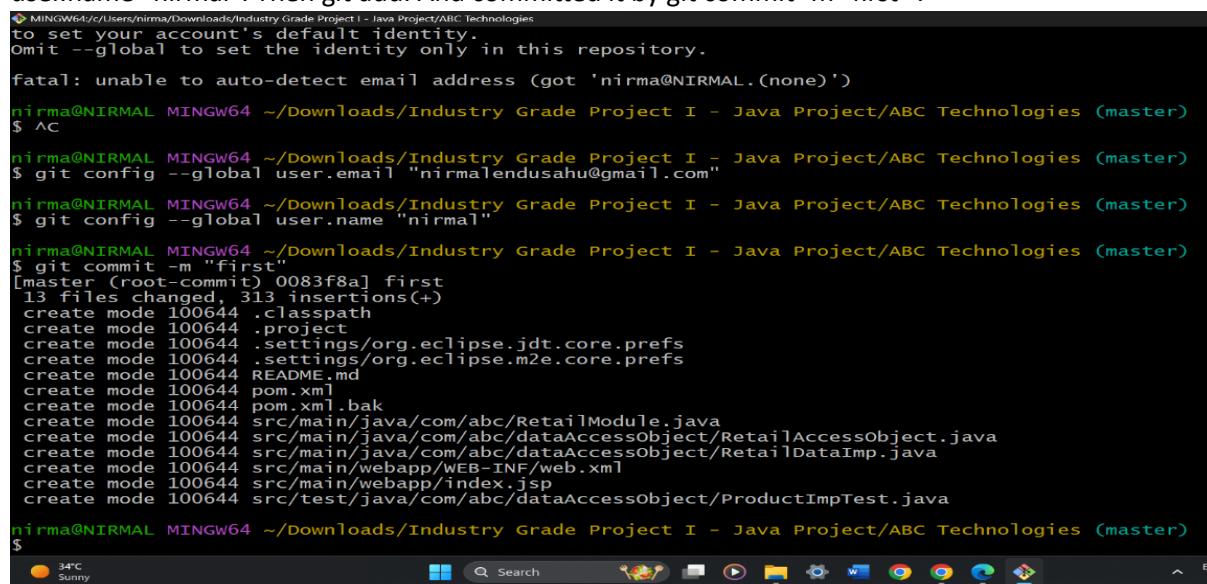


Detailed Solution Document

- **Task 1:** Clone the project from git hub link shared in resources to your local machine. Build the code using maven commands.

Step 1: Downloaded industry grade project-I from LMS to my laptop and extracted the zip file. I have previously installed git bash, java, maven in my local machine.

Step 2: Opened git bash inside the extracted folder and executed sudo yum update -y, git init. Set global config name & email by the command git config --global user.email "nirmalendusahu@gmail.com" & git config --global user.name "nirmal". Then git add. And committed it by git commit -m "first" .



```
MINGW64:/c/Users/nirma/Downloads/Industry Grade Project I - Java Project/ABC Technologies
to set your account's default identity.
Omit --global to set the identity only in this repository.

fatal: unable to auto-detect email address (got 'nirma@NIRMAL.(none)')

nirma@NIRMAL MINGW64 ~/Downloads/Industry Grade Project I - Java Project/ABC Technologies (master)
$ AC

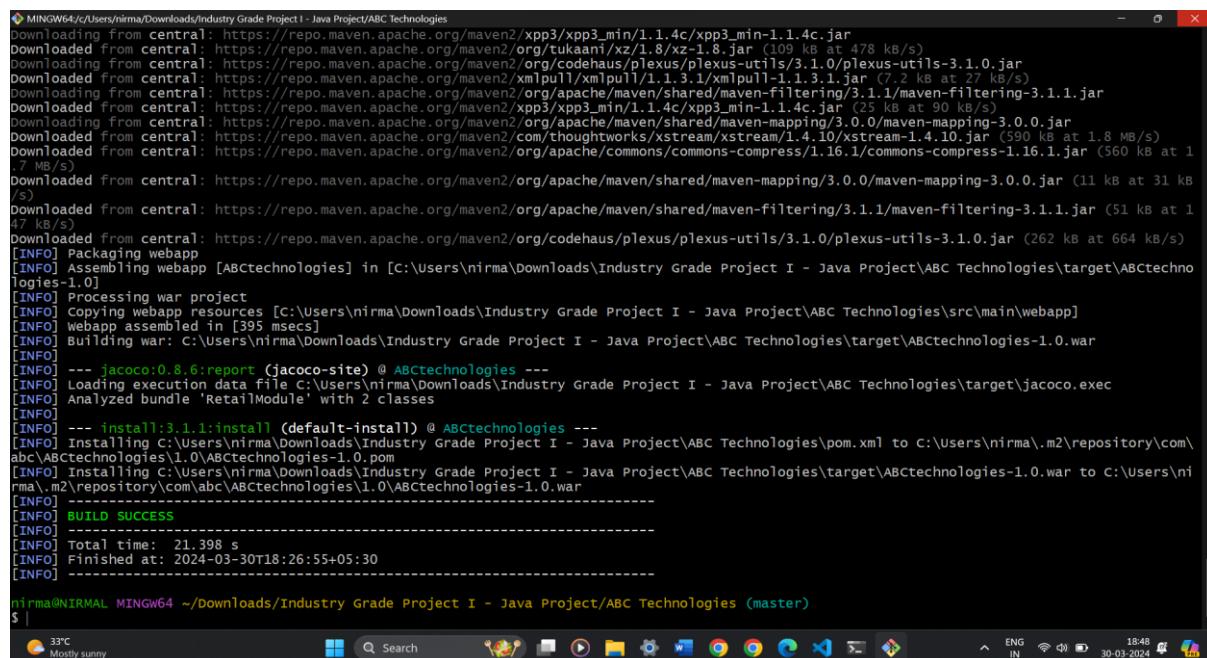
nirma@NIRMAL MINGW64 ~/Downloads/Industry Grade Project I - Java Project/ABC Technologies (master)
$ git config --global user.email "nirmalendusahu@gmail.com"

nirma@NIRMAL MINGW64 ~/Downloads/Industry Grade Project I - Java Project/ABC Technologies (master)
$ git config --global user.name "nirmal"

nirma@NIRMAL MINGW64 ~/Downloads/Industry Grade Project I - Java Project/ABC Technologies (master)
$ git commit -m "first"
[master (root-commit) 0083f8a] first
 13 files changed, 313 insertions(+)
 create mode 100644 .classpath
 create mode 100644 .project
 create mode 100644 .settings/org.eclipse.jdt.core.prefs
 create mode 100644 .settings/org.eclipse.m2e.core.prefs
 create mode 100644 README.md
 create mode 100644 pom.xml
 create mode 100644 pom.xml.bak
 create mode 100644 src/main/java/com/abc/RetailModule.java
 create mode 100644 src/main/java/com/abc/dataAccessObject/RetailAccessObject.java
 create mode 100644 src/main/java/com/abc/dataAccessObject/RetailDataImp.java
 create mode 100644 src/main/webapp/WEB-INF/web.xml
 create mode 100644 src/main/webapp/index.jsp
 create mode 100644 src/test/java/com/abc/dataAccessObject/ProductImpTest.java

nirma@NIRMAL MINGW64 ~/Downloads/Industry Grade Project I - Java Project/ABC Technologies (master)
$
```

Step 3: Then mvn compile, mvn test , mvn package the code file.



```
MINGW64:/c/Users/nirma/Downloads/Industry Grade Project I - Java Project/ABC Technologies
Downloading from central: https://repo.maven.apache.org/maven2/xpp3/xpp3_min/1.1.4c/xpp3_min-1.1.4c.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/tukaani/xz/1.8/xz-1.8.jar (109 kB at 478 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-utils/3.1.0/plexus-utils-3.1.0.jar
Downloaded from central: https://repo.maven.apache.org/maven2/xmlpull/xmlpull/1.1.3.1/xmlpull-1.1.3.1.jar (7.2 kB at 27 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/shared/maven-filtering/3.1.1/maven-filtering-3.1.1.jar
Downloaded from central: https://repo.maven.apache.org/maven2/xpp3/xpp3_min/1.1.4c/xpp3_min-1.1.4c.jar (25 kB at 90 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/shared/maven-mapping/3.0.0/maven-mapping-3.0.0.jar
Downloaded from central: https://repo.maven.apache.org/maven2/com/thoughtworks/xstream/xstream/1.4.10/xstream-1.4.10.jar (590 kB at 1.8 MB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/commons/commons-compress/1.16.1/commons-compress-1.16.1.jar (560 kB at 1.7 MB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/shared/maven-mapping/3.0.0/maven-mapping-3.0.0.jar (11 kB at 31 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/shared/maven-filtering/3.1.1/maven-filtering-3.1.1.jar (51 kB at 1.47 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-utils/3.1.0/plexus-utils-3.1.0.jar (262 kB at 664 kB/s)
[INFO] Packaging webapp
[INFO] Assembling webapp [ABCtechnologies] in [C:\Users\nirma\Downloads\Industry Grade Project I - Java Project\ABC Technologies\target\ABCtechnologies-1.0]
[INFO] Processing war project
[INFO] Copying webapp resources [C:\Users\nirma\Downloads\Industry Grade Project I - Java Project\ABC Technologies\src\main\webapp]
[INFO] Webapp assembled in [395 ms]
[INFO] Building war: C:\Users\nirma\Downloads\Industry Grade Project I - Java Project\ABC Technologies\target\ABCtechnologies-1.0.war
[INFO] 
[INFO] --- jacoco:0.8.6:report (jacoco-site) @ ABCtechnologies ---
[INFO] Loading execution data file C:\Users\nirma\Downloads\Industry Grade Project I - Java Project\ABC Technologies\target\jacoco.exec
[INFO] Analyzed bundle 'RetailModule' with 2 classes
[INFO] 
[INFO] --- install:3.1.1:install (default-install) @ ABCtechnologies ---
[INFO] Installing C:\Users\nirma\Downloads\Industry Grade Project I - Java Project\ABC Technologies\pom.xml to C:\Users\nirma\.m2\repository\com\abc\ABCtechnologies\1.0\ABCtechnologies-1.0.pom
[INFO] Installing C:\Users\nirma\Downloads\Industry Grade Project I - Java Project\ABC Technologies\target\ABCtechnologies-1.0.war to C:\Users\nirma\.m2\repository\com\abc\ABCtechnologies\1.0\ABCtechnologies-1.0.war
[INFO] 
[INFO] BUILD SUCCESS
[INFO] 
[INFO] Total time: 21.398 s
[INFO] Finished at: 2024-03-30T18:26:55+05:30
[INFO] 
```

- **Task 2:** Setup git repository and push the source code. Login to Jenkins 1. create a build pipeline containing a job each • One for compiling source code • Second for testing source code • Third for packing the code 2. Execute CICD pipeline to execute the jobs created in step1 3. Setup master-slave node to distribute the tasks in pipeline.

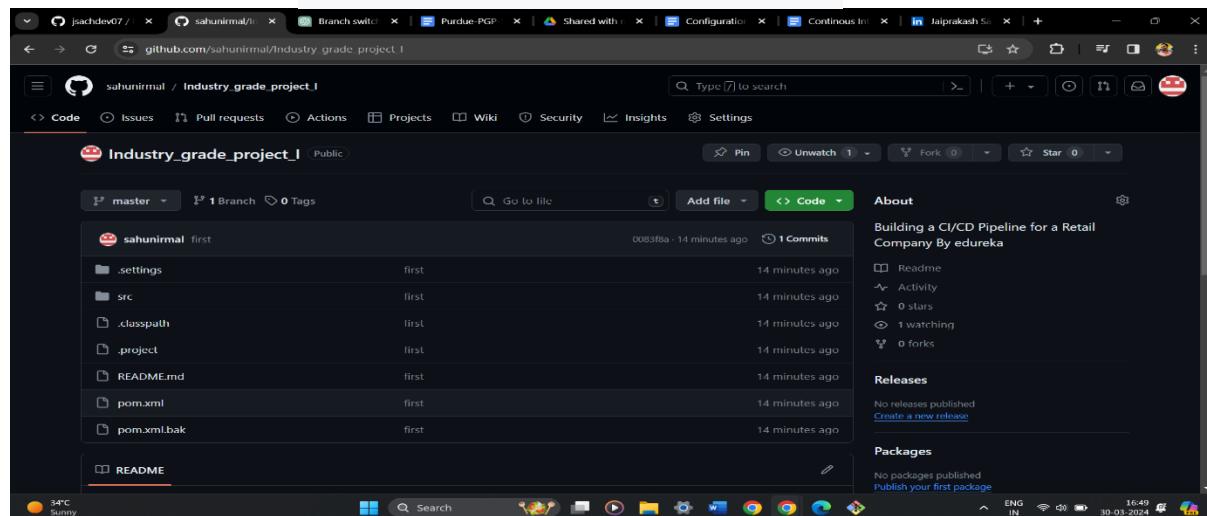
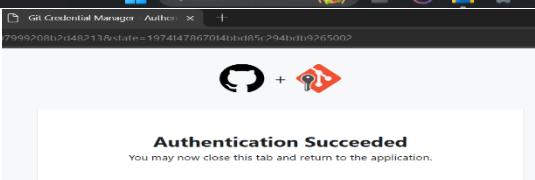
Step1: Created a repository named [sahunirmal/Industry_grade_project_I](https://github.com/sahunirmal/Industry_grade_project_I) in git hub account. I linked remote and local repo by command (git remote add origin https://github.com/sahunirmal/Industry_grade_project_I.git)

and authorised the pop up. Pushed local code files with package .war file to remote repo git push -u origin master .

```
nirma@NIRMAL MINGW64 ~/Downloads/Industry Grade Project I - Java Project/ABC Technologies (master)
$ git remote add origin "https://github.com/sahunirmal/Industry_grade_project_I.git"
nirma@NIRMAL MINGW64 ~/Downloads/Industry Grade Project I - Java Project/ABC Technologies (master)
$ git remote -v
origin  https://github.com/sahunirmal/Industry_grade_project_I.git (fetch)
origin  https://github.com/sahunirmal/Industry_grade_project_I.git (push)

nirma@NIRMAL MINGW64 ~/Downloads/Industry Grade Project I - Java Project/ABC Technologies (master)
$ git push origin master
Enumerating objects: 29, done.
Counting objects: 100% (29/29), done.
Delta compression using up to 12 threads
Compressing objects: 100% (20/20), done.
Writing objects: 100% (29/29), 4.43 KiB | 377.00 KiB/s, done.
Total 29 (delta 0), reused 0 (delta 0), pack-reused 0
To https://github.com/sahunirmal/Industry_grade_project_I.git
 * [new branch]      master -> master

nirma@NIRMAL MINGW64 ~/Downloads/Industry Grade Project I - Java Project/ABC Technologies (master)
$
```



Step 2: Created Vm EC2 instance on AWS. Created dir mkdir myproject.

installed git, java & Jenkins . commands used sudo amazon-linux-extras install java-openjdk11 -y
sudo wget -O /etc/yum.repos.d/jenkins.repo https://pkg.jenkins.io/redhat-stable/jenkins.repo

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

yum install jenkins -y

systemctl start jenkins

systemctl status jenkins.

Then log in to jenkins server by public ip:8080 and done initial set up.

Step 3: Pulled github repository git pull https://github.com/sahunirmal/Industry_grade_project_I.git.

Downloaded maven plugin in manage jenkins>>install pulgins>>maven .and set it up as mymaven. Created 4 jobs 1.compile , 2.code review, 3.Unit test, 4.package. invoked top level maven commands>>select maven version mymaven>> selected goal are compile, pmd:pmd, test and package respectively. It generated ABCtechnolgy.war file .

```
Progress (2): 229/334 kB | 212/267 kB
Progress (2): 229/334 kB | 229/267 kB
Progress (2): 229/334 kB | 245/267 kB
Progress (2): 229/334 kB | 262/267 kB
Progress (2): 229/334 kB | 267 kB
Progress (2): 245/334 kB | 267 kB
Progress (2): 262/334 kB | 267 kB
Progress (2): 278/334 kB | 267 kB
Progress (2): 294/334 kB | 267 kB
Progress (2): 311/334 kB | 267 kB
Progress (2): 327/334 kB | 267 kB
Progress (2): 334 kB | 267 kB

Downloaded from central: https://repo.maven.apache.org/maven2/com/thoughtworks/qdox/qdox/2.0.3/qdox-2.0.3.jar (334 kB at 4.5 MB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-utils/3.5.0/plexus-utils-3.5.0.jar (267 kB at 4.1 MB/s)
[INFO] Changes detected - recompiling the module! input tree
[INFO] Compiling 3 source files with javac [debug target 1.8] to target/classes
[WARNING] bootstrap class path not set in conjunction with -source 8
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 9.220 s
[INFO] Finished at: 2024-04-01T06:46:53Z
[INFO] -----
Finished: SUCCESS
```

A screenshot of a Microsoft Edge browser window. The address bar shows a Jenkins job URL: "sahunirmal/Industry_grade_p...". The tabs include "Continuous Integration with Jenkins", "PMD Warnings [Jenkins]", and "EC2 Instance Connect | us-east-1". The main content area displays Jenkins status icons (green for success, yellow for warning, red for failure) and a summary of build results. A search bar at the top right contains the text "Search (CTRL+K)". The system tray shows the date as "01-04-2024" and the time as "12:19".

Dashboard > 2.codereview > #3 > PMD Warnings

Status Changes Console Output Edit Build Information Delete build '#3' Git Build Data PMD Warnings Previous Build

PMD Warnings

Overview

High Normal Low

History

Normal

A screenshot of a Windows taskbar at the bottom of a screen. It shows several open browser tabs in the center, including 'Continuous Integration with Jenkins', '3.unittest #1 Console [Jenkins]', and 'EC2 Instance Connect | us-east-1'. On the left, there's a 'Current temp' icon with 'Near record' text. On the right, there are icons for battery (ENG IN), signal strength, and the date/time (02-04-2024). The taskbar has a light blue background.

Dashboard > 3.unittest > #1 > Console Output

```
Progress (1): 18 KB

Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/surefire/common-java5/3.2.2/common-java5-3.2.2.jar
(18 KB at 798 KB/s)
[INFO]
[INFO] -----
[INFO] T E S T S
[INFO] -----
[INFO] Running com.abc.dataAccessObject.ProductImpTest
[INFO] Tests run: 4, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.167 s -- in com.abc.dataAccessObject.ProductImpTest
[INFO]
[INFO] Results:
[INFO]
[INFO] Tests run: 4, Failures: 0, Errors: 0, Skipped: 0
[INFO]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 10.535 s
[INFO] Finished at: 2024-04-02T12:26:50Z
[INFO] -----
Finished: SUCCESS
```

RGB - LSG In 2 hours Search Jenkins 2.440.2 REST API 17:57 ENG IN 02 04 2024

The screenshot shows the Jenkins interface for the '3.unittest' job. On the left, there's a sidebar with options like Status, Changes, Workspace, Build Now, Configure, Delete Project, and Rename. The main area displays the 'Latest Test Result' (no failures) and 'Upstream Projects' (2.codereview). A 'Test Result Trend' chart shows data for build #2: 4 Passed, 0 Skipped, and 0 Failed. Below this is a 'Permalinks' section with links to the last four builds. A 'Build History' panel on the left lists builds #2 and #1 with their respective dates. The bottom part of the dashboard shows the Jenkins logo, search bar, and various system icons.

This screenshot shows the Jenkins console output for the '4.package' job. It displays a log of Maven build steps, including packaging, assembling, and executing Jacoco reports. The log concludes with a 'BUILD SUCCESS' message and a total execution time of 12.720 seconds. The Jenkins logo, search bar, and system icons are visible at the top.

Step 4: Setup master-slave node to distribute the tasks in pipeline. For this created an another ec2 vm named linux_slave . Installed git, java in it. Created a directory and give read/write/execute access to it. \$ cd /tmp , \$ mkdir jenkinsdir , \$ chmod -R 777 /tmp/jenkinsdir. From Manage Jenkins >Manage nodes >Click on + New node >Gave node name: linux_slave>Select Permanent Agent>Click on create.

Done settings as follows >

Number of executors: 1

Remote root directory: /tmp/jenkinsdir

Labels : linux_slave

Usage : select second option from dropdown

Launch method: launch agents via SSH

Host: private IP of agent node

Credentials: clicked on Add button > clicked on jenkins

Select Kind : SSH username and private key

username: ec2-user

Private key: opened *.pem file copied as text and pasted in jenkins > under private key.

Now select the newly created credentials from the drop down.

Host Key Verification Strategy → select the 4th option->Non verifying Verification Strategy. Saved the node details. On the dashboard the node is now connected to master

The screenshot shows the Jenkins 'Nodes' page. On the left, there are sections for 'Build Queue' (empty) and 'Build Executor Status' (one 'Built-In Node' is idle). The main area displays a table of nodes:

S	Name	Architecture	Clock Difference	Free Disk Space	Free Swap Space	Free Temp Space	Response Time
	Built-In Node	Linux (amd64)	In sync	5.15 GiB	0 B	5.15 GiB	0ms
	linux_slave		N/A	N/A	N/A	N/A	N/A

Icons for sorting by name, model, and last activity are at the bottom of the table.

The screenshot shows the Jenkins interface with the title 'Jenkins 2.440.2'. It includes a 'REST API' link and a status bar showing 'ENG IN' and the date '02-04-2024'.

Step 5: Distributed 1.compile and 3. Unittest jobs linux_slave node for execution.

The screenshot shows the Jenkins 'Console Output' for build '#2' of the '1.compile' job. The output shows the build starting on the 'linux_slave' node and cloning the 'industry_grade_project_1' repository from GitHub.

```

Started by user unknown or anonymous
Running on SYSTEM
Building remotely on linux_slave in workspace /tmp/jenkinsdir/workspace/1.compile
The recommended git tool is: NONE
No credentials specified
Cloning the remote Git repository
Cloning repository https://github.com/sahunirmal/Industry_grade_project_1.git
> git init /tmp/jenkinsdir/workspace/1.compile # timeout=10
Fetching upstream changes from https://github.com/sahunirmal/Industry_grade_project_1.git
+refs/heads/*:refs/remotes/origin/* # timeout=10
> git fetch --tags --force --progress -- https://github.com/sahunirmal/Industry_grade_project_1.git
+refs/heads/*:refs/remotes/origin/* # timeout=10
> git config remote.origin.url https://github.com/sahunirmal/Industry_grade_project_1.git # timeout=10
> git config --add remote.origin.fetch +refs/heads/*:refs/remotes/origin/* # timeout=10
> git config --add remote.origin.fetch +refs/heads/*:refs/remotes/origin/* # timeout=10
Avoid second fetch
> git rev-parse refs/remotes/origin/master^{commit} # timeout=10
Checking out Revision 815afchd102415efacf720a56e5485dfa064e87 (refs/remotes/origin/master)
> git config core.sparsecheckout # timeout=10
> git checkout -f 815afchd102415efacf720a56e5485dfa064e87 # timeout=10

```

The status bar shows '20:28 02-04-2024'.

The screenshot shows the Jenkins 'Console Output' for build '#4' of the '3.unittest' job. The output shows the build starting on the 'linux_slave' node and cloning the 'industry_grade_project_1' repository from GitHub.

```

Started by upstream project ".codereview" build number 5
originally caused by:
Started by upstream project "1.compile" build number 3
originally caused by:
Started by user unknown or anonymous
Running as SYSTEM
Building remotely on linux_slave in workspace /tmp/jenkinsdir/workspace/3.unittest
The recommended git tool is: NONE
No credentials specified
Cloning the remote Git repository
Cloning repository https://github.com/sahunirmal/Industry_grade_project_1.git
> git init /tmp/jenkinsdir/workspace/3.unittest # timeout=10
Fetching upstream changes from https://github.com/sahunirmal/Industry_grade_project_1.git
+refs/heads/*:refs/remotes/origin/* # timeout=10
> git fetch --tags --force --progress -- https://github.com/sahunirmal/Industry_grade_project_1.git
+refs/heads/*:refs/remotes/origin/* # timeout=10
> git config remote.origin.url https://github.com/sahunirmal/Industry_grade_project_1.git # timeout=10
> git config --add remote.origin.fetch +refs/heads/*:refs/remotes/origin/* # timeout=10
> git config --add remote.origin.fetch +refs/heads/*:refs/remotes/origin/* # timeout=10
Avoid second fetch

```

The status bar shows '20:37 02-04-2024'.

Step 6 : Connected all 4 jobs as pipeline and pushed the package.war file to github.

S	Build	Time Since 1	Status
4.package #3	1 min 45 sec	stable	View
3.unittest #4	2 min 10 sec	stable	View
2.codereview #5	2 min 30 sec	stable	View
1.compile #3	2 min 47 sec	stable	View
4.package #2	6 min 45 sec	stable	View
3.unittest #3	7 min 5 sec	stable	View
2.codereview #4	7 min 25 sec	stable	View
1.compile #2	7 min 53 sec	stable	View

Task 3: Write a Dockerfile Create an Image and container on docker host. Integrate docker host with Jenkins. Create CI/CD job on Jenkins to build and deploy on a container 1. Enhance the package job created in step 1 of task 2 to create a docker image 2. In the docker image add code to move the war file to tomcat server and build the image.

Step 1: Downloaded docker by and configured with docker hub by providing username and access token. Created a Dockerfile in the same directory where ABCtechnology-01.war file is present . Command used :

- yum install docker -y
- docker login -u nirmalendusahu and gave access token
- vim Dockerfile >> FROM tomcat:latest

```
ADD ABCtechnology-1.0.war /usr/local/tomcat/webapps
EXPOSE 8080
CMD ["catalina.sh", "run"]
```

- systemctl start docker

```
[root@ip-172-31-0-17 target]# pwd
/root/myproject/target
[root@ip-172-31-0-17 target]# ls
ABCtechnology-1.0 ABCtechnology-1.0.war classes Dockerfile jacoco.exec maven-archiver maven-status site surefire-reports test-classes
[root@ip-172-31-0-17 target]# cat Dockerfile
FROM tomcat:9.0.73-jdk8-corretto-al2
ADD . /usr/local/tomcat/webapps
[root@ip-172-31-0-17 target]#
```

Step 2: I build the image and run docker image to create container and push it to my private docker hub.

Command used :

- docker build -t industryapp .
- docker images # to check the image created.
- docker run -d -p 8989:8080 --name industryapp industryapp
- docker ps -a # to check the container created.

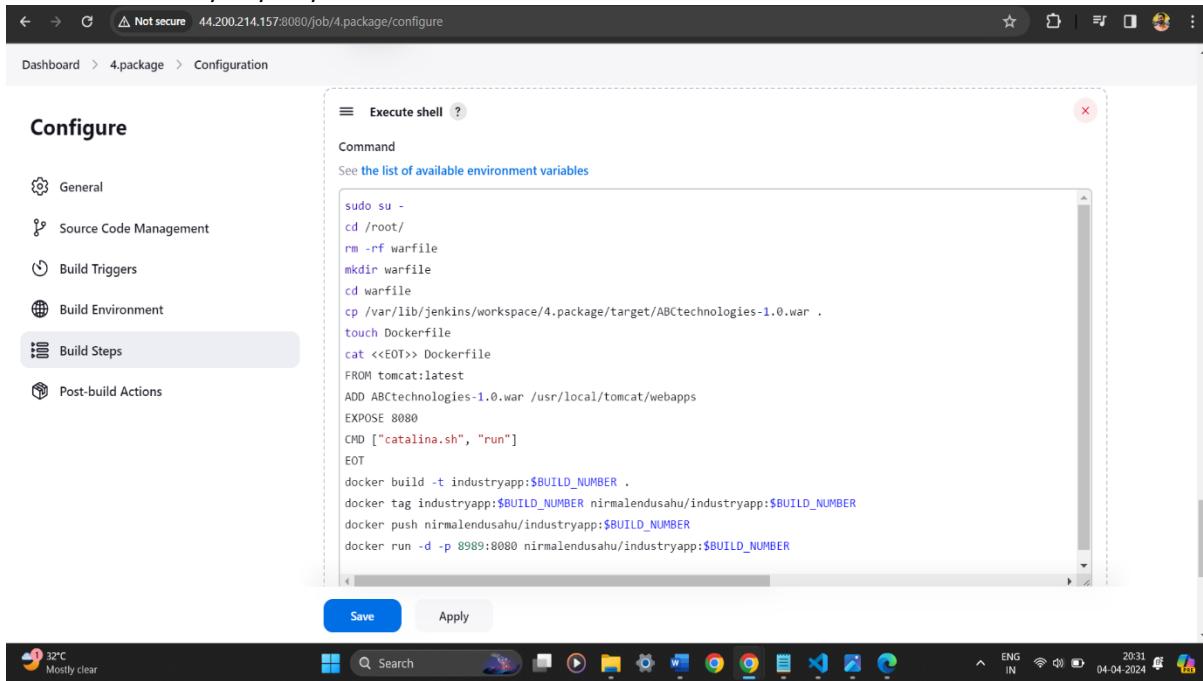
```
[root@ip-172-31-0-17 target]# docker build -t industryapp .
Sending build context to Docker daemon 15.4MB
Step 1/4 : FROM tomcat:9.0.73-jdk8-corretto-al2
--> 5b5414c0bbbb
Step 2/4 : COPY /root/myproject/target/ABCtechnologies-1.0.war /usr/local/tomcat/webapps
COPY failed: file not found in build context or excluded by .dockerignore: stat root/myproject/target/ABCtechnologies-1.0.war: file does not exist
[root@ip-172-31-0-17 target]# docker images
REPOSITORY TAG IMAGE ID CREATED SIZE
tomcat 9.0.73-jdk8-corretto-al2 5b5414c0bbbb 12 months ago 382MB
[root@ip-172-31-0-17 target]# vim Dockerfile
[root@ip-172-31-0-17 target]# docker build -t industryapp .
Sending build context to Docker daemon 15.4MB
Step 1/4 : FROM tomcat:9.0.73-jdk8-corretto-al2
--> 5b5414c0bbbb
Step 2/4 : ADD . /usr/local/tomcat/webapps
--> 57ccb66b880
Step 3/4 : EXPOSE 8080
--> Running in 7a86070bc6ab
Removing intermediate container 7a86070bc6ab
--> 2d387262fc92
Step 4/4 : CMD ["catalina.sh", "run"]
--> Running in aad02c5f400c
Removing intermediate container aad02c5f400c
--> b5277655089
Successfully built bf5277655089
Successfully tagged industryapp:latest
[root@ip-172-31-0-17 target]#
```

i-0797117e8ae31ee60 (Industry_grade_project_1)

PublicIPs: 18.209.229.37 PrivateIPs: 172.31.0.17

Step 3 : To Enhance the Package Job to Create Docker File and Build Docker Image: I configured job 4.package in build step wrote shell command which will be executed after build as provided in below image. To add the Jenkins user to the **docker** group and set appropriate permissions, I used the following commands as Jenkins user is **jenkins** :

- sudo usermod -aG docker jenkins
- sudo chown root:docker /var/run/docker.sock
- sudo chmod 660 /var/run/docker.sock



Step 4: I build the job 1.Compile which triggered whole pipeline one by one. As mentioned below image my build was successful. And it executed shell command which build image ,run the container ,pushed it to my private dockerhub . it can be access through internet by giving instance's public ip:8989/ABCTechnologies-1.0

#war file package name. Screenshots attached serially.

The screenshot shows the Jenkins interface for a build named '4.package' under job #15. The 'Console Output' tab is selected. The log output is as follows:

```
Started by upstream project "3.unittest" build number 5
originally caused by:
Started by user unknown or anonymous
Running as SYSTEM
Building in workspace /var/lib/jenkins/workspace/4.package
The recommended git tool is: NONE
No credentials specified
> git rev-parse --resolve-git-dir /var/lib/jenkins/workspace/4.package/.git # timeout=10
Fetching changes from the remote Git repository
> git config remote.origin.url https://github.com/sahunirmal/Industry_grade_project_I.git # timeout=10
Fetching upstream changes from https://github.com/sahunirmal/Industry_grade_project_I.git
> git --version # timeout=10
> git --version # git version 2.40.1'
> git fetch --tags --force --progress -- https://github.com/sahunirmal/Industry_grade_project_I.git
+refs/heads/*:refs/remotes/origin/* # timeout=10
> git rev-parse refs/remotes/origin/master^{commit} # timeout=10
Checking out Revision 815afcb1102415ef4cf720a56c5485dfa064e87 (refs/remotes/origin/master)
> git config core.sparsecheckout # timeout=10
> git checkout -f 815afcb1102415ef4cf720a56c5485dfa064e87 # timeout=10
Commit message: "second"
```

The status bar at the bottom indicates it's 32°C and mostly clear. The system tray shows ENG IN, 20:28, and the date 04-04-2024.

The screenshot shows the Jenkins interface for a build named '4.package' under job #15. The 'Console Output' tab is selected. The log output is as follows:

```
[INFO]
[INFO] --- jacoco:0.8.6:report (jacoco-site) @ ABCTechnologies ---
[INFO] Loading execution data file /var/lib/jenkins/workspace/4.package/target/jacoco.exec
[INFO] Analyzed bundle 'RetailModule' with 2 classes
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 9.008 s
[INFO] Finished at: 2024-04-04T14:55:04Z
[INFO] -----
[4.package] $ /bin/sh -xe /tmp/jenkins5169947899914962454.sh
+ sudo su -
Last login: Thu Apr 4 14:52:37 UTC 2024 on pts/0
+ cd /root/
+ rm -rf warfile
+ mkdir warfile
+ cd warfile
+ cp /var/lib/jenkins/workspace/4.package/target/ABCtechnologies-1.0.war .
+ touch Dockerfile
+ cat
+ docker build -t industryapp:15 .
Sending build context to Docker daemon 7.136MB

Step 1/4 : FROM tomcat:latest
latest: Pulling from library/tomcat
23828d760c7b: Pulling fs layer
dfcd9da6855e: Pulling fs layer
3026e8edc115: Pulling fs layer
```

The status bar at the bottom indicates it's 32°C and mostly clear. The system tray shows ENG IN, 20:28, and the date 04-04-2024.

The screenshot shows the Jenkins interface for a build named '4.package' under job #15. The 'Console Output' tab is selected. The log output is as follows:

```
c04/v04ecj80: Pull complete
6789efeb2b2c4: Pull complete
4a8163fa748d: Pull complete
bfad39da6ecc: Pull complete
edadd12eb936: Pull complete
Digest: sha256:0c6f42391c80066ce4ebf635726ace10biccd22861683a57c40791ce129d4cb4
Status: Downloaded newer image for tomcat:latest
--> 0e4bc5c3e311
Step 2/4 : ADD ABCTechnologies-1.0.war /usr/local/tomcat/webapps
--> 461514ab8431a
Step 3/4 : EXPOSE 8080
--> Running in 5c9b9e1185a8
Removing intermediate container 5c9b9e1185a8
--> ac0a76e94265
Step 4/4 : CMD ["catalina.sh", "run"]
--> Running in 74b9bfb7f1e7
Removing intermediate container 74b9bfb7f1e7
--> b63c1e48d587
Successfully built b63c1e48d587
Successfully tagged industryapp:15
+ docker tag industryapp:15 nirmalendusahu/industryapp:15
+ docker push nirmalendusahu/industryapp:15
The push refers to repository [docker.io/nirmalendusahu/industryapp]
b173b56106a7: Preparing
51bd5a7a934d: Preparing
4254913ef896: Preparing
02a9687e95e: Preparing
3e75af8aba85: Preparing
```

The status bar at the bottom indicates it's 32°C and mostly clear. The system tray shows ENG IN, 20:29, and the date 04-04-2024.

Dashboard > 4.package > #14 > Console Output

```
3e/5arsabaa85: Preparing
c2ef3e72aded: Preparing
d5a8ba54b65: Preparing
17031737aa00: Preparing
5498e8c22f69: Preparing
c2ef3e72aded: Waiting
d5a8ba54b65: Waiting
17031737aa00: Waiting
5498e8c22f69: Waiting
3e75af8aba85: Layer already exists
4254913ef896: Layer already exists
02a99687e95e: Layer already exists
51bd5a7a934d: Layer already exists
c2ef3e72aded: Layer already exists
d5a8ba54b65: Layer already exists
17031737aa00: Layer already exists
5498e8c22f69: Layer already exists
ce6fb6469020: Pushed
14: digest: sha256:f8a045398ca41edc1617bd293314a12f0d82a426c9a1758206c7eb66e43eac88 size: 2206
+ docker run -d -p 8989:8080 nirmalendusahu/industryapp:14
52bbb3433ed22a62211a94eabe5536cd648caaecf5c5c1f684f66ecdf389101
Finished: SUCCESS
```



hub.docker.com/repositories/nirmalendusahu

nirmalendusahu / industryapp
Contains: Image • Last pushed: 6 minutes ago

Search Docker Hub

Create repository



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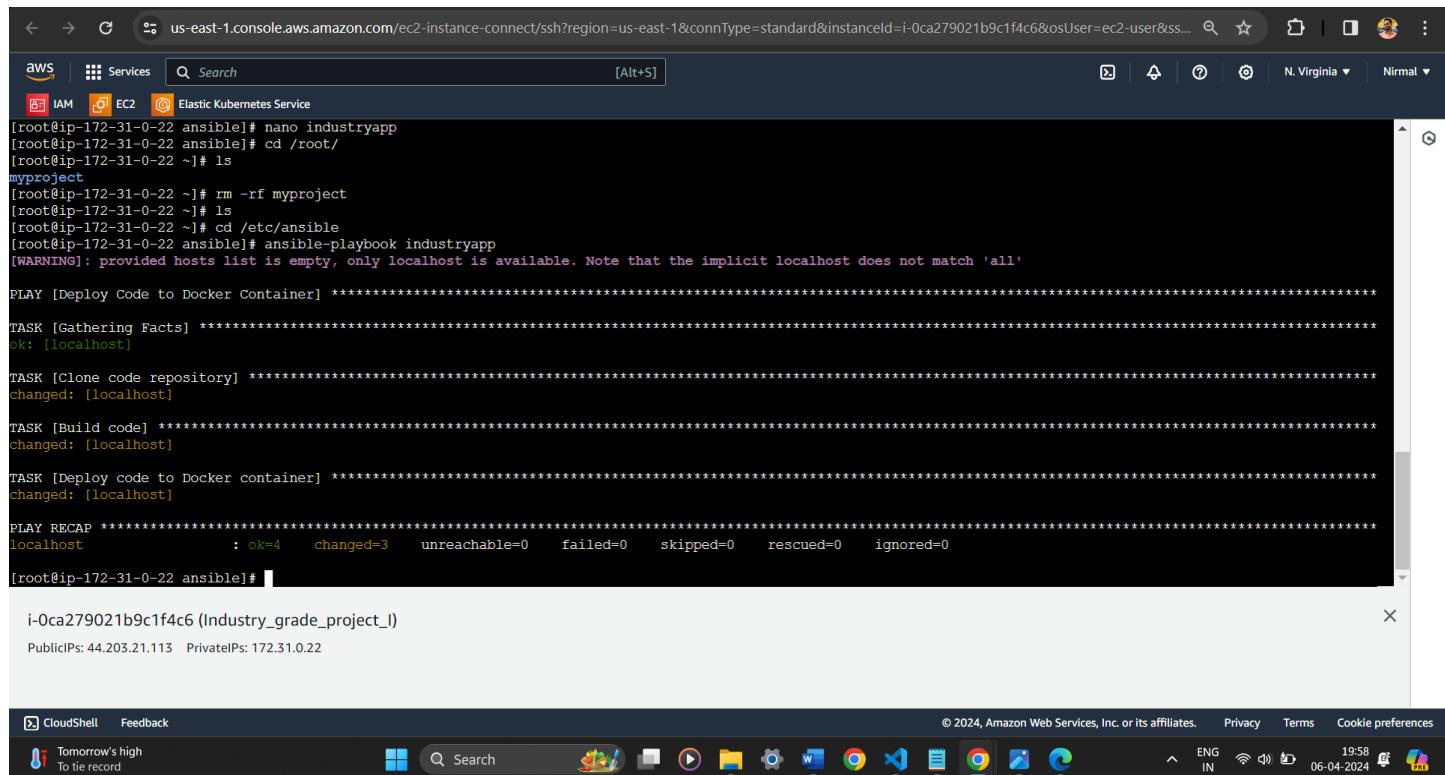
https://hub.docker.com/repositories/nirmalendusahu



Task 4: Integrate Docker host with Ansible. Write ansible playbook to create Image and create continuer.
Integrate Ansible with Jenkins. Deploy ansible-playbook. CI/CD job to build code on ansible and deploy it on docker container 1. Deploy Artifacts on Kubernetes 2. Write pod, service, and deployment manifest file 3. Integrate Kubernetes with ansible 4. Ansible playbook to create deployment and service.

Step 1: For this I downloaded ansible on my EC2 and wrote ansible playbook as below in /etc/ansible and run manually on local to test :-

```
---
- name: Deploy Code to Docker Container
  hosts: localhost
  tasks:
    - name: Clone code repository
      git:
        repo: https://github.com/sahunirmal/Industry_grade_project_I.git
        dest: /tmp/industryapp
        version: master
    - name: Build code
      shell: |
        cd /tmp/industryapp
        mvn clean package
    - name: Deploy code to Docker container
      docker_container:
        name: mycontainer
        image: nirmalendusahu/industryapp:15
        state: started
        volumes:
          - /tmp/industryapp:/app
        ports:
          - "8989:8080"
```



```
[root@ip-172-31-0-22 ansible]# nano industryapp
[root@ip-172-31-0-22 ansible]# cd /root
[root@ip-172-31-0-22 ~]# ls
myproject
[root@ip-172-31-0-22 ~]# rm -rf myproject
[root@ip-172-31-0-22 ~]# ls
[root@ip-172-31-0-22 ~]# cd /etc/ansible
[root@ip-172-31-0-22 ansible]# ansible-playbook industryapp
[WARNING]: provided hosts list is empty, only localhost is available. Note that the implicit localhost does not match 'all'

PLAY [Deploy Code to Docker Container] ****
TASK [Gathering Facts] ****
ok: [localhost]
TASK [Clone code repository] ****
changed: [localhost]
TASK [Build code] ****
changed: [localhost]
TASK [Deploy code to Docker container] ****
changed: [localhost]

PLAY RECAP ****
localhost : ok=4    changed=3    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0

[root@ip-172-31-0-22 ansible]# i-0ca279021b9c1f4c6 (Industry_grade_project_I)
PublicIPs: 44.203.21.113 PrivateIPs: 172.31.0.22
```

Step 2: Then I installed ansible plugin in Jenkins available-plugin section And set it up as myansible and gave /usr/bin as Path to ansible executable directory. Created a new pipeline job and wrote the script as given below and build it which will invoke playbook and deploy container:

```

pipeline {
    agent any
    stages {
        stage('Run Ansible Playbook') {
            steps {
                sh 'ansible-playbook /etc/ansible/industryapp.yml -i /etc/ansible/hosts -f 5 --connection=local'
            }
        }
    }
}

```

Not secure 44.203.21.113:8080/job/deploy%20with%20playbook/configure

Dashboard > deploy with playbook > Configuration

Configure

Definition

Pipeline script

General

Advanced Project Options

Pipeline

Script

```

1 * pipeline {
2     agent any
3     stages {
4         stage('Run Ansible Playbook') {
5             steps {
6                 sh 'ansible-playbook /etc/ansible/industryapp.yml -i /etc/ansible/hosts -f 5 --connection=local'
7             }
8         }
9     }
10 }
11

```

Use Groovy Sandbox

[Pipeline Syntax](#)

Save **Apply**

29°C Partly cloudy

Search

ENG IN 22:24 06-04-2024

Not secure 44.203.21.113:8080/job/deploy%20with%20playbook/6/console

Jenkins

Search (CTRL+K)

Nirmalendu Sahu log out

Dashboard > deploy with playbook > #6

Status

</> Changes

Console Output

View as plain text

Edit Build Information

Delete build '#6'

Restart from Stage

Replay

Pipeline Steps

Workspaces

Previous Build

Console Output

Started by user Nirmalendu Sahu

[Pipeline] Start of Pipeline

[Pipeline] node

Running on Jenkins in /var/lib/jenkins/workspace/deploy with playbook

[Pipeline] {

[Pipeline] stage

[Pipeline] { (Run Ansible Playbook)

[Pipeline] sh

+ ansible-playbook /etc/ansible/industryapp.yml -i /etc/ansible/hosts -f 5 --connection=local

PLAY [Deploy Code to Docker Container] ****

TASK [Gathering Facts] ****

[WARNING]: Platform linux on host localhost is using the discovered Python interpreter at /usr/bin/python, but future installation of another Python interpreter could change this. See https://docs.ansible.com/ansible/2.9/reference_appendices/interpreter_discovery.html for more information.

ok: [localhost]

TASK [Clone code repository] ****

Dashboard > deploy with playbook > #6

Workspaces

← Previous Build

```
interpreter could change this. See https://docs.ansible.com/ansible/2.9/references/appendices/interpreter\_discovery.html for more information.  
ok: [localhost]  
  
TASK [Clone code repository] ****  
changed: [localhost]  
  
TASK [Build code] ****  
changed: [localhost]  
  
TASK [Deploy code to Docker container] ****  
changed: [localhost]  
  
PLAY RECAP ****  
localhost : ok=4    changed=3    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0  
  
[Pipeline] }  
[Pipeline] // stage  
[Pipeline] }  
[Pipeline] // node  
[Pipeline] End of Pipeline  
Finished: SUCCESS
```



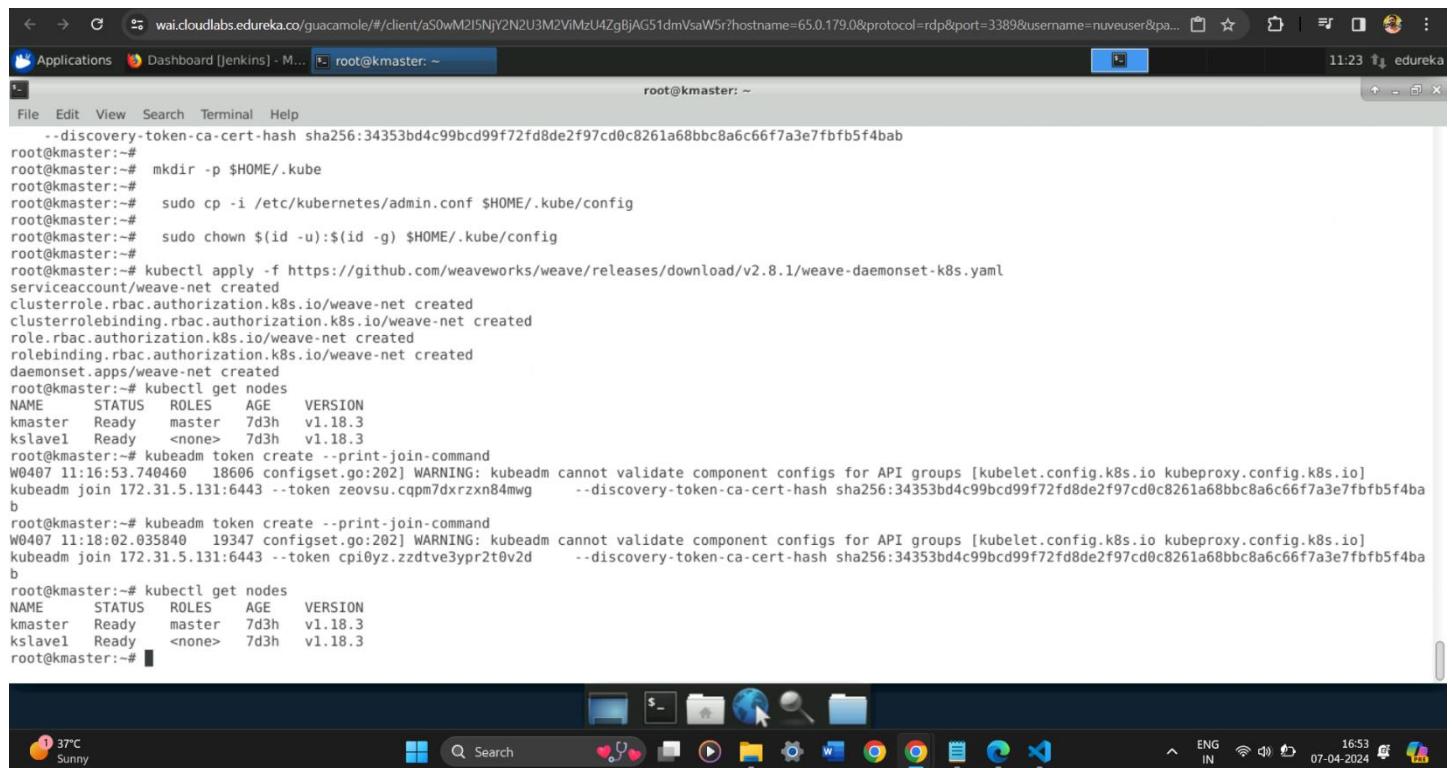
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Step 3: Now I have to integrate Kubernetes with ansible for deployment and service. Firstly I downloaded container runtime and kube adm, kubectl and kubelet on both master and slave. Configured weave network driver on master node. Generated token on master and copied to slave node.

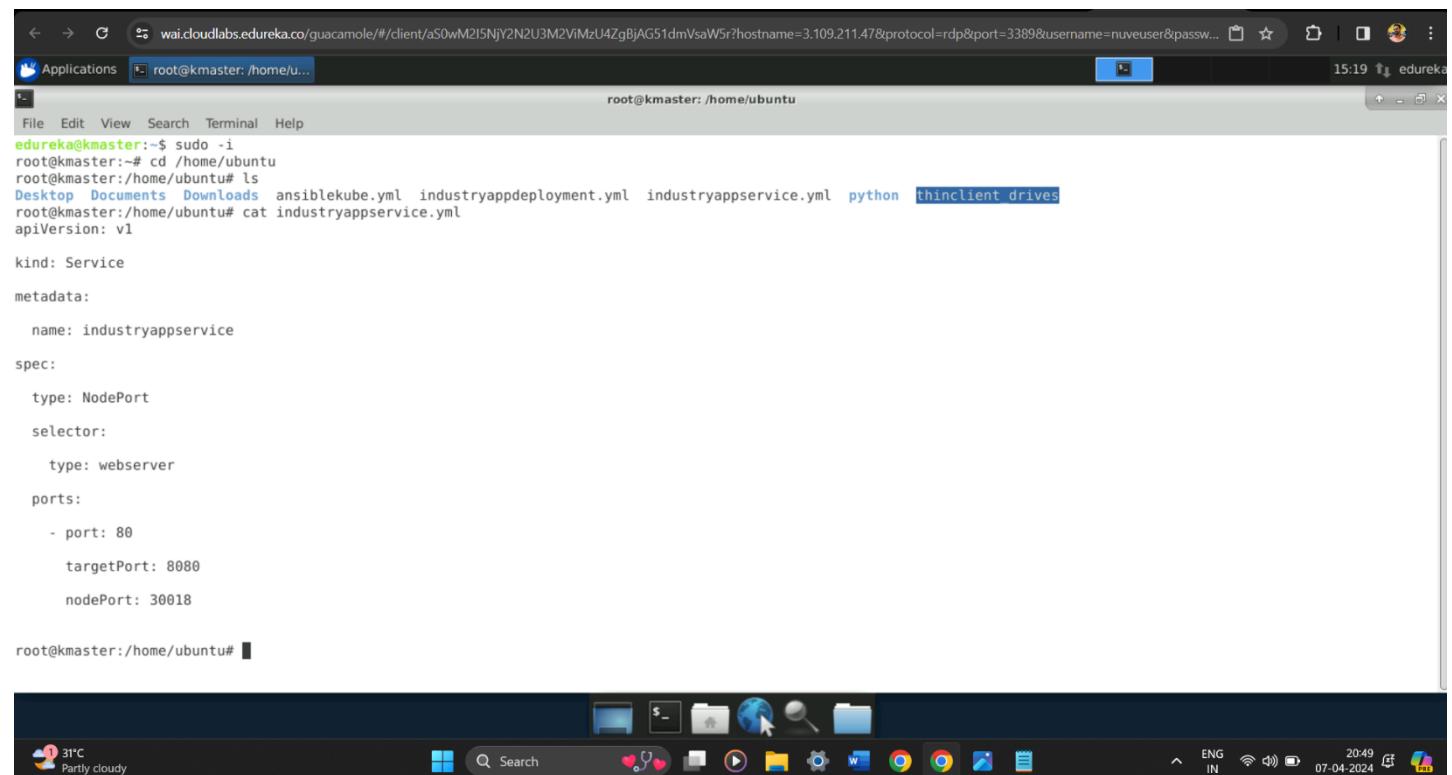


```

root@kmaster:~# --discovery-token-ca-cert-hash sha256:34353bd4c99bcd99f72fd8de2f97cd0c8261a68bbc8a6c66f7a3e7fbfb5f4bab
root@kmaster:~# mkdir -p $HOME/.kube
root@kmaster:~# sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config
root@kmaster:~# sudo chown $(id -u):$(id -g) $HOME/.kube/config
root@kmaster:~# kubectl apply -f https://github.com/weaveworks/weave/releases/download/v2.8.1/weave-daemonset-k8s.yaml
serviceaccount/weave-net created
clusterrole.rbac.authorization.k8s.io/weave-net created
clusterrolebinding.rbac.authorization.k8s.io/weave-net created
role.rbac.authorization.k8s.io/weave-net created
rolebinding.rbac.authorization.k8s.io/weave-net created
daemonset.apps/weave-net created
root@kmaster:~# kubectl get nodes
NAME STATUS ROLES AGE VERSION
kmaster Ready master 7d3h v1.18.3
kslave Ready <none> 7d3h v1.18.3
root@kmaster:~# kubeadm token create --print-join-command
W0407 11:16:53.740460 18606 configset.go:202] WARNING: kubeadm cannot validate component configs for API groups [kubelet.config.k8s.io kubeProxy.config.k8s.io]
kubeadm join 172.31.5.131:6443 --token zeovsu.cqpm7dxrxn84mwg --discovery-token-ca-cert-hash sha256:34353bd4c99bcd99f72fd8de2f97cd0c8261a68bbc8a6c66f7a3e7fbfb5f4ba
b
root@kmaster:~# kubeadm token create --print-join-command
W0407 11:18:02.035840 19347 configset.go:202] WARNING: kubeadm cannot validate component configs for API groups [kubelet.config.k8s.io kubeProxy.config.k8s.io]
kubeadm join 172.31.5.131:6443 --token cpi0yz.zzdtve3yprt2t0v2d --discovery-token-ca-cert-hash sha256:34353bd4c99bcd99f72fd8de2f97cd0c8261a68bbc8a6c66f7a3e7fbfb5f4ba
b
root@kmaster:~# kubectl get nodes
NAME STATUS ROLES AGE VERSION
kmaster Ready master 7d3h v1.18.3
kslave Ready <none> 7d3h v1.18.3
root@kmaster:~#

```

Step 4: I Created Manifests file for Service and Deployment as bellow. And test was successful.



```

root@kmaster:~# sudo -i
root@kmaster:~# cd /home/ubuntu
root@kmaster:/home/ubuntu# ls
Desktop Documents Downloads ansiblekube.yml industryappdeployment.yml industryappservice.yml python thinclient drives
root@kmaster:/home/ubuntu# cat industryappservice.yml
apiVersion: v1

kind: Service
metadata:
  name: industryappservice
spec:
  type: NodePort
  selector:
    type: webserver
  ports:
    - port: 80
      targetPort: 8080
      nodePort: 30018

root@kmaster:/home/ubuntu#

```

```
wai.cloudlabs.edureka.co/guacamole/#/client/a50wM2l5NjY2N2U3M2ViMzU4ZgBjAG51dmVsW5r?hostname=3.109.211.47&protocol=rdp&port=3389&username=nuveuser&password=edureka  
Applications root@kmaster: /home/u...  
root@kmaster:/home/ubuntu# cat industryappdeployment.yml  
apiVersion: apps/v1  
  
kind: Deployment  
  
metadata:  
  name: industryappdeployment  
  
spec:  
  replicas: 2  
  selector:  
    matchLabels:  
      type: webserver  
  template:  
    metadata:  
      labels:  
        type: webserver  
    spec:  
      containers:  
        - name: c1  
  
31°C Partly cloudy Search File Edit View Search Terminal Help 15:20 ENG IN 20:50 07-04-2024
```

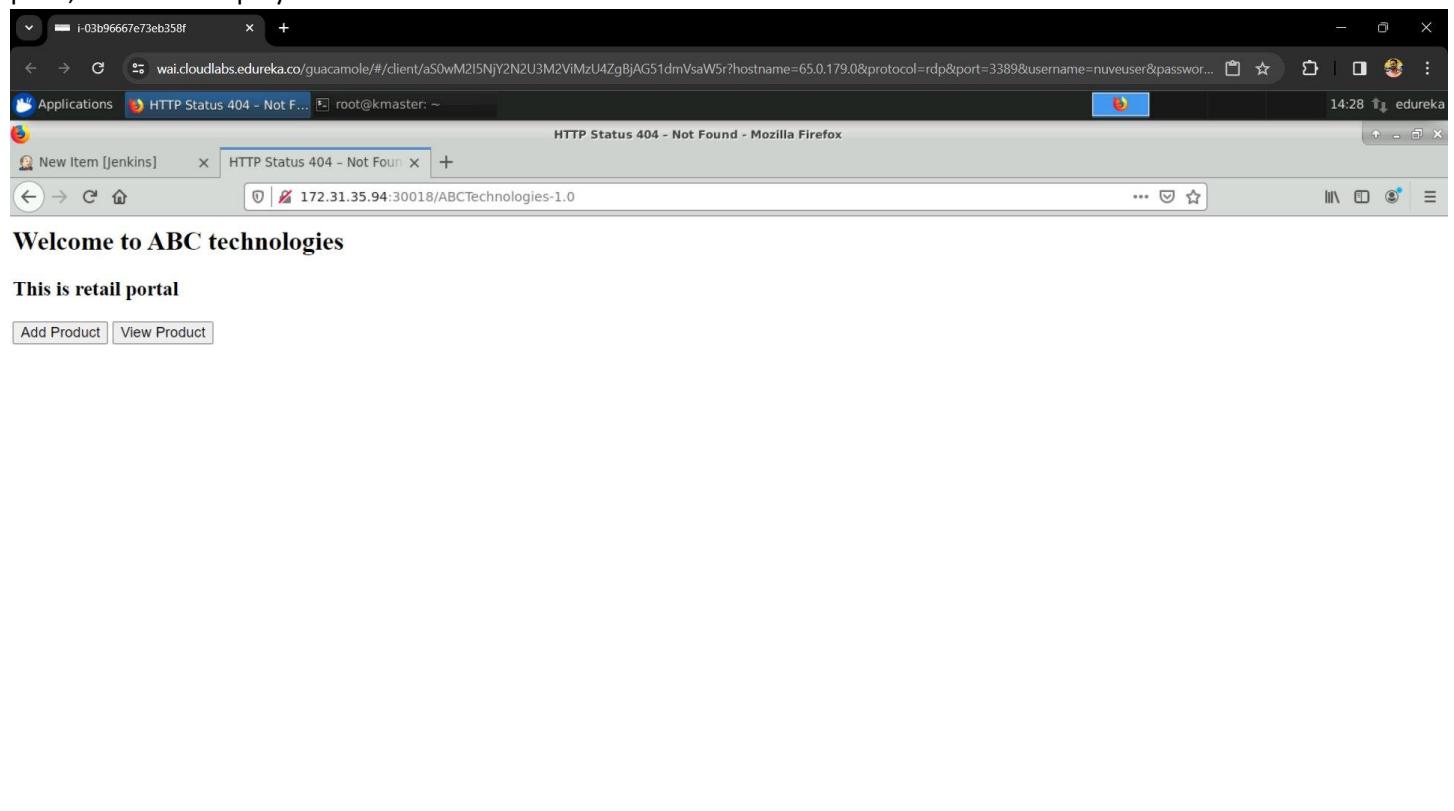
Kubeansible.yml playbook

```
wai.cloudlabs.edureka.co/guacamole/#/client/a50wM2l5NjY2N2U3M2ViMzU4ZgBjAG51dmVsW5r?hostname=3.109.211.47&protocol=rdp&port=3389&username=nuveuser&password=edureka  
Applications root@kmaster: /home/u...  
root@kmaster:/home/ubuntu# cat kubeansible.yml  
File Edit View Search Terminal Help 15:21  
---  
- hosts: localhost  
  become: true  
  tasks:  
    - name: Deploy Kubernetes Service  
      kubernetes.core.k8s:  
        state: present  
        namespace: default  
        src: "/home/ubuntu/industryappservice.yml"  
  
    - name: Deploy Kubernetes Deployment  
      kubernetes.core.k8s:  
        state: present  
        namespace: default  
        src: "/home/ubuntu/industryappdeployment.yml"  
  
root@kmaster:/home/ubuntu#  
31°C Partly cloudy Search File Edit View Search Terminal Help 20:51 ENG IN 20:51 07-04-2024
```

```
i-03b96667e73eb358f wai.cloudlabs.edureka.co/guacamole/#/client/a50wM2l5NjY2N2U3M2ViMzU4ZgBjAG51dmVsaW5r?hostname=65.0.179.0&protocol=rdp&port=3389&username=nuveuser&password=edureka  
Applications Dashboard [Jenkins] - M... root@kmaster: /home/u...  
root@kmaster: /home/ubuntu  
File Edit View Search Terminal Help  
[ -f FORKS ] [-M MODULE_PATH] [--playbook-dir BASEDIR]  
[ -a MODULE_ARGS ] [-m MODULE_NAME]  
pattern  
ansible: error: too few arguments  
root@kmaster:~# ansible --version  
ansible 2.9.27  
config file = /etc/ansible/ansible.cfg  
configured module search path = [u'/root/.ansible/plugins/modules', u'/usr/share/ansible/plugins/modules']  
ansible python module location = /usr/lib/python2.7/dist-packages/ansible  
executable location = /usr/bin/ansible  
python version = 2.7.17 (default, Jul 20 2020, 15:37:01) [GCC 7.5.0]  
root@kmaster:~# ls  
snap  
root@kmaster:~# cd /home/ubuntu  
root@kmaster:/home/ubuntu# ls  
Desktop Documents Downloads thinclient drives  
root@kmaster:/home/ubuntu# cd downloads  
-bash: cd: downloads: No such file or directory  
root@kmaster:/home/ubuntu# cd Downloads  
root@kmaster:/home/ubuntu/Downloads# ls  
root@kmaster:/home/ubuntu/Downloads# cd..  
cd..: command not found  
root@kmaster:/home/ubuntu/Downloads# cd ..  
root@kmaster:/home/ubuntu# nano industryappservice.yml  
root@kmaster:/home/ubuntu# nano industryappservice.yml  
root@kmaster:/home/ubuntu# kubectl create -f industryappservice.yml  
service/industryappservice created  
root@kmaster:/home/ubuntu# kubectl get all  
NAME TYPE CLUSTER-IP EXTERNAL-IP PORT(S) AGE  
service/industryappservice NodePort 10.109.159.23 <none> 80:30018/TCP 16s  
service/kubernetes ClusterIP 10.96.0.1 <none> 443/TCP 7d4h  
root@kmaster:/home/ubuntu#
```

```
i-03b96667e73eb358f wai.cloudlabs.edureka.co/guacamole/#/client/a50wM2l5NjY2N2U3M2ViMzU4ZgBjAG51dmVsaW5r?hostname=65.0.179.0&protocol=rdp&port=3389&username=nuveuser&password=edureka  
Applications HTTP Status 404 - Not Found root@kmaster: /home/u...  
root@kmaster: /home/ubuntu  
File Edit View Search Terminal Help  
See 'snap info <snapname>' for additional versions.  
root@kmaster:/home/ubuntu# kubectl create -f industryappservice.yml  
The Service "industryappservice" is invalid: spec.ports[0].nodePort: Invalid value: 30018: provided port is already allocated  
root@kmaster:/home/ubuntu# kubectl create -f industryappservice.yml  
The Service "industryappservice" is invalid: spec.ports[0].nodePort: Invalid value: 30018: provided port is already allocated  
root@kmaster:/home/ubuntu# kubectl apply -f industryappdeployment.yml  
deployment.apps/industryappdeployment created  
root@kmaster:/home/ubuntu# get pods -o wide  
Command 'get' not found, but there are 18 similar ones.  
root@kmaster:/home/ubuntu# kubectl apply -f industryappdeployment.yml  
deployment.apps/industryappdeployment unchanged  
root@kmaster:/home/ubuntu# kubectl get pods -o wide  
NAME READY STATUS RESTARTS AGE IP NODE NOMINATED-NODE READINESS GATES  
industryappdeployment-7dd6b7d9-f8wl2 1/1 Running 0 65s 10.244.1.3 kslavel <none> <none>  
industryappdeployment-7dd6b7d9-xxrvk 1/1 Running 0 65s 10.244.1.2 kslavel <none> <none>  
root@kmaster:/home/ubuntu# kubectl create -f industryappdeployment.yml  
Error from server (AlreadyExists): error when creating "industryappdeployment.yml": deployments.apps "industryappdeployment" already exists  
root@kmaster:/home/ubuntu# curl http://169.254.169.254/latest/meta-data/local-ipv4  
172.31.5.131root@kmaster:/h^C  
root@kmaster:/home/ubuntu# kubectl get pods -o wide  
NAME READY STATUS RESTARTS AGE IP NODE NOMINATED-NODE READINESS GATES  
industryappdeployment-7dd6b7d9-f8wl2 1/1 Running 0 8m31s 10.244.1.3 kslavel <none> <none>  
industryappdeployment-7dd6b7d9-xxrvk 1/1 Running 0 8m31s 10.244.1.2 kslavel <none> <none>  
root@kmaster:/home/ubuntu# kubectl get nodes -o wide  
NAME STATUS ROLES AGE VERSION INTERNAL-IP EXTERNAL-IP OS-IMAGE KERNEL-VERSION CONTAINER-RUNTIME  
kmaster Ready master 7d4h v1.18.3 172.31.5.131 <none> Ubuntu 18.04.3 LTS 4.15.0-1021-aws docker://24.0.2  
kslavel Ready <none> 7d4h v1.18.3 172.31.35.94 <none> Ubuntu 18.04.5 LTS 5.4.0-1025-aws docker://24.0.2  
root@kmaster:/home/ubuntu#  
root@kmaster:/home/ubuntu#
```

Step 5: I configured jenkins where ansible play book will be invoked which is in master node. Which created the pods, nodes and deployed .



Task 5: Using Prometheus monitor the resources like CPU utilization: Total Usage, Usage per core, usage breakdown, Memory , Network on the instance by providing the end points in local host. Install node exporter and add URL to target in Prometheus. Using this data login to Grafana and create a dashboard to show the metrics.

Step 1: I installed Prometheus and Grafana on master node and connected them. Then I installed Node_exporter in both master and worker node . Written exporter-config.yml file where hosts IP address is mentioned.

A screenshot of the Prometheus Targets page. The URL is 'http://172.31.5.131:9090/targets?search='. The page lists two targets: 'localhost:9100' and '172.31.35.94:9100'. Both are marked as 'UP' and 'Healthy'. The 'localhost' entry has a dropdown menu showing its configuration: 'instance="localhost:9100"', 'job="node"', and 'scrape_interval="15s"'. The '172.31.35.94' entry also has a dropdown menu showing its configuration: 'instance="172.31.35.94:9100"', 'job="node"', and 'scrape_timeout="10s"'. The bottom of the screen shows a Windows taskbar with various icons and system status.

Node Exporter

Node Exporter

Prometheus Node Exporter

Version: (version=1.7.0, branch=HEAD, revision=7333465abf9efba81876303bb57e6fad946041b)

- Metrics

Welcome to Grafana

Basic

The steps below will guide you to quickly finish setting up your Grafana installation.

TUTORIAL

DATA SOURCE AND DASHBOARDS

Grafana fundamentals

Set up and understand Grafana if you have no prior experience. This tutorial guides you through the entire process and covers the "Data source" and "Dashboards" steps to the right.

COMPLETE

Add your first data source

Learn how in the docs

COMPLETE

Create your first dashboard

Learn how in the docs

It looks like you haven't started Firefox in a while. Do you want to clean it up for a fresh, like-new experience? And by the way, welcome back!

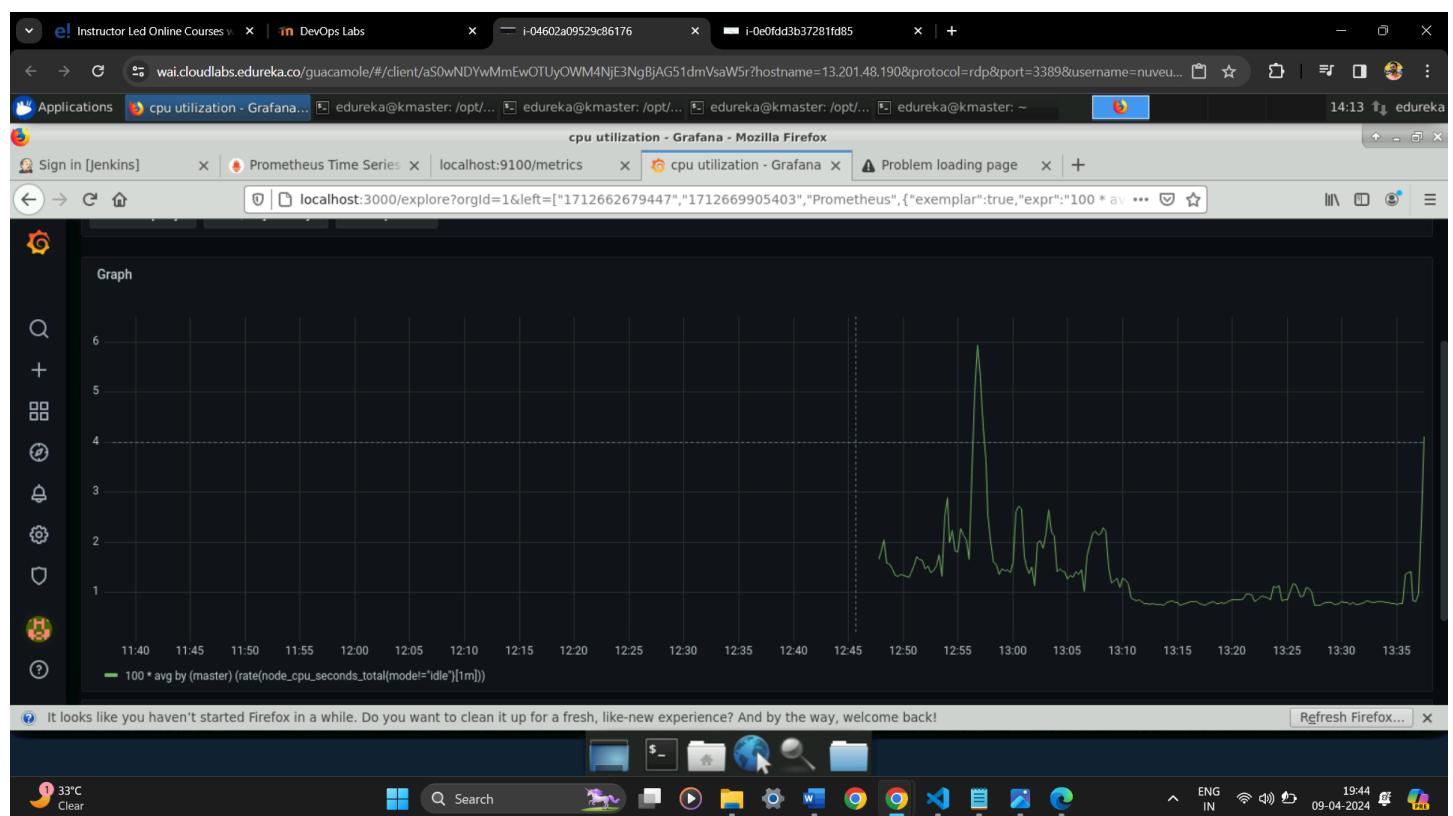
Configfile to connect Prometheus server to both local and worker's ips.

```
root@kmaster: ~/prometheus/prometheus-2.51.1.linux-amd64$ nano exporter-config.yml
global:
  scrape_interval: 15s

scrape_configs:
  - job_name: node
    static_configs:
      - targets: ['localhost:9100']

Save modified buffer? (Answering "No" will DISCARD changes.)
Y Yes
N No      C Cancel
```

Step 2: Created Grafana dashboard and showed the metrics of CPU utilization, Memory , and Network.



Screenshot of a Firefox browser window showing multiple tabs and the Grafana interface.

- Top tabs: "Instructor Led Online Courses", "DevOps Labs", "i-04602a09529c86176", "i-0e0fd3b37281fd85", "wai.cloudlabs.edureka.co/guacamole//client/a50wNDYwMmEwOTUyOWM4NjE3NgBjAG51dmVsaW5r?hostname=13.201.48.190&protocol=rdp&port=3389&username=edureka@kmaster", "Applications", "cpu utilization - Grafana", "edureka@kmaster: /opt...", "edureka@kmaster: /opt...", "edureka@kmaster: ~".
- Second tab: "cpu utilization - Grafana - Mozilla Firefox".
- Content area: Shows three search queries for Prometheus metrics:
 - "Metrics node_memory_MemAvailable_bytes" (Range, Instant, Both, Step, auto, Exemplars)
 - "Metrics node_network_receive_bytes_total" (Range, Instant, Both, Step, auto, Exemplars)
 - "Metrics node_network_transmit_bytes_total" (Range, Instant, Both, Step, auto, Exemplars)
 A message states: "Many time series results returned Consider aggregating with sum()".
- Bottom status bar: Shows a warning about not starting Firefox recently, a toolbar with various icons, and system status: 33°C Clear, ENG IN, 19:51, 09-04-2024.



CONCLUSION :

ABC Technologies has successfully completed the first phase of the project to acquire the data from the offline business store and use it for analytics and prediction. The team has used the DevOps model to automate the development, deployment, and testing of the servlets and HTML page. This has resulted in a more reliable, scalable, and efficient system that is easier to maintain.