St. Francis Institute of Technology, Mumbai-400 103

Department Of Information Technology

A.Y. 2024-2025

Class: TE-ITA/B, Semester: V

Subject: **DevOps Lab**

Experiment – 5: To implement continuous integration with Jenkins

1. **Aim:** To implement continuous integration with Jenkins
2. **Objectives:** Aim of this experiment is that, the students will be able
   - To Integrate and deploy tools like Jenkins and Maven, which is used to build applications in DevOps environment
3. **Outcomes:** After study of this experiment, the students will be able
   - To understand the importance of Jenkins to Build and deploy Software Applications on server environment.
   - Learn about Jenkins (With Architecture)
   - To have introduction to Maven / Gradle / Ant
4. **Prerequisite:** Knowledge of software engineering concept of integration
5. **Requirements:** Jenkins, JDK, python, ANT, Personal Computer, Windows operating system, browser, Internet Connection, Microsoft Word.
6. **Pre-Experiment Exercise:**
   Brief Theory: Refer shared material
7. **Laboratory Exercise**
   A. **Procedure:**
      a. **Answer the following:**
         - Explain continuous integration
         - Why Jenkins is popular? Mention advantages.
      b. **Execute following (Refer the shared material) and attach screenshots:**
         - Build jobs in Jenkins

8. **Post-Experiments Exercise**
   A. **Extended Theory:**
      Nil
   B. **Questions:**
      - How is continuous integration achieved using Jenkins?
      - Have you created a build job in Jenkins? Explain how to do it.
      - What are the types of jobs or projects in Jenkins?
   C. **Conclusion:**
      - Write what was performed in the experiment.
      - Write the significance of the topic studied in the experiment.
   D. **References:**
      https://jenkins.io/doc/
      https://www.cloudbees.com/jenkins/what-is-jenkins
      https://vmokshagroup.com/blog/what-is-jenkins/

      https://www.infoworld.com/article/3239666/what-is-jenkins-the-ci-server-explained.html
      https://hackr.io/blog/jenkins-interview-questions
      https://www.edureka.co/blog/interview-questions/jenkins-interview-questions/

7. LABORATORY EXERCISE:

Continuous Integration (CI):

Answer: Continuous Integration (CI) is a software development practice where code changes are frequently integrated into a shared repository, typically several times a day. Each integration is followed by automated builds and tests to ensure that new code does not introduce errors or break existing functionality. Key benefits of CI include:

1. Early Detection of Issues: Regular integration helps identify and address integration problems and bugs early, before they become significant issues.
2. Automated Testing: CI systems automate the process of running tests, which helps maintain code quality and catch issues quickly.
3. Better Collaboration: Frequent integration encourages team members to work together more closely, reducing integration conflicts and improving team cohesion.
4. Increased Efficiency: Automating the build and testing process saves time compared to manual methods, allowing developers to focus more on coding and less on managing integrations.

Why is Jenkins popular?

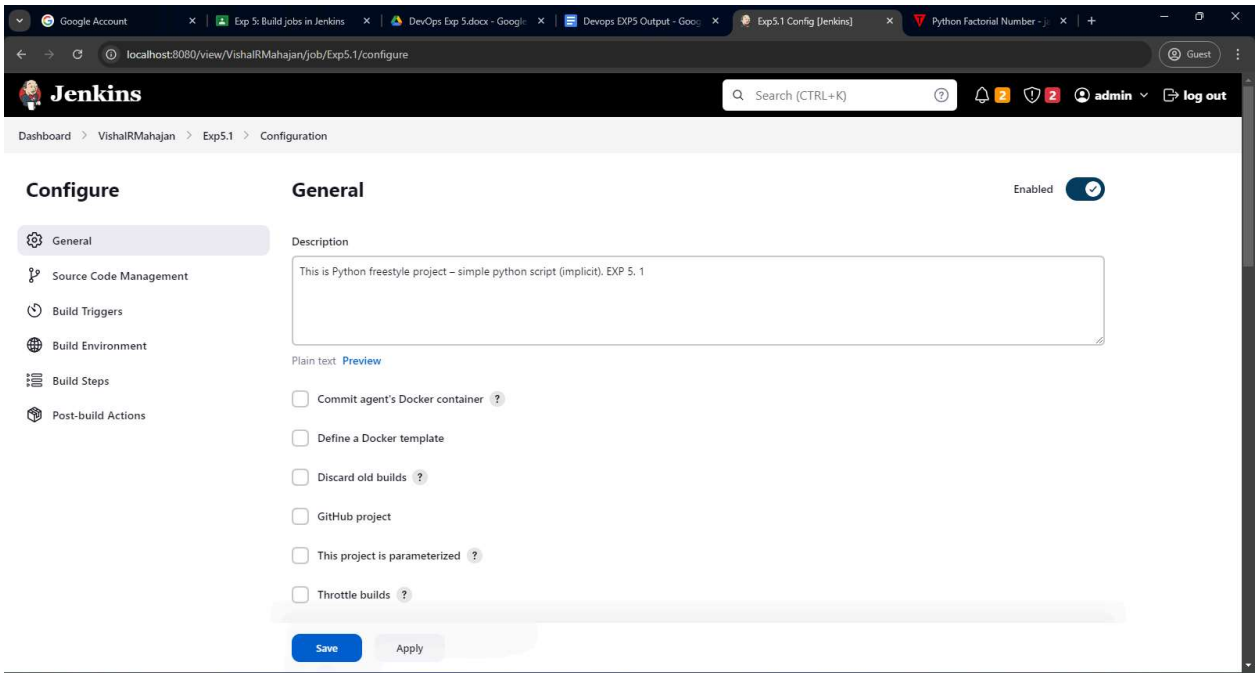
Answer:

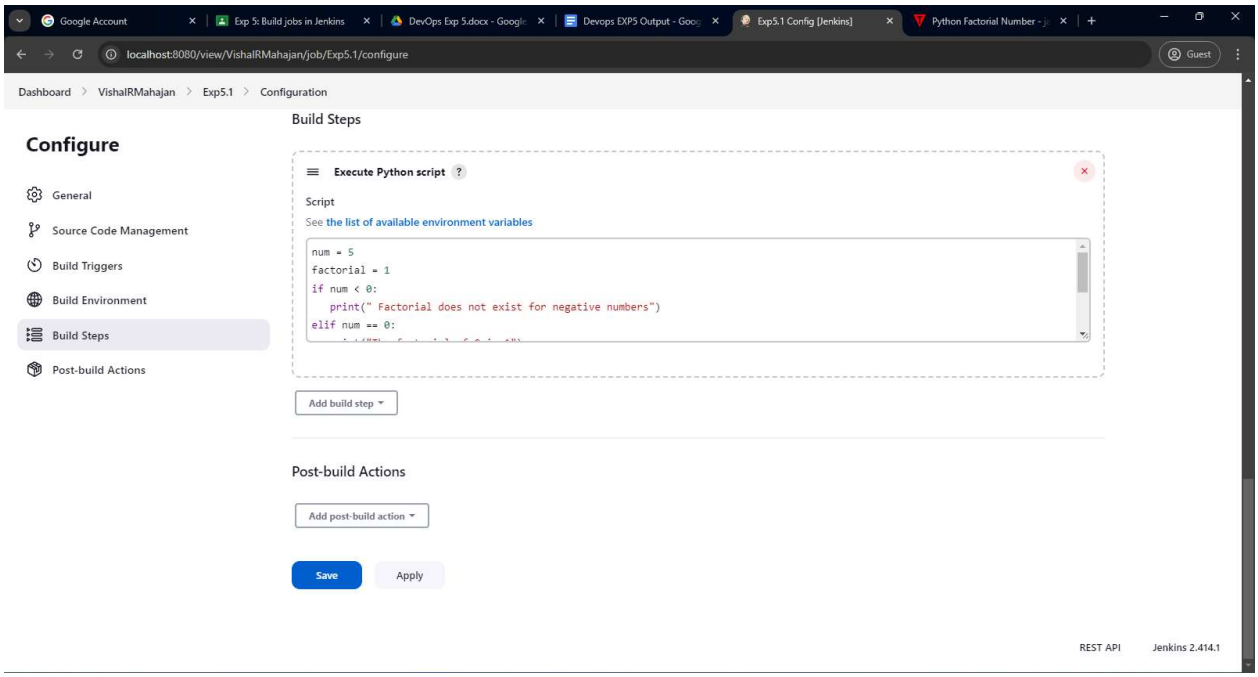
Jenkins is popular due to its:

1. Open Source Nature: Free and customizable.
2. Extensive Plugin Ecosystem: Over 1,800 plugins for integration with various tools.
3. User-Friendly Interface: Easy to set up and manage.
4. Flexible Pipelines: Supports complex workflows with scripted and declarative pipelines.
5. Strong Community Support: Active community and extensive resources.
6. Scalability: Can distribute tasks across multiple machines.
7. CI/CD Capabilities: Supports both continuous integration and delivery.

B.Execute following (Refer the shared material) and attach screenshots:

1. Python freestyle project – simple python script (implicit)



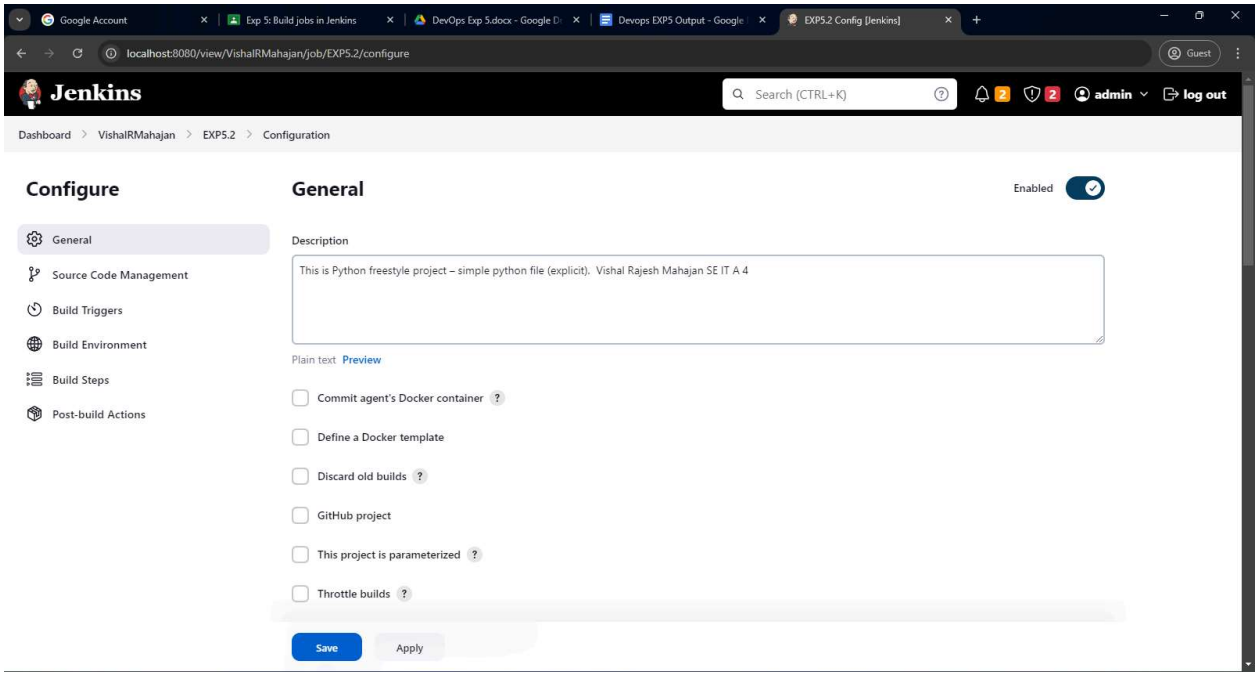


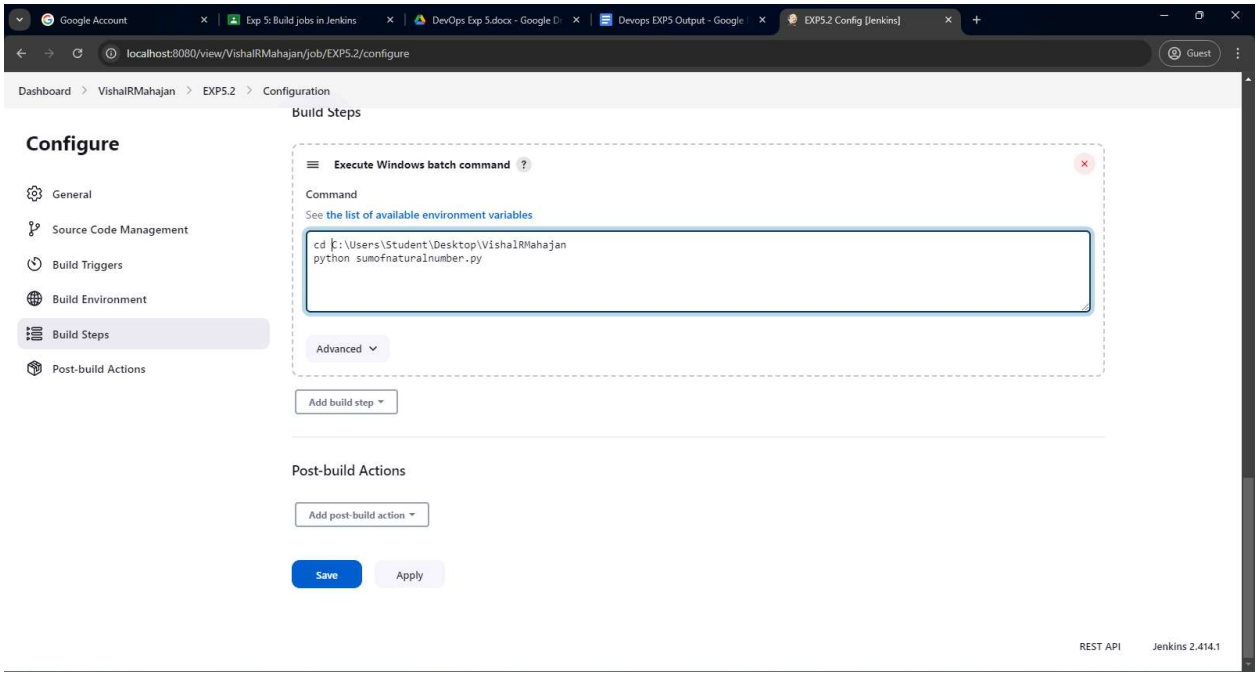
Code/Scripts added in Execute Python Scripts:

```
num = 5
factorial = 1
if num < 0:
   print(" Factorial does not exist for negative numbers")
elif num == 0:
   print("The factorial of 0 is 1")
else:
   for i in range(1,num + 1):
       factorial = factorial*i
   print("The factorial of",num,"is",factorial)
```

Console Output After Building the freestyle project.

2. Python freestyle project – simple python file (explicit)





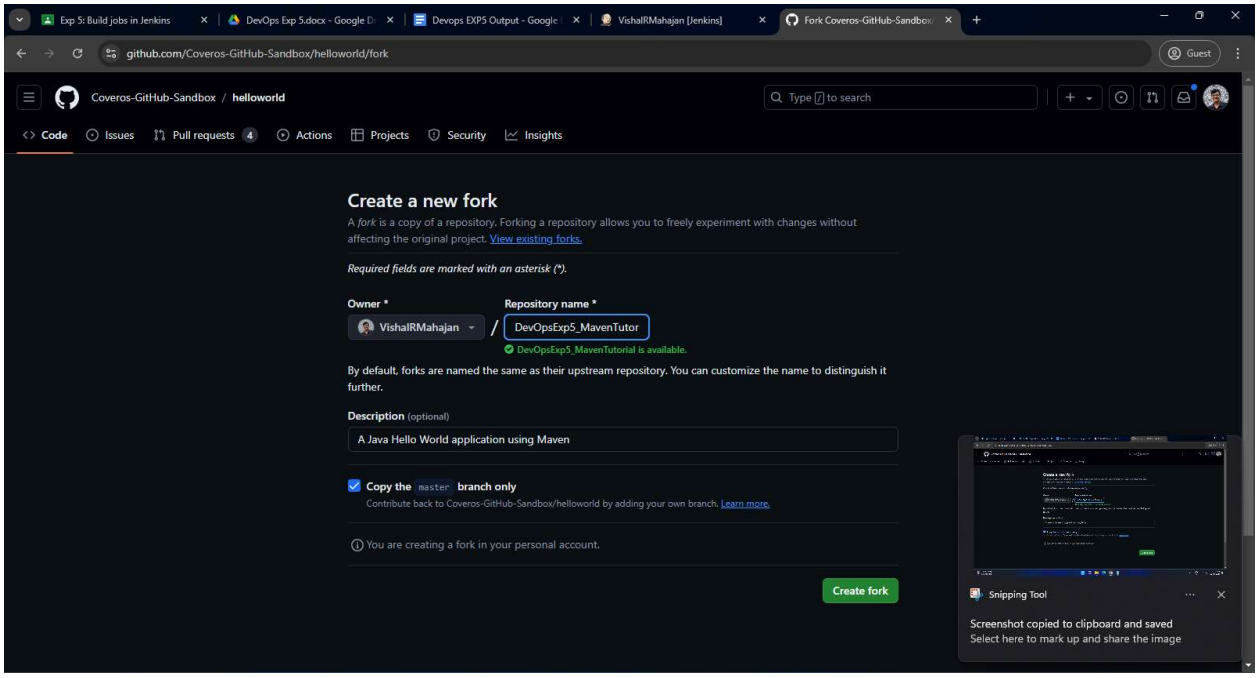
Code/Scripts added in sumofnaturalnumber.py file:

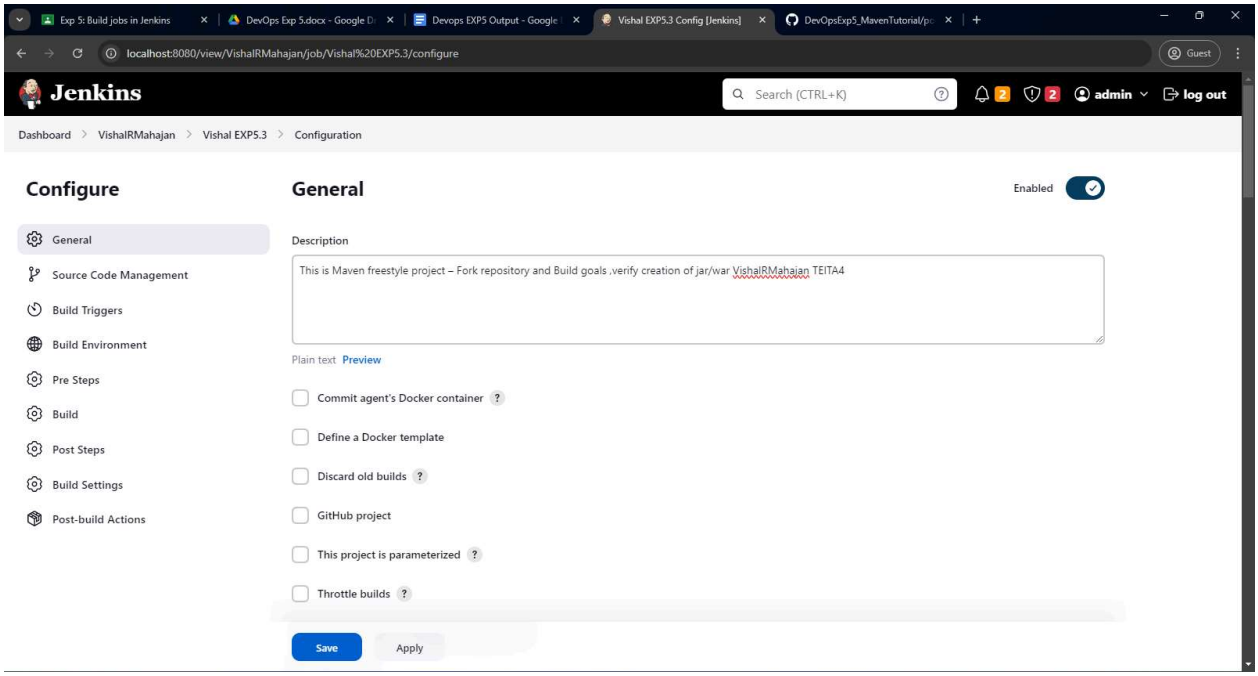
```
num=10

if num < 0:
   print("Enter a positive number")
else:
   sum = 0
   # use while loop to iterate un till zero
   while(num > 0):
       sum += num
       num -= 1
   print("The sum is",sum)
```

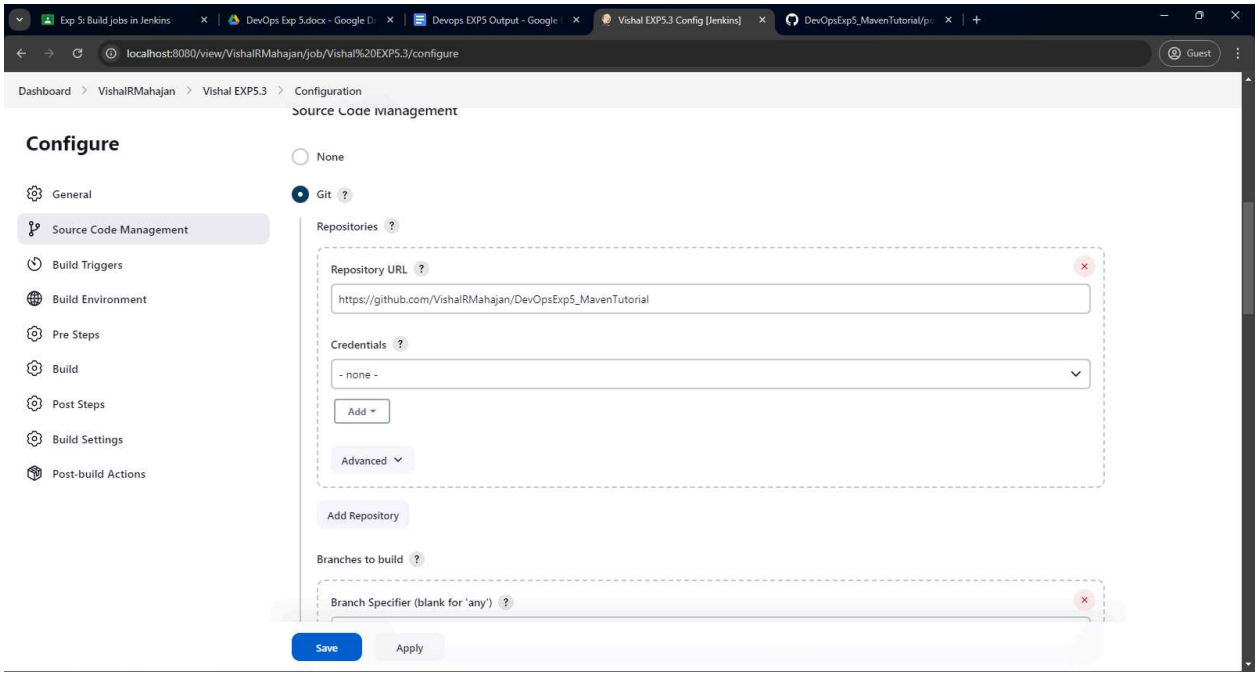
Console Output After Building the freestyle project.

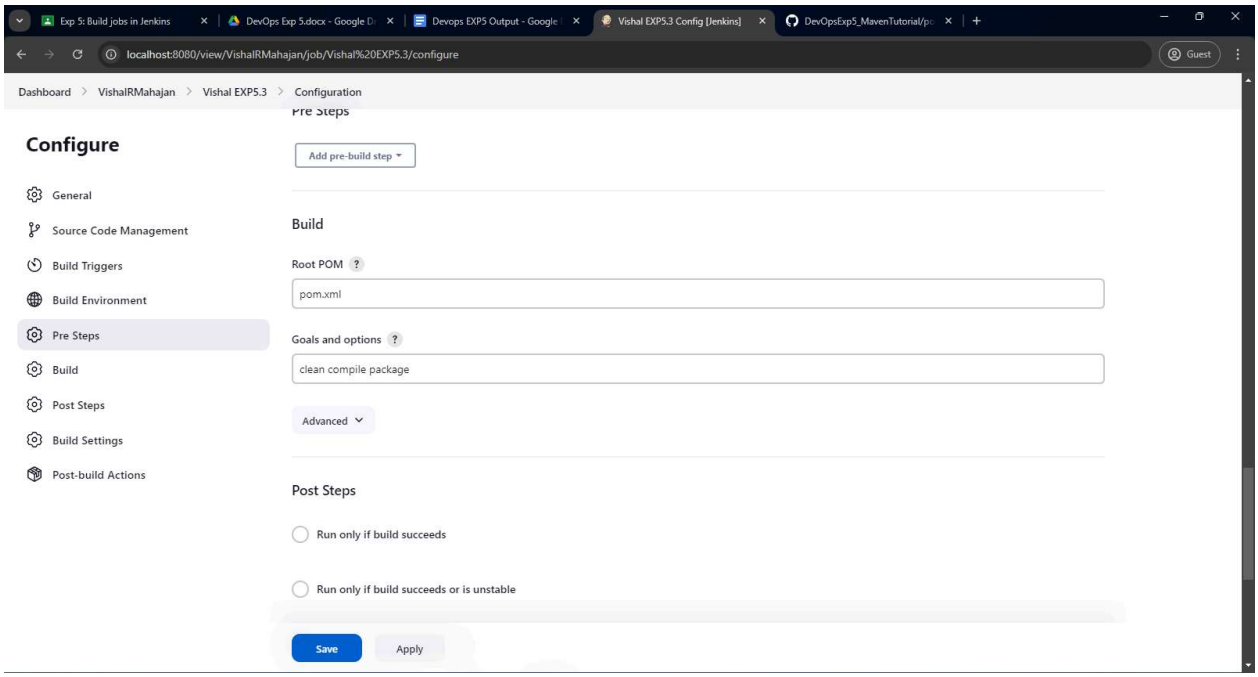
3.Maven freestyle project – Fork repository and Build goals, verify creation of jar/war

Forking a maven Github Repository:






Exp 5: Build jobs in Jenkins
DevOps Exp 5.docx - Google D
Devops EXP5 Output - Google
Vishal EXP5.3 Config [Jenkins]
DevOpsExp5_MavenTutorial/p
localhost:8080/view/VishalRMahajan/job/Vishal%20EXP5.3/configure
Guest
Dashboard > VishalRMahajan > Vishal EXP5.3 > Configuration
Configure
General
Source Code Management
Build Triggers
Build Environment
Pre Steps
Build
Post Steps
Build Settings
Post-build Actions
Source Code Management
None
Git
Repositories
Repository URL
https://github.com/VishalRMahajan/DevOpsExp5_MavenTutorial
Credentials
- none -
Add
Advanced
Add Repository
Branches to build
Branch Specifier (blank for 'any')
Save
Apply


Exp 5: Build jobs in Jenkins
DevOps Exp 5.docx - Google D
Devops EXP5 Output - Google
Vishal EXP5.3 Config [Jenkins]
DevOpsExp5_MavenTutorial/p
localhost:8080/view/VishalRMahajan/job/Vishal%20EXP5.3/configure
Guest
Dashboard > VishalRMahajan > Vishal EXP5.3 > Configuration
Configure
General
Source Code Management
Build Triggers
Build Environment
Pre Steps
Build
Post Steps
Build Settings
Post-build Actions
Pre Steps
Add pre-build step
Build
Root POM
pom.xml
Goals and options
clean compile package
Advanced
Post Steps
Run only if build succeeds
Run only if build succeeds or is unstable
Save
Apply

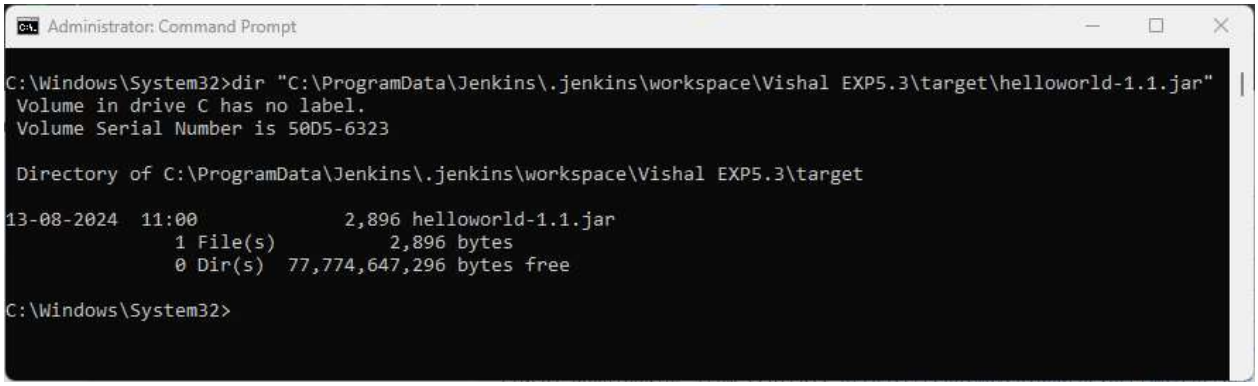
Console Output After Building the Maven project.

Console Output

```
Started by user admin
Running as SYSTEM
Building in workspace C:\ProgramData\Jenkins\.jenkins\workspace\Vishal EXP5.3
The recommended git tool is: NONE
No credentials specified
Cloning the remote Git repository
Cloning repository https://github.com/VishalRMahajan/DevOpsExp5_MavenTutorial
 > C:\Program Files\Git\bin\git.exe init C:\ProgramData\Jenkins\.jenkins\workspace\Vishal EXP5.3 # timeout=10
Fetching upstream changes from https://github.com/VishalRMahajan/DevOpsExp5_MavenTutorial
 > C:\Program Files\Git\bin\git.exe --version # timeout=10
 > git --version # 'git version 2.34.1.windows.1'
 > C:\Program Files\Git\bin\git.exe fetch --tags --force --progress -- https://github.com/VishalRMahajan/DevOpsExp5_MavenTutorial
+refs/heads/*:refs/remotes/origin/* # timeout=10
```

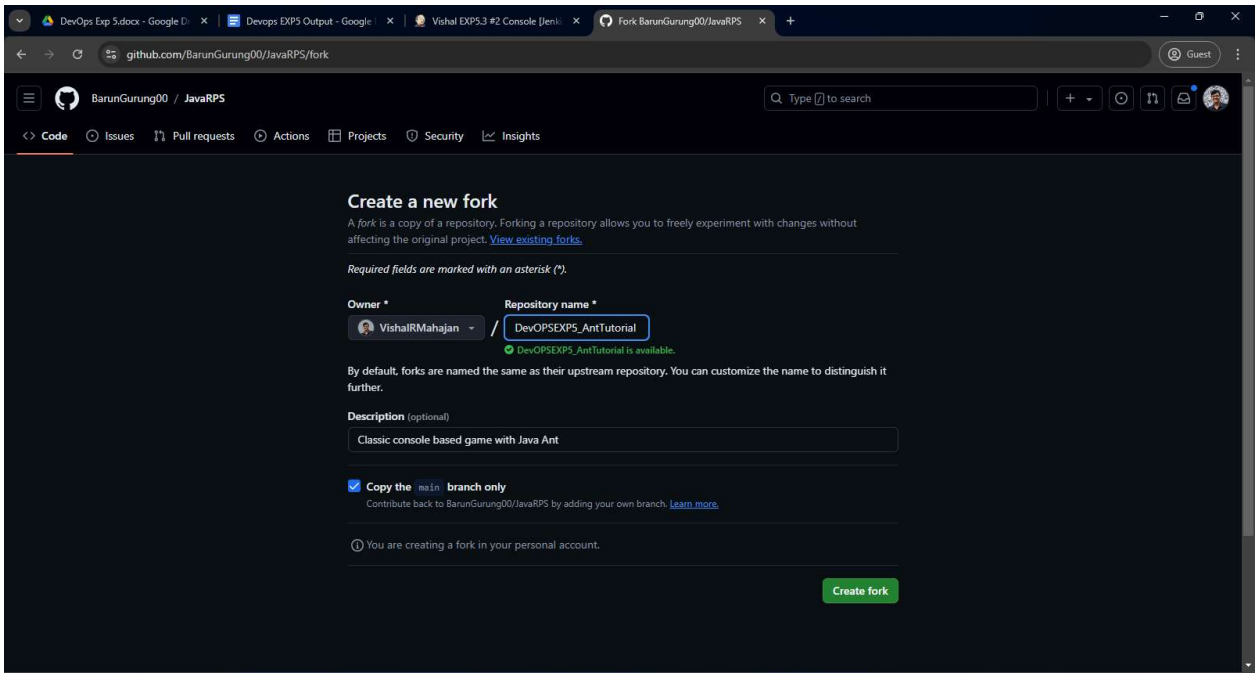
```
[INFO] Building jar: C:\ProgramData\Jenkins\.jenkins\workspace\Vishal EXP5.3\target\helloworld-1.1.jar
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time:  7.486 s
[INFO] Finished at: 2024-08-13T11:00:19+05:30
[INFO] ------------------------------------------------------------------------
Waiting for Jenkins to finish collecting data
[JENKINS] Archiving C:\ProgramData\Jenkins\.jenkins\workspace\Vishal EXP5.3\pom.xml to com.coveros.demo/helloworld/1.1/helloworld-1.1.pom
[JENKINS] Archiving C:\ProgramData\Jenkins\.jenkins\workspace\Vishal EXP5.3\target\helloworld-1.1.jar to com.coveros.demo/helloworld/1.1/helloworld-1.1.jar
channel stopped
Finished: SUCCESS
```

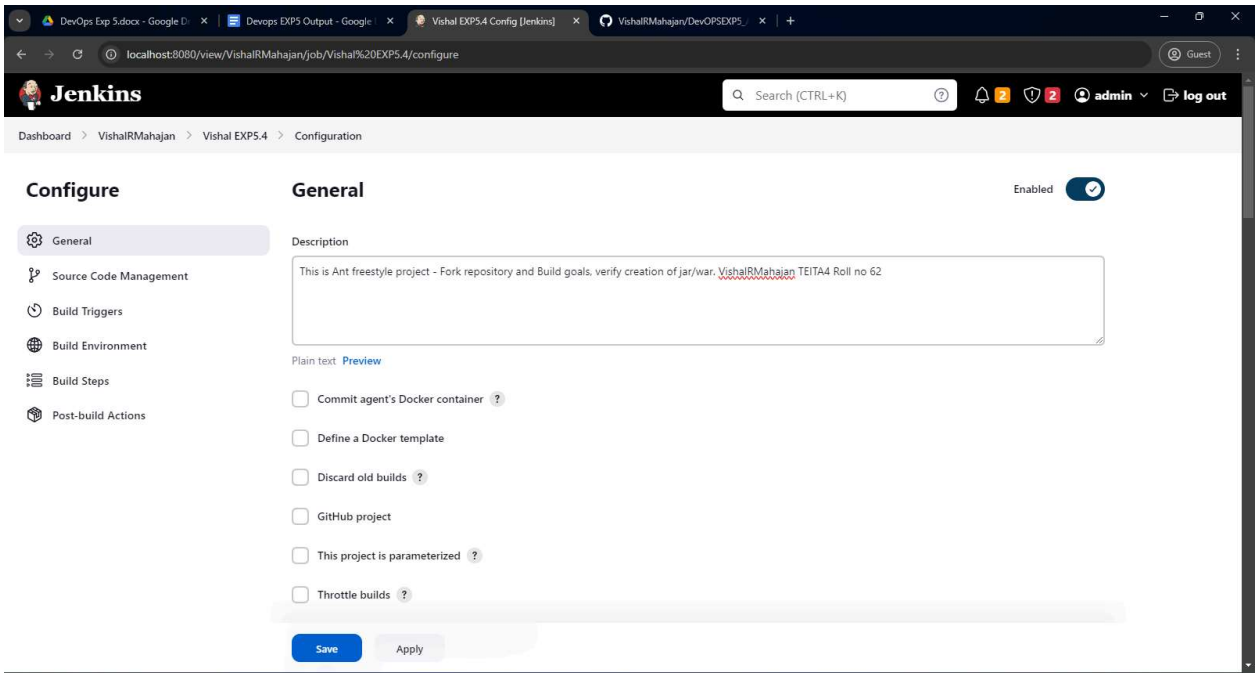
JAR File getting created.

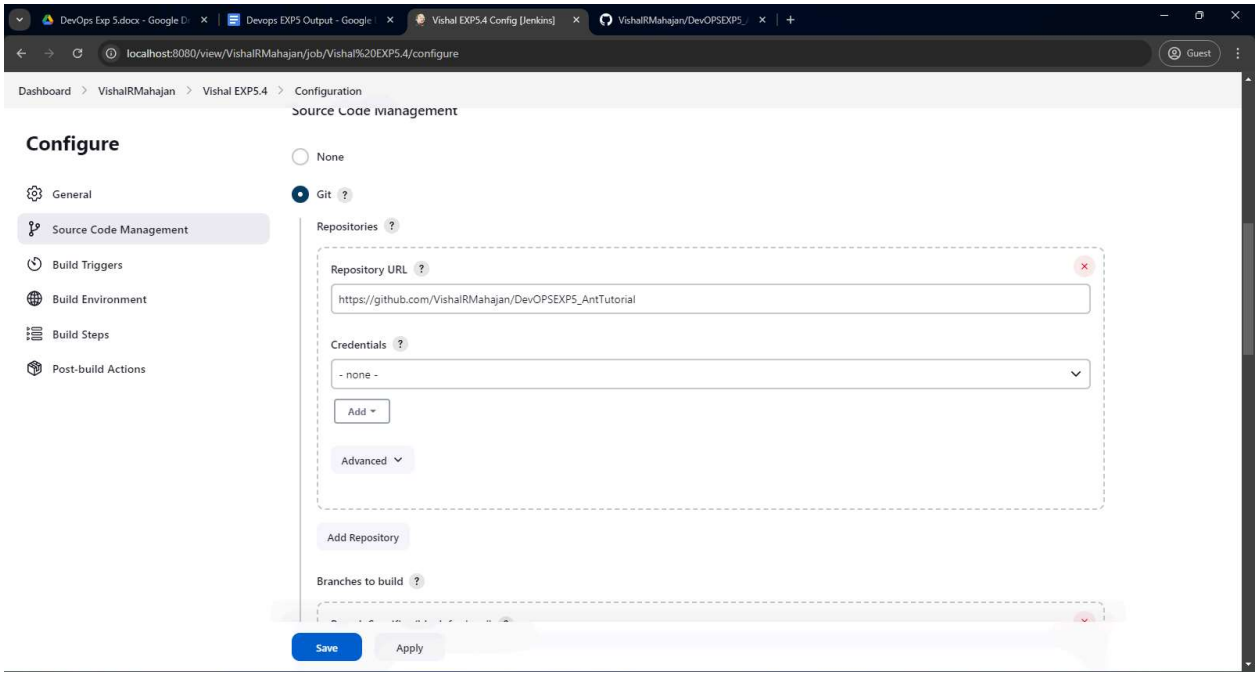


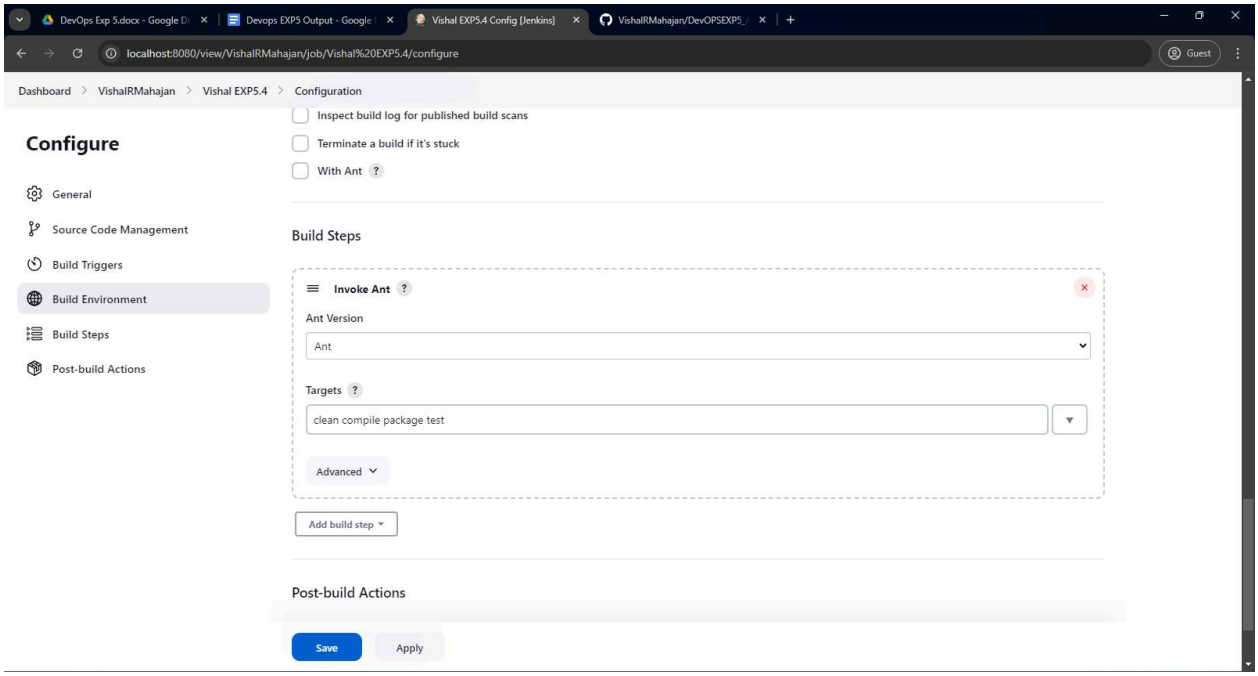
4. Ant freestyle project - Fork repository and Build goals, verify creation of jar/war

Forking a maven Github Repository:






DevOps Exp 5.docx - Google D
Devops EXP5 Output - Google
Vishal EXP5.4 Config [Jenkins]
VishalRMahajan/DevOPSEXP5_
localhost:8080/view/VishalRMahajan/job/Vishal%20EXP5.4/configure
Guest
Dashboard > VishalRMahajan > Vishal EXP5.4 > Configuration
Configure
General
Source Code Management
Build Triggers
Build Environment
Build Steps
Post-build Actions
Source Code Management
None
Git
Repositories
Repository URL
https://github.com/VishalRMahajan/DevOPSEXP5_AntTutorial
Credentials
- none -
Add
Advanced
Add Repository
Branches to build
Save
Apply


DevOps Exp 5.docx - Google D
Devops EXP5 Output - Google
Vishal EXP5.4 Config [Jenkins]
VishalRMahajan/DevOPSEXP5_
localhost:8080/view/VishalRMahajan/job/Vishal%20EXP5.4/configure
Guest
Dashboard > VishalRMahajan > Vishal EXP5.4 > Configuration
Configure
General
Source Code Management
Build Triggers
Build Environment
Build Steps
Post-build Actions
Inspect build log for published build scans
Terminate a build if it's stuck
With Ant
Build Steps
Invoke Ant
Ant Version
Ant
Targets
clean compile package test
Advanced
Add build step
Post-build Actions
Save
Apply

Console Output After Building the Ant FreeStyle project.

Console Output

```
Started by user admin
Running as SYSTEM
Building in workspace C:\ProgramData\Jenkins\.jenkins\workspace\Vishal EXP5.4
The recommended git tool is: NONE
No credentials specified
 > C:\Program Files\Git\bin\git.exe rev-parse --resolve-git-dir C:\ProgramData\Jenkins\.jenkins\workspace\Vishal EXP5.4\.git # timeout=10
Fetching changes from the remote Git repository
 > C:\Program Files\Git\bin\git.exe config remote.origin.url https://github.com/VishalRMahajan/DevOPSEXP5_AntTutorial.git # timeout=10
Fetching upstream changes from https://github.com/VishalRMahajan/DevOPSEXP5_AntTutorial.git
 > C:\Program Files\Git\bin\git.exe --version # timeout=10
 > git --version # 'git version 2.34.1.windows.1'
 > C:\Program Files\Git\bin\git.exe fetch --tags --force --progress -- https://github.com/VishalRMahajan/DevOPSEXP5_AntTutorial.git
+refs/heads/*:refs/remotes/origin/* # timeout=10
 > C:\Program Files\Git\bin\git.exe rev-parse "refs/remotes/origin/master^{commit}" # timeout=10
Checking out Revision 02f88a382dda116a84e7f3e5955f827879c04dea (refs/remotes/origin/master)
 > C:\Program Files\Git\bin\git.exe config core.sparsecheckout # timeout=10
 > C:\Program Files\Git\bin\git.exe checkout -f 02f88a382dda116a84e7f3e5955f827879c04dea # timeout=10
Commit message: "Create ant.yml"
First time build. Skipping changelog.
[Vishal EXP5.4] $ cmd.exe /C "C:\apache-ant-1.10.14\bin\ant.bat clean compile package test && exit %%ERRORLEVEL%%"
Buildfile: C:\ProgramData\Jenkins\.jenkins\workspace\Vishal EXP5.4\build.xml
```

WAR File getting created.