Advanced Rancher Container Engine and Kubernetes Orchestration (5 Days)
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Learning Objective

Upon completion of the course, you will be able to accomplish:

- Install and configure Kubernetes (on your laptop/desktop or production grade cluster on AWS)
- Use Rancher Desktop Client (with kubernetes), kubeadm, kops, or minikube to setup your cluster
- Be able to run stateless and stateful applications on Kubernetes
- Use Healthchecks, Secrets, ConfigMaps, placement strategies using Node/Pod affinity / anti-affinity
- Use StatefulSets to deploy a Cassandra cluster on Kubernetes
- Add users, set quotas/limits, do node maintenance, setup monitoring
- Use Volumes to provide persistence to your containers
- Be able to scale your apps using metrics
- Package applications with Helm and write your own Helm charts for your applications

Introduction of Rancher Desktop

- Rancher Desktop Installation and Configurations
- Introduction of Rancher Compose
- Installation of Rancher Compose and running hello world program
- Introduction of Rancher Registry
- Rancher Desktop vs Rancher Engine
- Introduction of containerd
- Introduction of Container?
- Components of Containers & How Containers works?
- History & Origin of Rancher
- Types of Release in Rancher
- Latest version of Rancher
- Technology used in Rancher development
- Official Website & Reference
- Major Use Cases of Rancher
- Major Feature and Advantage of Rancher
- Terminology used in Rancher
- Components of Rancher
    - Rancher Engine
    - Rancher Registry
    - Rancher Image
    - Rancher Container

- Architecture of Rancher & How Rancher works?
- Workflow of Rancher
- Best Alternative of Rancher

Basic Workflow of Container using Rancher

- Commonly used commands in Rancher
- Create a Rancher Container
- Start a Rancher Container
- Stop a Rancher Container
- Restart a Rancher Container
- Pause a Rancher Container
- Unpause a Rancher Container
- Remove a Rancher Container
- Kill a Rancher Container
- Difference between Rancher Stop & Rancher Start
- Difference between Rancher Pause & Rancher Unpause
- Difference between Rancher Stop & Rancher Kill

Differences & Comparison of Rancher Container with

- Rancher Container vs Virtual Machines
- Rancher Container vs Kubernetes pod
- Rancher Container vs Podman Container
- Rancherd vs containerd
- Rancherd vs CRI-O
- CRI-O vs runc

Advance Workflow of Containers using Rancher

- Importance of PID 1 of container?
- Rancher run command with example
- Rancher run command with example
- How to use containers on a daily basis?
    - Rancher exec command with example
    - Rancher attach command with example
- How to de-attached from container?
- How to set the name of the container?
- Copying a files/dir with container using Rancher cp
- Rancher diff command with example & use cases
- Rename a container using Rancher rename
- Inspect a container using Rancher inspect
- List port mappings or a specific mapping for the container

- Update configuration of one or more containers using "Rancher update"
- Use cases & example of "Rancher wait"

Monitoring & Troubleshooting Rancher Containers

- Rancher Container - Fetch the logs of a container
- Rancher Container - Display a live stream of container(s) resource usage statistics
- Rancher Container - Display the running processes of a container
- Rancher Server - Get real time events from the Rancher server
- Rancher Server - Rancherd service process Troubleshooting
- Rancher Server - Logging of Rancher Server
- Rancher Server - Configuration of a Rancher server

Working with Rancher Volume

- Storage Overview
- Why do I need Rancher volume?
- What are Rancher volumes?
- Types of Rancher volumes?
- Overview of Rancher Volume Mount
- Overview of Rancher Bind Mounts
- Overview of Rancher tmpfs Mounts
- Creating & Using Rancher Volume Mount with Container
- Creating & Using Rancher Bind Mount with Container
- Creating & Using Rancher tmpfs Mount with Container
- Troubleshoot Volume problems

Understanding a Networking with Rancher Containers

- Networking overview
- Types of default Networking driver in Rancher
- Use bridge networks with Rancher container
- Use overlay networks with Rancher container
- Use host networking with Rancher container
- Disable networking for a container
- Configure the daemon and containers

Building & Troubleshooting Rancher Images

- Understanding a Rancher image
- Deep dive into Rancher Layers & filesystems
- Internal & AnatoRancher of Rancher image
- How to create Rancher image?
    - Using Existing Rancher Container
    - Using Rancher Desktop manifest file
- Create a Rancher image using Existing Rancher Container
- Show the history of an image
- List images
- Create a Rancher image using Rancher Desktop manifest file
- Deep dive into Rancher Desktop manifest file
- Rancher Desktop manifest file best practices
- Use multi-stage builds
- Create your own base image (advanced)

Share a Rancher images using registry

- Introduction of Rancher registry
    - Introduction of Rancher hub
- Export a container’s filesystem as a tar archive
- Import the contents from a tarball to create a filesystem image
- Load an image from a tar archive or STDIN
- Save one or more images to a tar archive (streamed to STDOUT by default)
- Difference between Rancher Import & Rancher save
- Difference between Rancher export & Rancher Load
- Working with Rancher tag for Rancher images
- Sharing(Pull/Push) a Rancher images using Rancher hub
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- Creating a Deployment in Kubernetes using YAML
- Creating a Service in Kubernetes
- Understanding about pod, Replication & Deploymentconfiguration
- Using Rolling Updates in Kubernetes
- Configure Environment variable in application
- Configure secret resource for sensitive value
- Creating Config Map
- Scale Applications
- Multi Container PODs
- Init Containers

Storage Management

- Creating Persistent volume
- Persistent Volume Claim
- Volume claim policy understanding
- Attach storage on deployment

Pod Scheduling

- Manual Scheduling
- Labels and Selectors
- Taints and Tolerations
- Node Selectors
- Node Affinity
- DaemonSets
- Static Pods
- Configuring Kubernetes Scheduler

Resource Allocation

- Restrict Limit Memory & CPU use
- Creating Resource Quota
- Creating Limit Quota

Networking

- Network Namespace understanding
- Docker Network
- Deploy Kubernetes Network
- Cluster Networking
- Pod Networking
- Creating Service Network
- DNS Concept in kubernetes
- Ingress System kuberbnetes

Monitoring Kubernetes

- Logging and Monitoring
- Monitoring Cluster Component

- Managing application Logs

Pod Security

- Authentication
- TLS Introduction
- Certificate System kubernetes
- Creating Certificate
- Role base Access Controls
- Cluster Role and Role Binding
- SCC: Security Constant Conta & Network Policy
- Image Security

Helm

- Understand Helm and Helm Charts
- Helm Commands
- Deploy Kubernetes Dashboard using Helm
- Create Helm Chart and Deploy Applications using Helm Chart
- Test Helm Chart
- Upgrade Application using Helm Chart
- Downgrade Application using Helm Chart