

## 🏆 Application Containerization and Deployment in AWS Infra 📢

### Prerequisite 👍

- + Docker Basic Understanding at concept level and hands-on level is must
  - Docker architecture
  - Container life cycle basic operations like run | pull | start | stop | exec | build etc
  - Linux command line knowledge at advanced level is must
- 😊 AWS Cloud ☁️ Good working knowledge using {**Console** | **CLI** and **CDK** } is must
  - Some Specific services like ec2 | EBS | Load Balancer

**Important Alert** 👍 ➡️ AWS CDK things won't be discussed we will have be having demos ready

### Day 1:

#### Docker Container Lifecycle and Architecture

- Overview of Docker Container Lifecycle
- Docker Container States: Created, Running, Paused, Stopped
- Docker Container Architecture: Namespace, Control Groups, Union File Systems

#### Advanced Docker Image Building Techniques

- Multi-Stage Builds
- Docker BuildKit
- Docker Build Cache Optimization

#### Docker Compose for Container Orchestration

- Introduction to Docker Compose
- Compose YAML Syntax and Structure
- Creating Multi-Container Applications with Compose

#### Docker Registry: Docker Hub and Amazon ECR

- Overview of Docker Registry
- Using Docker Hub for Image Management
- Working with Amazon ECR for Secure Image Storage

#### Logging Docker Containers to AWS CloudWatch

- Configuring AWS CloudWatch Logs Agent
- Sending Docker Container Logs to CloudWatch
- Monitoring and Analyzing Docker Container Logs in CloudWatch Logs

## **Problem with Hosting apps in docker**

- Understanding problems with docker server while hosting application
- Solution using ECS and EKS

## **Docker images build use cases with app type :**

- Containerizing python based web app
- Containerizing java spring boot based web app
- Containerizing nodes based web with mongo db
- Understanding support of systemd with docker and usage
- Image building with github actions and pushing it to ECR

## **Day 2: : Introduction to Amazon ECS and Cluster Setup**

### **Introduction to Amazon ECS**

- What is Amazon ECS?
- Benefits of Using Amazon ECS
- Use Cases

### **Understanding ECS Components**

- ECS Clusters
- Task Definitions
- Tasks and Services

### **IAM Role Setup for ECS**

- Creating IAM Roles for ECS Tasks
- Assigning IAM Policies

### **Setting Up ECS Cluster with Amazon CDK**

- Installing CDK and Setting Up Development Environment
- Writing CDK Code for ECS Cluster Setup
- Deploying ECS Cluster

### **Running Tasks on ECS Cluster**

- Registering Task Definitions
- Running Tasks on ECS Cluster
- Monitoring Task Status

## Day 3: Managing Containers with Amazon ECS

### Managing ECS Services

- Introduction to ECS Services
- Creating and Managing Services with EC2 Launch Type
- Creating and Managing Services with Fargate Launch Type
- Service Auto-Scaling and Load Balancing

### ECS Network Modes

- Understanding ECS Network Modes: Bridge, Host, and AWS VPC
- Configuring Network Modes for ECS Tasks and Services

### Environment Variables in ECS

- Managing Environment Variables in Task Definitions
- Passing Environment Variables to Containers

### ECS Storage using EFS

- Introduction to Amazon EFS
- Configuring ECS Tasks to Use EFS for Persistent Storage

## Day 4: Introduction to Amazon EKS and Cluster Setup

### Understanding Amazon EKS

- Introduction to Amazon EKS
- Advantages of EKS over ECS
- Use Cases for EKS

### Setting Up Amazon EKS Cluster with CDK

- Overview of Amazon CDK
- Installing CDK and Setting Up Development Environment
- Writing CDK Code for EKS Cluster Setup
- Deploying EKS Cluster with Nodegroups and Fargate Profile

### Introduction to Kubernetes and EKS Architecture

- Overview of Kubernetes
- Understanding EKS Architecture
- Components of EKS: Control Plane, Nodes, Pods, Services

### Deploying Applications on EKS

- Creating Kubernetes Deployment YAML
- Deploying Pods and Controllers
- Managing Deployments and Pods

## Day 5: Advanced Topics in Amazon EKS

### **Service Ingress in EKS**

- Introduction to Kubernetes Services
- Setting Up Service Ingress in EKS
- Load Balancing and Routing Traffic to Services

### **Storage in EKS using Amazon EFS**

- Overview of Amazon EFS
- Configuring EFS as Persistent Storage in EKS
- Using EFS Volume with Kubernetes Pods

### **Accessing EKS Web UI**

- Introduction to Kubernetes Dashboard
- Setting Up Dashboard Access for EKS Cluster
- Monitoring and Managing EKS Cluster Using Web UI

### **App Mesh for EKS**

- Introduction to AWS App Mesh
- Configuring App Mesh for EKS Cluster
- Service Discovery and Load Balancing with App Mesh

### **Comparison of EKS and ECS**

- Differences Between EKS and ECS
- Choosing Between EKS and ECS Based on Use Case
- Best Practices and Considerations