using local clusters before using cloud-managed solutions.

2️⃣ What is Kind? (Kubernetes IN Docker) 🐳

- Kind runs Kubernetes **clusters in Docker containers** → each container acts like an individual node (either control-plane or worker).
- Lightweight → easy to setup and destroy clusters quickly for learning and testing.
- Great for hands-on Kubernetes practice.

3️⃣ Prerequisites ✅

- **Go 1.16+** installed (not always mandatory if using pre-built binaries).
- Docker / Podman / NerdCTL installed (the container runtime).
- kubectl CLI installed (to interact with your Kubernetes cluster).

4️⃣ Install Kind CLI 🛠️

Installation options:

- **Mac:** `brew install kind`
- **Windows:** `choco install kind` (chocolatey package manager)
- **Linux:** Download release binaries or install from source if preferred.

```
# Example on Mac
brew install kind
```

5️⃣ Creating Your First Cluster with Kind 🚀

```
kind create cluster --image kindest/node:v1.29.4 --name cka-cluster1
```

- `--image`: specifies Kubernetes node image version to use (match exam version, here 1.29.4).
- `--name`: name of the cluster (default is `kind`).
- This command spins up Docker containers as nodes with the Kubernetes control plane and worker inside same node by default.

6️⃣ Verify Cluster Status ⚙️

```
kubectl cluster-info --context kind-cka-cluster1
kubectl get nodes
```

- Shows the API server URL and running nodes (single node with control plane and worker roles combined).
- `kubectl` interacts with Kubernetes clusters via **context**.
- Make sure `kubectl` CLI is installed. Check version:

```
kubectl version --client
```

7️⃣ Creating a Multi-Node Cluster with Kind (Control Plane + Workers) 🏗️

Create a Kind config YAML file (`config.yml`):

```
kind: Cluster
apiVersion: kind.x-k8s.io/v1alpha4
nodes:
  - role: control-plane
  - role: worker
  - role: worker
```

- 1 control plane node + 2 worker nodes → 3 nodes total.

Create cluster with config file:

```
kind create cluster --name cka-cluster2 --image kindest/node:v1.29.4 --config
config.yml
```

8️⃣ Check nodes of new cluster:

```
kubectl get nodes
```

- Will show 3 nodes with roles: 1 control-plane + 2 worker nodes.

9️⃣ Managing Multiple Clusters with kubectl Contexts 🔀

- Each cluster has a **context** in kubeconfig.
- To list contexts:

```
kubectl config get-contexts
```

- `*` shows current context in use.

- To switch context (i.e. switch cluster you target commands to):

```
kubectl config use-context kind-cka-cluster1
kubectl get nodes   # shows nodes from cluster 1
```

Switch back to cluster 2:

```
kubectl config use-context kind-cka-cluster2
kubectl get nodes   # shows nodes from cluster 2
```

Important: In the CKA exam, make sure to switch to the right context before beginning each task.

🔟 Helpful Kubernetes CLI Command Tips

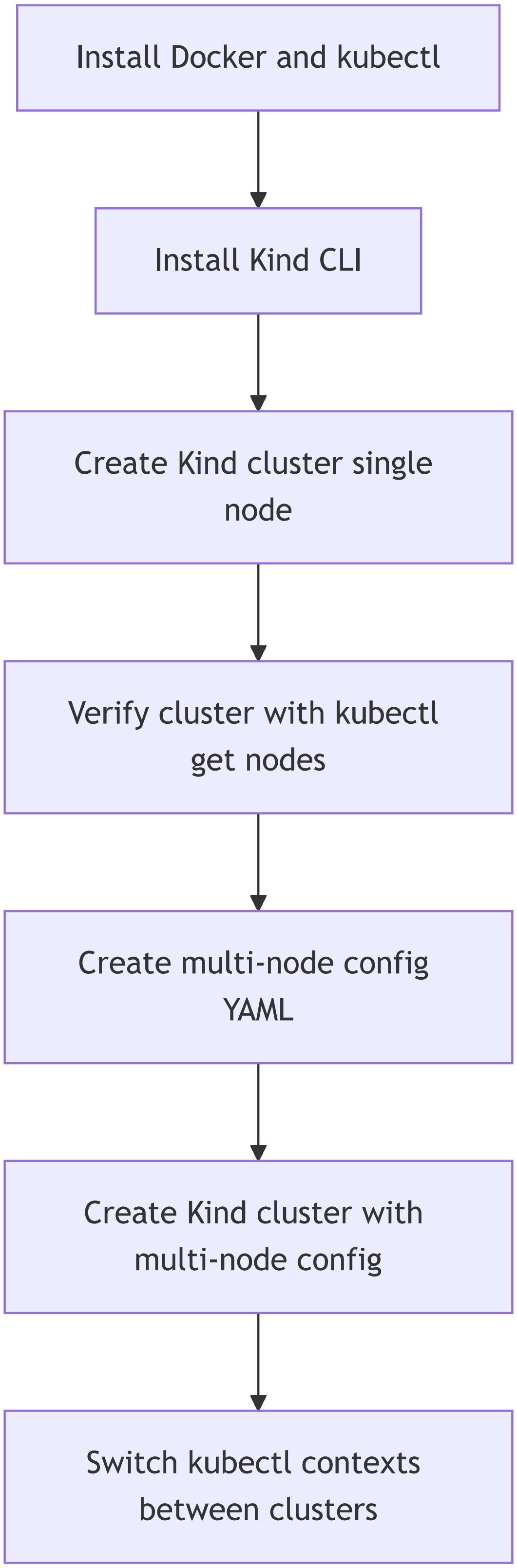
Task	Command
List all contexts	`kubectl config get-contexts`
Switch to a context	`kubectl config use-context`
Get cluster info	`kubectl cluster-info`
List nodes	`kubectl get nodes`

1️⃣1️⃣ Useful Kubernetes Docs & Cheatsheets 📚

- **Main docs**: kubernetes.io/docs
- **Cheat sheet**: Search for "kubectl cheat sheet" on kubernetes.io → essential for exam.

- **Exam note:** You will have access to official docs during the exam to copy long commands, so no need to memorize everything, but practice enough to be efficient.

🔄 Workflow Summary: Installing and Using Kind


Install Docker and kubectl
Install Kind CLI
Create Kind cluster single node
Verify cluster with kubectl get nodes
Create multi-node config YAML
Create Kind cluster with multi-node config
Switch kubectl contexts between clusters

💡 Key Takeaways:

- **Kind uses Docker containers as nodes** — simple, fast local k8s clusters.
- Always check & switch kubectl context before running commands.
- Multi-node cluster simulates real environments better than default single-node cluster.
- Use Kubernetes official docs and cheat sheets for exam reference.
- Practice common `kubectl` commands well for exam speed.

👀 What's Next?

- Next video: Creating pods, difference between imperative vs declarative commands, and writing **YAML manifests** (basic Kubernetes resource files).

🌟 **Happy Learning & Kubernetes Exploration!** 🌟

Feel free to ask if you want diagrams or more detailed code examples!

🧱 `kind` Kubernetes Cluster Setup Notes

🔧 Basic Command Structure

```
kind create cluster [flags]
```

🧩 Common Flags:

Flag	Description
`--name <name>`	Name your cluster
`--image <image>`	Choose Kubernetes version (via kindest/node image)
`--config <file.yaml>`	Use a custom cluster config file
`--wait`	Time to wait for cluster readiness (e.g. `60s`)

🟢 Single Node Cluster

A **default cluster** created by `kind` is a single node (control plane only).

🧪 Create a single node cluster:

```
kind create cluster --name cka --image kindest/node:v1.30.0
```

✅ Verify:

```
kubectl cluster-info --context kind-cka
kubectl get nodes
```

🟦 Multi-Node Cluster (1 Control Plane + 2 Workers)

To create a multi-node cluster, you need a **YAML config file**.

🛠️ Step 1: Create `cluster-config.yaml`

```
# cluster-config.yaml
kind: Cluster
apiVersion: kind.x-k8s.io/v1alpha4
nodes:
  - role: control-plane
  - role: worker
  - role: worker
```

🧪 Step 2: Create cluster using config

```
kind create cluster --name cka-multi --config cluster-config.yaml --image
kindest/node:v1.30.0
```

✅ Verify:

```
kubectl get nodes
```

Expected output:

```
NAME                 STATUS   ROLES           AGE     VERSION
cka-multi-control-plane   Ready    control-plane   1m      v1.30.0
cka-multi-worker          Ready    <none>          1m      v1.30.0
cka-multi-worker2         Ready    <none>          1m      v1.30.0
```

📦 List All Clusters

```
kind get clusters
```

🧹 Delete Cluster

```
kind delete cluster --name cka
kind delete cluster --name cka-multi
```

📌 Pro Tips

- Always match `kind` version with your Kubernetes version.
- Useful for **local testing**, **CI pipelines**, and **certification prep** (e.g., CKA).
- Can expose ports by adding `extraPortMappings` in the config file.
- Docker must be running ✅.
