KUBERNETES CONCEPTS AND ARCHITECTURE

Sandra Kumi

REVIEWER Mr. Thomas Darko

Kubernetes Concepts and Architecture

Introduction to Kubernetes

Kubernetes is an open-source platform for automating deployment, scaling, and management of containerized applications. It provides a framework to run distributed systems resiliently, focusing on container orchestration.

Kubernetes Architecture

Kubernetes has a master-worker architecture where master nodes manage the cluster, and worker nodes run the containerized applications. The key components include:

1. API Server: Centralized control plane for interacting with the cluster.

2. etcd: Distributed key-value store for cluster state.

3. Scheduler: Assigns work to available worker nodes.

4. Controller Manager: Manages the state of the cluster, handling replication and failover.

5. Kubelet: Runs on each worker node and ensures containers are running in pods.

6. Kube Proxy: Handles networking, routing, and load balancing for services in the cluster.

Kubernetes Objects

Kubernetes objects represent the state of the cluster and include:

1. Pods: The smallest deployable unit in Kubernetes, representing one or more containers.

2. Deployments: Declarative updates for Pods, allowing rolling updates and scaling.

3. Services: Defines how to access a set of Pods, providing load balancing and servicediscovery.

4. ReplicaSets: Ensures that a specified number of pod replicas are running at any giventime.

Key Kubernetes Features

1. Automated Rollouts and Rollbacks: Kubernetes allows automated updates and rollbacksfor applications.

2. Self-healing: Restarts failed containers, replaces and reschedules containers when nodesdie.

3. Horizontal Scaling: Automatically scale applications up and down based on resource use.

4. Secret and Config Management: Secure management of sensitive data without exposing itin the container.

Conclusion

Kubernetes simplifies the management of containerized applications, allowing developers to focus on their applications. Its architecture supports scalability, resilience, and automation, making it a powerful tool for modern cloud-native deployments.