High-Level Design (HLD)

Cloud Migration and Monitoring Project

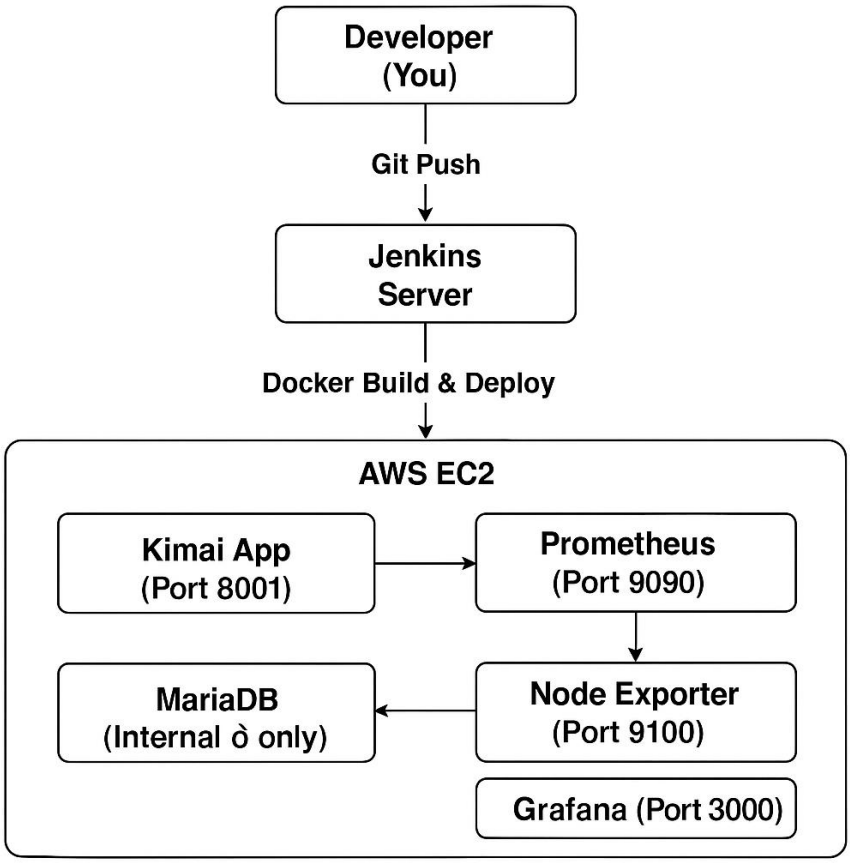
Project Overview

This project involves migrating the open-source Kimai time-tracking application to the AWS cloud infrastructure using Infrastructure as Code (Terraform), Docker-based deployment, Jenkins CI/CD automation, and cloud monitoring with Prometheus and Grafana. Security measures and scalability were also incorporated.

Objectives

- Host Kimai app on a secure and scalable AWS infrastructure.
- Automate provisioning using Terraform.
- Deploy using Docker containers.
- Enable CI/CD pipeline using Jenkins.
- Integrate monitoring and alerting using Prometheus and Grafana.

Architecture Diagram



Components

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1. AWS Infrastructure

- EC2 instance with Amazon Linux 2023.
- Security Groups (Inbound: 22, 8001, 9090, 3000, 9100 from Bastion or Developer IP).
- IAM Role for EC2 (CloudWatch access).

2. Terraform (IAC)

- Used to create EC2, IAM, Security Groups, Key Pair.
- Used main.tf and variables.tf for modular configuration.

3. Docker Deployment

- Docker Compose runs Kimai and MariaDB.
- Monitoring stack runs Prometheus, Grafana, and Node Exporter.

4. CI/CD with Jenkins

- Jenkins job pulls GitHub repo.
- Jenkins triggers Docker Compose deployment.
- Optional: Jenkins runs inside Docker.

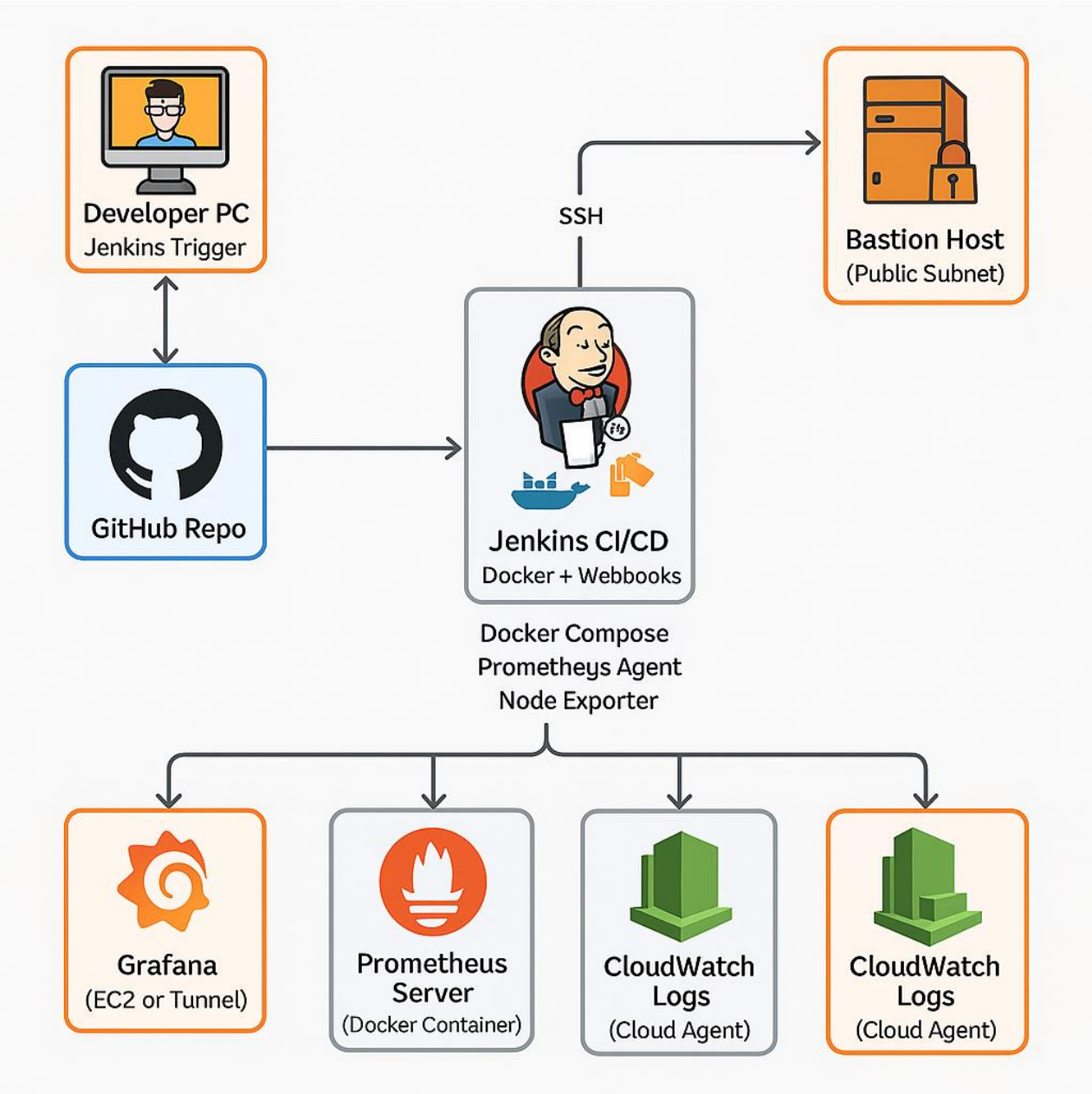
5. Monitoring

- Prometheus scrapes metrics.
- Node Exporter provides system metrics.
- Grafana visualizes metrics.
- Alerts configured for CPU usage.

Key Ports Used

Component	Port
Kimai	8001
Jenkins	8080
Prometheus	9090
Grafana	3000
Node Exporter	9100
SSH	22

Visual Representation of Architecture Diagram



Deployment Flow

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1. **Terraform** provisions infrastructure.
2. **Jenkins** pulls code and builds Docker containers.
3. **Docker Compose** deploys:
    - Kimai + MariaDB
    - Prometheus + Node Exporter
    - Grafana
4. **Monitoring** via Prometheus scraping + Grafana dashboard.
5. **Alerts** raised for CPU usage or system failures.

Security Considerations

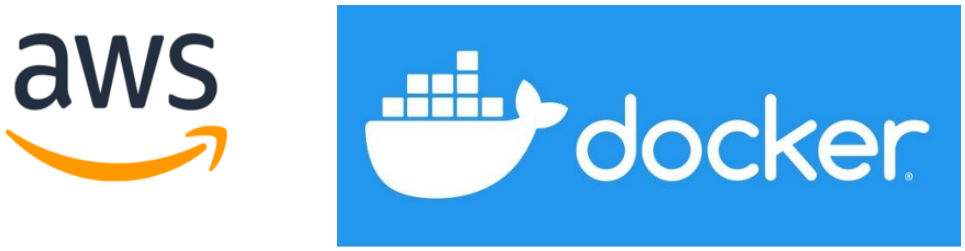
- SSH restricted to Bastion or your IP.
- IAM Role with minimum permissions.
- Internal traffic between services (MariaDB).
- Docker networks isolated.

Scalability and Maintenance

- Stateless components (Kimai, Prometheus) can be horizontally scaled.
- Docker Compose simplifies service restart/recovery.
- Logs streamed to CloudWatch.

Tools & Technologies

- **Cloud**: AWS EC2, IAM, Security Groups
- **IaC**: Terraform
- **Containerization**: Docker, Docker Compose
- **CI/CD**: Jenkins
- **Monitoring**: Prometheus, Grafana, Node Exporter



Outcome

The architecture ensures:

- Reliable and repeatable deployments.
- Real-time monitoring of application and infrastructure health.
- CI/CD automation.
- Easy-to-maintain MNC-style structure for long-term use.

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