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PROJECT INFORMATION

Description:

Project Description:

CI/CD Deployment for Spring Boot Application

As a Full Stack Developer, you have to build a CI/CD pipeline to demonstrate continuous deployment and host the application on AWS EC2 instance

Developer:

Le Giang Nam

Project github url:

https://github.com/rzngnam1402/spring-boot-helloworld

Technical Stack:

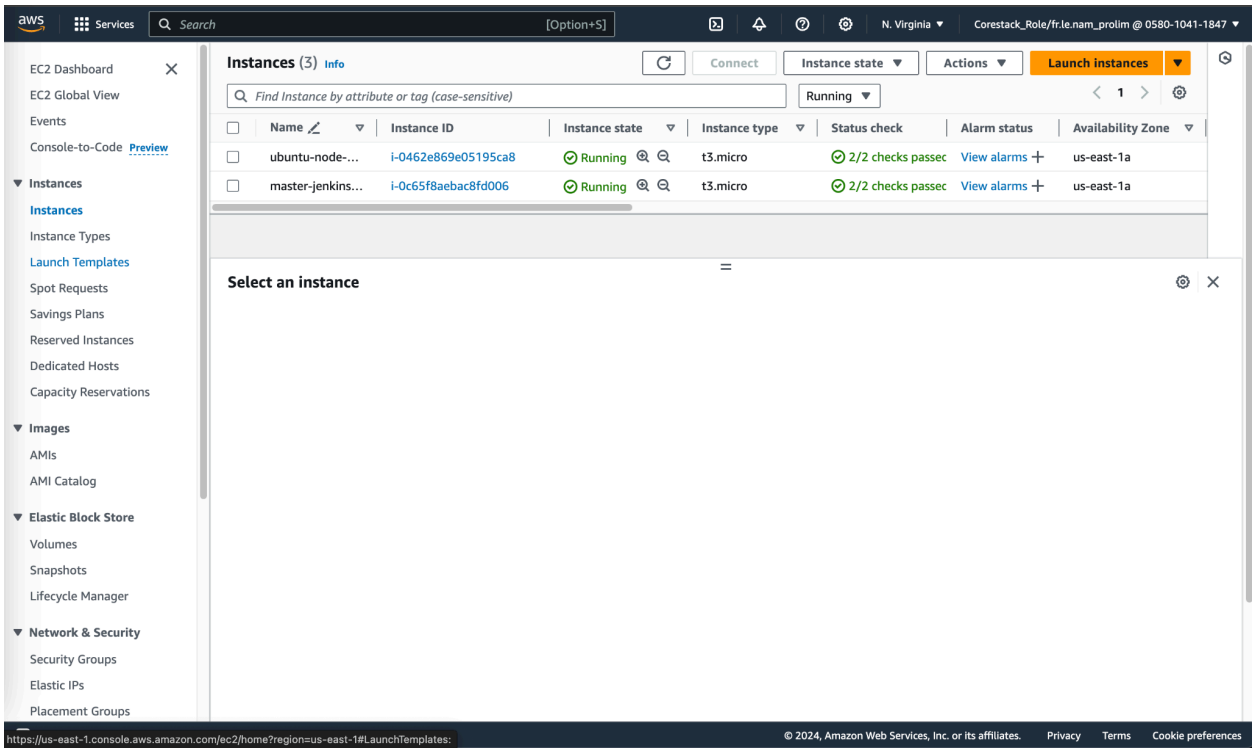
Programming Language: Java
Version Control System (VCS): Git
Hosting Platform: GitHub, AWS
Tool: Jenkins

STEP-BY-STEP BREAKDOWN

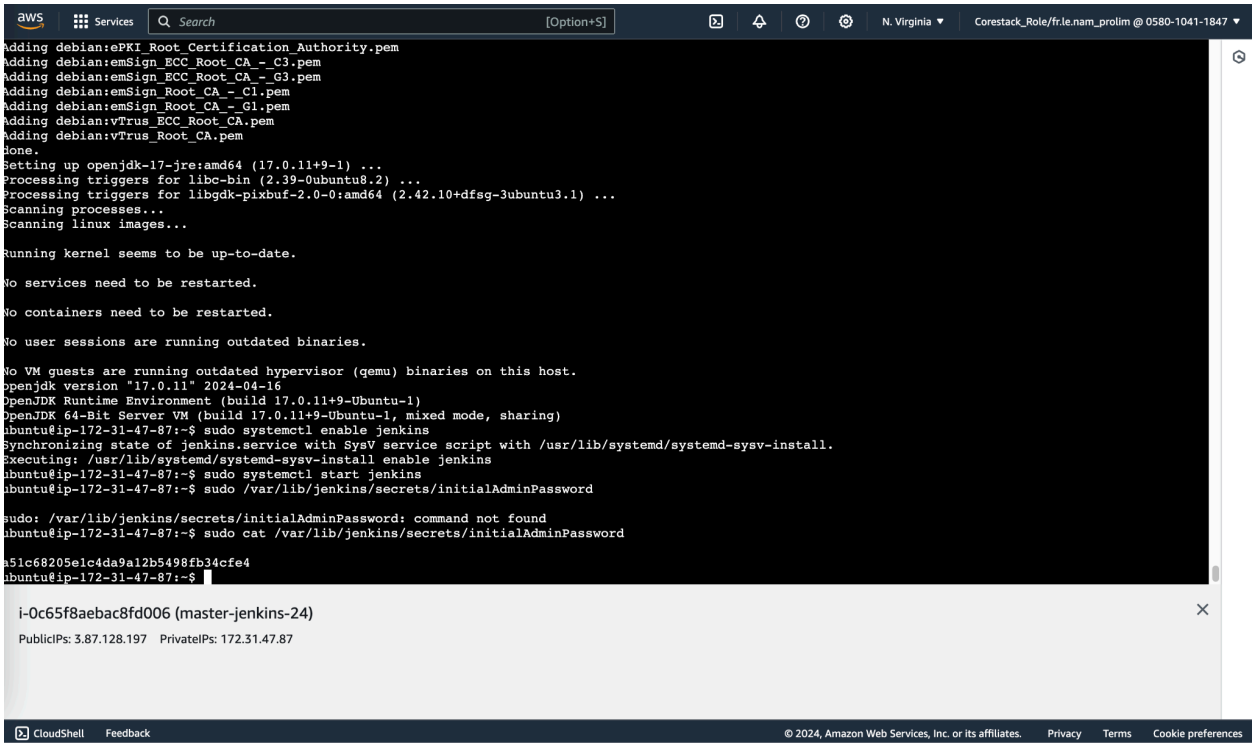
Step 1: Setup AWS EC2 Instance

1. Go to the AWS Management Console.
2. Navigate to EC2 and launch a new instance.
3. Configure instance details, add storage, and configure security group (allow SSH, HTTP, and any other necessary ports).
4. Launch and download the key pair

For this project, I used two instances to deploy the application because a single instance does not have enough resources to handle both Jenkins and Java. One instance is dedicated to running Jenkins, while the other is used for running the Java Spring Boot application.



5. Connect to EC2 Instances:



Step 2: Setup Jenkins

1. Install Jenkins, java 17 on my EC2 Instance using these commands:

Long Term Support release

A LTS (Long-Term Support) release is chosen every 12 weeks from the stream of regular releases as the stable release for that time period. It can be installed from the `debian-stable` apt repository.

```bash
sudo wget -O /usr/share/keyrings/jenkins-keyring.asc \
  https://pkg.jenkins.io/debian-stable/jenkins.io-2023.key
echo "deb [signed-by=/usr/share/keyrings/jenkins-keyring.asc]" \
  https://pkg.jenkins.io/debian-stable binary/ | sudo tee \
  /etc/apt/sources.list.d/jenkins.list > /dev/null
sudo apt-get update
sudo apt-get install jenkins
```

```bash
sudo apt update
sudo apt install fontconfig openjdk-17-jre
java -version
openjdk version "17.0.8" 2023-07-18
OpenJDK Runtime Environment (build 17.0.8+7-Debian-1deb12u1)
OpenJDK 64-Bit Server VM (build 17.0.8+7-Debian-1deb12u1, mixed mode, sharing)
```

2. Start Jenkins on the server:

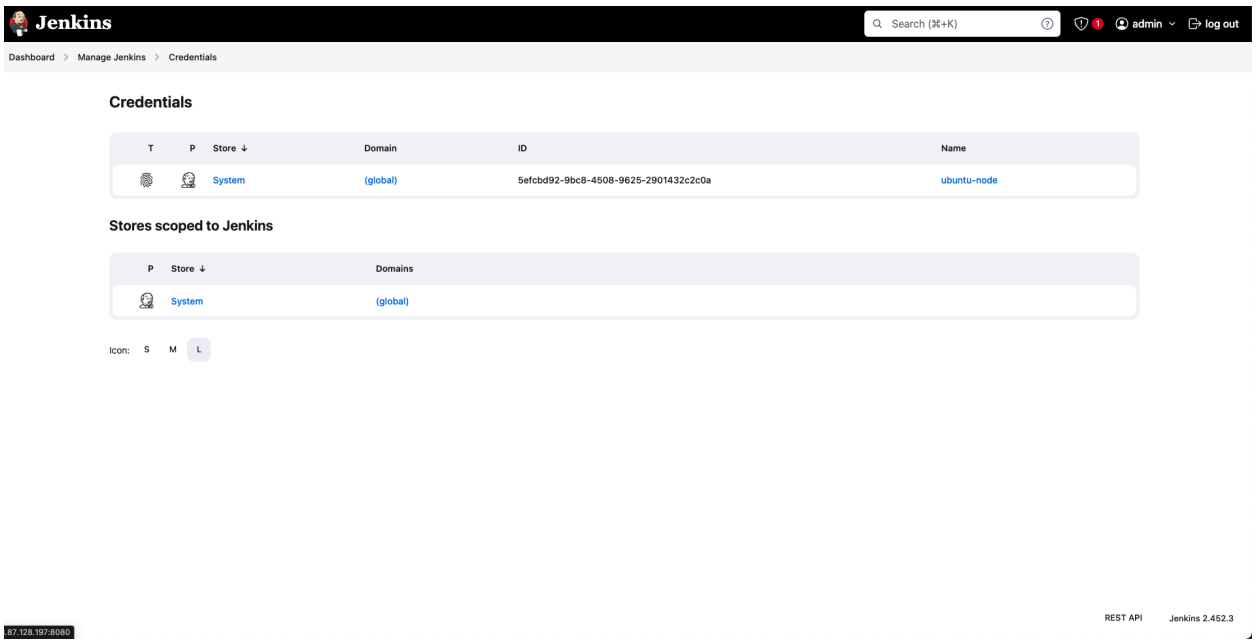
```
ubuntu@ip-172-31-47-87:~$ sudo systemctl status jenkins
● jenkins.service - Jenkins Continuous Integration Server
     Loaded: loaded (/usr/lib/systemd/system/jenkins.service; enabled; preset: enabled)
     Active: active (running) since Wed 2024-07-24 03:26:31 UTC; 49min ago
   Main PID: 4892 (java)
      Tasks: 45 (limit: 1078)
     Memory: 524.7M (peak: 531.9M)
        CPU: 4min 14.180s
     CGroup: /system.slice/jenkins.service
             └─4892 /usr/bin/java -Djava.awt.headless=true -jar /usr/share/java/jenkins.war --webroot=/var/cache/jenkins/war --httpPort=8080

Jul 24 03:28:29 ip-172-31-47-87 jenkins[4892]: 2024-07-24 03:28:29.117+0000 [id=263]        INFO        jenkins.InitReactorRunner$1#onAttained: Listed a>
Jul 24 03:28:29 ip-172-31-47-87 jenkins[4892]: 2024-07-24 03:28:29.117+0000 [id=262]        INFO        jenkins.InitReactorRunner$1#onAttained: Prepared>
Jul 24 03:28:29 ip-172-31-47-87 jenkins[4892]: 2024-07-24 03:28:29.172+0000 [id=263]        INFO        jenkins.InitReactorRunner$1#onAttained: Started >
Jul 24 03:28:29 ip-172-31-47-87 jenkins[4892]: 2024-07-24 03:28:29.174+0000 [id=263]        INFO        jenkins.InitReactorRunner$1#onAttained: Augmente>
Jul 24 03:28:29 ip-172-31-47-87 jenkins[4892]: 2024-07-24 03:28:29.234+0000 [id=261]        INFO        jenkins.InitReactorRunner$1#onAttained: System c>
Jul 24 03:28:29 ip-172-31-47-87 jenkins[4892]: 2024-07-24 03:28:29.234+0000 [id=261]        INFO        jenkins.InitReactorRunner$1#onAttained: System c>
Jul 24 03:28:29 ip-172-31-47-87 jenkins[4892]: 2024-07-24 03:28:29.261+0000 [id=261]        INFO        jenkins.InitReactorRunner$1#onAttained: Loaded a>
Jul 24 03:28:29 ip-172-31-47-87 jenkins[4892]: 2024-07-24 03:28:29.261+0000 [id=262]        INFO        jenkins.InitReactorRunner$1#onAttained: Configur>
Jul 24 03:28:29 ip-172-31-47-87 jenkins[4892]: 2024-07-24 03:28:29.755+0000 [id=264]        INFO        jenkins.InitReactorRunner$1#onAttained: Complete>
Jul 24 03:28:29 ip-172-31-47-87 jenkins[4892]: 2024-07-24 03:28:29.756+0000 [id=73]        INFO        h.m.UpdateCenter$CompleteBatchJob#run: Completed >
lines 1-20/20 (END)
```

i-0c65f8aebac8fd006 (master-jenkins-24)

PublicIPs: 3.87.128.197 PrivateIPs: 172.31.47.87

3. Configure Jenkins

- Access Jenkins on 3.82.15.132/8080 and install suggested plugins
- Create credentials for the second instance



4. Set up Jenkins pipeline

Use this script to set up java spring boot for deployment on the second instance:

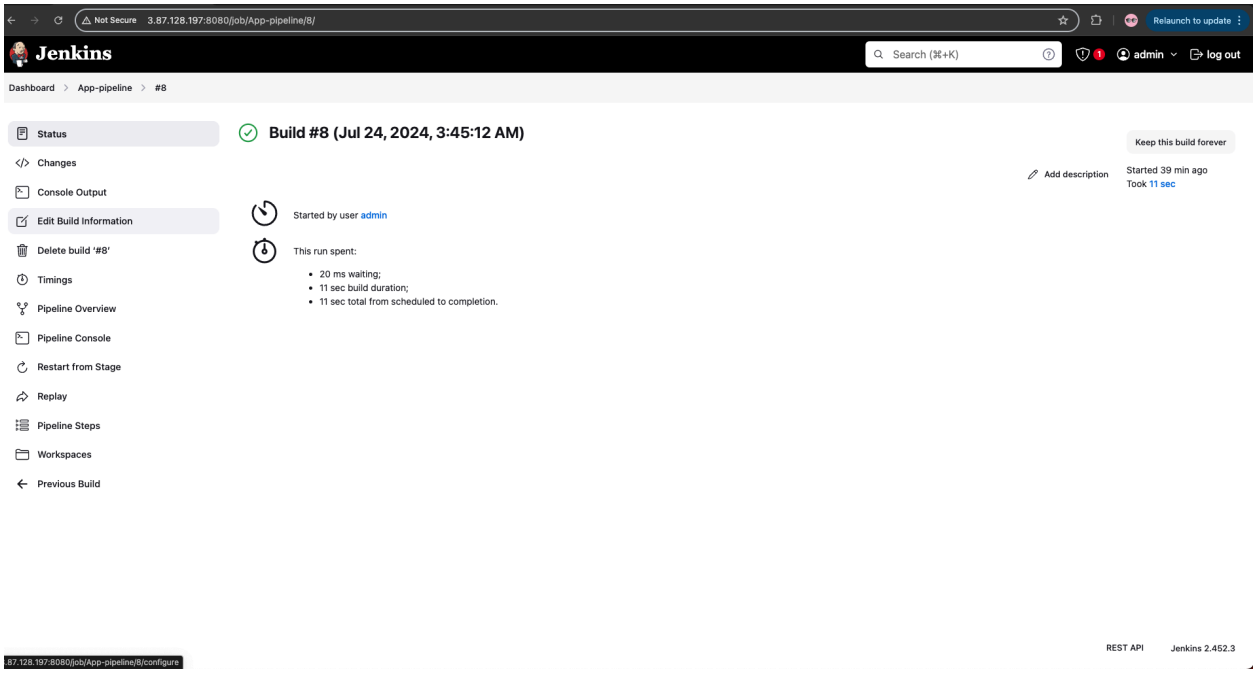
```
pipeline {
  agent any

  environment {
    SECOND_INSTANCE_IP = '3.82.15.132'
    REPO_URL = 'https://github.com/rzngnam1402/spring-boot-helloworld'
    SECOND_INSTANCE_SSH_KEY = '5efcbd92-9bc8-4508-9625-2901432c2c0a'
    APP_NAME = 'spring-boot-helloworld'
    JAR_NAME = 'hello-world-0.0.1-SNAPSHOT.jar'
  }

  stages {
    stage('Clone Repository') {
      steps {
        withCredentials([sshUserPrivateKey(credentialsId: SECOND_INSTANCE_SSH_KEY, keyFileVariable: 'SSH_KEY_FILE')])
{
          script {
            sh """
            ssh -i \${SSH_KEY_FILE} ubuntu@\${SECOND_INSTANCE_IP} " \
              if [ ! -d \"/home/ubuntu/${APP_NAME}\" ]; then \
                git clone ${REPO_URL} /home/ubuntu/${APP_NAME}; \
              else \
                cd /home/ubuntu/${APP_NAME} && git fetch && git checkout main && git pull origin main; \
              fi"
            """
          }
        }
      }
    }

    stage('Build Application') {
      steps {
        withCredentials([sshUserPrivateKey(credentialsId: SECOND_INSTANCE_SSH_KEY, keyFileVariable: 'SSH_KEY_FILE')])
{
          script {
            sh """
            ssh -i \${SSH_KEY_FILE} ubuntu@\${SECOND_INSTANCE_IP} " \
              cd /home/ubuntu/${APP_NAME} \
              && mvn clean package -X"
            """
          }
        }
      }
    }

    stage('Deploy Application') {
      steps {
        withCredentials([sshUserPrivateKey(credentialsId: SECOND_INSTANCE_SSH_KEY, keyFileVariable: 'SSH_KEY_FILE')])
{
          script {
            sh """
            ssh -i \${SSH_KEY_FILE} ubuntu@\${SECOND_INSTANCE_IP} "

              nohup java -jar /home/ubuntu/${APP_NAME}/target/${JAR_NAME} > /home/ubuntu/app.log 2>&1 &

            "
            """
          }
        }
      }
    }


  post {
    success {
      echo 'Build and deployment succeeded!'
    }
    failure {
      echo 'Build and deployment failed!'
    }
  }
}
```

Step 3: Setup GitHub Repository

1. Create new repo
2. Push source code to github: https://github.com/rzngnam1402/spring-boot-helloworld

Step 4: Run Jenkins pipeline

1. Select Build Now
2. See changes in Build Output



Jenkins

Search (⌘+K) admin log out

Dashboard > App-pipeline > #8 > Pipeline Overview

Build #8

Rebuild Console Configure

Pipeline

Start Clone Repository Build Application Deploy Applicat... *Post Actions* End

Details

Manually run by admin

Started 42 min ago

Queued 2 ms

Took 11 sec

Jenkins 2.452.3

Jenkins

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Dashboard > App-pipeline > #8 > Pipeline Console

Build #8

Rebuild Overview Configure ...

Success 43 min ago in 11 sec

- Clone Repository
- Build Application
- Deploy Application
- *Post Actions*

Stage 'Post Actions'

Started 43 min ago

Queued 0 ms

Took 0.1 sec

Success

View as plain text

Build and deployment succeeded!

Print Message 42 ms

```
0   Build and deployment succeeded!
```

Jenkins 2.452.3

Jenkins

Search (⌘+K) 1 admin log out

Dashboard > App-pipeline > #8 > Pipeline Steps

- Status
- Changes
- Console Output
- Edit Build Information
- Delete build '#8'
- Timings
- Pipeline Overview
- Pipeline Console
- Restart from Stage
- Replay
- Pipeline Steps
- Workspaces
- Previous Build

Step	Arguments	Status
Start of Pipeline - (11 sec in block)		
node - (10 sec in block)		
node block - (10 sec in block)		
withEnv - (10 sec in block)	REPO_URL, JAR_NAME, APP_NAME, SECOND_INSTANCE_IP, SECOND_INSTANCE_SSH_KEY	
withEnv block - (10 sec in block)		
stage - (1.9 sec in block)	Clone Repository	
stage block (Clone Repository) - (1.8 sec in block)		
withCredentials - (1.7 sec in block)		
withCredentials block - (1.6 sec in block)		
script - (1.5 sec in block)		
script block - (1.4 sec in block)		
sh - (1.4 sec in self)	ssh -i ${SSH_KEY_FILE} ubuntu@${SECOND_INSTANCE_IP} " if [! -d "/home/ubuntu/spring-boot-helloworld"]; then git clone https://github.com/rzngnam1402/spring-boot-helloworld /home/ubuntu/spring-boot-helloworld; else cd /home/ubuntu/spring-boot-helloworld && git fetch && git checkout main && git pull origin main; fi"	
stage - (7.7 sec in block)	Build Application	
stage block (Build Application) - (7.6 sec in block)		
withCredentials - (7.5 sec in block)		
withCredentials block - (7.5 sec in block)		
script - (7.4 sec in block)		
script block - (7.4 sec in block)		
sh - (7.3 sec in self)	ssh -i ${SSH_KEY_FILE} ubuntu@${SECOND_INSTANCE_IP} " cd /home/ubuntu/spring-boot-helloworld && mvn clean package -X"	
stage - (0.88 sec in block)	Deploy Application	
stage block (Deploy Application) - (0.81 sec in block)		
withCredentials - (0.74 sec in block)		
withCredentials block - (0.67 sec in block)		
script - (0.62 sec in block)		
script block - (0.56 sec in block)		
sh - (0.52 sec in self)	ssh -i ${SSH_KEY_FILE} ubuntu@${SECOND_INSTANCE_IP} " nohup java -jar /home/ubuntu/spring-boot-helloworld/target/hello-world-0.0.1-SNAPSHOT.jar > /home/ubuntu/app.log 2>&1 & "	
stage - (0.15 sec in block)	Declarative: Post Actions	
stage block (Declarative: Post Actions) - (0.1 sec in block)		
echo - (42 ms in self)	Build and deployment succeeded!	

Jenkins 2.452.3

3. When built successfully, access http://3.82.15.132:8080/ to see deployed application

Conclusion

In this project, I gained valuable experience in setting up and managing a deployment pipeline for a Spring Boot application using Jenkins and AWS EC2 instances. Key takeaways from this project include:

1. **Resource management**: I learned the importance of resource allocation and management. By utilizing separate EC2 instances for Jenkins and the Spring Boot application, I effectively mitigated resource constraints and ensured smooth operation of both systems.
2. **Continuous integration and deployment (CI/CD)**: Implementing a CI/CD pipeline helped me understand the nuances of automating build and deployment processes.
3. **Debugging and error Handling**: Through troubleshooting issues like deployment errors and script failures, I developed problem-solving skills and learned how to debug and resolve issues effectively. This included managing log files and understanding error messages to pinpoint and fix problems.
4. **Hands-on experience**: The project provided hands-on experience with AWS EC2 instances, SSH commands, Maven build processes, and Jenkins job configurations.