

# **Project 1**

## **Building a CI/CD Pipeline for a Retail Company**

### **Business Challenge/Requirement**

ABC technologies is a leading online retail store. ABC has recently acquired a large retail offline business store. The business store has large number of stores across the globe but is following conventional pattern of development and deployment. As a result, it has landed to great loss and are facing below challenges.

- low available
- low scalable
- low Performance
- Hard built and maintained
- Developed and deployed is time consuming

ABC will acquire the data from all these storage systems and plan to use it for analytics and prediction of the firm's growth and sales prospect. In the first phase ABC has to create the servlets to Add a product and Display product details. Add servlet dependencies required to compile the servlets. Create an HTML page which will be used to add a product. Team is using git to keep all the source code.

ABC has decided to use DevOps model and Once source code is available in Github, we need to integrate it with Jenkins and provide continuous build generation for continuous Delivery, integrate with Ansible and Kubernetes for deployment. Use docker hub to pull and push images between ansible and Kubernetes. Implement CICD such that ABC Company.

Verify following software is installed in the working machine:

- Java
- Maven
- Git
- Jenkins
- Docker
- Ansible
- Kubernetes
- Prometheus
- Grafana

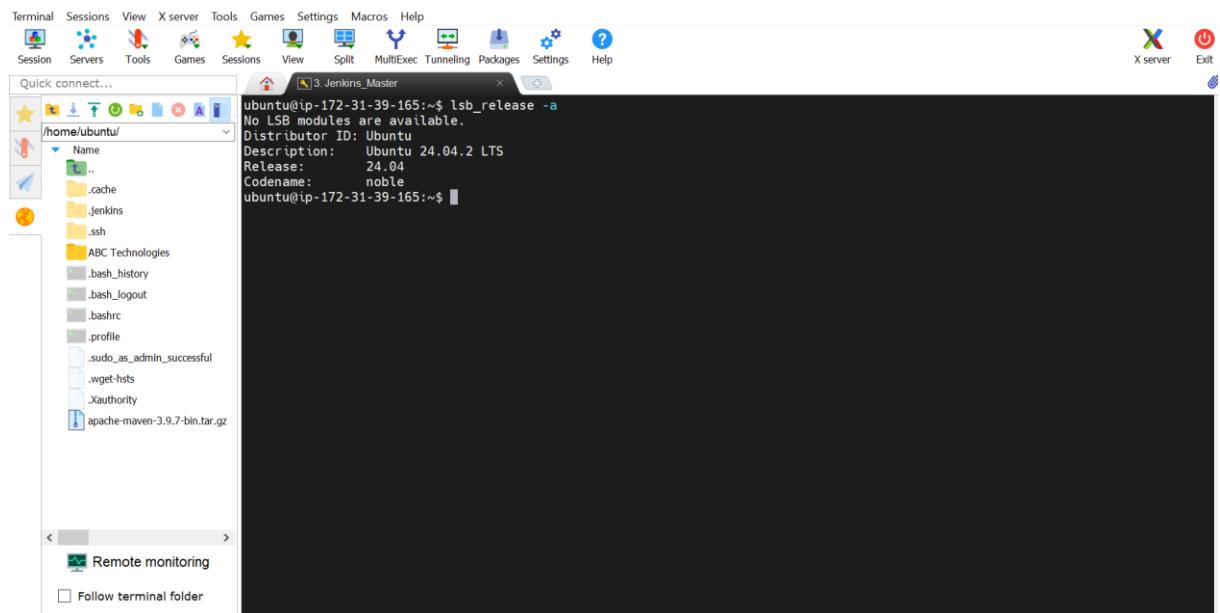
I made the explanations in the order above. In practice, the configuration definitions occurred in a different order.

[https://github.com/sehra06/ABC\\_project1](https://github.com/sehra06/ABC_project1)

I will follow “git config >> created project repo on github, initialise git and push the project on github>> Installed Jenkins on ec2 (Manually) and Through Ansible Play book >> Creating pipeline for CI on jenkins gui (Compile, test, package) and creating CI on jenkins with

jenkinsfile written in groovy script >> Installation of K8s manually and with ansible playbook >> deployment the artifacts on K8s kluster>> monitoring tools Prometheus and grafana tools integration”

**To find out which version of AWS Ubuntu is installed:**



## 1. Java

```
sudo apt update && sudo apt upgrade -y
```

```
sudo apt install openjdk-21-jdk -y
```

```
java -version
```

**Copy the path (e.g., /usr/lib/jvm/java-21-openjdk-amd64/) and set it in your environment variables:**

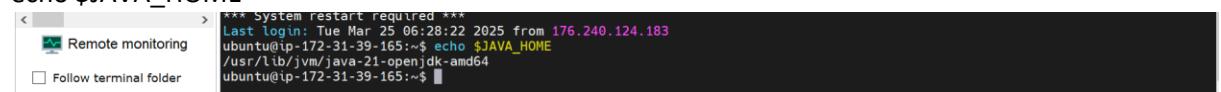
```
echo 'export JAVA_HOME=/usr/lib/jvm/java-21-openjdk-amd64' >> ~/.bashrc
```

```
echo 'export PATH=$JAVA_HOME/bin:$PATH' >> ~/.bashrc
```

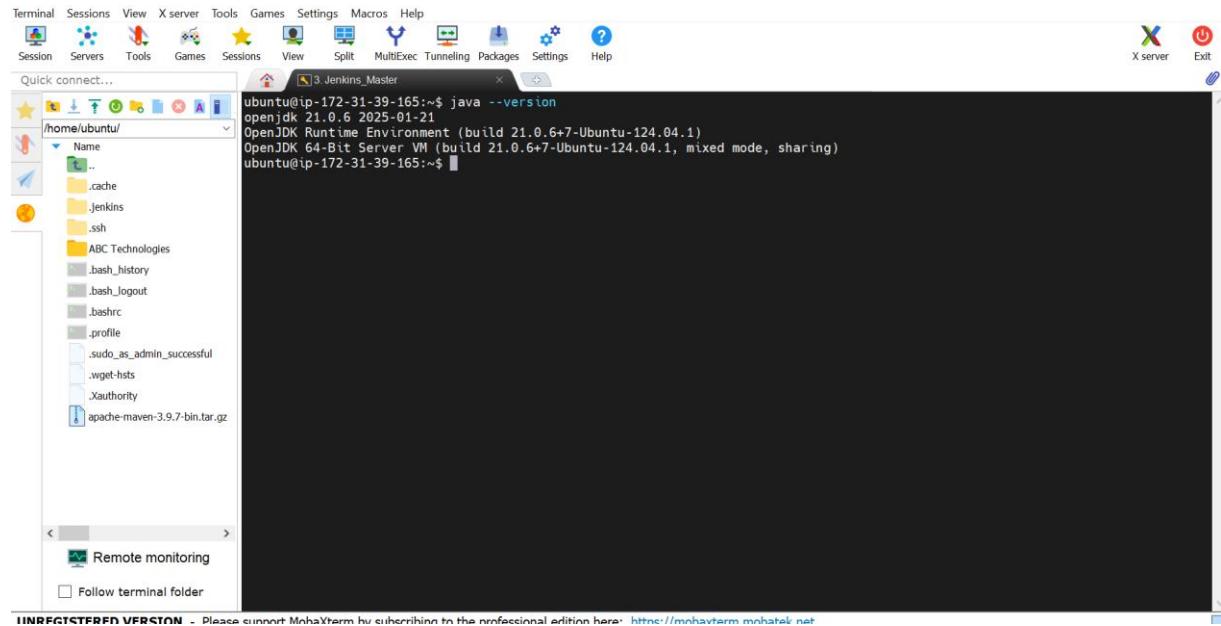
```
source ~/.bashrc
```

**Verify:**

```
echo $JAVA_HOME
```



I installed 21.0.6 version of Java.



## 2. Maven

Apache Maven is a popular build automation and dependency management tool for Java-based projects. Maven makes it easy to compile, test, package, and deploy code, especially for large-scale projects.

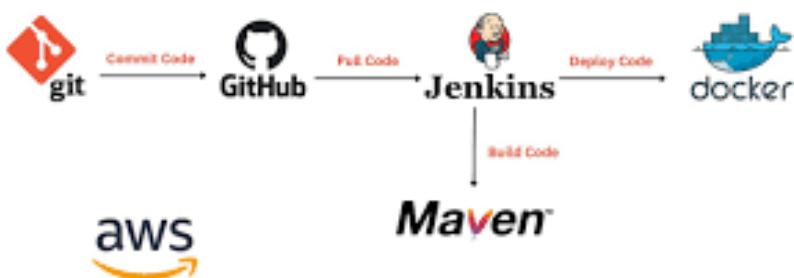
**To install Apache Maven 3.9.7;**

```
 wget https://mirrors.estointernet.in/apache/maven/maven-3/3.9.7/binaries/apache-maven-3.9.7-bin.tar.gz
 sudo mkdir -p /opt/maven
 sudo tar -xvf apache-maven-3.9.7-bin.tar.gz -C /opt/maven/ --strip-components=1
 sudo ln -s /opt/maven/bin/mvn /usr/bin/mvn
 mvn --version
```

## Apache Maven 3.9.7

```
ubuntu@ip-172-31-39-165:~$ mvn --version
Apache Maven 3.9.7 (8b094c9513efc1b9ce2d952b3b9c8aeaaf8cbf0)
Maven home: /opt/maven
Java version: 21.0.6, vendor: Ubuntu, runtime: /usr/lib/jvm/java-21-openjdk-amd64
Default locale: en, platform encoding: UTF-8
OS name: "Linux", version: "6.8.0-1024-aws", arch: "amd64", family: "unix"
ubuntu@ip-172-31-39-165:~$
```

## 3. Git



```
sudo apt update && sudo apt upgrade -y
sudo apt install git -y
git --version
```

```
ubuntu@ip-172-31-39-165:~$ echo $JAVA_HOME
/usr/lib/jvm/java-21-openjdk-amd64
ubuntu@ip-172-31-39-165:~$ git --version
git version 2.43.0
ubuntu@ip-172-31-39-165:~$
```

### Go to Set User Information:

```
git config --global user.name "semra06"
git config --global user.email smrknnc@gmail.com
```

```
ubuntu@ip-172-31-39-165:~$ git config --list
ubuntu@ip-172-31-39-165:~$ git config --global user.name "semra06"
git config --global user.email smrknnc@gmail.com
ubuntu@ip-172-31-39-165:~$ git config --list
user.name=semra06
user.email=smrknnc@gmail.com
ubuntu@ip-172-31-39-165:~$
```

### **Clone Repository**

**In the terminal, change to the directory where you will download the project and run the following command( used HTTPS):**

```
git clone https://github.com/semra06/ABC\_project1.git
```

### **Enter the Folder and Check Branches**

```
cd ABC\ Technologies/
```

```
ubuntu@ip-172-31-39-165:~$ cd ABC\ Technologies/
ubuntu@ip-172-31-39-165:~/ABC Technologies$ ls
README.md pom.xml pom.xml.bak src
ubuntu@ip-172-31-39-165:~/ABC Technologies$
```

### **To see all branches:**

```
ubuntu@ip-172-31-39-165:~/ABC Technologies$ git branch -a
* main
  remotes/origin/main
ubuntu@ip-172-31-39-165:~/ABC Technologies$
```

### **Initialize a New Git Repository (git init)**

```
git init
```

```
git add .
```

```
git commit -m "" --> local commit
```

```
git remote add origin https://github.com/semra06/ABC_project1.git
```

```
git remote -v
```

```
git push origin master
```

After all these processes, all documents were pushed to GitHub.

The screenshot shows the GitHub repository page for 'ABC\_project1'. The repository is public and was created by 'semra06'. The commit history lists 33 commits, mostly from 'sema06' updating Jenkinsfiles and adding project files like '.settings', 'ABC\_project1', 'src', and 'Dockerfile'. There is also a commit from 'Jenkinsfile' and one from 'README.md'. The repository has 0 stars, 1 watching, and 0 forks. It includes sections for About (no description), Releases (no releases), Packages (no packages), and Languages (Java 90.3%, Dockerfile 9.7%). A 'Suggested workflows' section is also present.

Github to make webhook setting.

**Webhooks / Manage webhook**

**Payload URL \***  
http://51.21.162.117:8080/github-webhook/

**Content type \***  
application/x-www-form-urlencoded

**Secret**

**SSL verification**  
 Enable SSL verification    Disable (not recommended)

Which events would you like to trigger this webhook?

**Webhooks**

Webhooks allow external services to be notified when certain events happen. When the specified events happen, we'll send a POST request to each of the URLs you provide. Learn more in our [Webhooks Guide](#).

✓ http://51.21.162.117:8080/github-w... (push)

Last delivery was successful.

## 4. Jenkins

```
sudo apt update && sudo apt upgrade -y
```

We will install by adding the official Jenkins repository.

### Add GPG Key:

I added jenkins user as first

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

**Start Jenkins:**

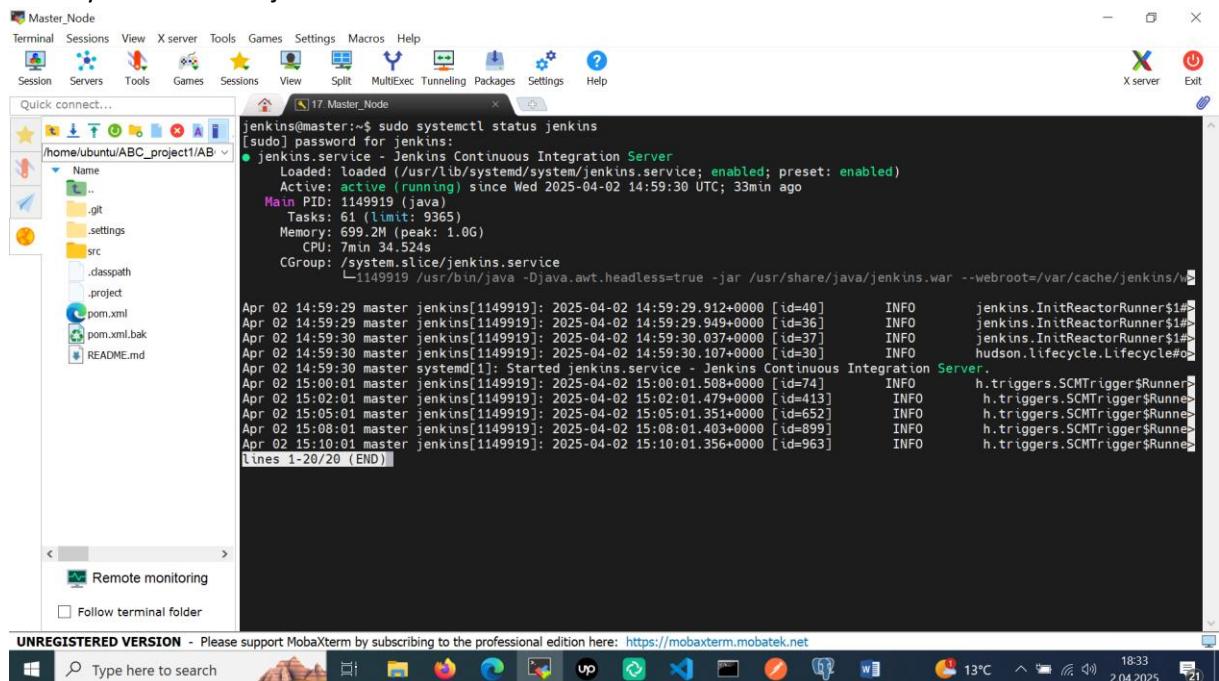
```
sudo systemctl start jenkins
```

**To enable Jenkins to start automatically on every startup:**

```
sudo systemctl enable jenkins
```

**To check status of Jenkins:**

```
sudo systemctl status jenkins
```



The screenshot shows a terminal window titled 'Master\_Node' with the command 'sudo systemctl status jenkins' run. The output indicates that the Jenkins service is active and running. The terminal interface includes a sidebar with session management and a taskbar at the bottom.

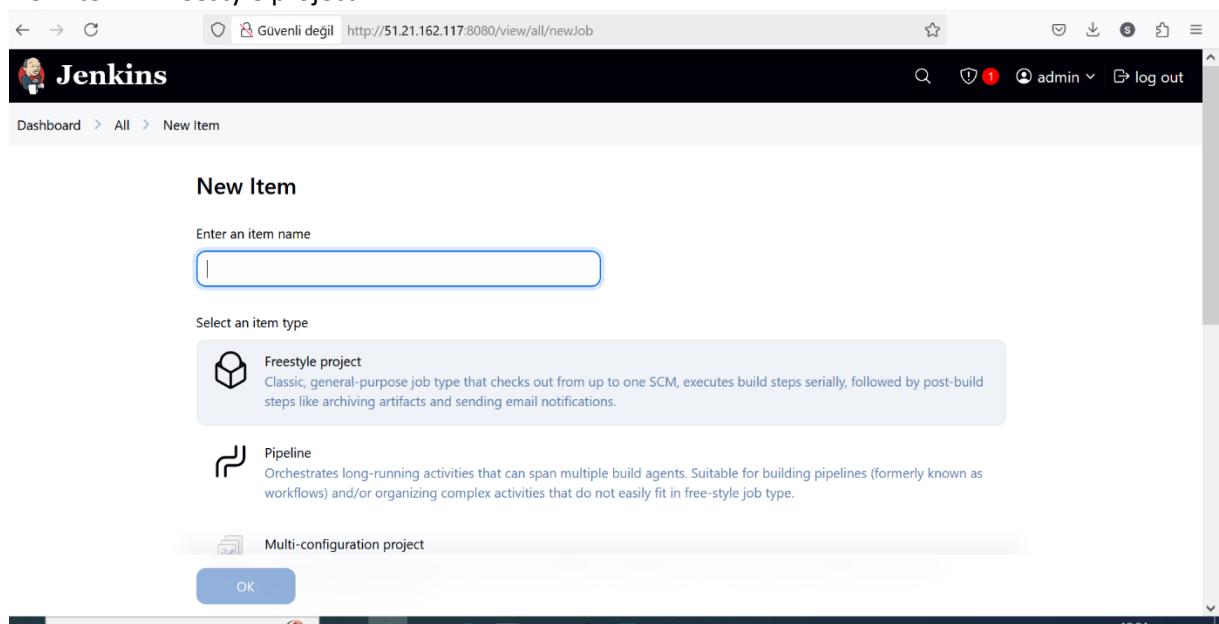
```
jenkins@master:~$ sudo systemctl status jenkins
[sudo] password for jenkins:
● jenkins.service - Jenkins Continuous Integration Server
    Loaded: loaded (/usr/lib/systemd/system/jenkins.service; enabled; preset: enabled)
    Active: active (running) since Wed 2025-04-02 14:59:30 UTC; 33min ago
      Main PID: 1149919 (java)
        Tasks: 61 (limit: 9365)
       Memory: 699.2M (peak: 1.0G)
          CPU: 7min 34.524s
         CGroup: /system.slice/jenkins.service
                   └─1149919 /usr/bin/java -Djava.awt.headless=true -jar /usr/share/java/jenkins.war --webroot=/var/cache/jenkins/war

Apr 02 14:59:29 master jenkins[1149919]: 2025-04-02 14:59:29.912+0000 [id=40]     INFO     jenkins.InitReactorRunner$1@>
Apr 02 14:59:29 master jenkins[1149919]: 2025-04-02 14:59:29.949+0000 [id=36]     INFO     jenkins.InitReactorRunner$1@>
Apr 02 14:59:30 master jenkins[1149919]: 2025-04-02 14:59:30.037+0000 [id=37]     INFO     jenkins.InitReactorRunner$1@>
Apr 02 14:59:30 master jenkins[1149919]: 2025-04-02 14:59:30.107+0000 [id=30]     INFO     hudson.lifecycle.Lifecycle#>
Apr 02 14:59:30 master jenkins[1149919]: Started jenkins.service - Jenkins Continuous Integration Server.
Apr 02 15:00:01 master jenkins[1149919]: 2025-04-02 15:00:01.508+0000 [id=74]     INFO     h.triggers.SCMTrigger$Runner>
Apr 02 15:02:01 master jenkins[1149919]: 2025-04-02 15:02:01.479+0000 [id=413]    INFO     h.triggers.SCMTrigger$Runner>
Apr 02 15:05:01 master jenkins[1149919]: 2025-04-02 15:05:01.351+0000 [id=652]    INFO     h.triggers.SCMTrigger$Runner>
Apr 02 15:08:01 master jenkins[1149919]: 2025-04-02 15:08:01.403+0000 [id=899]    INFO     h.triggers.SCMTrigger$Runner>
Apr 02 15:10:01 master jenkins[1149919]: 2025-04-02 15:10:01.356+0000 [id=963]    INFO     h.triggers.SCMTrigger$Runner>
lines 1-20/20 (END)
```

**Accessing Jenkins via Web Interface:**

<http://16.171.37.119:8080/>

New Item-> Freestyle project



The screenshot shows the Jenkins 'New Item' configuration page. It prompts for an item name and offers three project types: Freestyle project, Pipeline, and Multi-configuration project. The 'Freestyle project' option is selected.

New Item

Enter an item name

Select an item type

**Freestyle project**  
Classic, general-purpose job type that checks out from up to one SCM, executes build steps serially, followed by post-build steps like archiving artifacts and sending email notifications.

**Pipeline**  
Orchestrates long-running activities that can span multiple build agents. Suitable for building pipelines (formerly known as workflows) and/or organizing complex activities that do not easily fit in free-style job type.

**Multi-configuration project**

OK

I made github setting on the Jenkins.

The screenshots show three configuration pages for a Jenkins job named "maven\_project".

**Source Code Management (Top Screenshot):**

- General tab selected.
- Source Code Management section: Git is selected, and the Repository URL is set to `https://github.com/semta06/ABC_project1`.
- Credentials dropdown shows "- none -".
- Buttons: Save, Apply.

**Triggers (Middle Screenshot):**

- Triggers tab selected.
- Branches to build: Branch Specifier is set to `*/main`.
- Repository browser: (Auto).
- Additional Behaviours: Add dropdown.
- Buttons: Save, Apply.

**Triggers (Bottom Screenshot):**

- Triggers tab selected.
- Automated actions:
  - Trigger builds remotely (e.g., from scripts) ?
  - Build after other projects are built ?
  - Build periodically ?
  - GitHub hook trigger for GITScm polling ?
  - Poll SCM ?
- Environment section: Configure settings and variables that define the context in which your build runs, like credentials, paths, and global parameters.
- Buttons: Save, Apply.

I saved and applied the my new project.

The screenshot shows the Jenkins dashboard at <http://51.21.162.117:8080>. The main content area displays the 'maven\_project' job details. The job status is 'S' (Stable) with a green checkmark icon, and it has a yellow sun icon. The last success was 10 hr ago (#2). The last failure is marked as 'N/A'. The last duration was 0.62 sec. A 'Build Queue' section shows 'No builds in the queue.' Below the main table, there are tabs for 'Icon: S M L' and 'Build Executor Status 0/2'. On the left sidebar, there are links for 'New Item', 'Build History', 'Manage Jenkins', and 'My Views'. A 'Build Queue' dropdown shows 'No builds in the queue.'. A 'Build Executer Status' dropdown shows '0/2'. A button 'Add description' is located in the top right corner.

The screenshot shows the Jenkins job page for 'maven\_project' at [http://51.21.162.117:8080/job/maven\\_project/](http://51.21.162.117:8080/job/maven_project/). The left sidebar contains links for 'Changes', 'Workspace', 'Build Now', 'Configure', 'Delete Project', 'GitHub Hook Log', and 'Rename'. The main content area is titled 'Permalinks' and lists four items: 'Last build (#2), 12 hr ago', 'Last stable build (#2), 12 hr ago', 'Last successful build (#2), 12 hr ago', and 'Last completed build (#2), 12 hr ago'. Below this is a 'Builds' section with a table:

Build	Date
#2 8:21PM	March 24, 2025
#1 8:19PM	

A 'Filter' input field is present above the table. The Jenkins version 'Jenkins 2.502' is visible in the top right corner.

Güvenli değil http://51.21.162.117:8080/job/maven\_project/lastBuild/console

Dashboard > maven\_project > #2 > Console Output

Status Changes Console Output Edit Build Information Delete build '#2' Polling Log Timings Git Build Data Previous Build

## Console Output

```

Started by GitHub push by semra06
Running as SYSTEM
Building in workspace /var/lib/jenkins/workspace/maven_project
The recommended git tool is: NONE
No credentials specified
> git rev-parse --resolve-git-dir /var/lib/jenkins/workspace/maven_project/.git # timeout=10
Fetching changes from the remote Git repository
> git config remote.origin.url https://github.com/semra06/ABC_project1 # timeout=10
Fetching upstream changes from https://github.com/semra06/ABC_project1
> git --version # timeout=10
> git --version # 'git version 2.43.0'
> git fetch --tags --force --progress -- https://github.com/semra06/ABC_project1 +refs/heads/*:refs/remotes/origin/* # timeout=10
> git rev-parse refs/remotes/origin/main^{commit} # timeout=10
Checking out Revision 396032bb0f8cf1590bbe9e7fbdc543fc32cac8a6 (refs/remotes/origin/main)
> git config core.sparsecheckout # timeout=10
> git checkout -f 396032bb0f8cf1590bbe9e7fbdc543fc32cac8a6 # timeout=10
Commit message: "Update RetailModule.java"
> git rev-list --no-walk d0e3tba58bd5d63d95042341225a372a5804c86e # timeout=10
Finished: SUCCESS

```

**I created new items:**  
**ABC\_project\_Compile**

Güvenli değil http://16.171.37.119:8080

Dashboard > new item

Add description

Build History Manage Jenkins My Views

All +

S	W	Name	Last Success	Last Failure	Last Duration
✓	☀️	ABC_project_Compile	46 sec #21	N/A	5.4 sec
✓	☀️	ABC_project_Package	16 sec #34	N/A	8.7 sec
✓	🌧	ABC_project_Pipeline	3 min 6 sec #39	6 min 44 sec #38	49 sec
✓	☀️	ABC_project_testing	31 sec #28	N/A	8.2 sec
✓	☀️	maven_project	1 day 2 hr #2	N/A	0.58 sec

Icon: S M L

docker-registry-credentials

Type here to search

The image displays two nearly identical screenshots of a web-based configuration interface, likely for a Continuous Integration (CI) or Continuous Deployment (CD) system. Both screenshots show the 'Configuration' page for a project named 'ABC\_project\_Compile'. The interface includes a left sidebar with navigation links: General, Source Code Management, Triggers, Environment, Build Steps, and Post-build Actions. The 'Source Code Management' tab is currently selected.

**Top Configuration (Left):**

- Repository URL:** https://github.com/semra06/ABC\_project1.git
- Credentials:** - none -
- Advanced:** A dropdown menu with options like 'Add Repository' and 'Branches to build'.
- Buttons:** Save and Apply.

**Bottom Configuration (Right):**

- Branch Specifier (blank for 'any'):** \*/main
- Repository browser:** (Auto)
- Additional Behaviours:** An 'Add' button.
- Buttons:** Save and Apply.

The background of the interface shows a Windows taskbar at the bottom with various application icons and system status indicators. The top of the window shows a browser header with the URL http://16.171.37.119:8080/job/ABC\_project\_Compile/configure.

The screenshot shows the Jenkins configuration interface for a job named "ABC\_project\_Compile". In the "Triggers" section, two options are selected: "GitHub hook trigger for GITScm polling" and "Poll SCM". The "Poll SCM" section includes a "Schedule" field set to "H/5 \* \* \* \*". A note below states: "Would last have run at Wednesday, April 2, 2025, 3:10:00 PM Coordinated Universal Time; would next run at Wednesday, April 2, 2025, 3:15:00 PM Coordinated Universal Time." There is also an unchecked checkbox for "Ignore post-commit hooks".

The screenshot shows the Jenkins configuration interface for the same job. In the "Build Steps" section, a single step is defined under "Goals": "compile". Below this, there is an "Advanced" dropdown and a "Add build step" button. In the "Post-build Actions" section, a "Build other projects" action is configured with a project named "Projects to build".

Configure

General Source Code Management Triggers Environment Build Steps Post-build Actions

Build other projects

Projects to build ABC\_project\_testing

Trigger only if build is stable

Add post-build action

Save Apply



ABC\_project\_Package

General Source Code Management Triggers Environment Build Steps Post-build Actions

None

Git

Repository URL https://github.com/semra06/ABC\_project1.git

Credentials - none -

+ Add Advanced

Save Apply

docker-registry-credentials

Type here to search

18:13 2.04.2025

The screenshot shows the Jenkins configuration interface for a job named "ABC\_project\_Package". The left sidebar has sections: General, Source Code Management, Triggers (selected), Environment, Build Steps, and Post-build Actions. The main panel is titled "Configuration" and contains a "Branches to build" section with a "Branch Specifier (blank for 'any') ?" field containing "/main". Below it is an "Add Branch" button. A "Repository browser ?" dropdown is set to "(Auto)". Under "Additional Behaviours", there is an "Add" button. At the bottom are "Save" and "Apply" buttons.

The screenshot shows the Jenkins configuration interface for the same job. The "Triggers" section is selected in the sidebar. It lists several options: "Trigger builds remotely (e.g., from scripts) ?" (unchecked), "Build after other projects are built ?" (unchecked), "Build periodically ?" (unchecked), "GitHub hook trigger for GITScm polling ?" (checked), and "Poll SCM ?" (checked). The "Poll SCM" section includes a "Schedule ?" field with the value "H/5 \* \* \* \*". A note below states: "Would last have run at Wednesday, April 2, 2025, 3:13:00 PM Coordinated Universal Time; would next run at Wednesday, April 2, 2025, 3:18:00 PM Coordinated Universal Time." There is also an "Ignore post-commit hooks ?" checkbox (unchecked). At the bottom are "Save" and "Apply" buttons.

**Configure**

General  
Source Code Management  
Triggers  
Environment  
**Build Steps**  
Post-build Actions

**Build Steps**

Automate your build process with ordered tasks like code compilation, testing, and deployment.

Invoke top-level Maven targets ?

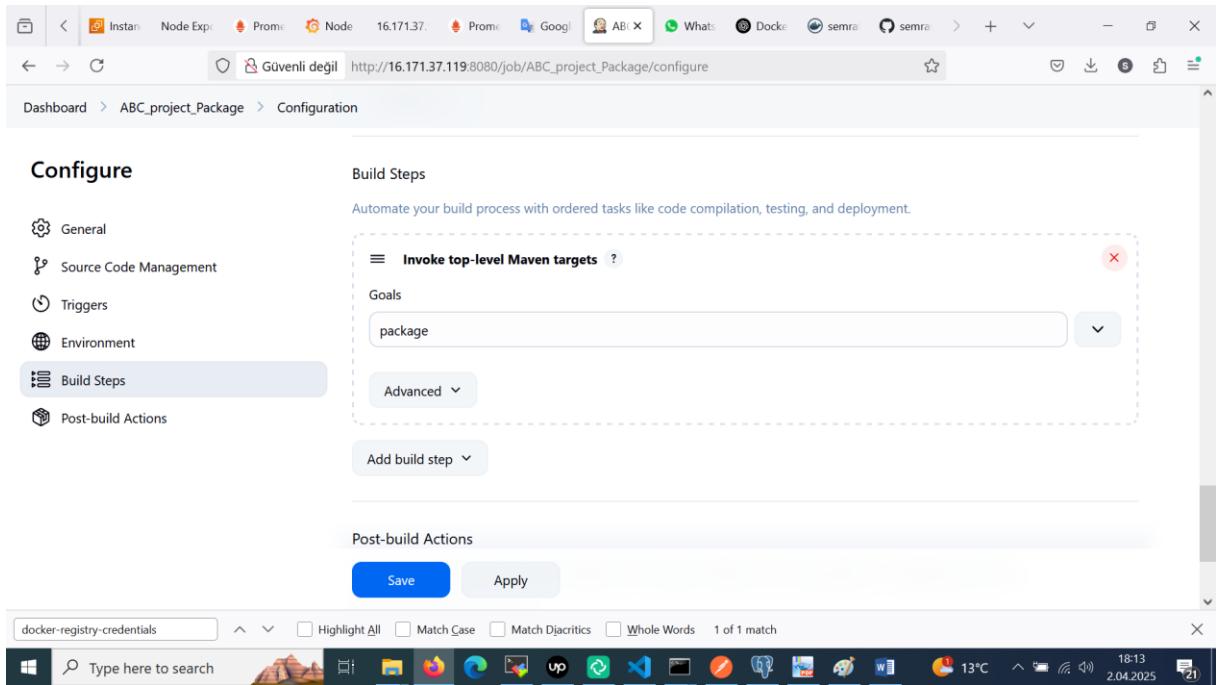
Goals  
package

Advanced

Add build step ▾

**Post-build Actions**

Save Apply



**ABC\_project\_Pipeline**

General  
**Triggers**  
Pipeline  
Advanced

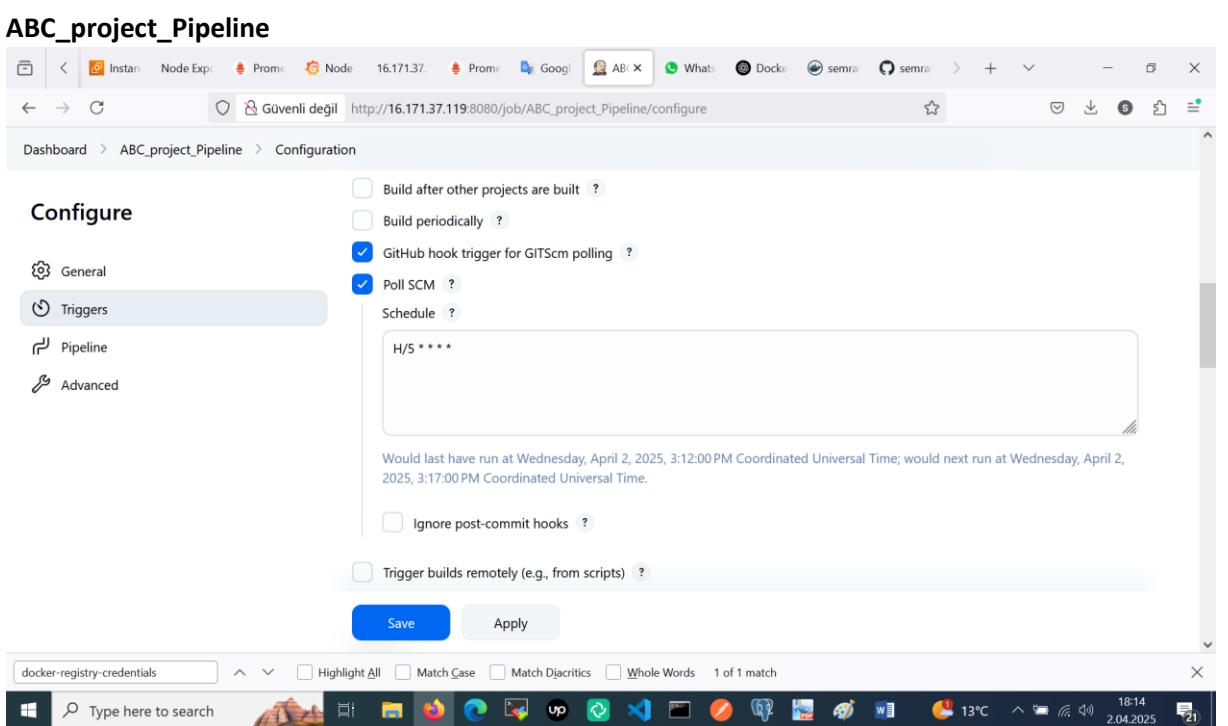
Build after other projects are built ?  
Build periodically ?  
 GitHub hook trigger for GITScm polling ?  
 Poll SCM ?

Schedule ?  
H/5 \* \* \* \*

Would last have run at Wednesday, April 2, 2025, 3:12:00 PM Coordinated Universal Time; would next run at Wednesday, April 2, 2025, 3:17:00 PM Coordinated Universal Time.

Ignore post-commit hooks ?  
 Trigger builds remotely (e.g., from scripts) ?

Save Apply



Dashboard > ABC\_project\_Pipeline > Configuration

Configure

Definition

Pipeline script from SCM

SCM ?

Git

Repositories ?

Repository URL ?

https://github.com/semra06/ABC\_project1.git

Credentials ?

- none -

Save Apply

docker-registry-credentials

Type here to search

Güvenli değil http://16.171.37.119:8080/job/ABC\_project\_Pipeline/configure

Dashboard > ABC\_project\_Pipeline > Configuration

Configure

Branches to build ?

Branch Specifier (blank for 'any') ?

\*/\*main

Add Branch

Repository browser ?

(Auto)

Additional Behaviours

Add

Save Apply

The screenshot shows the Jenkins Pipeline configuration page for the project 'ABC\_project\_Pipeline'. The left sidebar has tabs: General, Triggers, Pipeline, and Advanced (which is selected). The main area has tabs: Add Branch, Repository browser (set to Auto), Additional Behaviours (with an 'Add' dropdown), Script Path (set to Jenkinsfile), and Pipeline Syntax. At the bottom are Save and Apply buttons.

Dashboard > ABC\_project\_Pipeline > Configuration

## Configure

General

Triggers

Pipeline

Advanced

Add Branch

Repository browser ?

(Auto)

Additional Behaviours

Add

Script Path ?

Jenkinsfile

Lightweight checkout ?

Pipeline Syntax

Save Apply

The screenshot shows the Jenkins Pipeline configuration page for the project 'ABC\_project\_testing'. The left sidebar has tabs: General, Source Code Management (selected), Triggers, Environment, Build Steps, and Post-build Actions. The main area shows a 'Git' configuration with 'None' selected. Under 'Source Code Management', there is a 'Repositories' section with a 'Repository URL' field containing 'https://github.com/semtar06/ABC\_project1.git' and a 'Credentials' dropdown set to '- none -'. At the bottom are Save and Apply buttons.

Dashboard > ABC\_project\_testing > Configuration

## Configure

General

Source Code Management

Triggers

Environment

Build Steps

Post-build Actions

None

Git ?

Repositories ?

Repository URL ?

https://github.com/semtar06/ABC\_project1.git

Credentials ?

- none -

+ Add

Advanced

Save Apply

The screenshot shows the Jenkins configuration interface for a job named "ABC\_project\_testing". The left sidebar has tabs for General, Source Code Management, Triggers, Environment, Build Steps, and Post-build Actions. The "Triggers" tab is selected. In the main panel, under "Branches to build", there is a field labeled "Branch Specifier (blank for 'any') ?" containing the value "/main". Below it is a button "Add Branch". Under "Repository browser", the dropdown is set to "(Auto)". Under "Additional Behaviours", there is a "Save" button and an "Apply" button.

The screenshot shows the Jenkins configuration interface for triggers. The "Triggers" tab is selected in the sidebar. Under "Poll SCM", the checkbox "GitHub hook trigger for GITScm polling" is checked. Another checkbox "Poll SCM ?" is also checked. A "Schedule" field contains the cron expression "H/5 \* \* \* \*". A note below states: "Would last have run at Wednesday, April 2, 2025, 3:12:00 PM Coordinated Universal Time; would next run at Wednesday, April 2, 2025, 3:17:00 PM Coordinated Universal Time." There is also an unchecked checkbox for "Ignore post-commit hooks". At the bottom, there is an "Environment" section with a note: "Configure settings and variables that define the context in which your build runs, like credentials, paths, and global parameters." Below this are "Save" and "Apply" buttons. The system tray at the bottom shows the date as 2.04.2025 and time as 18:16.

The screenshot shows the Jenkins configuration interface for a job named "ABC\_project\_testing".

**Build Steps:**

- Invoke top-level Maven targets: Goals: test

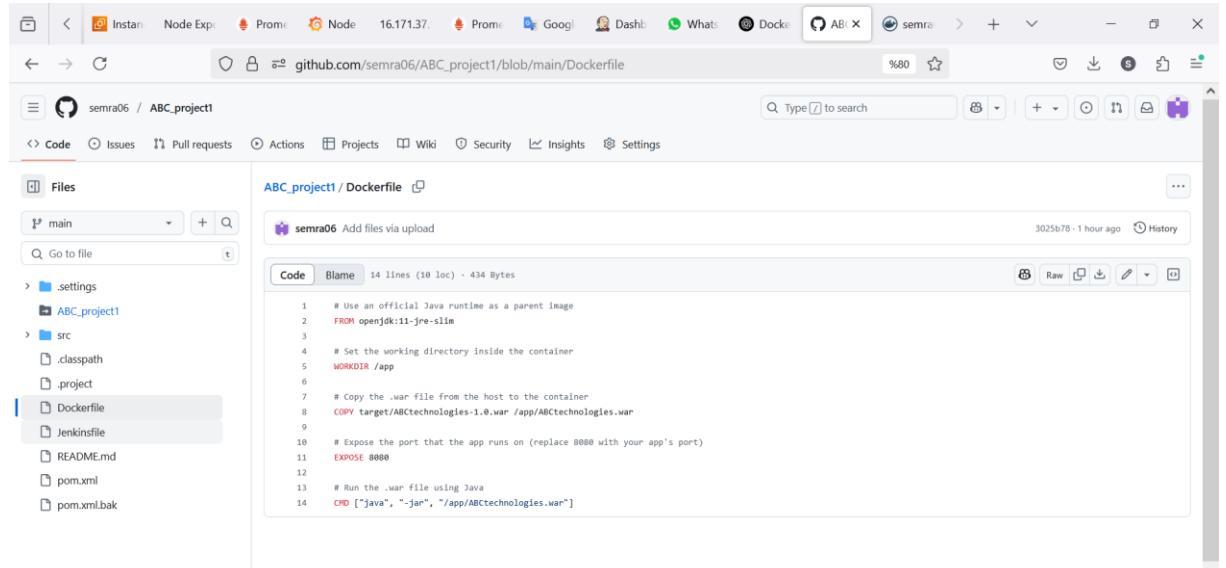
**Post-build Actions:**

- Build other projects: Projects to build: ABC\_project\_Package
- Trigger only if build is stable (radio button selected)
- Trigger even if the build is unstable
- Trigger even if the build fails

**Buttons:** Save, Apply

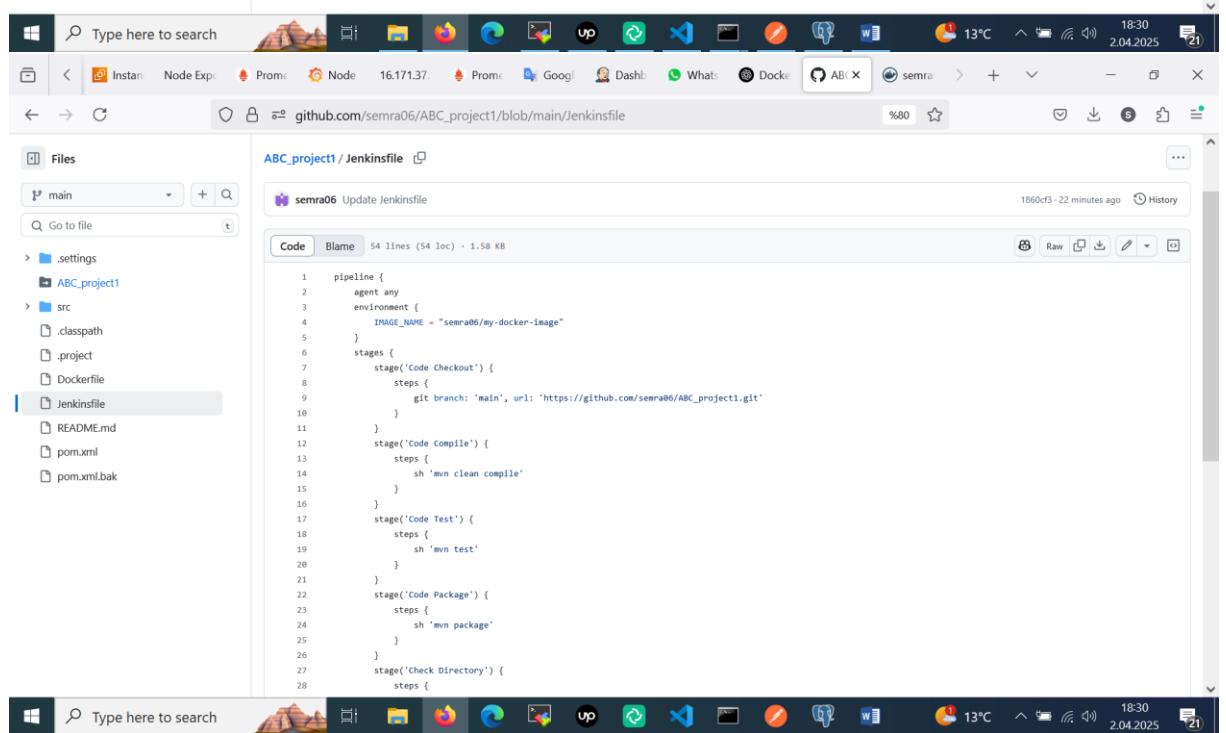
**Header:** REST API Jenkins 2.503

I also added two file (Jenkinsfile and Dockerfile):



The screenshot shows a GitHub repository page for 'ABC\_project1'. The left sidebar lists files: settings, ABC\_project1, src, classpath, project, Dockerfile, Jenkinsfile, README.md, pom.xml, and pom.xml.bak. The 'Dockerfile' file is selected. The main pane displays the Dockerfile code:

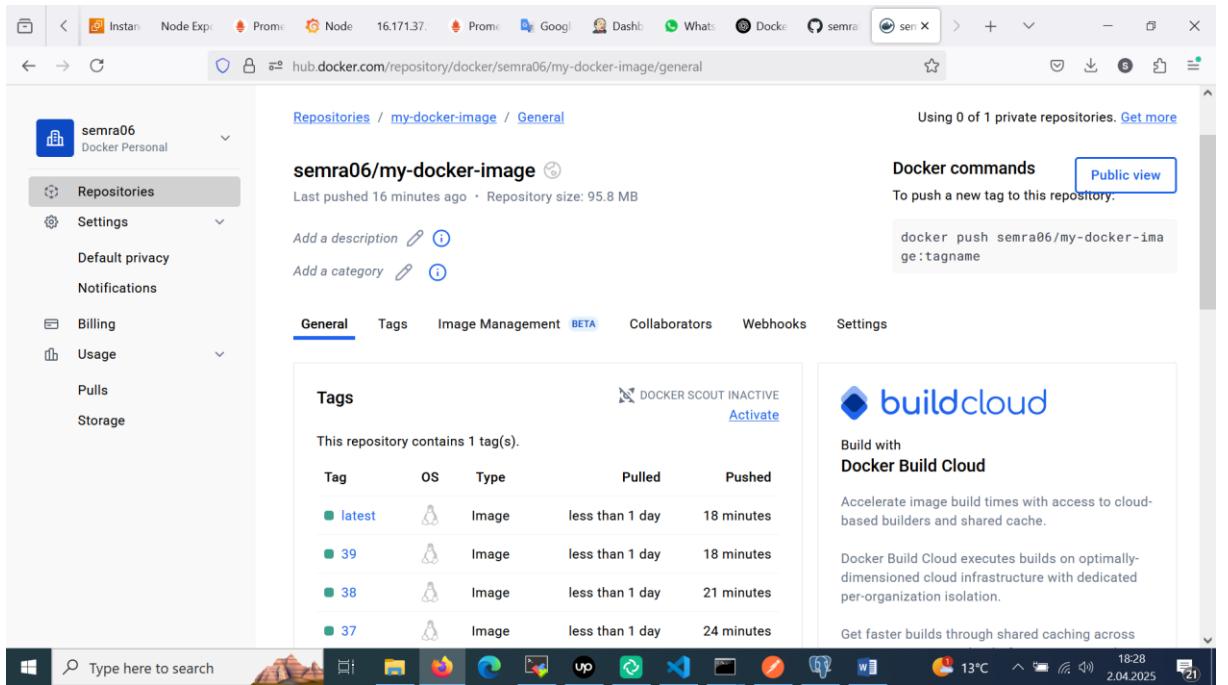
```
1 # Use an official Java runtime as a parent image
2 FROM openjdk:11-jre-slim
3
4 # Set the working directory inside the container
5 WORKDIR /app
6
7 # Copy the .war file from the host to the container
8 COPY target/ABCtechnologies-1.0.war /app/ABCtechnologies.war
9
10 # Expose the port that the app runs on (replace 8080 with your app's port)
11 EXPOSE 8080
12
13 # Run the .war file using Java
14 CMD ["java", "-jar", "/app/ABCtechnologies.war"]
```



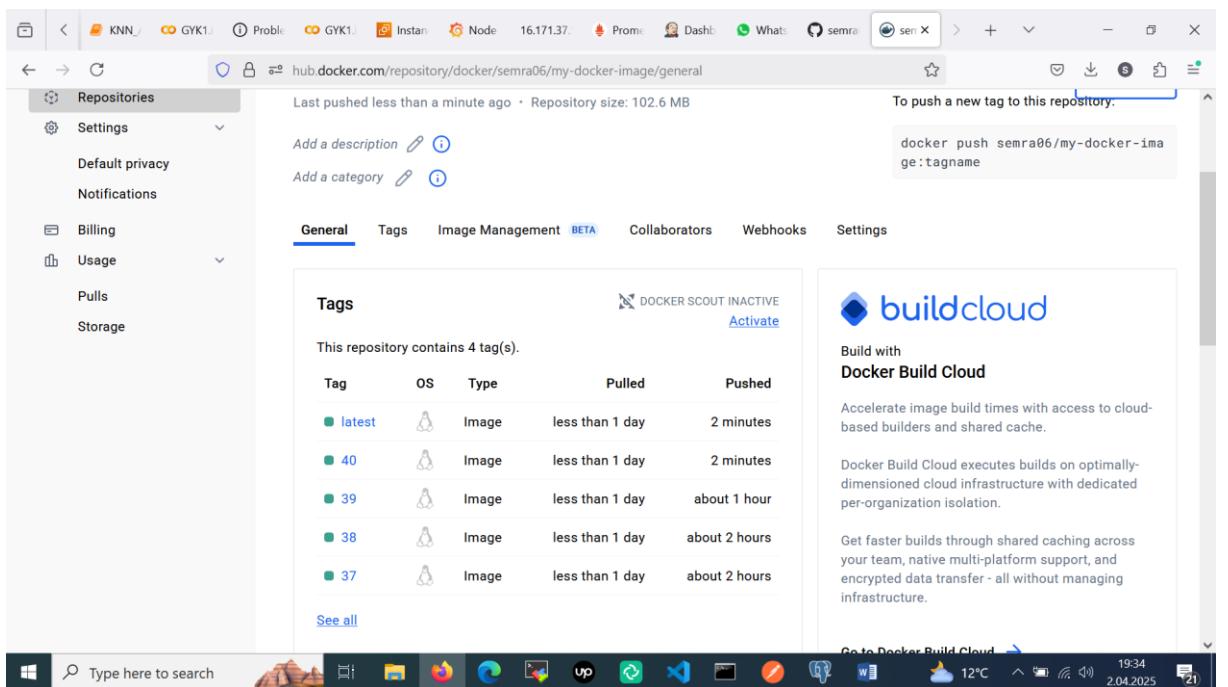
The screenshot shows a GitHub repository page for 'ABC\_project1'. The left sidebar lists files: settings, ABC\_project1, src, classpath, project, Dockerfile, Jenkinsfile, README.md, pom.xml, and pom.xml.bak. The 'Jenkinsfile' file is selected. The main pane displays the Jenkinsfile code:

```
1 pipeline {
2   agent any
3   environment {
4     IMAGE_NAME = "semra06/my-docker-image"
5   }
6   stages {
7     stage('Code Checkout') {
8       steps {
9         git branch: 'main', url: 'https://github.com/semra06/ABC_project1.git'
10      }
11    }
12    stage('Code Compile') {
13      steps {
14        sh 'mvn clean compile'
15      }
16    }
17    stage('Code Test') {
18      steps {
19        sh 'mvn test'
20      }
21    }
22    stage('Code Package') {
23      steps {
24        sh 'mvn package'
25      }
26    }
27    stage('Check Directory') {
28      steps {
```

Jenkins push latest image automatically to dockerhub.



I changed coding. I pushed to github. Docker image was created automatically.



## 5. Docker

Install using the apt repository  
**Set up Docker's apt repository:**

```
# Add Docker's official GPG key:  
sudo apt-get update
```

```

sudo apt-get install ca-certificates curl
sudo install -m 0755 -d /etc/apt/keyrings
sudo curl -fsSL https://download.docker.com/linux/ubuntu/gpg -o
/etc/apt/keyrings/docker.asc
sudo chmod a+r /etc/apt/keyrings/docker.asc

# Add the repository to Apt sources:
echo \
    "deb [arch=$(dpkg --print-architecture) signed-
by=/etc/apt/keyrings/docker.asc]
https://download.docker.com/linux/ubuntu \
    $(. /etc/os-release && echo "${UBUNTU_CODENAME}:-$VERSION_CODENAME}") stable" | \
    sudo tee /etc/apt/sources.list.d/docker.list > /dev/null
sudo apt-get update

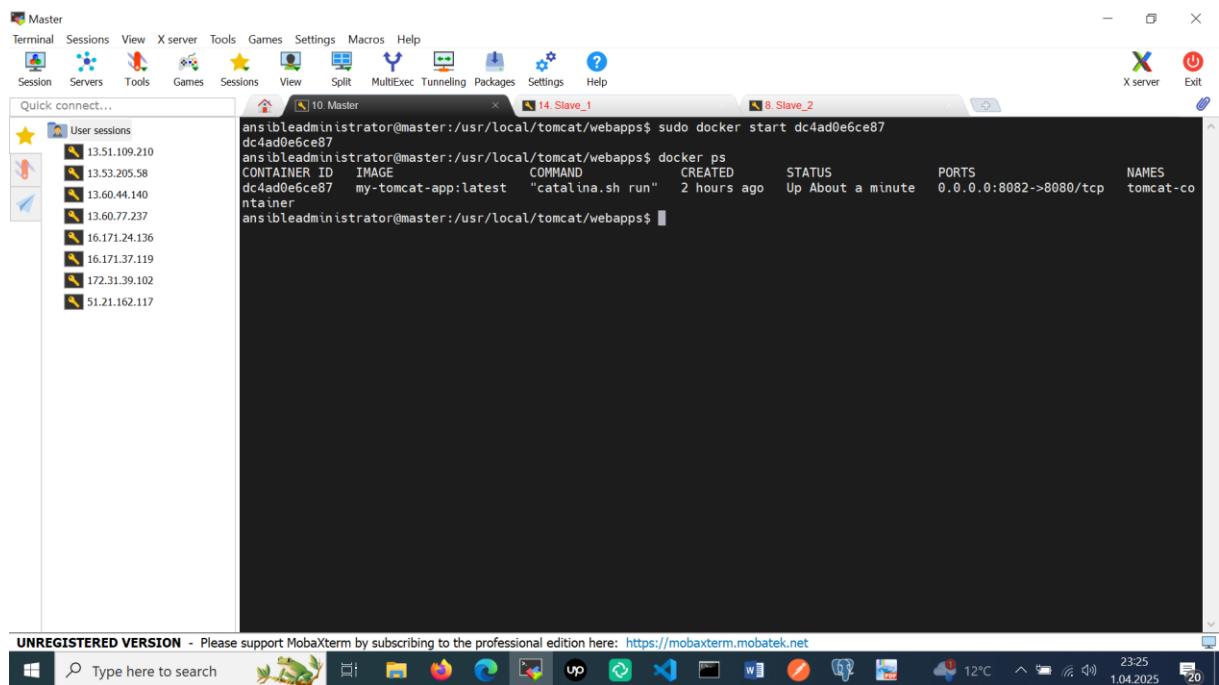
```

**To install the latest version, run:**

```

sudo apt-get install docker-ce docker-ce-cli containerd.io docker-buildx-plugin docker-
compose-plugin

```



```

docker --version

```

The screenshot shows the MobaXterm interface with several windows open:

- Terminal 10 Master:** Shows Ansible commands being run on a master node, including `sudo docker start dc4ad0e6ce87` and `docker ps` output.
- Terminal 14 Slave\_1:** Shows Docker version information and a file listing command.
- Terminal 8 Slave\_2:** Shows a file listing command.
- File Explorer:** Displays a list of user sessions and their IP addresses.
- Taskbar:** Shows a Windows taskbar with various icons and system status.

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```
ansibleadministrator@master:~/ansible_playbooks$ ansible-playbook -i inventory.ini
deploy_tomcat.yml
```

The screenshot shows the MobaXterm interface with one terminal window open:

```
ansibleadministrator@master:~/ansible_playbooks$ nano inventory.ini
ansibleadministrator@master:~/ansible_playbooks$ hostname
master
ansibleadministrator@master:~/ansible_playbooks$ ansible-playbook deploy_tomcat.yml -i inventory.ini

PLAY [Deploy Tomcat Container with Web App] ****
[WARNING]: Platform linux on host master is using the discovered Python interpreter at /usr/bin/python3.12, but future
installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-
core/2.17/reference_appendices/interpreter_discovery.html for more information.
ok: [master]

TASK [Ensure Docker is installed]
ok: [master]

TASK [Pull Tomcat Docker Image]
changed: [master]

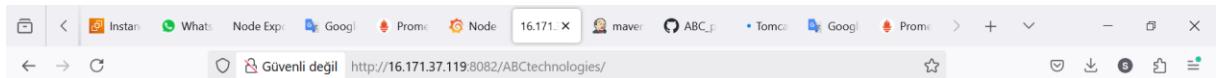
TASK [Start Tomcat Container on Port 8082]
changed: [master]

TASK [Copy WAR File to Tomcat Webapps Directory]
changed: [master]

TASK [Restart Tomcat Container]
ok: [master]

PLAY RECAP ****
master : ok=6    changed=3    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
ansibleadministrator@master:~/ansible_playbooks$
```

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## Welcome to ABC technologies

This is retail portal

Add Product View Product



I will show you below how to install ansible.

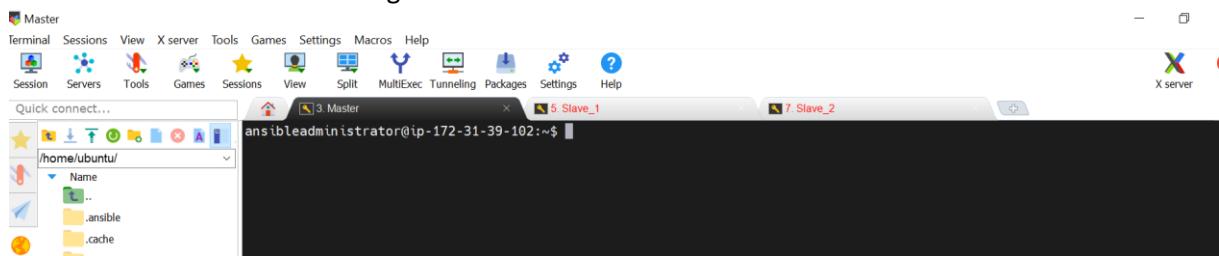
## 6. Ansible

[https://docs.ansible.com/ansible/latest/installation\\_guide/installation\\_distros.html#installing-ansible-on-ubuntu](https://docs.ansible.com/ansible/latest/installation_guide/installation_distros.html#installing-ansible-on-ubuntu)

Create 3 EC2 Instances 1 Controller/Master and 2 Slaves/Nodes.

Instances (1/3) <a href="#">Info</a>		Last updated less than a minute ago	<a href="#">C</a>	<a href="#">Connect</a>	<a href="#">Instance state ▾</a>	<a href="#">Actions ▾</a>	<a href="#">Launch instances</a>	▼
		Find Instance by attribute or tag (case-sensitive)			All states ▾	◀ 1 ▶	⚙	▼
■	Name <a href="#">🔗</a>	Instance ID	Instance state	Instance type	Status check	Alarm status		▼
<input checked="" type="checkbox"/>	Master	i-07161449111b2e43d	<span>Running</span> <a href="#">Q</a> <a href="#">R</a>	t3.micro	...	<a href="#">View alarms +</a>		▼
<input type="checkbox"/>	Slave_1	i-0b4afc67534583d39	<span>Running</span> <a href="#">Q</a> <a href="#">R</a>	t3.micro	...	<a href="#">View alarms +</a>		▼
<input type="checkbox"/>	Slave_2	i-0bf9349753c6adc68	<span>Running</span> <a href="#">Q</a> <a href="#">R</a>	t3.micro	...	<a href="#">View alarms +</a>		▼

Connect all three instances using SSH Client



### Ansible Master Node

**Installation on masternode:**

sudo apt update-> update package lists

sudo apt install software-properties-common-> Install Required Dependencies

sudo add-apt-repository --yes --update ppa:ansible/ansible -> Add the Official Ansible PPA

sudo apt install ansible -> Install Ansible

ansible --version -> verify the installation

```

No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-39-102:~$ ansible --version
ansible [core 2.17.9]
  config file = /etc/ansible/ansible.cfg
  configured module search path = ['/home/ubuntu/.ansible/plugins/modules', '/usr/share/ansible/plugins/modules']
  ansible python module location = /usr/lib/python3/dist-packages/ansible
  ansible collection location = /home/ubuntu/.ansible/collections:/usr/share/ansible/collections
  executable location = /usr/bin/ansible
  python version = 3.12.3 (main, Feb 4 2025, 14:48:35) [GCC 13.3.0] (/usr/bin/python3)
  jinja version = 3.1.2
  libyaml = True
ubuntu@ip-172-31-39-102:~$ 

```

Generates a new **Ansible configuration file (ansible.cfg)** with all available settings, but **commented out (disabled)**:

ansible-config init --disabled > ansible.cfg

`sudo adduser ansibleadministrator` → create ansible user

```

ubuntu@ip-172-31-39-102:~$ ansible-config init --disabled > ansible.cfg
ubuntu@ip-172-31-39-102:~$ ls
ABC_project1 ansible.cfg apache-maven-3.9.7-bin.tar.gz
ubuntu@ip-172-31-39-102:~$ sudo adduser ansibleadministrator
  info: Adding user 'ansibleadministrator' ...
  info: Selecting UID/GID from range 1000 to 59999 ...
  info: Adding new group 'ansibleadministrator' (1001) ...
  info: Adding new user 'ansibleadministrator' (1001) with group `ansibleadministrator` (1001) ...
  info: Creating home directory '/home/ansibleadministrator' ...
  info: Copying files from '/etc/skel' ...
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for ansibleadministrator
Enter the new value, or press ENTER for the default
  Full Name []: Ansible Administrator
  Root Number []:
  Work Phone []:
  Home Phone []:
  Other []:
Is the information correct? [Y/n] y
info: Adding new user 'ansibleadministrator' to supplemental / extra groups 'users' ...
info: Adding user 'ansibleadministrator' to group 'users' ...
ubuntu@ip-172-31-39-102:~$ ls
ABC_project1 ansible.cfg apache-maven-3.9.7-bin.tar.gz
ubuntu@ip-172-31-39-102:~$ su ansibleadministrator
Password:
ansibleadministrator@ip-172-31-39-102:/home/ubuntu$ 

```

`sudo chown -R ansibleadministrator:ansibleadministrator /etc/ansible`

```

ansibleadministrator@ip-172-31-39-102:/home/ubuntu$ sudo chown -R ansibleadmin:ansibleadmin /etc/ansible
[sudo] password for ansibleadministrator:
ansibleadministrator is not in the sudoers file.
ansibleadministrator@ip-172-31-39-102:/home/ubuntu$ cd
ansibleadministrator@ip-172-31-39-102:~$ exit
exit
ubuntu@ip-172-31-39-102:~$ sudo chown -R ansibleadmin:ansibleadmin /etc/ansible
chown: invalid user: 'ansibleadmin:ansibleadmin'
ubuntu@ip-172-31-39-102:~$ sudo chown -R ansibleadministrator:ansibleadministrator /etc/ansible
ubuntu@ip-172-31-39-102:~$ cd /etc/ansible/
ubuntu@ip-172-31-39-102:/etc/ansible$ ls
ansible.cfg hosts roles
ubuntu@ip-172-31-39-102:/etc/ansible$ 

```

`cat /etc/ansible/ansible.cfg`

`ls -al`

```

ubuntu@ip-172-31-39-102:/etc/ansible$ ls
ansible.cfg hosts roles
ubuntu@ip-172-31-39-102:/etc/ansible$ sudo chown -R ansibleadmin:ansibleadmin /etc/ansible/
ubuntu@ip-172-31-39-102:/etc/ansible$ ls -l
total 12
-rw-r--r-- 1 ansibleadmin ansibleadmin 614 Feb 25 16:59 ansible.cfg
-rw-r--r-- 1 ansibleadmin ansibleadmin 1175 Feb 25 16:59 hosts
drwxr-xr-x 2 ansibleadmin ansibleadmin 4096 Feb 25 16:59 roles
ubuntu@ip-172-31-39-102:/etc/ansible$ cat /etc/ansible/ansible.cfg
# Since Ansible 2.12 (core):
# To generate an example config file (a "disabled" one with all default settings, commented out):
#           $ ansible-config init --disabled > ansible.cfg
#
# Also you can now have a more complete file by including existing plugins:
# ansible-config init --disabled -t all > ansible.cfg
#
# For previous versions of Ansible you can check for examples in the 'stable' branches of each version
# Note that this file was always incomplete and lagging changes to configuration settings
#
# for example, for 2.9: https://github.com/ansible/ansible/blob/stable-2.9/examples/ansible.cfg
ubuntu@ip-172-31-39-102:/etc/ansible$ ls -l
total 12
-rw-r--r-- 1 ansibleadmin ansibleadmin 614 Feb 25 16:59 ansible.cfg
-rw-r--r-- 1 ansibleadmin ansibleadmin 1175 Feb 25 16:59 hosts
drwxr-xr-x 2 ansibleadmin ansibleadmin 4096 Feb 25 16:59 roles
ubuntu@ip-172-31-39-102:/etc/ansible$ ls -al
total 20
drwxr-xr-x 3 ansibleadmin ansibleadmin 4096 Mar 25 19:57 .
drwxr-xr-x 114 root      root      4096 Mar 25 20:03 ..
-rw-r--r-- 1 ansibleadmin ansibleadmin 614 Feb 25 16:59 ansible.cfg
-rw-r--r-- 1 ansibleadmin ansibleadmin 1175 Feb 25 16:59 hosts
drwxr-xr-x 2 ansibleadmin ansibleadmin 4096 Feb 25 16:59 roles
ubuntu@ip-172-31-39-102:/etc/ansible$ 

```

su ansibleadmin-> ansible admin user

```

drwxr-xr-x 2 ansibleadmin ansibleadmin 4096 Feb 25 16:59 roles
ubuntu@ip-172-31-39-102:/etc/ansible$ cd
ubuntu@ip-172-31-39-102:~$ su ansibleadmin
Password:
ansibleadmin@ip-172-31-39-102:/home/ubuntu$ pwd
/home/ubuntu
ansibleadmin@ip-172-31-39-102:/home/ubuntu$ cd ~
ansibleadmin@ip-172-31-39-102:~$ pwd
/home/ansibleadmin
ansibleadmin@ip-172-31-39-102:~$ 

```

**Copy paste Ansible Managed Node(Slave\_Node1) public ip adres on Master Node:**  
vi /etc/ansible/hosts

```

Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help
X server Exit
Quick connect...
Star Home Ubuntu /home/ubuntu/
Name .. .ansile .cache .ssh ABC_project1 .bash_history .bash_logout .bashrc .gitconfig .Jeshst .profile .sudo_as_admin_successful .wget-hsts .Xauthority apache-maven-3.9.7-bin.tar.gz
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help
X server Exit
3 Master 5 Slave_1 7 Slave_2
# If you have multiple hosts following a pattern, you can specify
# them like this:
## www[001:006].example.com
# You can also use ranges for multiple hosts:
## db-[99:101]-node.example.com
# Ex 3: A collection of database servers in the 'dbservers' group:
## [dbservers]
## db01.intranet.mydomain.net
## db02.intranet.mydomain.net
## 10.25.1.56
## 10.25.1.57
#
# Ex 4: Multiple hosts arranged into groups such as 'Debian' and 'openSUSE':
## [Debian]
## alpha.example.org
## beta.example.org
##
## [openSUSE]
## green.example.com
## blue.example.com
## [test]
## 13.60.44.140
## 13.60.77.237
"/etc/ansible/hosts" 56L, 1207B

```

Save and close after adding.

```

ansibleadministrator@ip-172-31-39-102:~/ssh$ vi /etc/ansible/hosts
ansibleadministrator@ip-172-31-39-102:~/ssh$ ls -al
total 24
drwxr-x--- 2 ansibleadministrator ansibleadministrator 4096 Mar 26 11:38 .
drwxr-x--- 5 ansibleadministrator ansibleadministrator 4096 Mar 26 16:16 ..
-rw----- 1 ansibleadministrator ansibleadministrator 432 Mar 26 11:19 id_ed25519
-rw-r--r-- 1 ansibleadministrator ansibleadministrator 119 Mar 26 11:19 id_ed25519.pub
-rw----- 1 ansibleadministrator ansibleadministrator 1956 Mar 26 11:38 known_hosts
-rw----- 1 ansibleadministrator ansibleadministrator 1120 Mar 26 11:38 known_hosts.old
ansibleadministrator@ip-172-31-39-102:~/ssh$ ls
id_ed25519 id_ed25519.pub known_hosts known_hosts.old
ansibleadministrator@ip-172-31-39-102:~/ssh$ 

```

### ***Adding Public Key to authorized\_keys File on Master Node:***

```

ubuntu@ip-172-31-39-102:~$ cd .ssh/
sudo cp authorized_keys /home/ansibleadministrator/.ssh

```

### ***Used to give ownership of the file to the ansible administrator user and group:***

```

sudo chown ansibleadministrator:ansibleadministrator
/home/ansibleadministrator/.ssh/authorized_keys

```

SSH expects the .ssh folder and files within it to be owned only by the owning user. Incorrect authorization can cause connection problems.

```

ansibleadministrator@ip-172-31-39-102:~/ssh$ ls
known_hosts
ansibleadministrator@ip-172-31-39-102:~/ssh$ exit
exit
ubuntu@ip-172-31-39-102:~$ ls - al
ls: cannot access `': No such file or directory
ls: cannot access `al': No such file or directory
ubuntu@ip-172-31-39-102:~$ ls -al
total 9460
drwxr-x--- 6 ubuntu ubuntu 4096 Mar 25 20:22 .
drwxr-xr-x 4 root root 4096 Mar 25 20:22 ..
-rw----- 1 ubuntu ubuntu 558 Mar 25 20:22 .Xauthority
drwxrwxr-x 3 ubuntu ubuntu 4096 Mar 25 19:58 .ansible
-rw----- 1 ubuntu ubuntu 7521 Mar 25 18:17 .bash_history
-rw-r--r-- 1 ubuntu ubuntu 220 Mar 31 2024 .bash_logout
-rw-r--r-- 1 ubuntu ubuntu 3823 Mar 24 20:32 .bashrc
drwxr---- 2 ubuntu ubuntu 4096 Mar 24 18:01 .cache
-rw-rw-r-- 1 ubuntu ubuntu 50 Mar 25 10:43 .gitconfig
-rw-r--r-- 1 ubuntu ubuntu 20 Mar 25 16:05 .lessht
drwxr---- 2 ubuntu ubuntu 4096 Mar 24 18:14 .profile
-rw-r--r-- 1 ubuntu ubuntu 807 Mar 31 2024 .sudo_as_admin_successful
-rw-r--r-- 1 ubuntu ubuntu 0 Mar 24 20:28 .sudo_as_admin_successful
drwxrwxr-x 5 ubuntu ubuntu 4096 Mar 25 10:44 ABC_project1
-rw-rv-r- 1 ubuntu ubuntu 40810 Mar 25 20:01 ansible.cfg
-rw-rv-r- 1 ubuntu ubuntu 9581488 Mar 25 10:39 apache-maven-3.9.7-bin.tar.gz
ubuntu@ip-172-31-39-102:~$ cd .ssh/
ubuntu@ip-172-31-39-102:~/ssh$ ls
authorized_keys known_hosts
ubuntu@ip-172-31-39-102:~/ssh$ cp authorized_keys /home/ansibleadministrator/.ssh
cp: cannot stat '/home/ansibleadministrator/.ssh': Permission denied
ubuntu@ip-172-31-39-102:~/ssh$ sudo cp authorized_keys /home/ansibleadministrator/.ssh
ubuntu@ip-172-31-39-102:~/ssh$ 

```

```

-rw-rw-r-- 1 ubuntu ubuntu 164 Mar 25 11:03 .wget-hsts
drwxrwxr-x 5 ubuntu ubuntu 4096 Mar 25 10:44 ABC_project1
-rw-rw-r-- 1 ubuntu ubuntu 40810 Mar 25 20:01 ansible.cfg
-rw-rw-r-- 1 ubuntu ubuntu 9581488 Mar 25 10:39 apache-maven-3.9.7-bin.tar.gz
ubuntu@ip-172-31-39-102:~$ cd .ssh/
ubuntu@ip-172-31-39-102:~/ssh$ ls
authorized_keys known_hosts
ubuntu@ip-172-31-39-102:~/ssh$ cp authorized_keys /home/ansibleadministrator/.ssh/
cp: cannot stat '/home/ansibleadministrator/.ssh': Permission denied
ubuntu@ip-172-31-39-102:~/ssh$ sudo cp authorized_keys /home/ansibleadministrator/.ssh/
ubuntu@ip-172-31-39-102:~/ssh$ sudo chown ansibleadministrator:ansibleadministrator /home/ansibleadministrator/.ssh/authorized_keys
ubuntu@ip-172-31-39-102:~/ssh$ su ansibleadministrator
Password:
ansibleadministrator@ip-172-31-39-102:~/home/ubuntu/.ssh$ ls
ls: cannot open directory .: Permission denied
ansibleadministrator@ip-172-31-39-102:~/home/ubuntu/.ssh$ cd
ansibleadministrator@ip-172-31-39-102:~$ ls
ansibleadministrator@ip-172-31-39-102:~$ la -al
total 36
drwxr-x--- 4 ansibleadministrator ansibleadministrator 4096 Mar 25 20:29 .
drwxr-xr-x 4 root root 4096 Mar 25 20:02 ..
drwxrwxr-x 4 ansibleadministrator ansibleadministrator 4096 Mar 25 20:28 ansible
-rw-r--r-- 1 ansibleadministrator ansibleadministrator 145 Mar 25 20:31 .bash_history
-rw-r--r-- 1 ansibleadministrator ansibleadministrator 220 Mar 25 20:02 .bash_logout
-rw-r--r-- 1 ansibleadministrator ansibleadministrator 3771 Mar 25 20:02 .bashrc
-rw-r--r-- 1 ansibleadministrator ansibleadministrator 807 Mar 25 20:02 .profile
drwxr----- 2 ansibleadministrator ansibleadministrator 4096 Mar 25 20:32 .ssh
-rw-r----- 1 ansibleadministrator ansibleadministrator 853 Mar 25 20:28 .viminfo
ansibleadministrator@ip-172-31-39-102:~$ cd .ssh
ansibleadministrator@ip-172-31-39-102:~/ssh$ ls
total 8
-rw-r----- 1 ansibleadministrator ansibleadministrator 89 Mar 25 20:32 authorized_keys

```

## Ansible Managed Node(Slave\_Node)

sudo apt update

I create same password and username with Master Node.

sudo adduser ansibleadministrator

su ansibleadministrator

**Created public ve private key for SSH (Secure Shell):**

ssh-keygen

```

Generating public/private ed25519 key pair.
Enter file in which to save the key (/home/ansibleadministrator/.ssh/id_ed25519):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/ansibleadministrator/.ssh/id_ed25519
Your public key has been saved in /home/ansibleadministrator/.ssh/id_ed25519.pub
The key fingerprint is:
SHA256:R78LV380DccDuRNc2Kr0MbG7usnTCHSGy/lqDGXNm8 ansibleadministrator@ip-172-31-39-102
The key's randomart image is:
++[ED25519 256] ++
| . oo.+
| . +..B=..
| ..+=.=,*o
| .+=. @ o.
| .S/ +
| o O B
| * B
| . E .
| oo+
+--[SHA256]--+
ansibleadministrator@ip-172-31-39-102:~$ ls -al
total 36
drwxr-x--- 4 ansibleadministrator ansibleadministrator 4096 Mar 25 20:29 .
drwxr-xr-x 4 root root 4096 Mar 25 20:02 ..
drwxrwxr-x 4 ansibleadministrator ansibleadministrator 4096 Mar 25 20:28 ansible
-rw-r--r-- 1 ansibleadministrator ansibleadministrator 158 Mar 25 20:39 .bash_history
-rw-r--r-- 1 ansibleadministrator ansibleadministrator 220 Mar 25 20:02 .bash_logout
-rw-r--r-- 1 ansibleadministrator ansibleadministrator 3771 Mar 25 20:02 .bashrc
-rw-r----- 2 ansibleadministrator ansibleadministrator 4096 Mar 25 20:40 .ssh
-rw-r----- 1 ansibleadministrator ansibleadministrator 853 Mar 25 20:28 .viminfo
ansibleadministrator@ip-172-31-39-102:~$ cd .ssh
ansibleadministrator@ip-172-31-39-102:~/ssh$ 

```

Slave\_1

```

/home/ubuntu/
.
..
```

```

total 44
drwxr-x--- 5 ansibleadministrator ansibleadministrator 4096 Mar 26 11:31 .
drwxr-xr-x  4 root          root          4096 Mar 26 09:32 ..
drwxr-xr-x  3 ansibleadministrator ansibleadministrator 4096 Mar 26 09:40 .ansible
-rw-r----- 1 ansibleadministrator ansibleadministrator 824 Mar 26 14:16 .bash_history
-rw-r--r--  1 ansibleadministrator ansibleadministrator 220 Mar 26 09:32 .bash_logout
-rw-r--r--  1 ansibleadministrator ansibleadministrator 3771 Mar 26 09:32 .bashrc
drwxr-xr-x  2 ansibleadministrator ansibleadministrator 4096 Mar 26 11:31 .cache
-rw-r--r--  1 ansibleadministrator ansibleadministrator 807 Mar 26 09:32 .profile
drwxr-xr-x  2 ansibleadministrator ansibleadministrator 4096 Mar 26 11:31 .ssh
-rw-r----- 1 ansibleadministrator ansibleadministrator 4393 Mar 26 11:31 .viminfo
ansibleadministrator@ip-172-31-37-44:~$ cd .ssh
ansibleadministrator@ip-172-31-37-44:~/ssh$ ls -al
total 20
drwxr-x--- 2 ansibleadministrator ansibleadministrator 4096 Mar 26 11:31 .
drwxr-x--- 5 ansibleadministrator ansibleadministrator 4096 Mar 26 11:31 ..
-rw-r----- 1 ansibleadministrator ansibleadministrator 119 Mar 26 11:31 authorized_keys
-rw-r--r--  1 ansibleadministrator ansibleadministrator 978 Mar 26 11:25 known_hosts
-rw-r--r--  1 ansibleadministrator ansibleadministrator 142 Mar 26 11:25 known_hosts.old
ansibleadministrator@ip-172-31-37-44:~/ssh$
```

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## My playbook yaml file.

Master\_Node

```

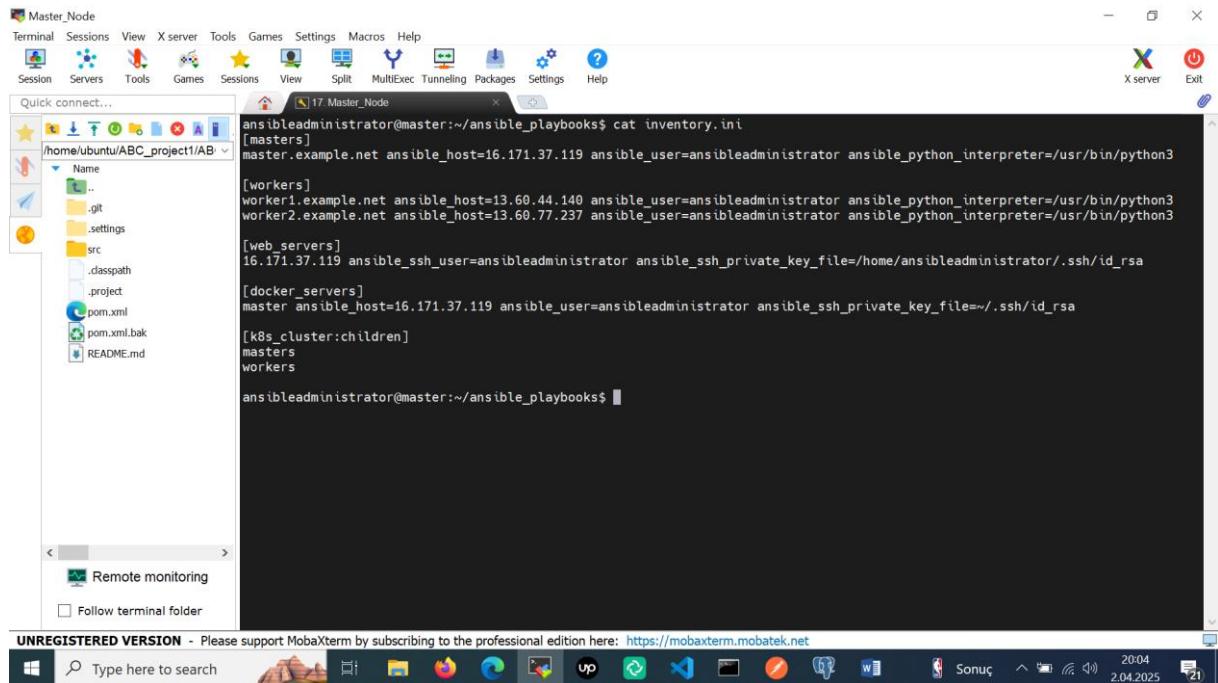
/home/ubuntu/ABC_project1/AB/
.
..
```

```

total 44
drwxr-x--- 5 ansibleadministrator ansibleadministrator 4096 Mar 26 11:31 .
drwxr-xr-x  4 root          root          4096 Mar 26 09:32 ..
drwxr-xr-x  3 ansibleadministrator ansibleadministrator 4096 Mar 26 09:40 .ansible
-rw-r----- 1 ansibleadministrator ansibleadministrator 824 Mar 26 14:16 .bash_history
-rw-r--r--  1 ansibleadministrator ansibleadministrator 220 Mar 26 09:32 .bash_logout
-rw-r--r--  1 ansibleadministrator ansibleadministrator 3771 Mar 26 09:32 .bashrc
drwxr-xr-x  2 ansibleadministrator ansibleadministrator 4096 Mar 26 11:31 .cache
-rw-r--r--  1 ansibleadministrator ansibleadministrator 807 Mar 26 09:32 .profile
drwxr-xr-x  2 ansibleadministrator ansibleadministrator 4096 Mar 26 11:31 .ssh
-rw-r----- 1 ansibleadministrator ansibleadministrator 4393 Mar 26 11:31 .viminfo
ansibleadministrator@ip-172-31-37-44:~$ cd ansible_playbooks/
ansibleadministrator@master:~/ansible_playbooks$ ls
deploy_tomcat.yml  grafana_install.yml  jenkins-install.yml  myenv      prometheus
docker_service.yml  inventory.ini     kubernetes_service.yml  node_exporter.yml  prometheus_install.yml
ansibleadministrator@master:~/ansible_playbooks$
```

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Check it inventory.ini file.



```
Master_Node
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help
Quick connect...
17.Master_Node
ansible@leadministrator@master:~/ansible_playbooks$ cat inventory.ini
[masters]
master.example.net ansible_host=16.171.37.119 ansible_user=ansibleleadministrator ansible_python_interpreter=/usr/bin/python3

[workers]
worker1.example.net ansible_host=13.60.44.140 ansible_user=ansibleleadministrator ansible_python_interpreter=/usr/bin/python3
worker2.example.net ansible_host=13.60.77.237 ansible_user=ansibleleadministrator ansible_python_interpreter=/usr/bin/python3

[web_servers]
16.171.37.119 ansible_ssh_user=ansibleleadministrator ansible_ssh_private_key_file=/home/ansibleleadministrator/.ssh/id_rsa

[docker_servers]
master ansible_host=16.171.37.119 ansible_user=ansibleleadministrator ansible_ssh_private_key_file=~/.ssh/id_rsa

[k8s_cluster:children]
masters
workers

ansible@leadministrator@master:~/ansible_playbooks$
```

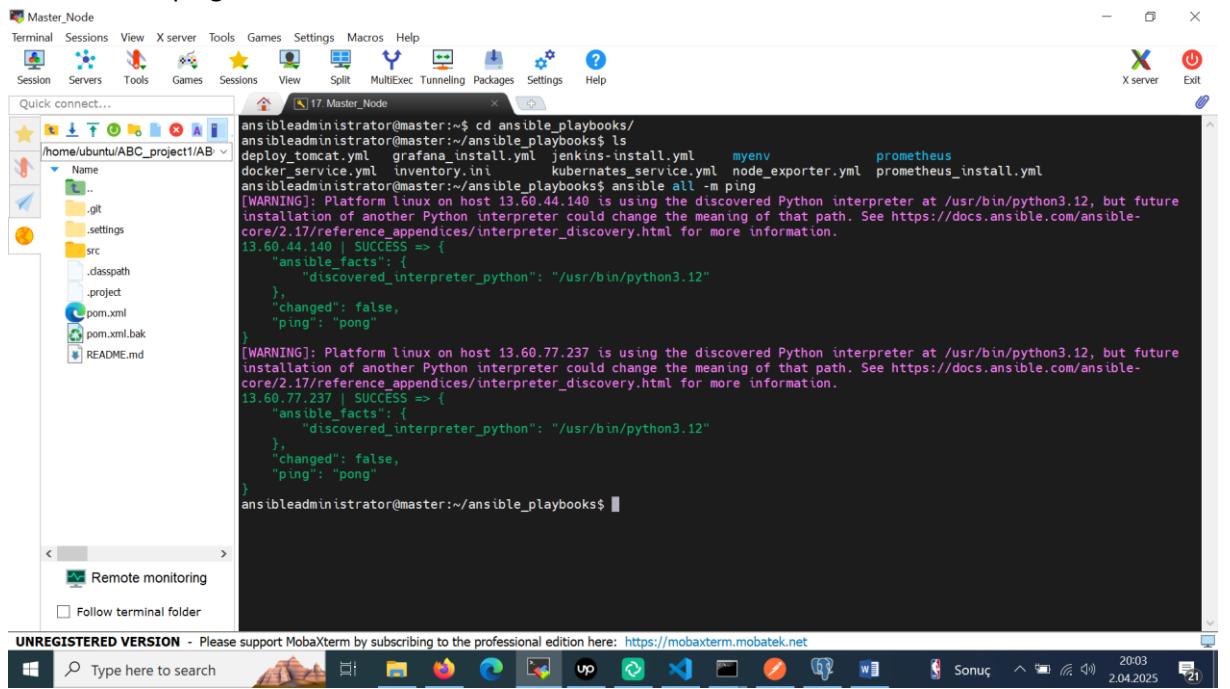
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Type here to search

## Master Node

**On master node check ansible is work or not with ansible username:**

ansible all -m ping

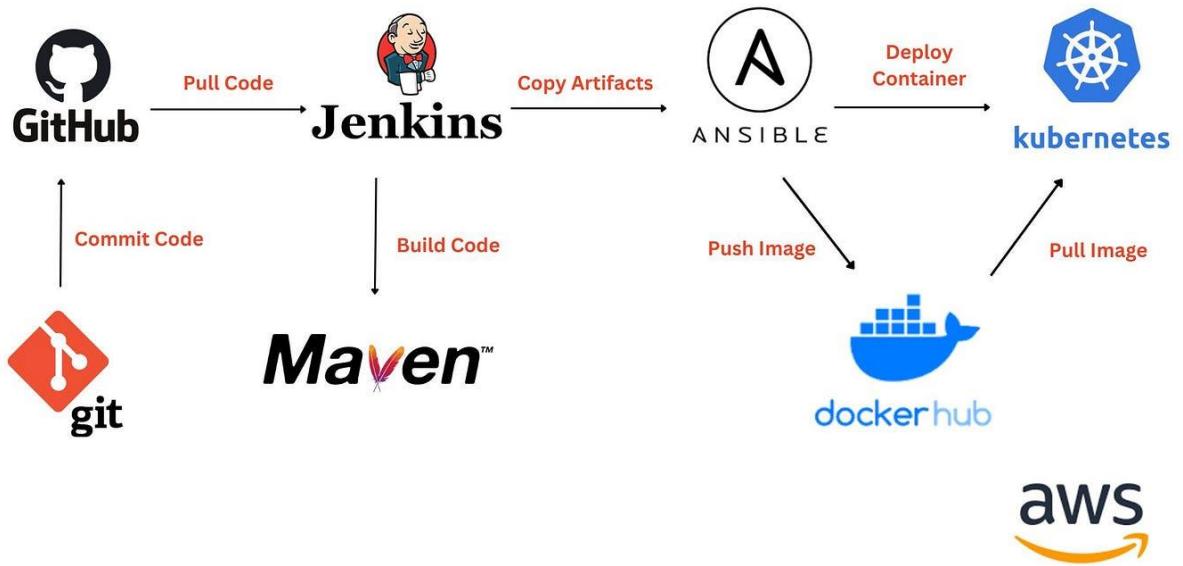


```
Master_Node
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help
Quick connect...
17.Master_Node
ansible@leadministrator@master:~/ansible_playbooks$ ls
deploy_tomcat.yml grafana_install.yml jenkins-install.yml myenv prometheus
docker_service.yml inventory.ini kubernetes_service.yml node_exporter.yml prometheus_install.yml
ansible@leadministrator@master:~/ansible_playbooks$ ansible all -m ping
[WARNING]: Platform linux on host 13.60.44.140 is using the discovered Python interpreter at /usr/bin/python3.12, but future
installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-
core/2.17/reference_appendices/interpreter_discovery.html for more information.
13.60.44.140 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3.12"
    },
    "changed": false,
    "ping": "pong"
}
[WARNING]: Platform linux on host 13.60.77.237 is using the discovered Python interpreter at /usr/bin/python3.12, but future
installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-
core/2.17/reference_appendices/interpreter_discovery.html for more information.
13.60.77.237 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3.12"
    },
    "changed": false,
    "ping": "pong"
}
ansible@leadministrator@master:~/ansible_playbooks$
```

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Type here to search

**The structure to be established:**



We worked with ansible playbooks yaml file. I created ansible\_playbooks folder and also jenkins-install.yml

```
name: Install Jenkins on Ubuntu 24.04
hosts: all
become: yes

tasks:
  - name: Update and upgrade system packages
    apt:
      update_cache: yes
      upgrade: yes

  - name: Install Java (Jenkins dependency)
    apt:
      name: openjdk-21-jdk
      state: present

  - name: Add Jenkins repository key
    apt_key:
      url: https://pkg.jenkins.io/debian/jenkins.io-2023.key
      state: present

  - name: Add Jenkins APT repository
    apt_repository:
      repo: "deb https://pkg.jenkins.io/debian-stable binary/"
      state: present
      filename: jenkins

  - name: Install Jenkins
    apt:
      name: jenkins
      state: present
      update_cache: yes
```

```

ansibleAdministrator@ip-172-31-39-102:~/ansible_playbooks
ansibleAdministrator@ip-172-31-39-102:~/ansible_playbooks$ ls
jenkins-install.yml
ansibleAdministrator@ip-172-31-39-102:~/ansible_playbooks$ vi jenkins-install.yml
ansibleAdministrator@ip-172-31-39-102:~/ansible_playbooks$ ansible all -m ping
[WARNING]: Platform linux on host 13.60.44.140 is using the discovered Python interpreter at /usr/bin/python3.12, but future
installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-
core/2.17/reference_appendices/interpreter_discovery.html for more information.
13.60.44.140 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3.12"
    },
    "changed": false,
    "ping": "pong"
}
[WARNING]: Platform linux on host 13.60.77.237 is using the discovered Python interpreter at /usr/bin/python3.12, but future
installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-
core/2.17/reference_appendices/interpreter_discovery.html for more information.
13.60.77.237 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3.12"
    },
    "changed": false,
    "ping": "pong"
}
ansibleAdministrator@ip-172-31-39-102:~/ansible_playbooks$ 

```

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### **Running ansible-playbook on Master Node:**

ansible-playbook jenkins-install.yml

```

Master
Terminal Sessions View Xserver Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help
X server Exit

Quick connect...
3 Master 9 Slave_1 8 Slave_2
/home/ubuntu/
Name
.. .ansibile .cache .ssh ABC_project1 .bash_history .bash_logout .bashrc .gitconfig .jessist .profile .sudo_as_admin_successful .wget-lists .Xauthority ansible.cfg apache-maven-3.9.7-bin.tar.gz

TASK [Add Jenkins APT repository] ****
ok: [13.60.44.140]
ok: [13.60.77.237]

TASK [Install Jenkins] ****
ok: [13.60.44.140]
ok: [13.60.77.237]

TASK [Start and enable Jenkins service] ****
ok: [13.60.44.140]
ok: [13.60.77.237]

TASK [Allow Jenkins through UFW (port 8080)] ****
ok: [13.60.44.140]
ok: [13.60.77.237]

TASK [Get initial Jenkins admin password] ****
ok: [13.60.44.140]
ok: [13.60.77.237]

TASK [Show Jenkins initial admin password] ****
ok: [13.60.44.140] => {
    "msg": "Jenkins Initial Admin Password: 268fafaae73842c3ab03b00e8dacc2a9"
}
ok: [13.60.77.237] => {
    "msg": "Jenkins Initial Admin Password: f9db8ccc12374b919e81f9a9530447d5"
}

PLAY RECAP ****
13.60.44.140 : ok=10 changed=0 unreachable=0 failed=0 skipped=0 rescued=0 ignored=0
13.60.77.237 : ok=10 changed=0 unreachable=0 failed=0 skipped=0 rescued=0 ignored=0

ansibleAdministrator@ip-172-31-39-102:~/ansible_playbooks$ 

```

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Jenkins is installed on Slave Node.

```

Slave_1
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help
Quick connect...
/home/ubuntu/
Name
.. .ansible .cache Jenkins .ssh
ABC Technologies .bash_history .bash_logout .bashrc .gitconfig .jesshst .profile .sudo_as_admin_successful .wget-hsts .xauthority apache-maven-3.9.7-bin.tar.gz
Remote monitoring Follow terminal folder
Slave_1
3. Master 9 Slave_1 8. Slave_2
ansbleadministrator@ip-172-31-37-44:~/home/ubuntu$ cd
ansbleadministrator@ip-172-31-37-44:~$ sudo systemctl stop jenkins
ansbleadministrator@ip-172-31-37-44:~$ sudo apt-get purge jenkins
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following package was automatically installed and is no longer required:
  net-tools
Use 'sudo apt autoremove' to remove it.
The following packages will be REMOVED:
  jenkins*
0 upgraded, 0 newly installed, 1 to remove and 3 not upgraded.
After this operation, 94.4 MB disk space will be freed.
Do you want to continue? [Y/n] y
(Reading database ... 142529 files and directories currently installed.)
Removing jenkins (2.503) ...
(Reading database ... 142519 files and directories currently installed.)
Purging configuration files for jenkins (2.503) ...
ansbleadministrator@ip-172-31-37-44:~$ sudo rm /etc/apt/sources.list.d/jenkins.list
ansbleadministrator@ip-172-31-37-44:~$ sudo rm -rf /var/lib/jenkins/
ansbleadministrator@ip-172-31-37-44:~$ sudo rm -rf /var/cache/Jenkins
sudo apt-get update
Hit:1 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease
Hit:4 https://download.docker.com/linux/ubuntu noble InRelease
Hit:5 http://security.ubuntu.com/ubuntu noble-security InRelease
Hit:6 https://ppa.launchpadcontent.net/ansible/ubuntu noble InRelease
Reading package lists... Done
ansbleadministrator@ip-172-31-37-44:~$ which jenkins
ansbleadministrator@ip-172-31-37-44:~$ which jenkins
/usr/bin/jenkins
ansbleadministrator@ip-172-31-37-44:~$ 

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Type here to search 28.03.2025 00:13
X server Exit

Slave_2
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help
Quick connect...
/home/ubuntu/
Name
.. .ansible .cache Jenkins .ssh
ABC Technologies .bash_history .bash_logout .bashrc .gitconfig .jesshst .profile .sudo_as_admin_successful .wget-hsts .xauthority apache-maven-3.9.7-bin.tar.gz
Remote monitoring Follow terminal folder
Slave_2
3. Master 9 Slave_1 8. Slave_2
Last login: Thu Mar 27 20:17:31 2025 from 176.240.124.183
ubuntu@ip-172-31-41-110:~$ sudo systemctl stop jenkins
sudo apt-get purge jenkins
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following package was automatically installed and is no longer required:
  net-tools
Use 'sudo apt autoremove' to remove it.
The following packages will be REMOVED:
  jenkins*
0 upgraded, 0 newly installed, 1 to remove and 3 not upgraded.
After this operation, 94.4 MB disk space will be freed.
Do you want to continue? [Y/n] y
(Reading database ... 142529 files and directories currently installed.)
Removing jenkins (2.503) ...
(Reading database ... 142519 files and directories currently installed.)
Purging configuration files for jenkins (2.503) ...
ubuntu@ip-172-31-41-110:~$ sudo rm /etc/apt/sources.list.d/jenkins.list
sudo rm -rf /var/lib/jenkins/
sudo rm -rf /var/cache/Jenkins
sudo apt-get update
Hit:1 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease
Hit:4 https://download.docker.com/linux/ubuntu noble InRelease
Hit:5 http://security.ubuntu.com/ubuntu noble-security InRelease
Hit:6 https://ppa.launchpadcontent.net/ansible/ubuntu noble InRelease
Reading package lists... Done
ubuntu@ip-172-31-41-110:~$ which jenkins
ubuntu@ip-172-31-41-110:~$ which jenkins
/usr/bin/jenkins
ubuntu@ip-172-31-41-110:~$ 

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Type here to search 28.03.2025 00:14
X server Exit

```

ansible-playbook -i inventory.ini kubernetes\_service.yml

## 7. Kubernetes

```

# Update and Upgrade Ubuntu (all nodes)
sudo apt update && sudo apt upgrade -y
sudo hostnamectl set-hostname "master.example.net"
exec bash
# On the worker nodes, run
sudo hostnamectl set-hostname "worker1.example.net" // 1st worker node
sudo hostnamectl set-hostname "worker2.example.net" // 2nd worker node

```

```
exec bash
MASTER NODE:
sudo nano /etc/hosts
#####Edit ip address##
# Master Node
16.171.37.119    master-node master.example.net
16.171.37.120# First Worker Node
16.171.37.12113.60.44.140    worker1-node worker1.example.net
16.171.37.122# Second Worker Node
16.171.37.12313.60.77.237    worker2-node worker2.example.net
16.171.37.124## Disable Swap (all nodes)
sudo swapoff -a
sudo sed -i '/ swap / s/^(\.*\)$/#\1/g' /etc/fstab

# Load the required kernel modules on all nodes:
sudo tee /etc/modules-load.d/containerd.conf <<EOF
overlay
br_netfilter
EOF
sudo modprobe overlay
sudo modprobe br_netfilter

# To load the above kernel parameters, run
sudo sysctl -system

## Install Containerd Runtime (all nodes)
sudo apt install -y curl gnupg2 software-properties-common apt-transport-https ca-certificates

# Enable the Docker repository:
sudo curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo gpg --dearmour -o /etc/apt/trusted.gpg.d/docker.gpg
sudo add-apt-repository "deb [arch=amd64]
https://download.docker.com/linux/ubuntu $(lsb_release -cs) stable"

# Update the package list and install containerd:
sudo apt update
sudo apt install -y containerd.io

# Configure containerd to start using systemd as cgroup:
containerd config default | sudo tee /etc/containerd/config.toml >/dev/null
2>&1
sudo sed -i 's/SystemdCgroup \= false/SystemdCgroup \= true/g'
/etc/containerd/config.toml
sudo systemctl restart containerd
sudo systemctl enable containerd
# Add Apt Repository for Kubernetes (all nodes)
```

```

echo "deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg]
https://pkgs.k8s.io/core:/stable:/v1.30/deb/ /" | sudo tee
/etc/apt/sources.list.d/kubernetes.list
curl -fsSL https://pkgs.k8s.io/core:/stable:/v1.30/deb/Release.key | sudo
gpg --dearmor -o /etc/apt/keyrings/kubernetes-apt-keyring.gpg

#Install Kubectl, Kubeadm, and Kubelet (all nodes)
sudo apt update
sudo apt install -y kubelet kubeadm kubectl
sudo apt-mark hold kubelet kubeadm kubectl

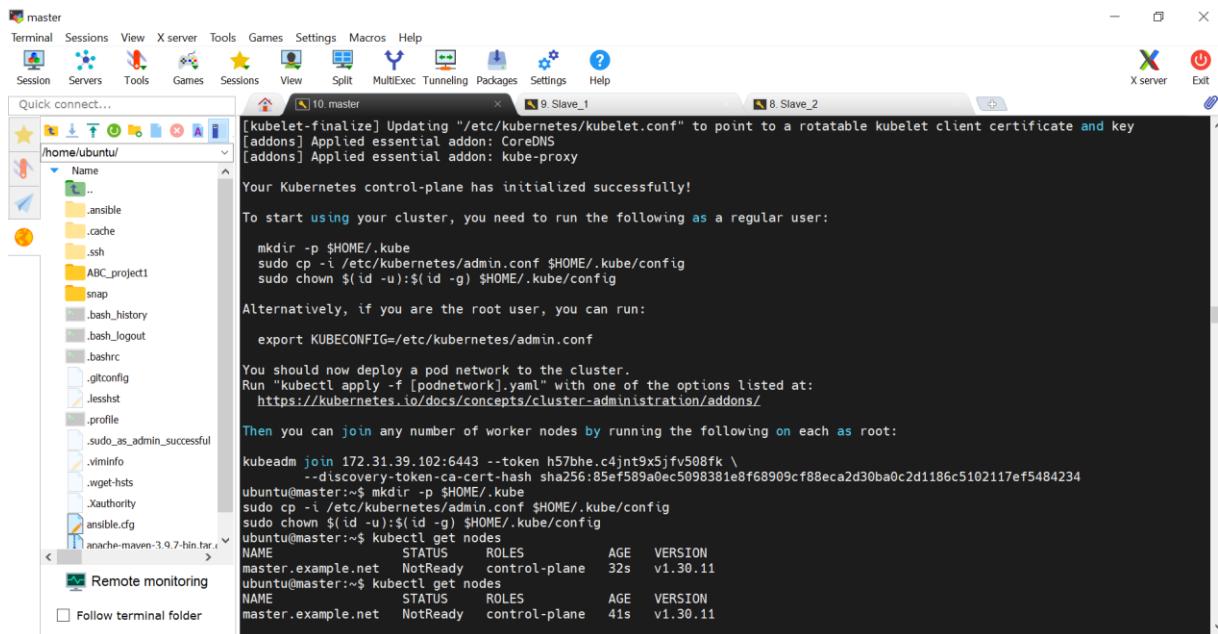
# Initialize Kubernetes Cluster with Kubeadm (master node)
sudo kubeadm init --ignore-preflight-errors=Mem

```

With all the prerequisites in place, initialize the Kubernetes cluster on the master node using the following Kubeadm command:

**Initialize Kubernetes Cluster with Kubeadm (master node):**

```
sudo kubeadm init --ignore-preflight-errors=Mem
```



After the initialization is complete make a note of the kubeadm join command for future reference.

**Run the following commands on the master node:**

```

mkdir -p $HOME/.kube
sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config
sudo chown $(id -u):$(id -g) $HOME/.kube/config

```

**Add Worker Nodes1 and 2 to the Cluster (worker nodes1 and 2):**

```

sudo kubeadm join 172.31.39.102:6443 --token h57bhe.c4jnt9x5jfv508fk
\ --discovery-token-ca-cert-hash

```

sha256:85ef589a0ec5098381e8f68909cf88eca2d30ba0c2d1186c5102117ef54842  
34

**Verify the cluster and test (master node) :**

```
kubectl get pods -n kube-system
kubectl get nodes
```

The screenshot shows the MobaXterm interface with two terminal windows. The left window is titled '10 master' and the right window is titled '9 Slave\_1'. Both windows show the command-line interface of a Ubuntu 18.04 LTS system. The user has run the following commands:

```
ubuntu@master:~$ kubectl get pods -n kube-system
ubuntu@master:~$ kubectl get nodes
```

The output of the 'kubectl get nodes' command is as follows:

NAME	READY	STATUS	RESTARTS	AGE
calico-kube-controllers-5b9b456c66-xjr97	1/1	Running	0	21m
calico-node-b7dk5	0/1	Running	0	21m
calico-node-c6php	0/1	Running	0	17m
calico-node-vw64q	0/1	Running	0	19m
coredns-55cb58b774-66s6h	1/1	Running	0	25m
coredns-55cb58b774-xtn9	1/1	Running	0	25m
etcd-master.example.net	1/1	Running	2	25m
kube-apiserver-master.example.net	1/1	Running	3	25m
kube-controller-manager-master.example.net	1/1	Running	4	25m
kube-proxy-ngwzc	1/1	Running	0	25m
kube-proxy-qd4bs	1/1	Running	0	19m
kube-proxy-xclk9	1/1	Running	0	17m
kube-scheduler-master.example.net	1/1	Running	5	25m
NAME STATUS ROLES AGE VERSION				
master.example.net Ready control-plane 25m v1.30.11				
worker1.example.net Ready <none> 19m v1.30.11				
worker2.example.net Ready <none> 17m v1.30.11				

At the bottom of the terminal, the user types 'ubuntu@master:~\$'

**Deploy test application on cluster (master node) :**

```
kubectl run nginx --image=nginx
```

The screenshot shows the MobaXterm interface with two terminal windows. The left window is titled '10 master' and the right window is titled '9 Slave\_1'. Both windows show the command-line interface of a Ubuntu 18.04 LTS system. The user has run the following command:

```
ubuntu@master:~$ kubectl run nginx --image=nginx
```

At the bottom of the terminal, the user types 'ubuntu@master:~\$'

**Copying Kubeconfig File to Worker Node:**

```
scp /home/ansibleadministrator/.kube/config
worker1.example.net:/home/ansibleadministrator/.kube/config
```

```
scp /home/ansibleadministrator/.kube/config
worker2.example.net:/home/ansibleadministrator/.kube/config
```

### On worker node:

```
ansibleadministrator@worker2:~$ mkdir -p /home/ansibleadministrator/.kube
```

```
System information as of Tue Apr 1 21:08:39 UTC 2025
System load: 0.52 Temperature: -273.1 C
Usage of /: 30.5% of 28.02GB Processes: 138
Memory usage: 66% Users logged in: 1
Swap usage: 0% IPv4 address for ens5: 172.31.37.44

Expanded Security Maintenance for Applications is not enabled.
10 updates can be applied immediately.
5 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

Last login: Tue Apr 1 21:01:14 2025 from 176.240.124.183
ubuntu@worker1:~$ su ansibleadministrator
Password:
ansibleadministrator@worker1:/home/ubuntu$ cd
ansibleadministrator@worker1:~$ sudo chown ansibleadministrator:ansibleadministrator /home/ansibleadministrator/.kube/config
chown: cannot access '/home/ansibleadministrator/.kube/config': No such file or directory
ansibleadministrator@worker1:~$ scp /home/ansibleadministrator/.kube/config worker1.example.net:/home/ansibleadministrator/.kube/config
scp /home/ansibleadministrator/.kube/config worker1.example.net:/home/ansibleadministrator/.kube/config
scp: stat local "/home/ansibleadministrator/.kube/config": No such file or directory
scp: stat local "/home/ansibleadministrator/.kube/config": No such file or directory
ansibleadministrator@worker1:~$ ls -l /home/ansibleadministrator/.kube/config
ls: cannot access '/home/ansibleadministrator/.kube/config': No such file or directory
ansibleadministrator@worker1:~$ mkdir -p /home/ansibleadministrator/.kube
ansibleadministrator@worker1:~$
```

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I used it to install with ansible.

```
This host key is known by the following other names/addresses:
  ~/.ssh/known_hosts:4: [hashed name]
Are you sure you want to continue connecting (yes/no/[fingerprint])? y
Please type 'yes', 'no' or the fingerprint: yes
Warning: Permanently added 'worker2.example.net' (ED25519) to the list of known hosts.
config                                         100% 5657    8.0MB/s  00:00
ansibleadministrator@master:~/ansible_playbooks$ ansible-playbook -i inventory.ini kubernetes_service.yml

PLAY [Manage Kubernetes Resources] ****
TASK [Gathering Facts] ****
[WARNING]: Platform linux on host 16.171.37.119 is using the discovered Python interpreter at /usr/bin/python3.12, but future installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-core/2.17/reference_appendices/interpreter_discovery.html for more information.
ok: [16.171.37.119]
ok: [master.example.net]
ok: [worker1.example.net]
ok: [worker2.example.net]

TASK [Create a Kubernetes Pod] ****
[WARNING]: kubernetes<24.2.0 is not supported or tested. Some features may not work.
ok: [master.example.net]
ok: [16.171.37.119]
ok: [worker1.example.net]
ok: [worker2.example.net]

PLAY RECAP ****
16.171.37.119 : ok=2    changed=0    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
master.example.net : ok=2    changed=0    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
worker1.example.net : ok=2    changed=0    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
worker2.example.net : ok=2    changed=0    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0

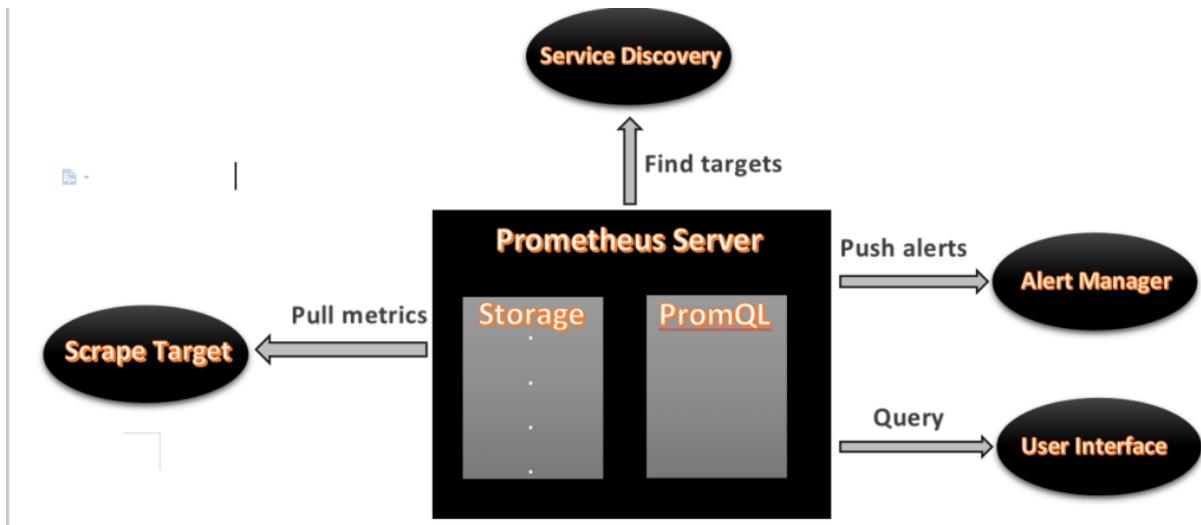
ansibleadministrator@master:~/ansible_playbooks$
```

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## 8. Prometheus

Prometheus is an **open-source monitoring and alerting system** designed to collect, store, and analyze time-series data. It is widely used for monitoring servers, applications, containers

(Kubernetes, Docker), and cloud environments (AWS, GCP, Azure). Prometheus is a **pull-based** system, meaning it actively **scrapes metrics** from predefined targets at specified intervals.



```
#Create a system user for Prometheus using below commands:  
sudo useradd --no-create-home --shell /bin/false prometheus  
  
#Create the directories in which we will be storing our configuration files  
and libraries:  
sudo mkdir /etc/prometheus  
sudo mkdir /var/lib/prometheus  
  
# Set the ownership of the /var/lib/prometheus directory with below command:  
sudo chown prometheus:prometheus /var/lib/prometheus  
  
# Download Prometheus Binary File  
cd /tmp/  
  
#Download the Prometheus setup using wget  
wget  
https://github.com/prometheus/prometheus/releases/download/v2.46.0/prometheus-  
2.46.0.linux-amd64.tar.gz  
  
# Extract the downloaded file using below command:  
tar xvf prometheus-2.46.0.linux-amd64.tar.gz  
  
# Move the configuration file and set the owner to the prometheus user:  
cd prometheus-2.46.0.linux-amd64  
sudo mv console* /etc/prometheus  
sudo mv prometheus.yml /etc/prometheus  
sudo chown -R prometheus:prometheus /etc/prometheus
```

```

# Move the binaries and set the owner:
sudo mv prometheus /usr/local/bin/
sudo chown prometheus:prometheus /usr/local/bin/prometheus

#Prometheus configuration file
sudo nano /etc/prometheus/prometheus.yml

#Add the following content to the file:
global:
  scrape_interval: 15s

scrape_configs:
  - job_name: 'prometheus'
    static_configs:
      - targets: ['localhost:9090']
  - job_name: 'worker-nodes'
    static_configs:
      - targets: ['13.60.44.140:9100', '13.60.77.237:9100']
  - job_name: 'kubernetes-nodes'
    kubernetes_sd_configs:
      - role: node

#Create a systemd unit file for Prometheus
sudo nano /etc/systemd/system/prometheus.service

[Unit]
Description=Prometheus
Wants=network-online.target
After=network-online.target

[Service]
User=prometheus
Group=prometheus
Type=simple
ExecStart=/usr/local/bin/prometheus \
  --config.file /etc/prometheus/prometheus.yml \
  --storage.tsdb.path /var/lib/prometheus/ \
  --web.listen-address=:9090 \
  --web.enable-lifecycle
[Install]
WantedBy=multi-user.target

#reload the systemd daemon
sudo systemctl daemon-reload

#Start the Prometheus service and enable it to start on boot:

```

```

sudo systemctl start prometheus
sudo systemctl enable prometheus
sudo systemctl status prometheus

#Use below command to enable prometheus service in firewall
sudo ufw allow 9090/tcp

# Prometheus service is ready to run and we can access it from any web
# browser.

http://server-IP-or-Hostname:9090

```

I integrate the prometheus with ansible. I run the following script on master node.

```

ansibleadministrator@master:~/ansible_playbooks$ ansible-galaxy init prometheus
- Role prometheus was created successfully

```

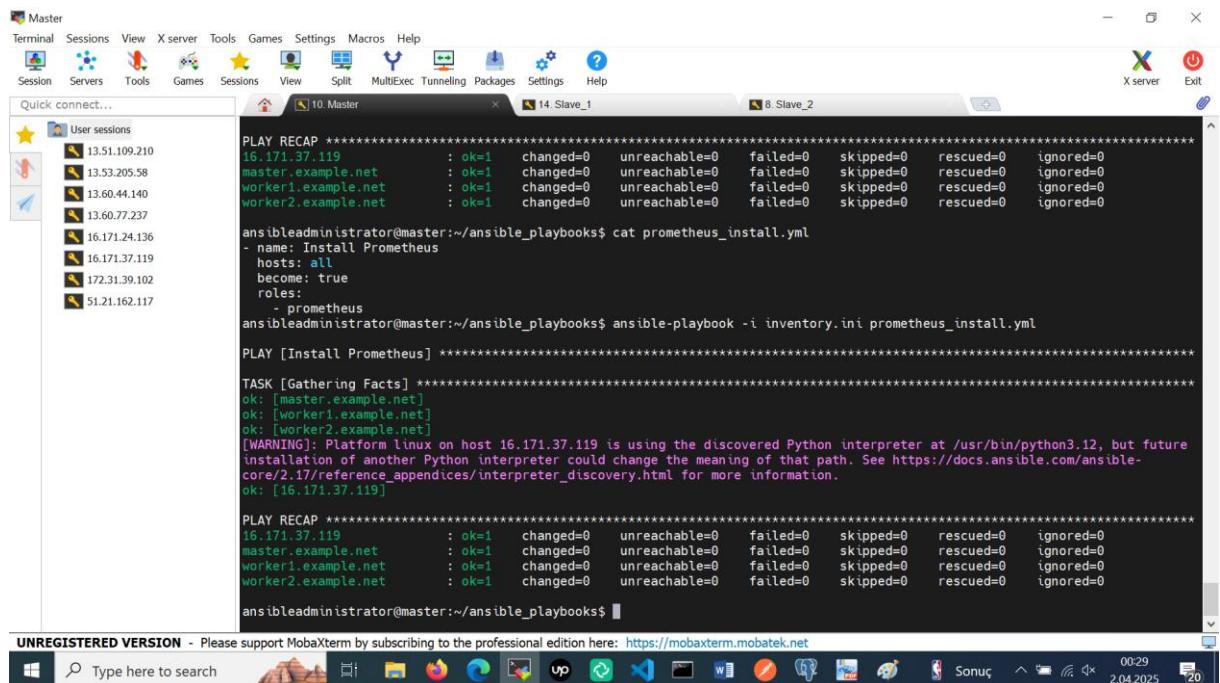
```

ansibleadministrator@master:~/ansible_playbooks$ cat prometheus_install.yml
- name: Install Prometheus
  hosts: all
  become: true
  roles:
    - prometheus
ansibleadministrator@master:~/ansible_playbooks$ 

```

#### **To Install Prometheus on All Nodes:**

```
ansible-playbook -i inventory.ini prometheus_install.yml
```



```

- prometheus
ansibleadministrator@master:~/ansible_playbooks$ ansible-playbook -i inventory.ini prometheus_install.yml
PLAY [Install Prometheus] *****
TASK [Gathering Facts] *****
ok: [master.example.net]
ok: [worker1.example.net]
ok: [worker2.example.net]
[WARNING]: Platform linux on host 16.171.37.119 is using the discovered Python interpreter at /usr/bin/python3.12, but future
installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-
core/2.17/reference_appendices/interpreter_discovery.html for more information.
ok: [16.171.37.119]

PLAY RECAP *****
16.171.37.119 : ok=1    changed=0    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
master.example.net : ok=1    changed=0    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
worker1.example.net : ok=1    changed=0    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
worker2.example.net : ok=1    changed=0    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0

ansibleadministrator@master:~/ansible_playbooks$ systemctl status prometheus
● prometheus.service - Prometheus
   Loaded: loaded (/etc/systemd/system/prometheus.service; enabled; preset: enabled)
   Active: active (running) since Mon 2025-03-31 22:08:48 UTC; 23h ago
     Main PID: 3360897 (prometheus)
        Tasks: 9 (limit: 9365)
       Memory: 99.3M (peak: 127.7M)
          CPU: 1m1n 42.070s
         CGroup: /system.slice/prometheus.service
                  └─3360897 /usr/local/bin/prometheus --config.file /etc/prometheus/prometheus.yml --storage.tsdb.path /var/lib/prometheus

Warning: some journal files were not opened due to insufficient permissions.
lines 1-11/11 (END)

```

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<http://16.171.37.119:9090> -> I access to Prometheus interface

Use local time  Enable query history  Enable autocomplete  Enable highlighting  Enable linter

Expression (press Shift+Enter for newlines)

Graph

Evaluation time

No data queried yet

Add Panel



### Download Node Exporter:

Go to the official release page of Prometheus Node Exporter and copy the link of the latest version of the Node Exporter package according to your OS type.

```
####Install Node Exporter#####
#Create a system user for Node Exporter using below commands:
sudo useradd --no-create-home --shell /bin/false node_exporter
```

```
cd /tmp/  
  
#Download the Node Exporter setup using wget  
wget  
https://github.com/prometheus/node_exporter/releases/download/v1.6.1/node_expo  
rter-1.6.1.linux-amd64.tar.gz  
  
# Extract the downloaded file using below command:  
sudo tar xvfz node_exporter-*.*-amd64.tar.gz  
  
# Move the binary file of node exporter to /usr/local/bin location  
sudo mv node_exporter-*.*-amd64/node_exporter /usr/local/bin/  
  
# Create a node_exporter user to run the node exporter service  
sudo useradd -rs /bin/false node_exporter  
  
# Create a systemd unit file for Node Exporter  
sudo nano /etc/systemd/system/node_exporter.service  
  
[Unit]  
  
Description=Node Exporter  
  
After=network.target  
  
  
[Service]  
  
User=node_exporter  
  
Group=node_exporter  
  
Type=simple  
  
ExecStart=/usr/local/bin/node_exporter  
  
  
[Install]  
  
WantedBy=multi-user.target  
  
# Reload the systemd daemon  
sudo systemctl daemon-reload  
sudo systemctl start node_exporter  
sudo systemctl enable node_exporter  
sudo systemctl status node_exporter
```

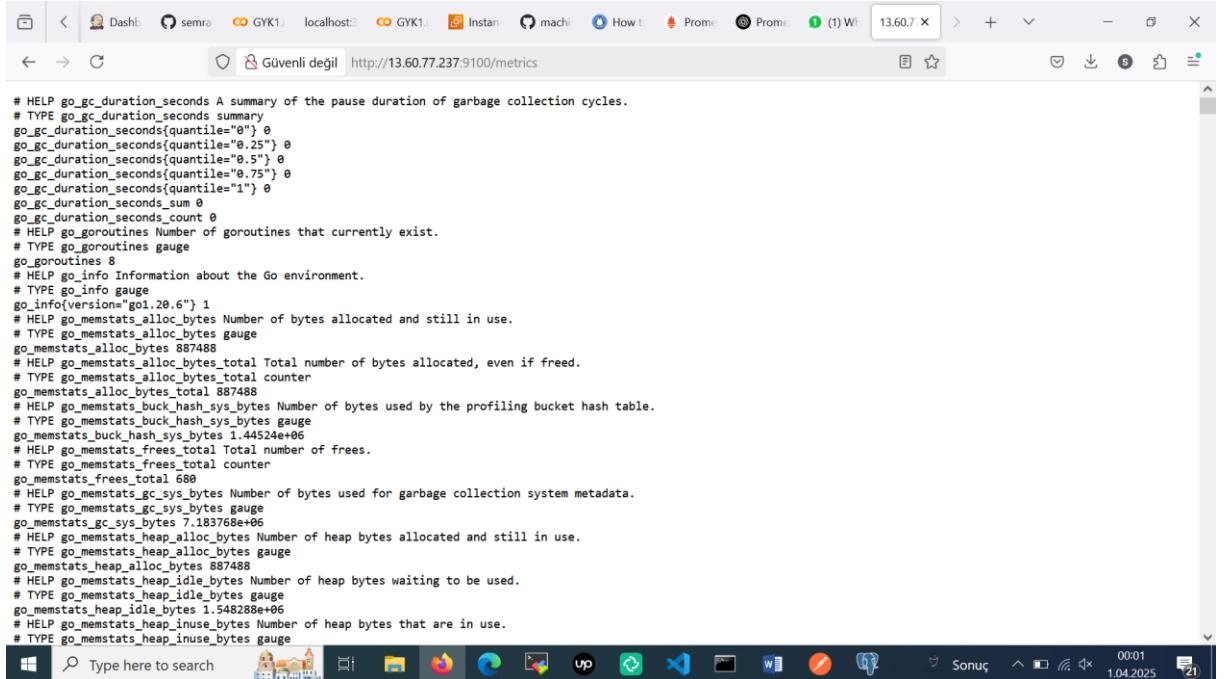
```
ubuntu@worker1:/tmp$ sudo mv node_exporter-* amd64/node_exporter /usr/local/bin/
ubuntu@worker1:/tmp$ sudo useradd -rs /bin/false node_exporter
useradd: user 'node_exporter' already exists
ubuntu@worker1:/tmp$ sudo useradd -rs /bin/false node_exporter
useradd: user 'node_exporter' already exists
ubuntu@worker1:/tmp$ sudo nano /etc/systemd/system/node_exporter.service
ubuntu@worker1:/tmp$ sudo systemctl daemon-reload
sudo systemctl start node_exporter
sudo systemctl enable node_exporter
sudo systemctl status node_exporter
Created symlink /etc/systemd/system/multi-user.target.wants/node_exporter.service → /etc/systemd/system/node_exporter.service.
● node_exporter.service - Node Exporter
   Loaded: loaded (/etc/systemd/system/node_exporter.service; enabled; preset: enabled)
     Active: active (running) since Mon 2025-03-31 20:48:47 UTC; 384ms ago
       Main PID: 5936 (node_exporter)
          Tasks: 4 (limit: 1077)
            Memory: 14.7M (peak: 15.0M)
              CPU: 28ms
            CGroup: /system.slice/node_exporter.service
                    └─5936 /usr/local/bin/node_exporter

Mar 31 20:48:47 worker1.example.net node_exporter[5936]: ts=2025-03-31T20:48:47.592Z caller=node_exporter.go:117 level=info c>
Mar 31 20:48:47 worker1.example.net node_exporter[5936]: ts=2025-03-31T20:48:47.592Z caller=node_exporter.go:117 level=info c>
Mar 31 20:48:47 worker1.example.net node_exporter[5936]: ts=2025-03-31T20:48:47.592Z caller=node_exporter.go:117 level=info c>
Mar 31 20:48:47 worker1.example.net node_exporter[5936]: ts=2025-03-31T20:48:47.592Z caller=node_exporter.go:117 level=info c>
Mar 31 20:48:47 worker1.example.net node_exporter[5936]: ts=2025-03-31T20:48:47.592Z caller=node_exporter.go:117 level=info c>
Mar 31 20:48:47 worker1.example.net node_exporter[5936]: ts=2025-03-31T20:48:47.592Z caller=node_exporter.go:117 level=info c>
Mar 31 20:48:47 worker1.example.net node_exporter[5936]: ts=2025-03-31T20:48:47.592Z caller=node_exporter.go:117 level=info c>
Mar 31 20:48:47 worker1.example.net node_exporter[5936]: ts=2025-03-31T20:48:47.592Z caller=node_exporter.go:117 level=info c>
Mar 31 20:48:47 worker1.example.net node_exporter[5936]: ts=2025-03-31T20:48:47.592Z caller=tls_config.go:274 level=info msg=>
Mar 31 20:48:47 worker1.example.net node_exporter[5936]: ts=2025-03-31T20:48:47.594Z caller=tls_config.go:277 level=info msg=>
lines 1-20/20 (END)
ubuntu@worker1:/tmp$
```

```
ubuntu@worker2:/tmp$ sudo systemctl daemon-reload
sudo systemctl start node_exporter
sudo systemctl enable node_exporter
sudo systemctl status node_exporter
● node_exporter.service - Node Exporter
   Loaded: loaded (/etc/systemd/system/node_exporter.service; enabled; preset: enabled)
     Active: active (running) since Mon 2025-03-31 20:53:10 UTC; 503ms ago
       Main PID: 6874 (node_exporter)
          Tasks: 4 (limit: 1077)
            Memory: 14.9M (peak: 15.1M)
              CPU: 32ms
            CGroup: /system.slice/node_exporter.service
                    └─6874 /usr/local/bin/node_exporter

Mar 31 20:53:11 worker2.example.net node_exporter[6874]: ts=2025-03-31T20:53:11.078Z caller=node_exporter.go:117 level=info c>
Mar 31 20:53:11 worker2.example.net node_exporter[6874]: ts=2025-03-31T20:53:11.078Z caller=node_exporter.go:117 level=info c>
Mar 31 20:53:11 worker2.example.net node_exporter[6874]: ts=2025-03-31T20:53:11.078Z caller=node_exporter.go:117 level=info c>
Mar 31 20:53:11 worker2.example.net node_exporter[6874]: ts=2025-03-31T20:53:11.078Z caller=node_exporter.go:117 level=info c>
Mar 31 20:53:11 worker2.example.net node_exporter[6874]: ts=2025-03-31T20:53:11.078Z caller=node_exporter.go:117 level=info c>
Mar 31 20:53:11 worker2.example.net node_exporter[6874]: ts=2025-03-31T20:53:11.078Z caller=node_exporter.go:117 level=info c>
Mar 31 20:53:11 worker2.example.net node_exporter[6874]: ts=2025-03-31T20:53:11.078Z caller=node_exporter.go:117 level=info c>
Mar 31 20:53:11 worker2.example.net node_exporter[6874]: ts=2025-03-31T20:53:11.078Z caller=node_exporter.go:117 level=info c>
Mar 31 20:53:11 worker2.example.net node_exporter[6874]: ts=2025-03-31T20:53:11.078Z caller=tls_config.go:274 level=info msg=>
Mar 31 20:53:11 worker2.example.net node_exporter[6874]: ts=2025-03-31T20:53:11.080Z caller=tls_config.go:277 level=info msg=>
lines 1-20/20 (END)
ubuntu@worker2:/tmp$
```

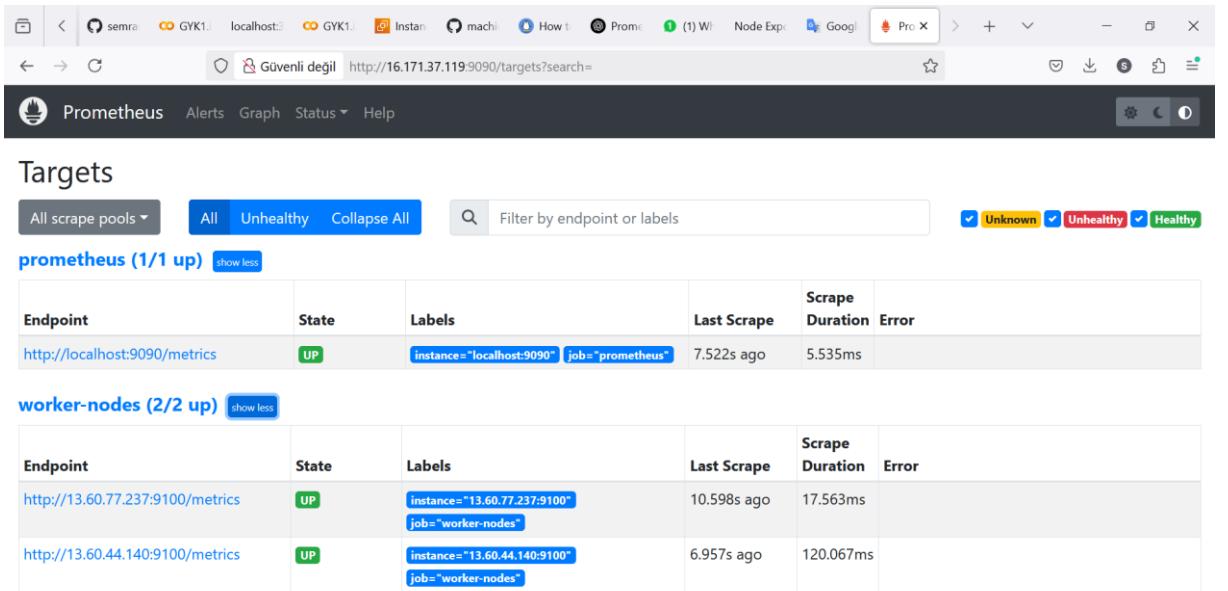
## Verify Access



```
# HELP go_gc_duration_seconds A summary of the pause duration of garbage collection cycles.
# TYPE go_gc_duration_seconds summary
go_gc_duration_seconds{quantile="0"} 0
go_gc_duration_seconds{quantile="0.25"} 0
go_gc_duration_seconds{quantile="0.5"} 0
go_gc_duration_seconds{quantile="0.75"} 0
go_gc_duration_seconds{quantile="1"} 0
go_gc_duration_seconds_sum 0
go_gc_duration_seconds_count 0
# HELP go_goroutines Number of goroutines that currently exist.
# TYPE go_goroutines gauge
go_goroutines 8
# HELP go_info Information about the Go environment.
# TYPE go_info gauge
go_info{version="go1.26.6"} 1
# HELP go_memstats_alloc_bytes Number of bytes allocated and still in use.
# TYPE go_memstats_alloc_bytes gauge
go_memstats_alloc_bytes 887488
# HELP go_memstats_alloc_bytes_total Total number of bytes allocated, even if freed.
# TYPE go_memstats_alloc_bytes_total counter
go_memstats_alloc_bytes_total 887488
# HELP go_memstats_buck_hash_sys_bytes Number of bytes used by the profiling bucket hash table.
# TYPE go_memstats_buck_hash_sys_bytes gauge
go_memstats_buck_hash_sys_bytes 1.445248e+06
# HELP go_memstats_frees_total Total number of frees.
# TYPE go_memstats_frees_total counter
go_memstats_frees_total 688
# HELP go_memstats_gc_sys_bytes Number of bytes used for garbage collection system metadata.
# TYPE go_memstats_gc_sys_bytes gauge
go_memstats_gc_sys_bytes 7.183768e+06
# HELP go_memstats_heap_alloc_bytes Number of heap bytes allocated and still in use.
# TYPE go_memstats_heap_alloc_bytes gauge
go_memstats_heap_alloc_bytes 887488
# HELP go_memstats_heap_idle_bytes Number of heap bytes waiting to be used.
# TYPE go_memstats_heap_idle_bytes gauge
go_memstats_heap_idle_bytes 1.548288e+06
# HELP go_memstats_heap_inuse_bytes Number of heap bytes that are in use.
# TYPE go_memstats_heap_inuse_bytes gauge
```

## Configure the Node Exporter as a Prometheus target:

Now to scrape the node\_exporter lets instruct the Prometheus by making a minor change in prometheus.yml file. So go to etc/prometheus and open prometheus.yml



The screenshot shows the Prometheus UI with the following details:

**Prometheus Targets:**

Endpoint	State	Labels	Last Scrape	Scrape Duration	Error
http://localhost:9090/metrics	UP	instance="localhost:9090", job="prometheus"	7.522s ago	5.535ms	

**worker-nodes Targets:**

Endpoint	State	Labels	Last Scrape	Scrape Duration	Error
http://13.60.77.237:9100/metrics	UP	instance="13.60.77.237:9100", job="worker-nodes"	10.598s ago	17.563ms	
http://13.60.44.140:9100/metrics	UP	instance="13.60.44.140:9100", job="worker-nodes"	6.957s ago	120.067ms	



I can create a new playbook that automates the Node Exporter installation process.

```
node_exporter.yml Playbook
```

```
---
```

- name: Install Node Exporter on Ubuntu
  - hosts: all # Target all nodes or specify a group like 'workers' or 'masters'
  - become: true
  - tasks:
    - name: Download Node Exporter tarball
      - get\_url:
      - url:  
"https://github.com/prometheus/node\_exporter/releases/download/v1.3.1/node\_exporter-1.3.1.linux-amd64.tar.gz"
      - dest: "/tmp/node\_exporter-1.3.1.linux-amd64.tar.gz"
    - name: Extract Node Exporter tarball
      - unarchive:
      - src: "/tmp/node\_exporter-1.3.1.linux-amd64.tar.gz"
      - dest: "/opt/"
      - remote\_src: yes
    - name: Create Node Exporter systemd service
      - copy:
        - dest: "/etc/systemd/system/node\_exporter.service"
        - content: |  
[Unit]  
Description=Prometheus Node Exporter  
Documentation=https://prometheus.io/docs/instrumenting/exporters/  
After=network.target
        - [Service]  
User=nobody  
Group=nogroup  
ExecStart=/opt/node\_exporter-1.3.1.linux-amd64/node\_exporter
        - [Install]  
WantedBy=multi-user.target
      - name: Reload systemd to register the Node Exporter service
        - systemd:
          - daemon\_reload: yes
      - name: Start Node Exporter service
        - systemd:
          - name: node\_exporter
          - state: started
          - enabled: yes

```

- name: Verify Node Exporter is running
  command: systemctl status node_exporter
  register: node_exporter_status
  failed_when: "'active (running)' not in node_exporter_status.stdout"
  changed_when: false

```

### Run Playbook:

```
ansible-playbook -i inventory.ini node_exporter.yml
```

```

Master
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help
X server Exit
Quick connect...
10 Master 14 Slave_1 8 Slave_2
changed: [master.example.net]
TASK [Create Node Exporter systemd service] *****
changed: [worker1.example.net]
changed: [worker2.example.net]
changed: [16.171.37.119]
ok: [master.example.net]

TASK [Reload systemd to register the Node Exporter service] *****
ok: [master.example.net]
ok: [worker1.example.net]
ok: [worker2.example.net]
ok: [16.171.37.119]

TASK [Start Node Exporter service] *****
ok: [worker1.example.net]
ok: [worker2.example.net]
changed: [16.171.37.119]
changed: [master.example.net]

TASK [Verify Node Exporter is running] *****
ok: [master.example.net]
ok: [16.171.37.119]
ok: [worker1.example.net]
ok: [worker2.example.net]

PLAY RECAP *****
16.171.37.119 : ok=7    changed=3    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
master.example.net : ok=7    changed=3    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
worker1.example.net : ok=7    changed=3    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
worker2.example.net : ok=7    changed=3    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
ansibleleadadministrator@master:~/ansible_playbooks$ 

```

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### Verify Installation with ansible:

```

Master
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help
X server Exit
Quick connect...
10 Master 14 Slave_1
ok: [worker2.example.net]
ok: [16.171.37.119]

TASK [Start Node Exporter service] *****
ok: [worker1.example.net]
ok: [worker2.example.net]
changed: [16.171.37.119]
changed: [master.example.net]

TASK [Verify Node Exporter is running] *****
ok: [master.example.net]
ok: [16.171.37.119]
ok: [worker1.example.net]
ok: [worker2.example.net]

PLAY RECAP *****
16.171.37.119 : ok=7    changed=3    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
master.example.net : ok=7    changed=3    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
worker1.example.net : ok=7    changed=3    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
worker2.example.net : ok=7    changed=3    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
ansibleleadadministrator@master:~/ansible_playbooks$ systemctl status node_exporter
● node_exporter.service - Prometheus Node Exporter
   Loaded: loaded (/etc/systemd/system/node_exporter.service; enabled; preset: enabled)
     Active: active (running) since Tue 2025-04-01 21:33:10 UTC; 3min 8s ago
       Docs: https://prometheus.io/docs/instrumenting/exporters/
 Main PID: 237498 (node_exporter)
   Tasks: 5 (limit: 9365)
     Memory: 2.3M (peak: 2.6M)
        CPU: 15ms
      CGroup: /system.slice/node_exporter.service
              └─237498 /opt/node_exporter-1.3.1.linux-amd64/node_exporter
ansibleleadadministrator@master:~/ansible_playbooks$ 

```

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## 9. Grafana

- Grafana is a free and open source visualization tool mostly used with Prometheus to which monitor metrics.
- Grafana provides various dashboards, charts, graphs, alerts for the particular data source.
- Grafana allows us to query, visualize, explore metrics and set alerts for the data source which can be a system, server, nodes, cluster, etc.
- We can also create our own dynamic dashboard for visualization and monitoring.
- We can save the dashboard and can even share with our team members which is one of the main advantage of Grafana.

Now lets Install Grafana for wonderful dashboards and data visualization for monitoring systems, servers, services, etc. We can install grafana on Ubuntu either by downloading .deb package from Grafana Download page or using APT which is more easier.Add the Grafana GPG key in Ubuntu using wget

### *Install Grafana:*

```
#### Install Grafana ####
wget -q -O - https://packages.grafana.com/gpg.key | sudo apt-key add -

##Next, add the Grafana repository to your APT sources:
sudo add-apt-repository "deb https://packages.grafana.com/oss/deb stable main"

#Refresh your APT cache to update your package lists:
sudo apt update

#Install Grafana using the following command:
sudo apt install grafana

#Start the Grafana service and enable it to start on boot:
sudo systemctl start grafana-server

#Enable the Grafana service to start on boot:
```

```
No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@master:/tmp$ sudo systemctl start grafana-server
ubuntu@master:/tmp$ sudo systemctl enable grafana-server
sudo systemctl status grafana-server
Synchronizing state of grafana-server.service with SysV service script with /usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable grafana-server
Created symlink /etc/systemd/system/multi-user.target.wants/grafana-server.service → /usr/lib/systemd/system/grafana-server.service.

● grafana-server.service - Grafana instance
    Loaded: loaded (/usr/lib/systemd/system/grafana-server.service; enabled; preset: enabled)
    Active: active (running) since Mon 2025-03-31 22:20:11 UTC; 9s ago
      Docs: http://docs.grafana.org
        Main PID: 3370761 (grafana)
           Tasks: 18 (limit: 9365)
         Memory: 95.9M (peak: 96.6M)
            CPU: 5.312s
          CGroup: /system.slice/grafana-server.service
                  └─3370761 /usr/share/grafana/bin/grafana server --config=/etc/grafana/grafana.ini --pidfile=/run/grafana/grafana.pid

Mar 31 22:20:20 master.example.net grafana[3370761]: logger=grafana-apiserver t=2025-03-31T22:20:20.882392018Z level=info msg="Starting Grafana API server"
Mar 31 22:20:20 master.example.net grafana[3370761]: logger=grafana-apiserver t=2025-03-31T22:20:20.894257319Z level=info msg="Listening on port 3000"
Mar 31 22:20:20 master.example.net grafana[3370761]: logger=grafana-apiserver t=2025-03-31T22:20:20.904338367Z level=info msg="Starting Grafana background installer"
Mar 31 22:20:20 master.example.net grafana[3370761]: logger=grafana-apiserver t=2025-03-31T22:20:20.909217255Z level=info msg="Background installer started"
Mar 31 22:20:21 master.example.net grafana[3370761]: logger=uninstaller.fs t=2025-03-31T22:20:21.042640259Z level=info msg="Downloaded Grafana version 7.2.1"
Mar 31 22:20:21 master.example.net grafana[3370761]: logger=app-regISTRY t=2025-03-31T22:20:21.098617637Z level=info msg="App registration successful"
Mar 31 22:20:21 master.example.net grafana[3370761]: logger=plugins.registration t=2025-03-31T22:20:21.184855306Z level=info msg="Plugin registration successful"
Mar 31 22:20:21 master.example.net grafana[3370761]: logger=plugin.backgroundinstaller t=2025-03-31T22:20:21.185223242Z level=info msg="Background plugin installer started"
Mar 31 22:20:21 master.example.net grafana[3370761]: logger=plugin.backgroundinstaller t=2025-03-31T22:20:21.185336367Z level=info msg="Background plugin installer finished"
Mar 31 22:20:21 master.example.net grafana[3370761]: logger=plugin.installer t=2025-03-31T22:20:21.335558968Z level=info msg="Plugin installation successful"

ubuntu@master:/tmp$
```

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Grafana Dashboard open your favorite browser, type server IP or Name followed by grafana default port 3000.

### Create a Playbook to Install Grafana:

Nano grafana\_install.yml

```
name: Install Grafana on Ubuntu
hosts: all # Can be adjusted to specific groups like 'workers' or 'masters'
become: true
tasks:
  - name: Add Grafana APT repository
    apt_repository:
      repo: "deb https://packages.grafana.com/oss/deb stable main"
      state: present
      filename: "grafana"

  - name: Install Grafana package
    apt:
      name: grafana
      state: latest
      update_cache: yes

  - name: Enable and start Grafana service
    systemd:
      name: grafana-server
      state: started
      enabled: yes

  - name: Verify Grafana is running
    command: systemctl status grafana-server
    register: grafana_status
    failed_when: "'active (running)' not in grafana_status.stdout"
    changed_when: false
```

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```

^C [ERROR]: User interrupted execution
ansibleAdministrator@master:~/ansible_playbooks$ ansible-playbook -i inventory.ini grafana_install.yml

PLAY [Install Grafana on Ubuntu] ****
TASK [Gathering Facts] ****
ok: [worker2.example.net]
ok: [worker1.example.net]
ok: [master.example.net]
[WARNING]: Platform linux on host 16.171.37.119 is using the discovered Python interpreter at /usr/bin/python3.12, but future
installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-
core/2.17/reference_appendices/interpreter_discovery.html for more information.
ok: [16.171.37.119]

TASK [Add Grafana APT repository] ****
ok: [worker2.example.net]
ok: [master.example.net]
ok: [16.171.37.119]
ok: [worker1.example.net]

TASK [Install Grafana package] ****
ok: [16.171.37.119]
ok: [master.example.net]
changed: [worker2.example.net]
ok: [worker1.example.net]

TASK [Enable and start Grafana service] ****
ok: [master.example.net]
ok: [16.171.37.119]
changed: [worker1.example.net]
changed: [worker2.example.net]

TASK [Verify Grafana is running] ****

```

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**Check prometheus status on ansible :**

sudo systemctl status prometheus

```

ok: [master.example.net]
ok: [16.171.37.119]
ok: [worker2.example.net]
ok: [worker1.example.net]

PLAY RECAP ****
16.171.37.119 : ok=5    changed=0    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
master.example.net : ok=5    changed=0    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
worker1.example.net : ok=5    changed=1    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
worker2.example.net : ok=5    changed=2    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0

ansibleAdministrator@master:~/ansible_playbooks$ sudo systemctl status prometheus
● prometheus.service - Prometheus
   Loaded: loaded (/etc/systemd/system/prometheus.service; enabled; preset: enabled)
     Active: active (running) since Mon 2025-03-31 22:08:48 UTC; 23h ago
       Main PID: 3360897 (prometheus)
          Tasks: 9 (limit: 9365)
         Memory: 110.0M (peak: 127.7M)
            CPU: 1m1n 44.734s
           CGroup: /system.slice/prometheus.service
                   └─3360897 /usr/local/bin/prometheus --config.file /etc/prometheus/prometheus.yml --storage.tsdb.path /var/lib/pr

Apr 01 17:00:07 master.example.net prometheus[3360897]: ts=2025-04-01T17:00:07.390Z caller=compact.go:464 level=info component=prometheus
Apr 01 17:00:07 master.example.net prometheus[3360897]: ts=2025-04-01T17:00:07.396Z caller=db.go:1617 level=info component=tsdb
Apr 01 17:00:07 master.example.net prometheus[3360897]: ts=2025-04-01T17:00:07.400Z caller=db.go:1617 level=info component=tsdb
Apr 01 17:00:07 master.example.net prometheus[3360897]: ts=2025-04-01T17:00:07.403Z caller=db.go:1617 level=info component=tsdb
Apr 01 19:00:10 master.example.net prometheus[3360897]: ts=2025-04-01T19:00:10.192Z caller=compact.go:523 level=info component=compact
Apr 01 19:00:10 master.example.net prometheus[3360897]: ts=2025-04-01T19:00:10.197Z caller=head.go:1293 level=info component=compact
Apr 01 21:00:10 master.example.net prometheus[3360897]: ts=2025-04-01T21:00:10.187Z caller=compact.go:523 level=info component=compact
Apr 01 21:00:10 master.example.net prometheus[3360897]: ts=2025-04-01T21:00:10.203Z caller=head.go:1293 level=info component=compact
Apr 01 21:00:10 master.example.net prometheus[3360897]: ts=2025-04-01T21:00:10.204Z caller=checkpoint.go:100 level=info component=checkpoint
Apr 01 21:00:10 master.example.net prometheus[3360897]: ts=2025-04-01T21:00:10.332Z caller=head.go:1261 level=info component=compact

```

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```

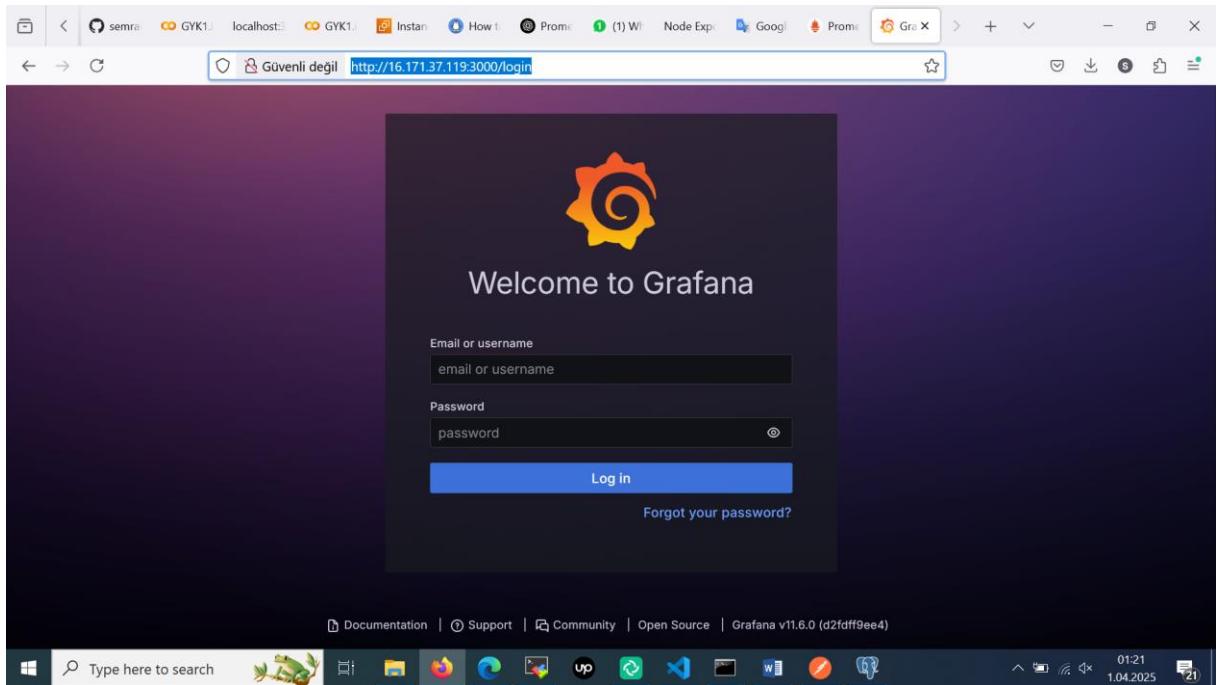
sudo ufw allow 3000/tcp
http://16.171.37.119:3000/login

```

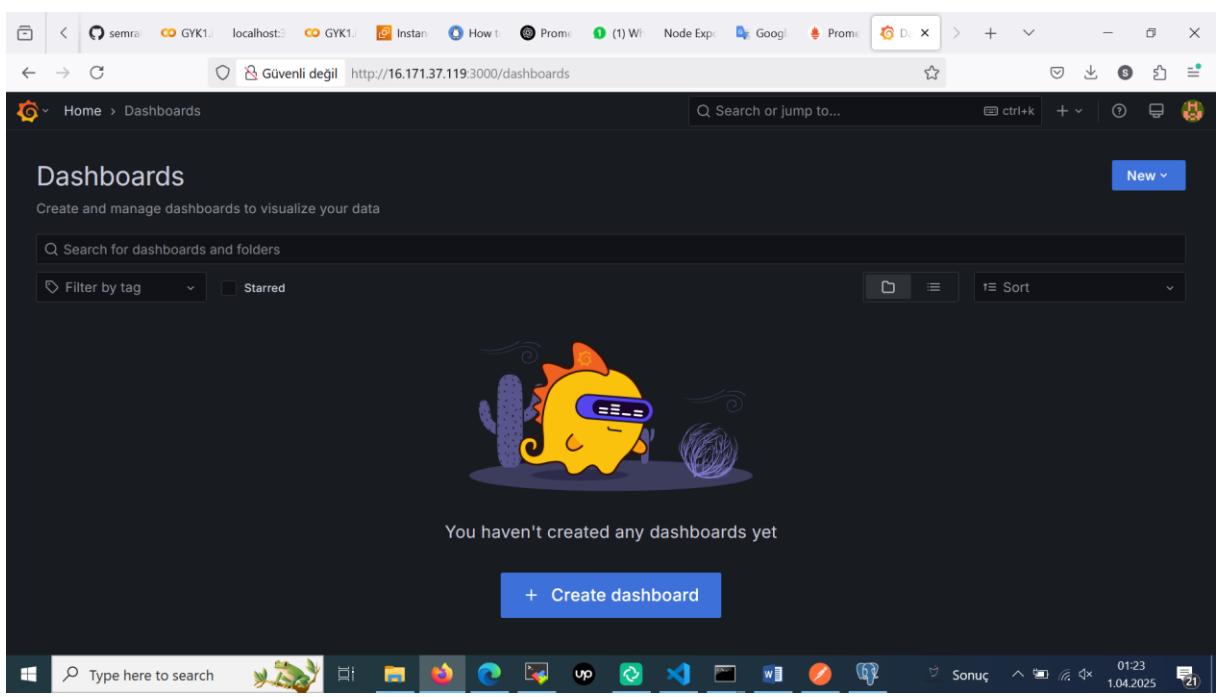
```

#Username - Admin
#Password - Admin

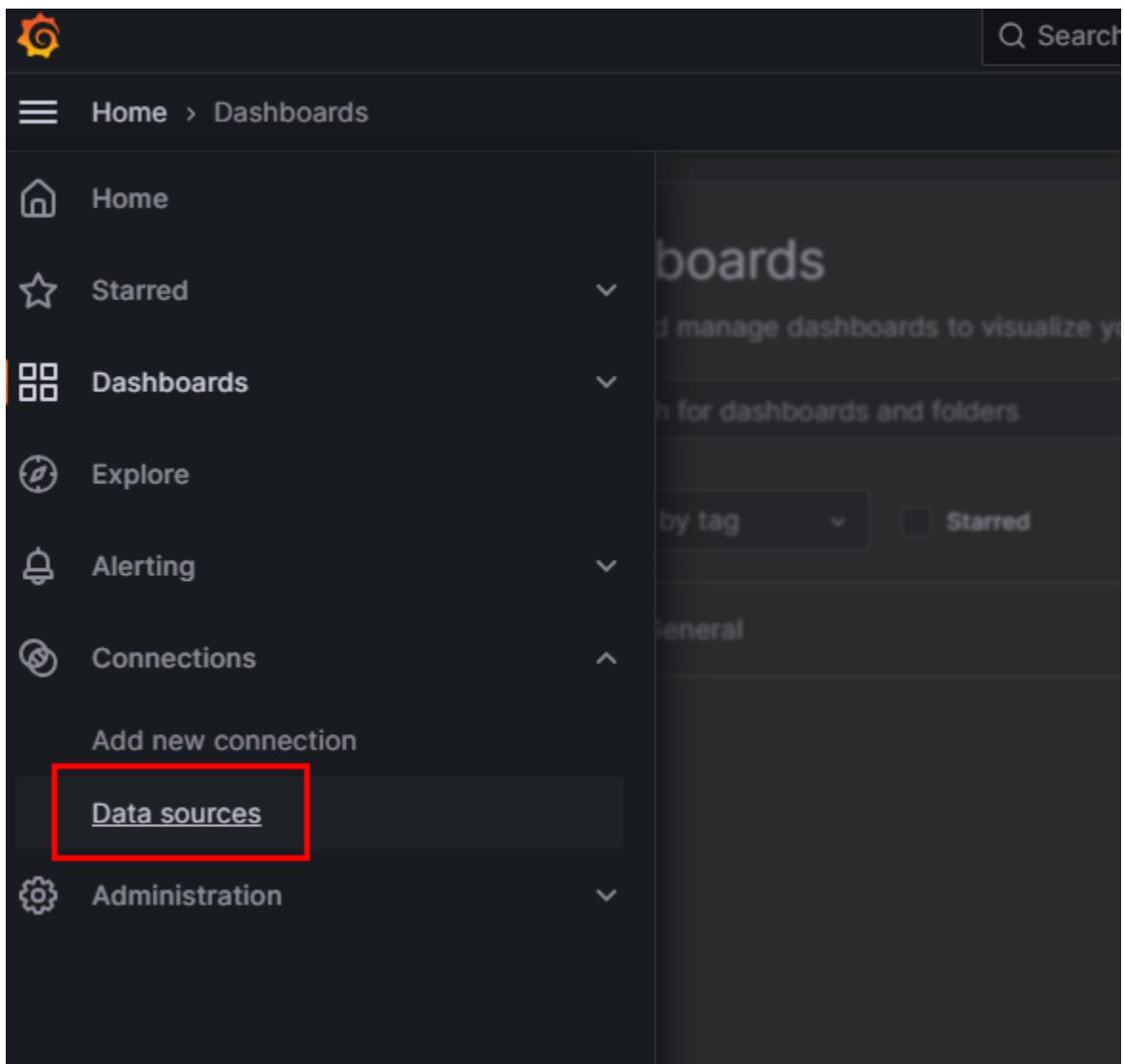
```



Now here you can see Home Dashboard page of Grafana



*Configure Prometheus as Grafana DataSource:*



Now lets click on **Add Data sources** and select **Prometheus**

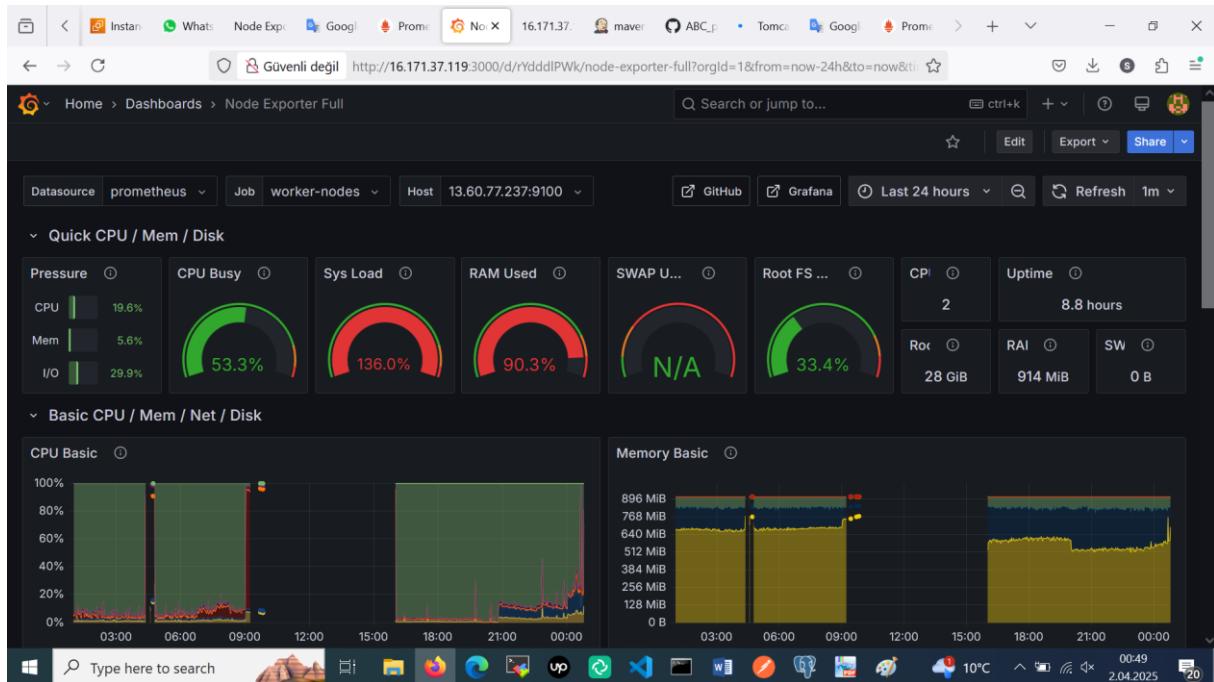
Now configure Prometheus data source by providing Prometheus URL

The screenshot shows the Grafana configuration interface for a Prometheus data source. At the top, there's a navigation bar with links like 'Home', 'Connections', 'Data sources', and 'prometheus'. Below it, a sub-navigation bar shows 'Configure your Prometheus data source below' and a note about skipping effort for managed data sources. A table row is selected with the name 'prometheus' and a 'Default' toggle switch. A message at the bottom says 'Before you can use the Prometheus data source, you must configure it below or in the config file. For detailed instructions, [view the documentation](#)'. A note below states 'Fields marked with \* are required'. The connection section is expanded, showing a field for 'Prometheus server URL' with the value 'http://16.171.37.119:9090/'. The browser's address bar shows 'Güvenli değil http://16.171.37.119:3000/connections/datasources/edit/dehjguhyybz0gb'. The taskbar at the bottom includes icons for File Explorer, Task View, Edge, and other system tools.

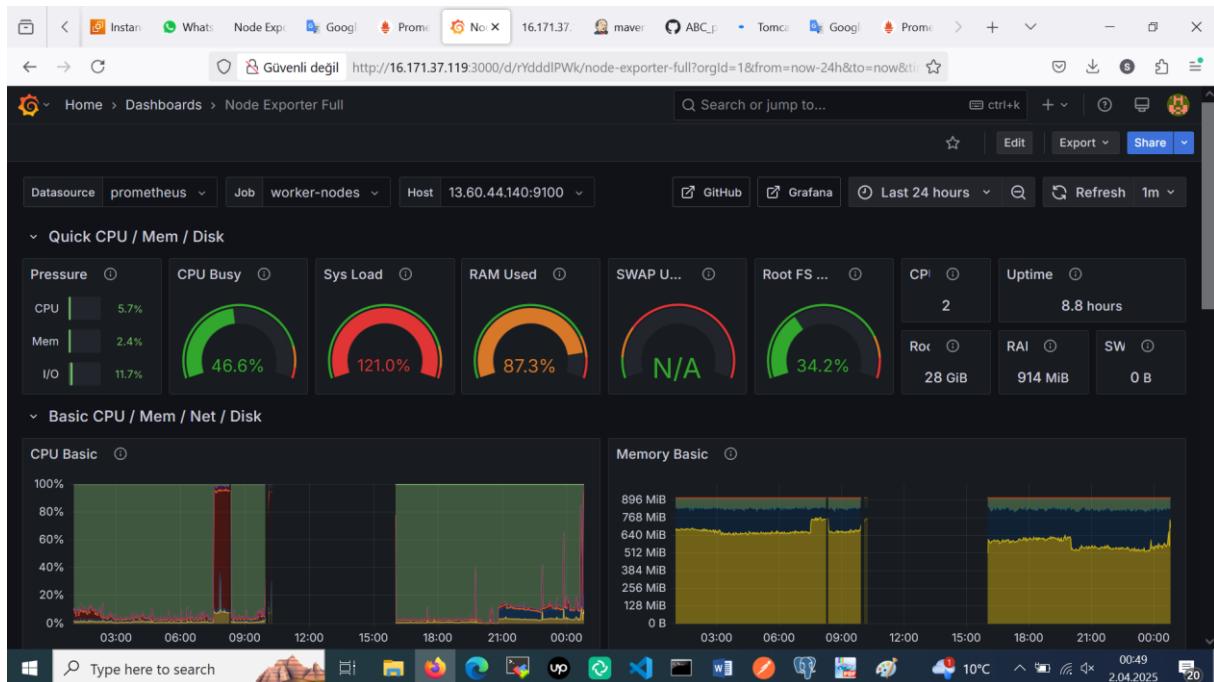
Now click on **Save & test** so it will prompt a message **Data Source is working**.

Now provide the Grafana.com Dashboard ID which is **1860** and click on **Load**

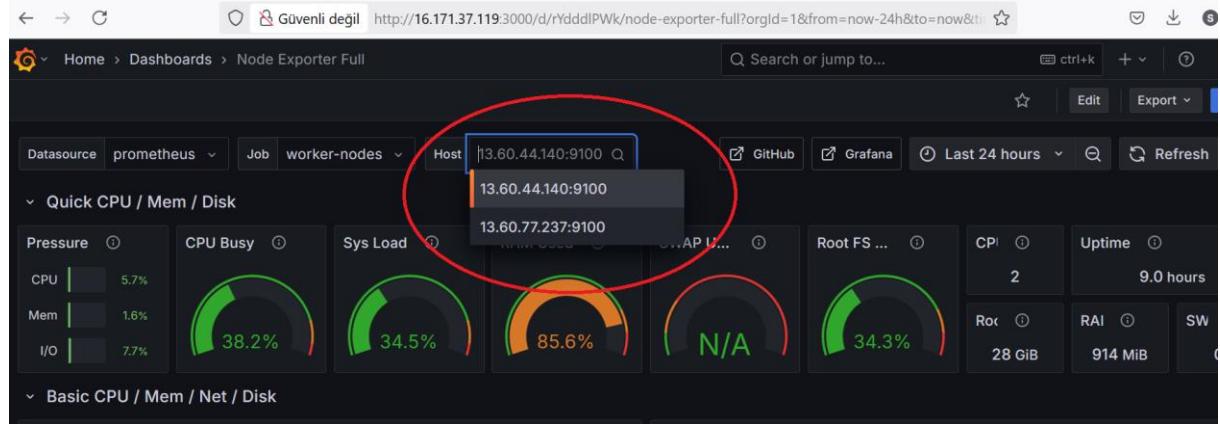
The screenshot shows the Grafana dashboard import interface. The title is 'Import dashboard'. It has a section for 'Upload dashboard JSON file' with a placeholder 'Drag and drop here or click to browse' and a note 'Accepted file types: .json, .txt'. Below this is a search bar with the text '1860' and a 'Load' button. A code editor window shows a JSON model for a dashboard panel. The browser's address bar shows 'Güvenli değil http://16.171.37.119:3000/dashboard/import'. The taskbar at the bottom includes icons for File Explorer, Task View, Edge, and other system tools.



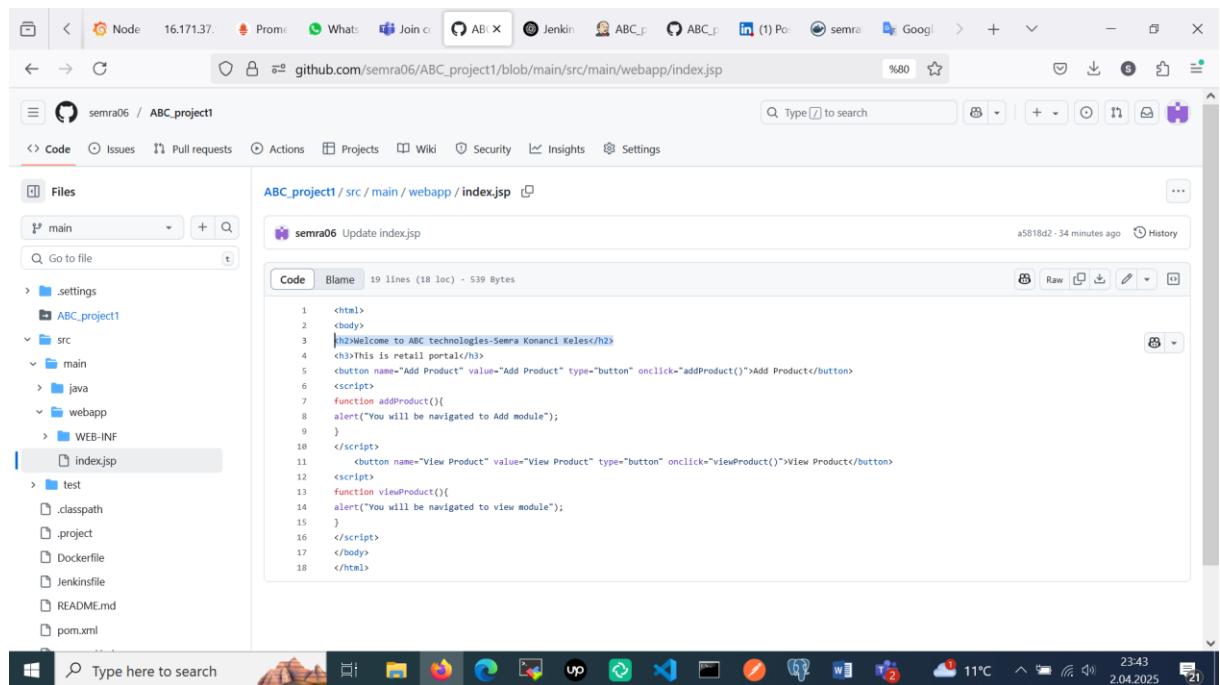
I changed host.



13.60.44.140 and 13.60.77.237 ip address belongs to worker nodes.



To prove that the CI/CD steps are automatic, I added my name to the code in github.



The screenshot shows the Jenkins dashboard. On the left, there's a sidebar with links for 'New Item', 'Build History' (selected), 'Manage Jenkins', and 'My Views'. Below this are two collapsed sections: 'Build Queue' (No builds in the queue) and 'Build Executor Status' (0 of 2 executors busy). The main area displays a table of recent builds:

S	W	Name	Last Success	Last Failure	Last Duration
✓	☀️	ABC_project_Compile	3 min 48 sec #35	N/A	5 sec
✓	☀️	ABC_project_Package	3 min 18 sec #55	N/A	7.7 sec
✓	☁️	ABC_project_Pipeline	6 min 48 sec #58	11 min #57	58 sec
✓	☀️	ABC_project_testing	3 min 33 sec #47	N/A	5.9 sec
✓	☀️	maven_project	1 day 7 hr #2	N/A	0.58 sec

A screenshot of a Windows taskbar. The search bar contains 'Type here to search'. Below it is a terminal window showing the command 'docker ps':

```
ansibleadmin@master:~/ansible_playbooks$ docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS
9e0823a0381b semra06/my-docker-image:58 "catalina.sh run" About a minute ago Up About a minute 0.0.0.0:8282->8080/tcp
p, :::8282->8080/tcp my-tomcat-58
ansibleadmin@master:~/ansible_playbooks$
```

Docker hub image changed as 58.

The screenshot shows the Docker Hub repository page for 'semra06/my-docker-image'. The 'General' tab is selected. On the left, there are sections for 'Notifications', 'Billing', 'Usage', 'Pulls', and 'Storage'. The main area shows the 'Tags' section with 18 tags listed:

Tag	OS	Type	Pulled	Pushed
latest		Image	less than 1 day	6 minutes
58		Image	less than 1 day	6 minutes
57		Image	less than 1 day	11 minutes
56		Image	less than 1 day	16 minutes
53		Image	less than 1 day	26 minutes

Below the table is a link 'See all'. To the right, there's a promotional box for 'buildcloud' with the text: 'Build with Docker Build Cloud. Accelerate image build times with access to cloud-based builders and shared cache. Docker Build Cloud executes builds on optimally-dimensioned cloud infrastructure with dedicated per-organization isolation. Get faster builds through shared caching across your team, native multi-platform support, and encrypted data transfer - all without managing infrastructure.' and a link 'Go to Docker Build Cloud →'.

Website restarted automatically:

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