

# **Complete Apache Kafka Administration (Kafka Operations + Security + Monitoring) using Docker**

**Prerequisites:** Basic knowledge of java

**Duration:** 6 Days (8 Hrs./Day)

**Course Objective:** This course offers an in-depth exploration of Big Data, Apache Kafka, and Docker. Participants will learn about Kafka's architecture, core concepts, and real-world applications, as well as Docker's networking and basic commands. Through practical labs, students will set up and manage Kafka clusters, develop Kafka applications in Java, and optimize Kafka performance. The course also covers advanced producer and consumer configurations, monitoring with Prometheus and Grafana, and implementing robust security measures, including SSL and Kerberos.

**Apache Kafka version:** Latest.

**Lab Requirement:** Koenig DC/Linux (CentOS 9) (customizable).

## **Module 1 - Introduction to Big Data, Apache Kafka and Docker**

Introduction to Big Data

Big Data Customer Scenarios

What is Kafka?

Need for Kafka

Core Concepts of Kafka

Kafka Architecture

Where is Kafka Used?

What is docker?

Docker networking

**Lab:** Installing Docker and its components

**Lab:** Creating custom network using docker

**Lab:** Docker basic commands

## **Module 2 - About Kafka Cluster**

Understanding the Components of Kafka Cluster

Producer of Kafka

Consumer of Kafka

**Lab:** Installation of Kafka Cluster

**Lab:** Configuring Kafka Cluster

**Lab:** Producer and Consumer in Action

### **Module 3 - Kafka with Java**

Understanding the Components of Kafka Cluster

Kafka SDK List

**Lab:** Creating Kafka Project with Java

**Lab:** Java Producer

**Lab:** Java Producer Callbacks

**Lab:** Java Producer with Keys

**Lab:** Java Consumer

**Lab:** Java Consumer with Graceful Shutdown

**Lab:** Java Consumer in Consumer Group

**Lab:** Java Consumer with Incremental Cooperative Rebalance and Static Group Membership

**Lab:** Java Consumer Auto Offset Commit Behavior

### **Module 4 - Kafka Operations and Performance Tuning**

Offset

Design

Hardware

Kafka Monitoring and Issues

Kafka Performance Tuning

### **Module 5 - Kafka Wikimedia Producer and Advanced Producer Configurations**

Introduction to Kafka Producer

**Lab:** Wikimedia Producer Project Setup

**Lab:** Wikimedia Producer Implementation with Java

**Lab:** Wikimedia Producer Run with Java

**Lab:** Producer Config Intros

**Lab:** Producer Acknowledgements

**Lab:** Producer Retries

**Lab:** Idempotent Producer

**Lab:** Safe Kafka Producer Settings

**Lab:** Wikimedia Producer Safe Producer Implementation

**Lab:** Kafka Message Compression

### **Module 6 - OpenSearch Consumer and Advanced Consumer Configurations**

Introduction to OpenSearch

**Lab:** OpenSearch Consumer with Java

**Lab:** Setting Up OpenSearch on Docker

**Lab:** OpenSearch Consumer Implementation with Java

**Lab:** Consumer Delivery Semantics

**Lab:** OpenSearch Consumer Implementation Idempotence

**Lab:** Consumer Offsets Commit Strategies

**Lab:** OpenSearch Consumer Implementation Delivery Semantics

**Lab:** OpenSearch Consumer Implementations Batching Data

**Lab:** Consumer Offset Reset Behavior

**Lab:** OpenSearch Consumer Implementation Replaying Data

## **Module 7 - Kafka Monitoring Setup with Prometheus**

Overview of Monitoring

**Lab:** Setting up Prometheus + Kafka Broker 1

**Lab:** Broker 2 & 3 Prometheus Setup

**Lab:** KRaft & Prometheus Setup

## **Module 8 - Kafka Monitoring Setup with Grafana**

Overview of Monitoring

**Lab:** Setup Grafana on Administration Server

**Lab:** Setup Kafka Dashboard on Grafana

**Lab:** Adding Graphs to Grafana

**Lab:** Adding more graphs to Grafana

**Lab:** Observing Grafana when we kill a broker

## **Module 9 - Introduction to Kafka Security**

Kafka Authentication Basics

Kafka Authentication with SSL and SASL\_SSL

Authorization

Encryption

Securing KRaft

Audit Logs

Security Recommendations

## **Module 10 – Kafka security hands on**

**Lab:** Creating a Certificate Authority (CA)

**Lab:** SSL Setup in Kafka



**Lab:** SSL Setup for Clients

**Lab:** SSL Authentication

**Lab:** Hands-On Kerberos - Part 1: Setup Azure Virtual Machines

**Lab:** Hands-On Kerberos - Part 2: Principals & Keytabs

**Lab:** Hands-On Kerberos - Part 3: Kafka Configuration

**Lab:** Hands-On Kerberos - Part 4: Client Configuration

**Lab:** JAAS file / config

**Lab:** Hands-On ACL demo