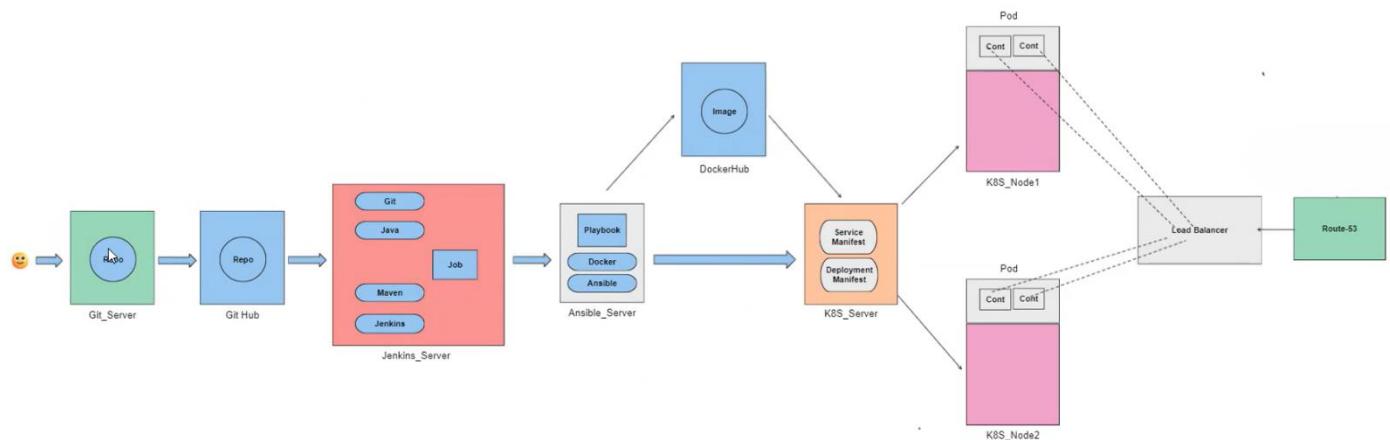


## K8S DEPLOYMENT

### Project Overview

This project focuses on deploying a Maven-based web application using a fully automated CI/CD pipeline integrated with Jenkins, Ansible, Docker, and Kubernetes for scalability and efficiency. The setup begins with configuring a Git server on an EC2 instance to manage the source code, followed by creating a Maven web application and pushing it to a GitHub repository. A Jenkins server is then set up to handle continuous integration, with plugins and job configurations enabling automated builds and deployments. Ansible is installed on a separate EC2 instance to manage configuration and deployment tasks, including creating Docker images from WAR files and pushing them to Docker Hub.

The deployment process involves setting up a Kubernetes cluster using Amazon EKS, where Docker images are pulled and containers are orchestrated for high availability. Kubernetes manifests are used to deploy the application with a load balancer, ensuring seamless user access. For monitoring, Prometheus and Grafana are integrated using Helm charts, providing real-time insights into the performance and resource utilization of the Kubernetes cluster. The pipeline automates tasks such as code cloning, building, transferring artifacts, and deploying containers, while password-less SSH ensures secure communication between servers. The final output is a scalable, fault-tolerant web application accessible via DNS, backed by robust monitoring and automated workflows deployments.



### Technologies Used

|                                  |                                  |
|----------------------------------|----------------------------------|
| Version Control                  | : Git, GitHub                    |
| Build & Deployment Tools         | : Maven, Jenkins                 |
| Containerization & Orchestration | : Docker, Kubernetes, Helm       |
| Configuration Management         | : Ansible                        |
| Cloud Technologies               | : AWS (EC2, VPC, IAM, EKS Stack) |
| Monitoring & Logging             | : Prometheus, Grafana            |
| Web & Application Servers        | : Tomcat                         |
| Operating Systems                | : Linux (Amazon Linux, Ubuntu)   |

Git server (developers machine)

Launch ec2 instance with following configuration

Name git-server  
 Ami amazon-linux  
 Instance type t2.micro  
 Key-pair  
 Security groups 22,80 ports  
 Storage 8 Gi

**Instances (1/1) Info**

| Name       | Instance ID         | Instance state | Instance type | Status check      | Alarm status  | Availability Zone | Public IP |
|------------|---------------------|----------------|---------------|-------------------|---------------|-------------------|-----------|
| Git_Server | i-0b05706f3155a10d6 | Running        | t2.micro      | 2/2 checks passed | View alarms + | ap-south-1b       | ec2-13-2  |

**i-0b05706f3155a10d6 (Git\_Server)**

- Details**
- Status and alarms
- Monitoring
- Security
- Networking
- Storage
- Tags

**Instance summary**

|                     |                              |   |
|---------------------|------------------------------|---|
| Instance ID         | Public IPv4 address          | Private IPv4 addresses  |
| i-0b05706f3155a10d6 | 13.234.30.170   open address | 172.31.11.131   |
| IPv6 address        | Instance state               | Public IPv4 DNS   |
| -                   | Running                      | ec2-13-234-30-170.ap-south-1.compute.amazonaws.com   open address |

Connect to git-server(ssh client(mobaxterm))

Install and config git using the below commands  
 Yum install git -y  
 git config --global user.name "kv"  
 git config --global user.email "kv@gmail.com"  
 git -version  
 git config --list

install maven, java and setting its path

maven  
 wget <https://dlcdn.apache.org/maven/maven-3/3.9.9/binaries/apache-maven-3.9.9-bin.tar.gz>  
 tar -xvzf apache-maven-3.9.9-bin.tar.gz  
 mv apache-maven-3.9.9/ maven

java  
 yum install java-17\* -y  
 find /usr/lib/jvm/java-17\* | head -n 3

vi .bash\_profile  
 JAVA\_HOME=/usr/lib/jvm/java-17-amazon-corretto.x86\_64  
 M2\_HOME=/opt/maven  
 M2=/opt/maven/bin  
 PATH=\$PATH:\$HOME/bin:\$JAVA\_HOME:\$M2:\$M2\_HOME

Ssh-connection  
 Password less ssh connection between github and local machine

Ssh-keygen

Cd .ssh

cat id\_rsa.pub

Copy this public key and paste it in github ssh and gpg keys

```
[root@ip-172-31-11-131 ~]# ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/root/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /root/.ssh/id_rsa
Your public key has been saved in /root/.ssh/id_rsa.pub
The key's randomart image is:
+---[RSA 3072]---+
| .. o+=+BX+.
| .. ++o=+++
| .. +o+= .
| o = S E .
| + B o o .
| o o = . o .
| . o... .
+----[SHA256]----+
[root@ip-172-31-11-131 ~]# ls
[root@ip-172-31-11-131 ~]# ls -la
total 36
dr-xr-x--- 3 root root 174 Dec 12 10:33 .
dr-xr-xr-x 18 root root 237 Nov 22 05:02 ..
-rw-r--r-- 1 root root 422 Dec 12 10:33 .bash_history
-rw-r--r-- 1 root root 18 Feb 2 2023 .bash_logout
-rw-r--r-- 1 root root 223 Dec 12 10:33 .bash_profile
-rw-r--r-- 1 root root 429 Feb 2 2023 .bashrc
-rw-r--r-- 1 root root 100 Feb 2 2023 .cshrc
-rw-r--r-- 1 root root 40 Dec 12 09:51 .gitconfig
-rw-r--r-- 1 root root 20 Dec 12 09:52 .lessht
drwxr--r-- 2 root root 61 Dec 12 10:37 .ssh
-rw-r--r-- 1 root root 129 Feb 2 2023 .tcshrc
-rw-r--r-- 1 root root 834 Dec 12 10:33 .viminfo
[root@ip-172-31-11-131 ~]# cd .ssh/
[root@ip-172-31-11-131 .ssh]# ls
authorized_keys id_rsa id_rsa.pub
[root@ip-172-31-11-131 .ssh]# cat id_rsa.pub
ssh-rsa AAAAB3NzaC1yc2EAAADQABAAAQjC3EOWrJkL029z4F2ad6hH3eGQQ9+xy4CKo/prigI1laScEZumWy+DIhSccV5ez/NYLsqFuxTUUVwnrnKSecc/B4yS20FB1/eVT8Re2Cp3fxLgtqAtjvc
JFOn8i5jLRYdGm9XqxC41YHws2PrAKWXbcA6Xb1F9Dw7gryZFZWXUocWoFcWzgU4nEJIX7MbEnUQ/dlxif/rHR/WoeGSKofihRK+3B6a0l6Qq3i32M1DRVpKH0m5uQ9am2RfHsYp8LrK9lFe1LBkLGYYv
```

UNREGISTERED VERSION - Please support MobaTerm by subscribing to the professional edition here: <https://mobaterm.mobatek.net>

Creating simple maven project

Mvn archetype:generate -> it give all available templates, out of which we want an archetype which contains a sample maven webapp project (2212 template )

Mvn archetype:generate | grep maven-archetype-webapp

```

ec2-user@ec2-13-234-30-170.ap-south-1: ~
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help Save
X server Exit
ec2-user@ec2-13-234-30-170.ap-south-1: ~
3497: remote -> ws.nzen.format.maven:zaftig_offal_hamisha (A maven archetype for my style of project.)
3498: remote -> ws.osiris:osiris-archetype (Maven Archetype for Osiris)
3499: remote -> xyz.luan.generator:xyz-gae-generator (-)
3500: remote -> xyz.luan.generator:xyz-gae-generator (-)
3501: remote -> za.co.absa.hyperdrive:component-archetype (-)
3502: remote -> za.co.absa.hyperdrive:component-archetype_2.11 (-)
3503: remote -> za.co.absa.hyperdrive:component-archetype_2.12 (-)
Choose a number or apply filter (format: [groupId]:[artifactId], case sensitive contains): 2207: 2212
Choose org.apache.maven.archetypes:maven-archetype-webapp version:
1: 1.0-alpha-1
2: 1.0-alpha-2
3: 1.0-alpha-3
4: 1.0-alpha-4
5: 1.0
6: 1.3
7: 1.4
8: 1.5
Choose a number: 8: 8
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/archetypes/maven-archetype-webapp/1.5/maven-archetype-webapp-1.5.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/archetypes/maven-archetype-webapp/1.5/maven-archetype-webapp-1.5.jar (9.9 kB at 26 kB/s)
Define value for property 'groupId': in.kv.webapp
Define value for property 'artifactId': webapp-project
Define value for property 'version' 1.0-SNAPSHOT:
Define value for property 'package' in.kv.webapp
Confirm properties configuration:
groupId: in.kv.webapp
artifactId: webapp-project
version: 1.0-SNAPSHOT
package: in.kv.webapp
Y: Y
[INFO] -----
[INFO] Using following parameters for creating project from Archetype: maven-archetype-webapp:1.5
[INFO] -----
[INFO] Parameter: groupId, Value: in.kv.webapp
[INFO] Parameter: artifactId, Value: webapp-project
[INFO] Parameter: version, Value: 1.0-SNAPSHOT
[INFO] Parameter: package, Value: in.kv.webapp
[INFO] Parameter: packageInPathFormat, Value: in/kv/webapp
[INFO] Parameter: package, Value: in.kv.webapp
[INFO] Parameter: groupId, Value: in.kv.webapp
[INFO] Parameter: artifactId, Value: webapp-project
[INFO] Parameter: version, Value: 1.0-SNAPSHOT
[INFO] -----
UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: https://mobaxterm.mobatek.net
84°F Haze Search
84°F Haze Search
ec2-user@ec2-13-234-30-170.ap-south-1: ~
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help Save
X server Exit
ec2-user@ec2-13-234-30-170.ap-south-1: ~
4: 1.0-alpha-4
5: 1.0
6: 1.3
7: 1.4
8: 1.5
Choose a number: 8: 8
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/archetypes/maven-archetype-webapp/1.5/maven-archetype-webapp-1.5.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/archetypes/maven-archetype-webapp/1.5/maven-archetype-webapp-1.5.jar (9.9 kB at 26 kB/s)
Define value for property 'groupId': in.kv.webapp
Define value for property 'artifactId': webapp-project
Define value for property 'version' 1.0-SNAPSHOT:
Define value for property 'package' in.kv.webapp
Confirm properties configuration:
groupId: in.kv.webapp
artifactId: webapp-project
version: 1.0-SNAPSHOT
package: in.kv.webapp
Y: Y
[INFO] -----
[INFO] Using following parameters for creating project from Archetype: maven-archetype-webapp:1.5
[INFO] -----
[INFO] Parameter: groupId, Value: in.kv.webapp
[INFO] Parameter: artifactId, Value: webapp-project
[INFO] Parameter: version, Value: 1.0-SNAPSHOT
[INFO] Parameter: package, Value: in.kv.webapp
[INFO] Parameter: packageInPathFormat, Value: in/kv/webapp
[INFO] Parameter: package, Value: in.kv.webapp
[INFO] Parameter: groupId, Value: in.kv.webapp
[INFO] Parameter: artifactId, Value: webapp-project
[INFO] Parameter: version, Value: 1.0-SNAPSHOT
[INFO] -----
[WARNING] CF Don't override file /root/webapp-project/src/main/webapp
[WARNING] CF Don't override file /root/webapp-project/.mvn
[INFO] Project created from Archetype in dir: /root/webapp-project
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 02:40 min
[INFO] Finished at: 2024-12-12T10:56:42Z
[INFO] -----
[root@ip-172-31-11-131 ~]# ls
webapp-project
[root@ip-172-31-11-131 ~]# 

```

UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: https://mobaxterm.mobatek.net

Now simple-maven-webapp project is created

Pushing the code to github(central-repo)

Create a repository in github and execute the following commands

```
git remote add origin git@github.com:KanthivardhanK/webapp-project.git
```

```
git branch -M main
```

```
git add .
```

```
git commit -m "first commit"
```

```
git push -u origin main
```

```

ec2-user@ec2-13-234-30-170.ap-south-1.compute.amazonaws.com ~
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help Save
ec2-user@ec2-13-234-30-170.ap-south-1: ~
nothing added to commit but untracked files present (use "git add" to track)
[root@ip-172-31-11-131 webapp-project]# git remote add origin git@github.com:KanthivardhanK/webapp-project.git
[root@ip-172-31-11-131 webapp-project]# git branch -M main
[root@ip-172-31-11-131 webapp-project]# git add .
[root@ip-172-31-11-131 webapp-project]# git commit -m "first commit"
[main (root-commit) 5af65e3] first commit
  5 files changed, 118 insertions(+)
   create mode 100644 .mvn/maven.config
   create mode 100644 pom.xml
   create mode 100644 src/main/webapp/WEB-INF/web.xml
   create mode 100644 src/main/webapp/index.jsp
[root@ip-172-31-11-131 webapp-project]# git push -u origin main
The authenticity of host 'github.com (20.207.73.82)' can't be established.
ED25519 key fingerprint is SHA256:+DiY3wvvV6TuJhbhpZisF/zLDA0zPMSvHdkr4UvCoQU.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'github.com' (ED25519) to the list of known hosts.
Enumerating objects: 11, done.
Counting objects: 100% (11/11), done.
Compressing objects: 100% (7/7), done.
Writing objects: 100% (11/11), 2.07 KiB | 2.07 MiB/s, done.
Total 11 (delta 0), reused 0 (delta 0), pack-reused 0
To github.com:KanthivardhanK/webapp-project.git
 * [new branch]      main -> main
branch 'main' set up to track 'origin/main'.
[root@ip-172-31-11-131 webapp-project]# git status
On branch main
Your branch is up to date with 'origin/main'.

nothing to commit, working tree clean
[root@ip-172-31-11-131 webapp-project]#
[root@ip-172-31-11-131 webapp-project]#

```

UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: <https://mobaxterm.mobatek.net>

KanthivardhanK / webapp-project

**Code** Issues Pull requests Actions Projects Wiki Security Insights Settings

**webapp-project** Public

**main** Branch Tags

Go to file Add file Code

**About**

No description, website, or topics provided.

Activity 1 star 0 forks 1 watching 0 forks

**Commits**

- DexGamr first commit · 5 minutes ago
- .mvn first commit · 5 minutes ago
- src/main/webapp first commit · 5 minutes ago
- pom.xml first commit · 5 minutes ago

**README**

Add a README

Help people interested in this repository understand your project by adding a README.

Add a README

**About**

No description, website, or topics provided.

Activity 1 star 0 forks 1 watching 0 forks

**Releases**

No releases published Create a new release

**Packages**

No packages published Publish your first package

**Languages**

Java 100.0%

**Suggested workflows**

Based on your tech stack

## Jenkins-server

Launch an ec2 server with below configuration

Name jenkins-server

Ami amazon-linux

Instance type t2.medium

Key-pair

Security groups 22,80,8080 ports

Storage 15 Gi

**Instances (1/2) Info**

| Name           | Instance ID         | Instance state | Instance type | Status check      | Alarm status  | Availability Zone | Public IP |
|----------------|---------------------|----------------|---------------|-------------------|---------------|-------------------|-----------|
| Git_Server     | i-0b05706f3155a10d6 | Running        | t2.micro      | 2/2 checks passed | View alarms + | ap-south-1b       | ec2-13-2  |
| jenkins-server | i-0bfd5df02b05ff8bf | Running        | t2.medium     | 2/2 checks passed | View alarms + | ap-south-1b       | ec2-13-2  |

**i-0bfd5df02b05ff8bf (jenkins-server)**

**Details** | Status and alarms | Monitoring | Security | Networking | Storage | Tags

**Instance summary**

|                                    |   |  |
|------------------------------------|---|--|
| Instance ID<br>i-0bfd5df02b05ff8bf | Public IPv4 address<br>13.233.82.199   open address | Private IPv4 addresses<br>172.31.7.198   |
| IPv6 address<br>-                  | Instance state<br>Running                           | Public IPv4 DNS<br>ec2-13-233-82-199.ap-south-1.compute.amazonaws.com   open address |

## Connect to Jenkins-server

prerequisite to install Jenkins – java

yum install java-17\* -y

find /usr/lib/jvm/java-17\* | head -n 3

install git and maven as we run the jobs related to maven

wget <https://dlcdn.apache.org/maven/maven-3/3.9.9/binaries/apache-maven-3.9.9-bin.tar.gz>

tar -xvzf apache-maven-3.9.9-bin.tar.gz

mv apache-maven-3.9.9/ maven

setting java and maven path

vi .bash\_profile

```
JAVA_HOME= /usr/lib/jvm/java-17-amazon-corretto.x86_64
M2_HOME=/opt/maven
M2=/opt/maven/bin
PATH=$PATH:$HOME/bin:$JAVA_HOME:$M2:$M2_HOME
```

## Install Jenkins

sudo wget -O /etc/yum.repos.d/jenkins.repo <https://pkg.jenkins.io/redhat-stable/jenkins.repo>

sudo rpm --import <https://pkg.jenkins.io/redhat-stable/jenkins.io-2023.key>

yum install Jenkins -y

service Jenkins start

chkconfig Jenkins on

## Jenkins dashboard

Public IP:8080

Welcome to Jenkins!

This page is where your Jenkins jobs will be displayed. To get started, you can set up distributed builds or start building a software project.

Start building your software project

Build Queue  
No builds in the queue.

Create a job +

Set up a distributed build

Set up an agent

Configure a cloud

Learn more about distributed builds ?

REST API Jenkins 2.479.2

Available plugins - Plugins [Jen]

Dashboard > Manage Jenkins > Plugins

Plugins

Search available plugins /

Install Name ↴ Released

GitHub 1.40.0 External Site/Tool Integrations / github This plugin integrates GitHub to Jenkins. 4 mo 5 days ago

Maven Integration 3.24 Build Tools This plugin provides a deep integration between Jenkins and Maven. It adds support for automatic triggers between projects depending on SNAPSHOTs as well as the automated configuration of various Jenkins publishers such as JUnit. 1 mo 19 days ago

Deploy to container 1.16 Artifact Uploaders This plugin allows you to deploy a war to a container after a successful build. Glassfish 3.x remote deployment. 4 yr 1 mo ago

Publish Over SSH 383.v4eb\_4c44da\_2dd Artifact Uploaders / Build Tools Send build artifacts over SSH. 22 days ago

Maven Invoker 2.5 External Site/Tool Integrations / Maven This plugin will parse result files produced by the maven-invoker-plugin. 1 yr 10 mo ago

Script Security 1369.v9b\_98a\_4e95b\_2d

84°F Haze Search ENG IN 12-12-2024 18:00

Configure the java,git and maven paths in Jenkins tools

## Jenkins-slave

Launch an ec2 instance and install java-17\*

In Jenkins dashboard create node and paste the command in jenkins slave now the node is connected successfully

Plugin instance identity

Manage Jenkins-security-agents-random

## Ansible-server

---

Launch ec2 instance

Name ansible-server

Ami amazon-linux

Instance type t2.micro

Key-pair

Security groups 22,80 ports

Storage 8 Gi

Connect to instance using mobaxterm

Install ansible

yum install python -y

Yum install python-pip

Pip install ansible

Ansible –version

Launch k8s-server ec2

Launch ec2 instance

Name k8s-server

Ami amazon-linux

Instance type t2.medium

Key-pair

Security groups 22,80 ports

Storage 25 Gi

Create user ansadmin and passwd in both the ansible-server and k8s-server

Visudo

Ansadmin ALL=ALL NOPASSWD=ALL

Vi /etc/ssh/sshd\_config

Passwordauthentication yes

Permitrootpassword yes

Connecting ansible server with k8s-server (password-less ssh authentication)

In ansible-server being ansadmin user

Ssh-keygen

In both ansible-server and k8s-server

Passwd root (give password)

Vi /etc/ssh/sshd\_config

PasswordAuthentication yes

Permitrootpassword yes

In ansible-server as ansadmin

Ssh-copy-id root@(k8s-server-private-ip)

Ssh-copy-id ansadmin@(ansible-server-private-ip)

Vi /etc/ansible/hosts

[k8s\_server]

k8s-server-private-ip

[ansible\_server]

ansible-server-private-ip

ansible all -m ping

```

ansible-server
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help Save
git-server Jenkins-server ansible-server k8s-deployment
[root@ip-172-31-14-113 ~]# vi /etc/ansible/hosts
[root@ip-172-31-14-113 ~]# ansible all -m ping
[WARNING]: Platform linux on host 172.31.36.163 is using the discovered Python interpreter at /usr/bin/python3.9, but future installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-core/2.15/reference_appendices/interpreter_discovery.html for more information.
172.31.36.163 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3.9"
    },
    "changed": false,
    "ping": "pong"
}
[WARNING]: Platform linux on host 172.31.14.113 is using the discovered Python interpreter at /usr/bin/python3.9, but future installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-core/2.15/reference_appendices/interpreter_discovery.html for more information.
172.31.14.113 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3.9"
    },
    "changed": false,
    "ping": "pong"
}
[root@ip-172-31-14-113 ~]#
[root@ip-172-31-14-113 ~]#

```

UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: <https://mobaxterm.mobatek.net>

Now ansible is connected to k8s server successfully!!

### Connecting Jenkins with ansible-server

Configure the system settings in jenkins dashboard as below

Dashboard > Manage Jenkins > System >

**SSH Servers**

| SSH Server   |               |
|--|---------------|
| Name   | ansible-host  |
| Hostname   | 172.31.14.113 |
| Username   | ansadmin      |
| Remote Directory   | //opt//docker |
| <input type="checkbox"/> Avoid sending files that have not changed |               |
| Advanced <input checked="" type="button"/> Edited                  |               |

Save Apply

In jenkins dashboard manage Jenkins>system add ssh server and details as above

### Installing docker in ansible server

Yum install docker -y

Service docker start

Creating a job(simple-maven-project) in Jenkins

## Add github repository and add maven goal

The screenshot shows the Jenkins CI Configuration page for a job named 'Instances | EC2 | ap-south-1'. The 'Source Code Management' section is selected. The 'Repository URL' field contains 'https://github.com/KanthivardhanK/webapp-project.git'. The 'Branches to build' field has 'Branch Specifier (blank for 'any')' set to '/main'. There are 'Save' and 'Apply' buttons at the bottom.

Finally add post-build action which transfer war file to the ansible-server(/opt/docker)

Give full permission to /opt/docker file

chown -r ansadmin:ansadmin /opt/docker

The screenshot shows the Jenkins CI Configuration page for the same job. The 'Post-build Actions' section is selected. A new action named 'ansible-host' is added under 'Transfers'. The 'Source files' field contains 'target/webapp-project.war'. The 'Remove prefix' field contains 'target'. The 'Remote directory' field contains '//opt//docker'. The 'Exec command' field is empty. There are 'Save' and 'Apply' buttons at the bottom.

After building the job we get war file in ansible server as below

```

ansible-server
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help Save
X server Exit
git-server Jenkins-server ansible-server k8s-deployment
[WARNING]: Platform linux on host 172.31.14.113 is using the discovered Python interpreter at /usr/bin/python3.9, but future installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-core/2.15/reference_appendices/interpreter_discovery.html
172.31.14.113 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3.9"
    },
    "changed": false,
    "ping": "pong"
}
[ansadmin@ip-172-31-14-113 ~]$ cd /opt/
[ansadmin@ip-172-31-14-113 opt]$ ls -al
total 0
drwx--xr-x. 5 root      root      49 Dec 12 17:53 .
dr-xr-xr-x. 18 root      root     237 Dec 12 16:48 ..
drwxr-xr-x.  4 root      root      33 Nov 22 05:03 aws
drwx--x--x.  4 root      root      28 Dec 12 14:28 containerd
drwxr-xr-x.  2 ansadmin  ansadmin   6 Dec 12 17:53 docker
[ansadmin@ip-172-31-14-113 opt]$ ls
aws  containerd  docker
[ansadmin@ip-172-31-14-113 opt]$ cd docker/
[ansadmin@ip-172-31-14-113 docker]$ ls
webapp-project.war
[ansadmin@ip-172-31-14-113 docker]$
[ansadmin@ip-172-31-14-113 docker]$

```

UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: <https://mobaxterm.mobatek.net>

In ansible server under /opt/docker as ansadmin

Vi Dockerfile

```

FROM tomcat:latest
RUN cp -R /usr/local/tomcat/webapps.dist/* /usr/local/tomcat/webapps
COPY ./*.war /usr/local/tomcat/webapps

```

Sudo chmod 777 /var/run/docker.sock

Vi webapp.yml

```

---
- hosts: ansible_server
  become: true
  tasks:
    - name: deleting image
      command: docker rmi webapp:v1
      ignore_errors: yes
    - name: create docker image
      command: docker build -t webapp:v1 .
      args:
        chdir: /opt/docker
    - name: deleting reserved image
      command: docker rmi kanthivardhan/webapp:v1
      ignore_errors: yes
    - name: log into Docker Hub
      command: docker login --username {"kanthivardhan"} --password {"Docker@0348"}
    - name: reserving space for image
      command: docker tag webapp:v1 kanthivardhan/webapp:v1
    - name: pushing image to docker hub
      command: docker push kanthivardhan/webapp:v1

```

ansible-playbook webapp.yml –check

ansible-playbook webapp.yml

```

ansible-server
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help Save
git-server Jenkins-server ansible-server k8s-deployment
REPOSITORY TAG IMAGE ID CREATED SIZE
kanthivardhan/webapp v1 4aa829acb720 32 minutes ago 472MB
webapp v1 4aa829acb720 32 minutes ago 472MB
[ansadmin@ip-172-31-14-113 docker]$ ansible-playbook webapp.yml
PLAY [ansible_server] ****
TASK [Gathering Facts] ****
[WARNING]: Platform linux on host 172.31.14.113 is using the discovered Python interpreter at /usr/bin/python3.9, but future installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-core/2.15/reference_appendices/interpreter_discovery.html for more information.
ok: [172.31.14.113]

TASK [deleting image] ****
changed: [172.31.14.113]

TASK [create docker image] ****
changed: [172.31.14.113]

TASK [deleting reserved image] ****
changed: [172.31.14.113]

TASK [log into Docker Hub] ****
changed: [172.31.14.113]

TASK [reserving space for image] ****
changed: [172.31.14.113]

TASK [pushing image to docker hub] ****
changed: [172.31.14.113]

PLAY RECAP ****
172.31.14.113 : ok=7    changed=6    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
[ansadmin@ip-172-31-14-113 docker]$ cat webapp.yml
- hosts: ansible_server
  become: true

UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: https://mobaxterm.mobatek.net
Watchlist Ideas Search ENG IN 01:39 13-12-2024

```

now the docker image is pushed to docker hub successfully.

In k8s server

Eksctl create cluster --name kv --region ap-south-1 --node-type t2.small  
it will create nodes in aws

|                          | Name               | Instance ID         | Instance state       | Instance type | Status check                   | Alarm status               | Availability Zone | Public IPv4 |
|--------------------------|--------------------|---------------------|----------------------|---------------|--------------------------------|----------------------------|-------------------|-------------|
| <input type="checkbox"/> | k8s-server         | i-023333fae824875b5 | <span>Running</span> | t2.medium     | <span>2/2 checks passed</span> | <span>View alarms +</span> | ap-south-1a       | ec2-13-126  |
| <input type="checkbox"/> | kv-nginx-95d8b3... | i-0663808c942d87d13 | <span>Running</span> | t2.small      | <span>2/2 checks passed</span> | <span>View alarms +</span> | ap-south-1a       | ec2-15-206  |
| <input type="checkbox"/> | Git_Server         | i-0b05706f3155a10d6 | <span>Running</span> | t2.micro      | <span>2/2 checks passed</span> | <span>View alarms +</span> | ap-south-1b       | ec2-13-234  |
| <input type="checkbox"/> | Jenkins-server     | i-0bfd5df02b05ff8bf | <span>Running</span> | t2.medium     | <span>2/2 checks passed</span> | <span>View alarms +</span> | ap-south-1b       | ec2-13-233  |
| <input type="checkbox"/> | Ansible-server     | i-0d5a8eca679ab08f9 | <span>Running</span> | t2.micro      | <span>2/2 checks passed</span> | <span>View alarms +</span> | ap-south-1b       | ec2-35-154  |
| <input type="checkbox"/> | kv-nginx-95d8b3... | i-0accbaeb098b89a6  | <span>Running</span> | t2.small      | <span>2/2 checks passed</span> | <span>View alarms +</span> | ap-south-1b       | ec2-3-110-4 |

Keep the below manifests in k8s-server under /root

```

Vi webappod.yaml
kind: Deployment
apiVersion: apps/v1
metadata:
  name: webapp-deploy

```

```

spec:
replicas: 3
selector:
matchLabels:
  app: webapp
template:
metadata:
labels:
  app: webapp
spec:
containers:
- name: webappcont
  image: kanthivardhan/webapp:v1
  imagePullPolicy: Always
  ports:
    - containerPort: 8080

```

Vi webappservice.yml

```

kind: Service
apiVersion: v1
metadata:
  name: webapp-service
spec:
  selector:
    app: webapp
  ports:
    - port: 8080
      targetPort: 8080
  type: LoadBalancer

```

in ansible-server keep the below playbook in /opt/docker. it is to manifests related to pods and services on k8s-server

```

vi kube-deploy
---
- hosts: k8s_server
  become: true
  tasks:
    - name: apply webapppod.yml manifessst
      command: /root/bin/kubectl apply -f /root/webapppod.yml
    - name: update deployment with new image updated in docker hub
      command: /root/bin/kubectl rollout restart deployment.apps/webapp-deploy
      ignore_errors: yes
    - name: waiting time
      command: sleep 20
    - name: applying webappservice.yml
      command: /root/bin/kubectl apply -f /root/webappservice.yml

```

the webapp.yml and kube-deploy.yml are main things here

webapp.yml created docker image and pushed to docker hub

kube-deploy creates pods and loadbalance in k8s-server

after creating al these paybooks and manifests

we have to place the two ansible command s in Jenkins-job configuration

After triggering the job automatically,  
 1-clone the code from github  
 2-build the source code  
 3-creates war file  
 4-war file transferred to ansible server  
 5-docker image is created including the war file  
 6-docker images is pushed to docker hub  
 7-from docker hub images is pulled and created containers in k8s-server  
 8-loadbalancer service is created  
 9-accessing using dns:8080/webapp-project  
 10-monitoring using Prometheus and Grafana

## The final webpage:

Welcome to My Simple Webpage

This is a SIMPLE WEBPAGE designed to demonstrate deploying a simple web application in CI/CD.

### Introduction

To create this page first we need maven, java installed in the server and configured

### Generating maven directory structure

mvn archetype:generate -DgroupId=com.example -DartifactId=webapp-project -Dversion=1.0.0 -DarchetypeArtifactId=maven-archetype-webapp -DinteractiveMode=false

After creating the maven project, we will get index.jsp file.

In index.jsp file paste this html code.

### Conclusion

Simple-maven-webapp is ready to deploy.

Monitoring the k8s cluster using Prometheus and Grafana  
Add the below helm repo  
helm repo add prometheus-grafana-kv <https://prometheus-community.github.io/helm-charts>  
helm repo list  
helm pull prometheus-grafana-kv/kube-prometheus-stack  
tar -xvzf kube-prometheus-stack-66.4.0.tgz

installing the helm chart  
helm install Prometheus Prometheus-grafana-kv/kube-prometheus-stack  
chart deployed

kubectl get all  
out of these many I need only one pod in which Prometheus and Grafana are running

```

k8s-deployment
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help Save
X server Exit
git-server Jenkins-server ansible-server k8s-deployment
NAME           NAMESPACE   REVISION  UPDATED             STATUS    CHART
prometheus     default      1         2024-12-12 22:00:19.983665936 +0000 UTC deployed  kube-prometheus-stack-66.4.0   APP VERSION
pod/alertmanager-prometheus-kube-prometheus-alertmanager-0 2/2       Running  0        14m
pod/prometheus-grafana-6c986b7586-5tvcf 3/3       Running  0        15m
pod/prometheus-kube-prometheus-operator-db97f9bbb-c6gjh 1/1       Running  0        15m
pod/prometheus-kube-state-metrics-d85c885bd-7p776 1/1       Running  0        15m
pod/prometheus-prometheus-kube-prometheus-prometheus-0 2/2       Running  0        14m
pod/prometheus-prometheus-node-exporter-nndw6 1/1       Running  0        15m
pod/prometheus-prometheus-node-exporter-zrzbm 1/1       Running  0        15m
pod/webapp-deploy-668c68b7d5-28qcd 1/1       Running  0        32m
pod/webapp-deploy-668c68b7d5-55qm4 1/1       Running  0        31m
pod/webapp-deploy-668c68b7d5-nt1sv 1/1       Running  0        32m

NAME          PORT(S)   AGE      TYPE    CLUSTER-IP      EXTERNAL-IP
service/alertmanager-operated  9093/TCP,9094/TCP,9094/UDP 14m     ClusterIP      <none>
service/kubernetes            443/TCP                138m    ClusterIP      10.100.0.1
service/prometheus-grafana    80/TCP                15m     ClusterIP      10.100.56.134
service/prometheus-kube-prometheus-alertmanager 9093/TCP,8080/TCP 15m     ClusterIP      10.100.195.177
service/prometheus-kube-prometheus-operator 443/TCP                15m     ClusterIP      10.100.95.96
service/prometheus-kube-prometheus-prometheus 9090/TCP,8080/TCP 15m     ClusterIP      10.100.48.148
service/prometheus-kube-state-metrics 8080/TCP               15m     ClusterIP      10.100.186.157
service/prometheus-operated   9090/TCP               14m     ClusterIP      None
service/prometheus-prometheus-node-exporter 9100/TCP               15m     ClusterIP      10.100.224.2
service/webapp-service        8080:31333/TCP 48m     LoadBalancer   a81cb97134479423a919bc9edd55e706-1540554703.ap-south-1.elb.amazonaws.com

```

UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: <https://mobaxterm.mobatek.net>

To get the dashboard I need to edit the service file type as LoadBalancer of Prometheus and Grafana  
 kubectl edit svc prometheus-grafana  
 kubectl get all  
 we got the LB for that pod

```

k8s-deployment
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help Save
X server Exit
git-server Jenkins-server ansible-server k8s-deployment
NAME           NAMESPACE   REVISION  UPDATED             STATUS    CHART
service/prometheus-grafana edited
[root@ip-172-31-36-163 ~]# kubectl get all
NAME           NAMESPACE   REVISION  UPDATED             STATUS    CHART
pod/alertmanager-prometheus-kube-prometheus-alertmanager-0 2/2       Running  0        18m
pod/prometheus-grafana-6c986b7586-5tvcf 3/3       Running  0        18m
pod/prometheus-kube-prometheus-operator-db97f9bbb-c6gjh 1/1       Running  0        18m
pod/prometheus-kube-state-metrics-d85c885bd-7p776 1/1       Running  0        18m
pod/prometheus-prometheus-kube-prometheus-prometheus-0 2/2       Running  0        18m
pod/prometheus-prometheus-node-exporter-nndw6 1/1       Running  0        18m
pod/prometheus-prometheus-node-exporter-zrzbm 1/1       Running  0        18m
pod/webapp-deploy-668c68b7d5-28qcd 1/1       Running  0        35m
pod/webapp-deploy-668c68b7d5-55qm4 1/1       Running  0        35m
pod/webapp-deploy-668c68b7d5-nt1sv 1/1       Running  0        35m

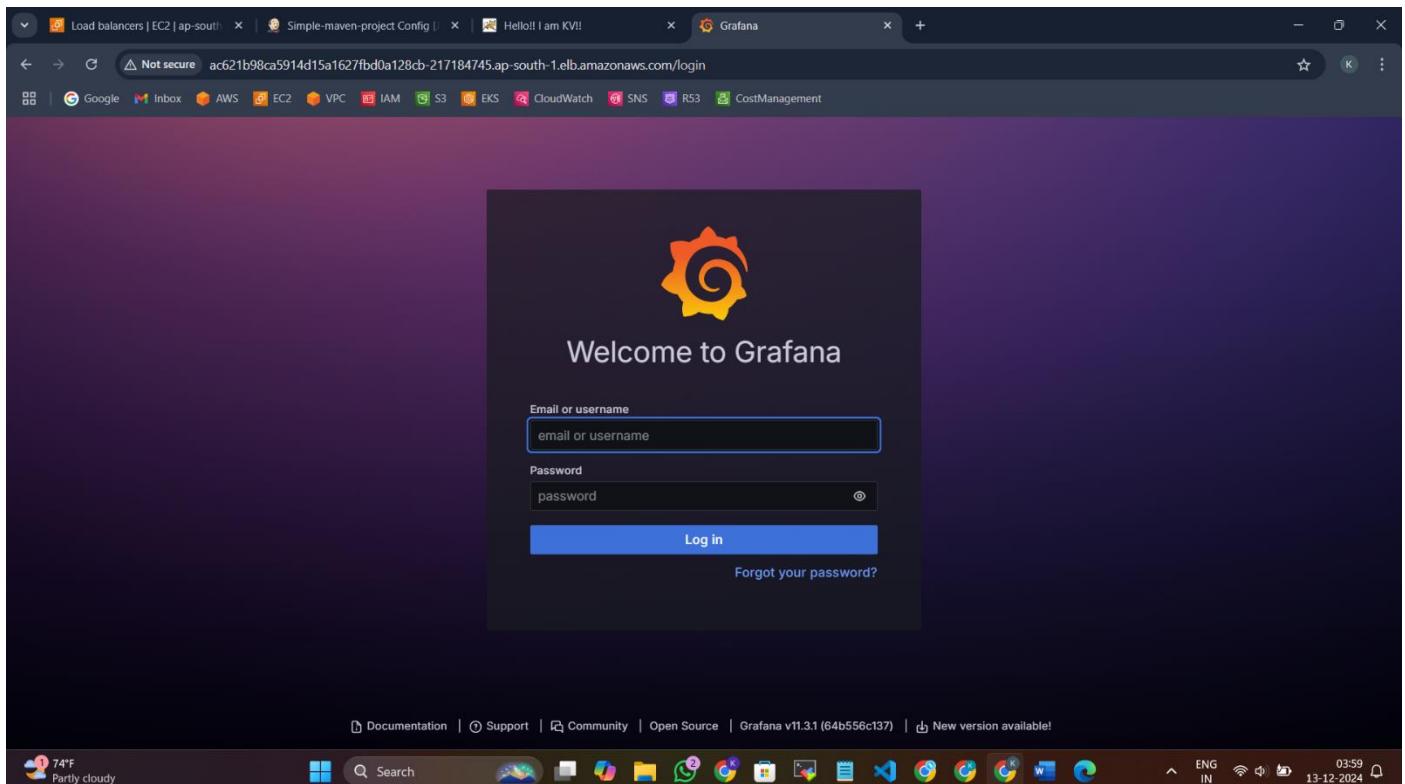
NAME          PORT(S)   AGE      TYPE    CLUSTER-IP      EXTERNAL-IP
service/alertmanager-operated  9093/TCP,9094/TCP,9094/UDP 18m     ClusterIP      <none>
service/kubernetes            443/TCP                141m    ClusterIP      10.100.0.1
service/prometheus-grafana    80:31500/TCP 18m     LoadBalancer   10.100.56.134 ac621b98ca5914d15a1627fdb0a128cb-217184745.ap-south-1.elb.amazonaws.com
service/prometheus-kube-prometheus-alertmanager 9093/TCP,8080/TCP 18m     ClusterIP      10.100.195.177
service/prometheus-kube-prometheus-operator 443/TCP                18m     ClusterIP      10.100.95.96
service/prometheus-kube-prometheus-prometheus 9090/TCP,8080/TCP 18m     ClusterIP      10.100.48.148
service/prometheus-kube-state-metrics 8080/TCP               18m     ClusterIP      10.100.186.157
service/prometheus-operated   9090/TCP               18m     ClusterIP      None
service/prometheus-prometheus-node-exporter 9100/TCP               18m     ClusterIP      10.100.224.2
service/webapp-service        8080:31333/TCP 52m     LoadBalancer   a81cb97134479423a919bc9edd55e706-1540554703.ap-south-1.elb.amazonaws.com

NAME          DESIRED  CURRENT  READY  UP-TO-DATE  AVAILABLE  NODE SELECTOR  AGE

```

UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: <https://mobaxterm.mobatek.net>

Copy load balancer and paste it in browser  
 We get Grafana login page



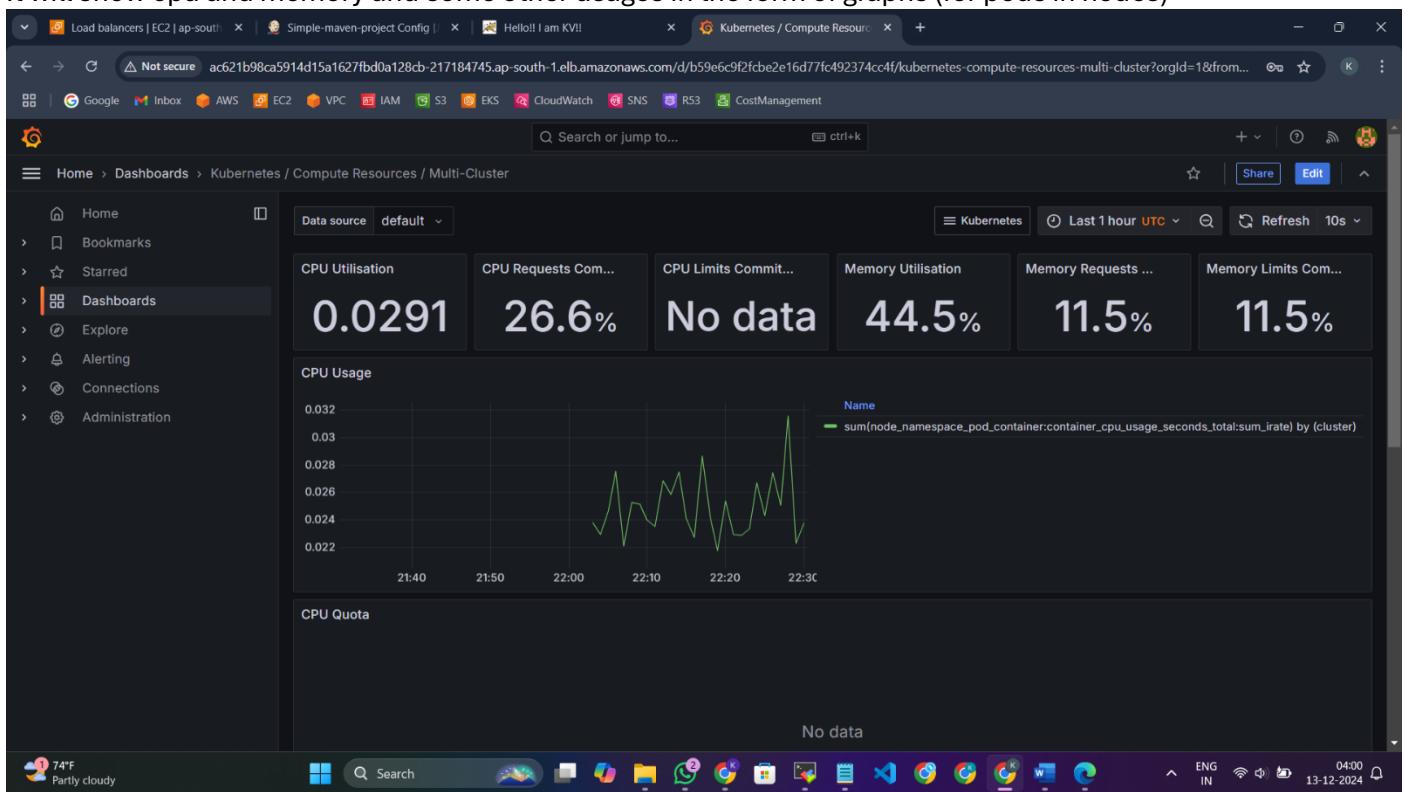
Username – admin

Password – prom-operator

Monitoring things

Kubernetes/computeResources/multi-cluster

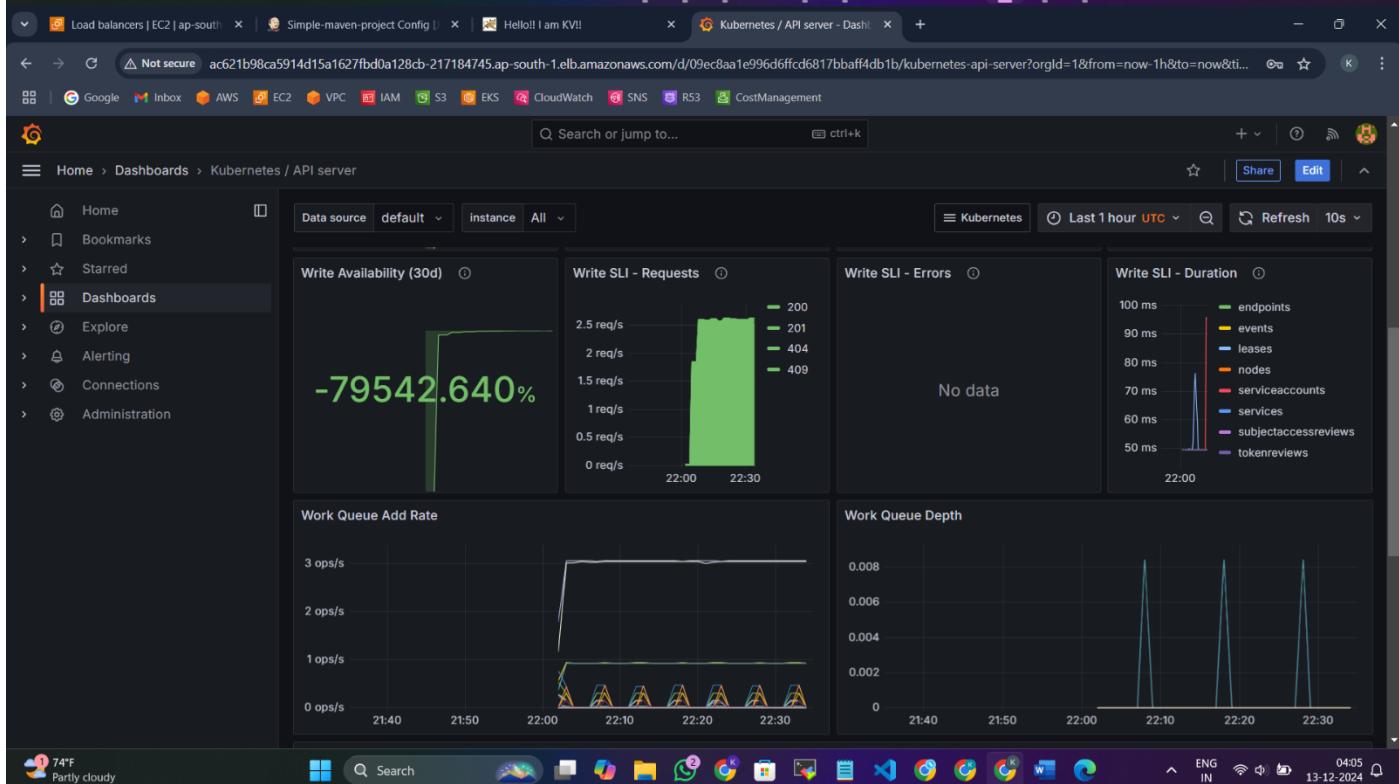
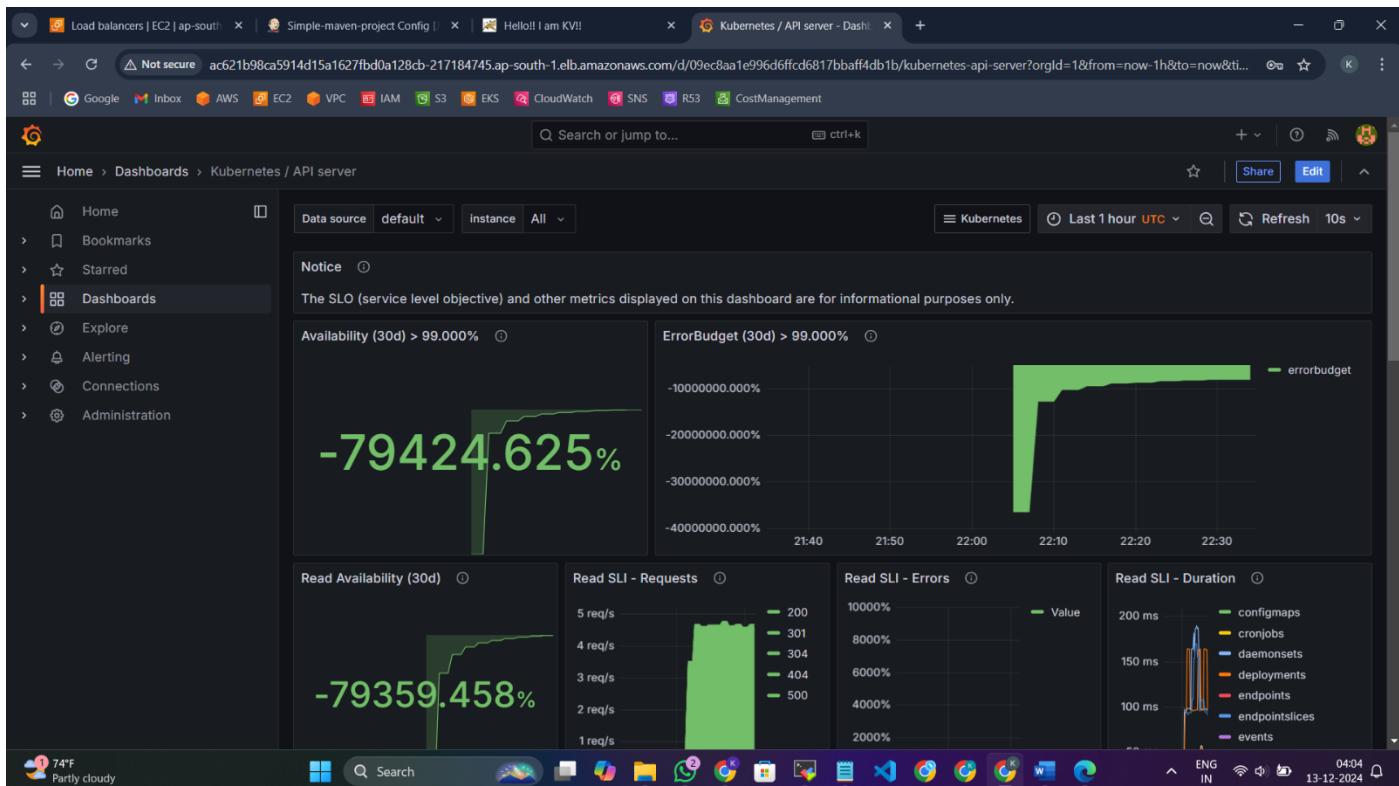
It will show cpu and memory and some other usages in the form of graphs (for pods in nodes)

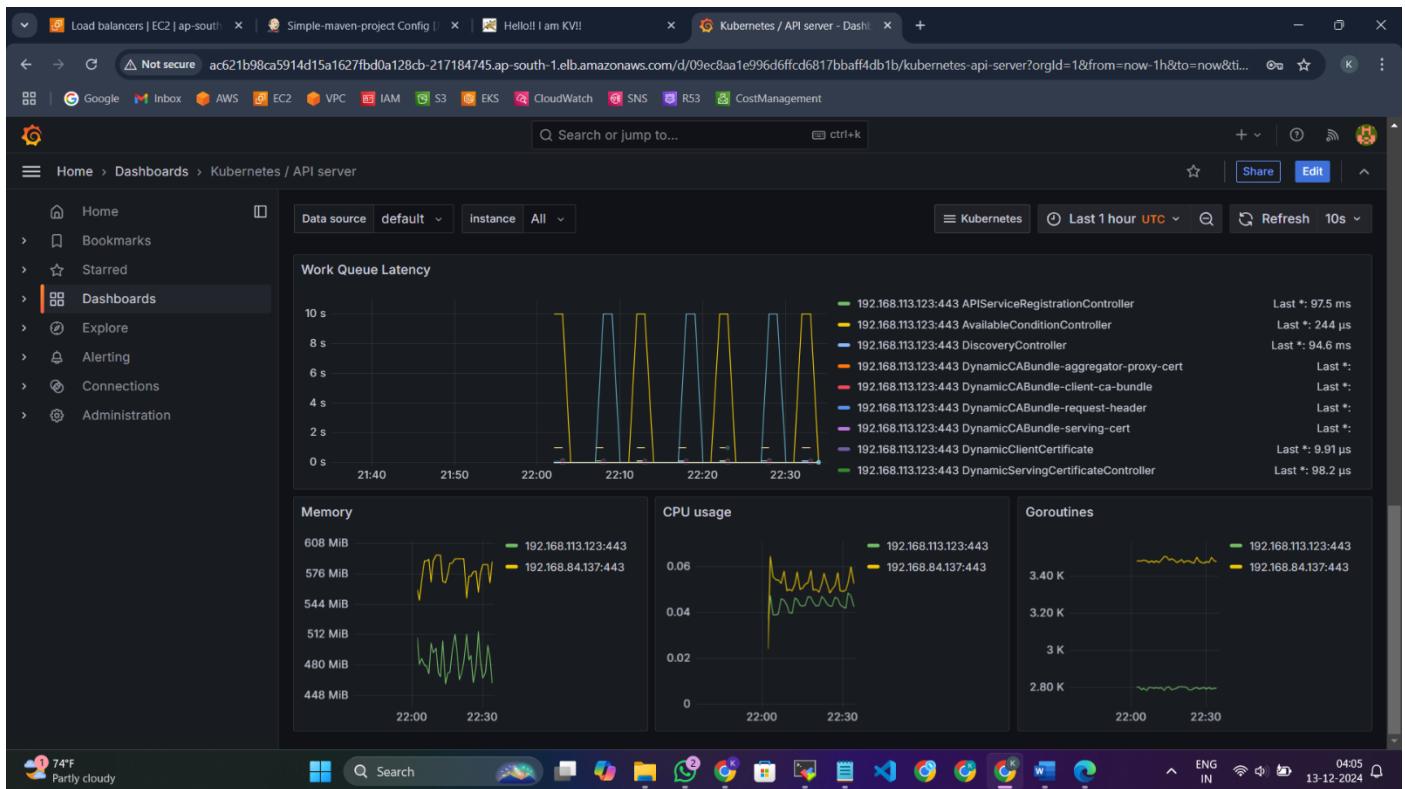


For server

Kubernetes/apiserver

It shows availability server, memory usage of server but mostly we see up and running of server





To monitor other things

NodeExporter/USEMethod/cluster  
Same graphs with different colours

