Experiment No. 5: To Build The Pipeline Of Jobs Using Maven / Gradle / Ant In Jenkins, Create A Pipeline Script To Test And Deploy An Application Over The Tomcat Server

Theory:

Introduction to Jenkins and CI/CD

Jenkins is an open-source automation server used for continuous integration and continuous deployment (CI/CD). It helps automate the software development lifecycle by building, testing, and deploying applications.

1.1 CI/CD Concepts

- Continuous Integration (CI): Automatically integrates code changes into a shared repository and runs tests.
- Continuous Deployment (CD): Automates the process of deploying applications to production or staging environments.

1.2 Tools Used

- Jenkins Automation server.
- Maven/Gradle/Ant Build automation tools.
- Tomcat A web server for deploying Java applications.

Installing and Configuring Jenkins

- 1. Download and Install Jenkins:
 - o Download from Jenkins official site. o Install and start the Jenkins service.
 - o Access Jenkins at http://localhost:8080/.
- 2. Install Required Plugins:
 - o Go to Manage Jenkins > Plugin Manager. o Install Pipeline, Maven Integration, and Deploy to Container plugins.

Creating a Jenkins Pipeline

Jenkins pipelines define a series of automated steps for building, testing, and deploying applications.

- a. Steps to Create a Pipeline
 - 1. Open Jenkins Dashboard and click on New Item.
 - 2. Select Pipeline and provide a project name.
 - 3. Click OK and navigate to the Pipeline section.
 - 4. Write a Pipeline script (Declarative or Scripted) to define the build and deployment process.

Writing a Jenkins Pipeline Script

The following script builds a Java application using Maven and deploys it to Tomcat:

```
pipeline {
  agent any
  stages {
     stage('Checkout Code') {
       steps {
          git 'https://github.com/your-repository.git'
     }
     stage('Build with Maven') {
       steps {
          sh 'mvn clean package'
     }
    stage('Deploy to Tomcat') {
       steps {
          deploy adapters: [
            tomcat8(
               credentialsId: 'tomcat-cred',
               path: ",
```

```
url: 'http://yourtomcat-server:8080'
)
],
war: '**/*.war'
}
}
```

Configuring Jenkins for Deployment

- 1. Configure Tomcat Server:
 - o Install Tomcat and start the server. o Set up a user with deployment privileges in conf/tomcatusers.xml: xml CopyEdit

```
<role rolename="manager-gui"/>
<role rolename="manager-script"/>
<user username="admin" password="admin" roles="manager-gui,manager-script"/> o

Restart Tomcat.
```

- 2. Set Up Jenkins Credentials:
 - Go to Manage Jenkins > Credentials.
 Add a username/password credential for Tomcat deployment.
- 3. Run the Pipeline in Jenkins:
 - o Click Build Now to execute the pipeline. o Verify the deployment at http://your-tomcat-server:8080/your-app.

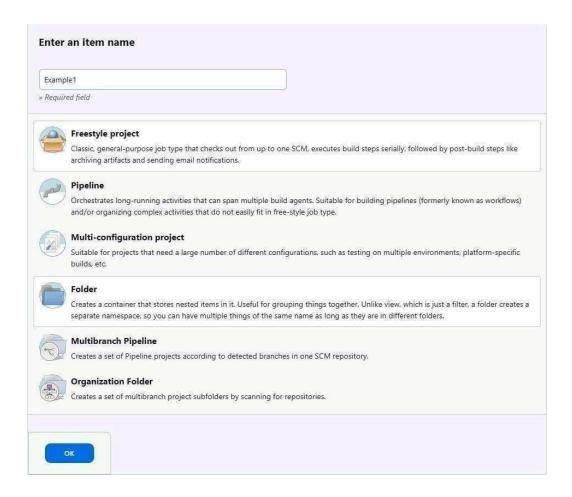
Example 1

Creating a job:

Start building your software project

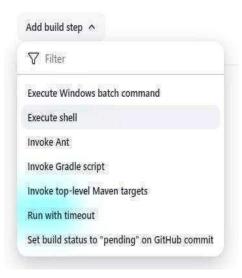
Create a job +

Naming the job and setting it as freestyle:



Selecting build type as "Execute shell":

Build Steps



Entering a simple command for the shell execution:

Build Steps Execute shell ? Command See the list of available environment variables echo "Hello TSEC"

Applying and saving the project configuration:



Building the project:

Advanced V



Console output (after building):



<u>Example 1.2: Taking parameters through files</u> Contents of script example1.cmd:



Executing script example 1.cmd on the terminal:

```
Microsoft Windows [Version 10.0.22621.3296]
(c) Microsoft Corporation. All rights reserved.

C:\Users\AI&DS 202>Microsoft Windows [Version 10.0.22631.3155) (c) Microsoft Corporation. All rights reserved.
'Microsoft' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\AI&DS 202>C:\Admin\Academics\TSEC\Start3\SEPM>example1.cmd
The system cannot find the path specified.

C:\Users\AI&DS 202>"Hello... Your address is "
'"Hello... Your address is "' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\AI&DS 202>C:\Admin\Academics\TSEC\Start3\SEPM>example1.cad Tanishq
The system cannot find the path specified.

C:\Users\AI&DS 202>"Hello Tanihsq... Your address is "
'"Hello Tanihsq... Your address is "' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\AI&DS 202>"Hello Tanihsq... Your address is "

'"Hello Tanihsq... Your address is "' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\AI&DS 202>C:\Admin\Academics\TSEC\Start3\SEPM>examplel.cmd Tanishq Girgaon "Helle Tanishq... Your address is Gi
rgaon"
The system cannot find the path specified.
```

Modifying the Jenkins project to execute the script while supplying required parameters: Build Steps

Execute Windows batch command?

Command

See the list of available environment variables

C:\Admin\Academics\TSEC\Start3\SEPM\example1.cmd Siddhant Goregaon

Advanced \(\text{Advanced} \)

Add build step \(\text{V} \)

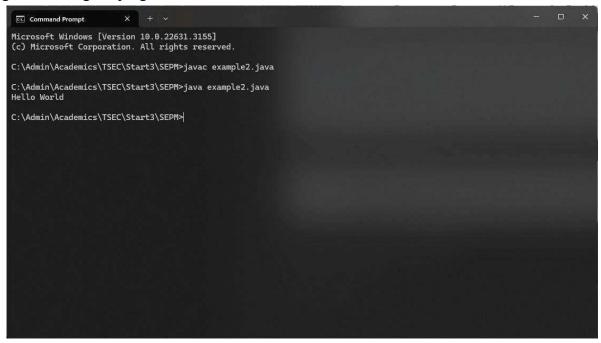
Console output after building the modified project:

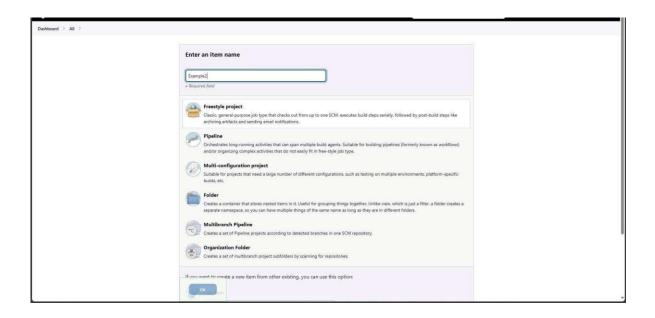


Example 2

<u>Example 2.1: Running a Java program under Jenkins</u> Creating a simple Java program:

Compiling and running the program on the terminal:





Configure new project:

Build Steps

=	Execute Windows batch command ?	×
C	ommand	
S	ee the list of available environment variables	
	<pre>javac C:\Admin\Academics\TSEC\Start3\SEPM\example2.java java C:\Admin\Academics\TSEC\Start3\SEPM\example2.java</pre>	
L		
	Advanced ✓	
Ad	ld build step 🐱	

Console output after building:

⊘ Console Output

```
Started by user Siddhant Chetlur

Running as SYSTEM

[Envinject] - Loading node environment variables.

Building in workspace (SyProgramData)Jenkins\,jenkins\workspace\Example2

[Example2] $ cmd /c call C:\WINDOWS\TEMP\jenkins\S296462484398614135.bat

C:\ProgramData\Jenkins\,jenkins\workspace\Example2>javac C:\Admin\Academics\TSEC\Start3\SEPM\example2.java

C:\ProgramData\Jenkins\,jenkins\workspace\Example2>java C:\Admin\Academics\TSEC\Start3\SEPM\example2.java

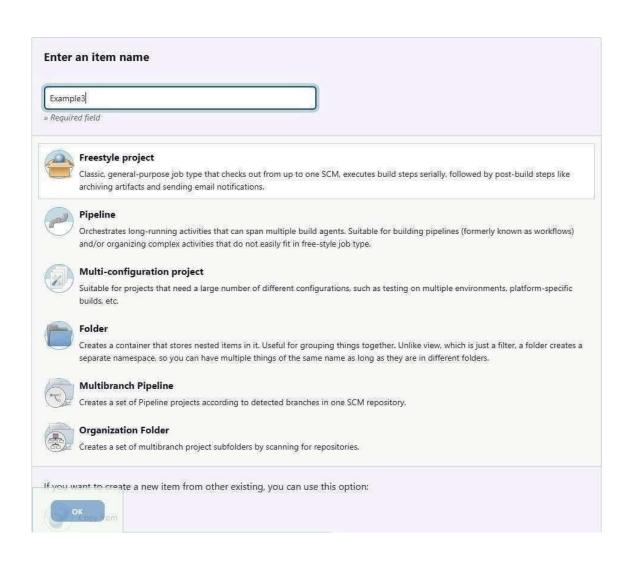
Hello Norld

C:\ProgramData\Jenkins\,jenkins\workspace\Example2>exit 0

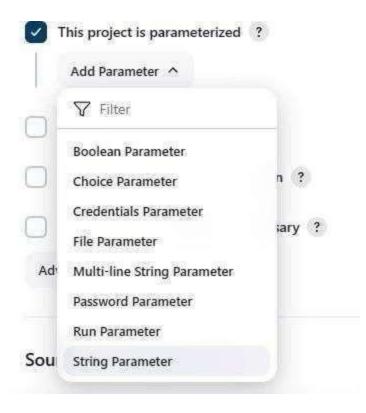
Finished: SUCCESS
```

Example 3

Example 3.1: Parameterise build



Enabling parameterisation and adding a String parameter:



Configuring the string parameter as Fname:



Adding a choice parameter and configuring it as City with the following choices:



Creating a script which takes 2 arguments for name and city:

```
C:\Users\AI&DS 202>Microsoft Windows [Version 10.0.22631.3155] (c) Microsoft Corporation. All rights reserved.
'Microsoft' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\AI&DS 202>C:\Admin\Academics\TSEC\Start3\SEPH>example3.cnd
The system cannot find the path specified.

C:\Users\AI&DS 202>Hello your name is and your city is
'Hello' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\AI&DS 202>C:\Admin\Academics\TSEC\Start3\SEPH example3.cmd Tanishq
The system cannot find the path specified.

C:\Users\AI&DS 202>Hello your name is Tanishq and your city is
'Hello' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\AI&DS 202>C:\Admin\Academics\TSEC\Start3\SEPM>example3.cmd Tansishq Bandra
The system cannot find the path specified.

C:\Users\AI&DS 202>C:\Admin\Academics\TSEC\Start3\SEPM>example3.cmd Tansishq Bandra
The system cannot find the path specified.

C:\Users\AI&DS 202>Hello your name is Tanishq and your city is Bandra
'Hello' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\AI&DS 202>C:\Admin\Academics\TSEC\Start3\SEPM
```

Configuring build steps:

Build Steps



Entering parameters for build:

Project Example3

ame	
Siddhant	
ty	
·y	

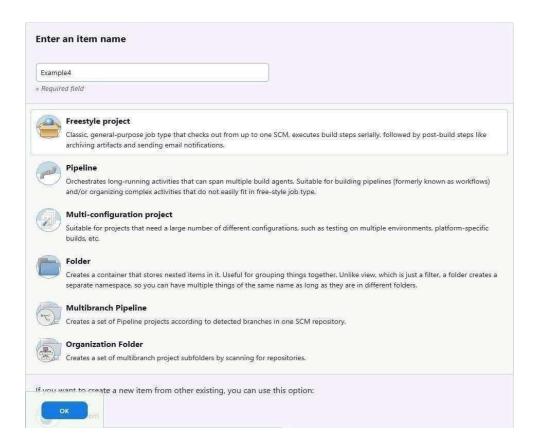
Console output after building:

⊘ Console Output

```
Started by user Siddhant Chetlur
Running as SYSTEN
[Envinject] - Loading node environment variables.
Building in workspace C:\ProgramOata\Jenkins\.jenkins\workspace\Example3
[Example3] $ cmd /c call C:\MINDOWS\TEMP\jenkins14894536165150986151.bat
C:\ProgramOata\Jenkins\.jenkins\workspace\Example3C:\Admin\Academics\TSEC\Start3\SEPN\example3.cmd Siddhant Bandra
Hello your name is Siddhant and your city is Bandra
Finished: SUCCESS
```

Example 3.2: Running a Java program with parameters Creating a Java program with an input argument:

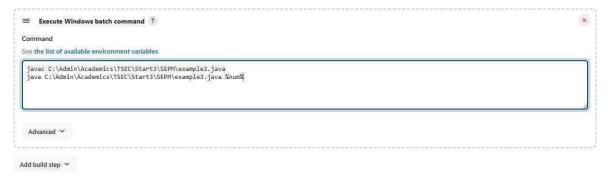
Testing the program on the terminal:



Parameterise the project by adding a string parameter as follows:



Configure the build steps: Build Steps



Entering the parameter for the build:

Project Example4



Console output after building:

⊘ Console Output

```
Started by user Siddhant Chetlur
Running as SYSTEM
[Envinject] - Loading node environment variables.
Building in ownexpace C:\ProgramData\?enkins\.jenkins\workspace\Example4
[Example4] $ cmd /c call C:\WINDOWS\TEMP\jenkins\SISISISS778823247708.bat

C:\ProgramData\?enkins\.jenkins\workspace\Example4>java C:\Admin\Academics\TSEC\Start3\SEPM\example3.java

C:\ProgramData\?enkins\.jenkins\workspace\Example4>java C:\Admin\Academics\TSEC\Start3\SEPM\example3.java 25

25 * 1 = 25

25 * 2 = 50

25 * 3 = 75

25 * 4 = 100

25 * 5 = 125

25 * 7 = 175

25 * 8 = 200

25 * 7 = 255

25 * 10 = 256

C:\ProgramData\?enkins\.jenkins\workspace\Example4>exit 0

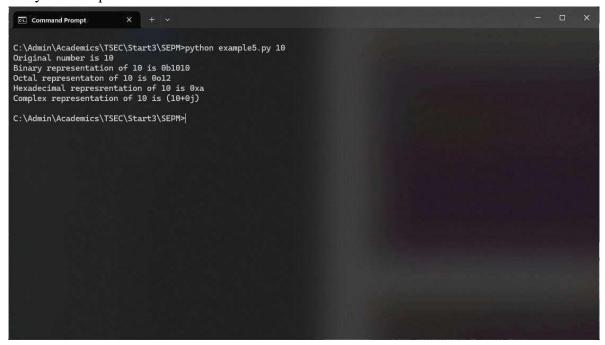
Finished: SUCCESS
```

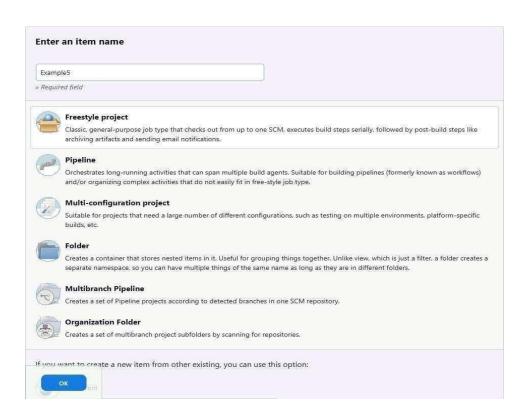
Example 5 Example

5.1: Running a Python program Creating a simple Python

script:

Running the Python script on the terminal:





Parameterising the project with a string parameter as follows:



Configuring the build steps:



Setting the parameter for the build:

Project Example5



Console output after building:

✓ Console Output

Started by user Siddhant Chetlur

Running as SYSTEM

[EmuTnject] : Loading node environment variables.

Building in workspace (:\ProgramOata\Jenkins\,jenkins\workspace\Example5

[Example5] \$ cmd /c call c:\WiNDOMS\TEMP\jenkins1157306491994478222.bat

C:\ProgramOata\Jenkins\,jenkins\workspace\Example5>python C:\Admin\Academics\TSEC\Start3\SEPM\example5.py 10

Original number is 10

Binary representation of 10 is 0012

Hexadecimal representation of 10 is 002

Hexadecimal representation of 10 is 002

C:\ProgramOata\Jenkins\,jenkins\workspace\Example5>exit 0

Finished: SUCCESS.

Conclusion

Thus, we have successfully build the pipeline of jobs using maven / gradle / ant in jenkins and created a pipeline script to test and deploy an application over the tomcat server.