

Software Engineering & Project Management Lab

Experiment No: - 05

Aim: 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:

Programming in Jenkins:

Continuous Integration is a software development practice where members of a team integrate their work frequently, usually each person integrates at least daily leading to multiple integrations per day. Each integration is verified by an automated build (including test) to detect integration errors as quickly as possible.” In simple way, Continuous integration (CI) is the practice of frequently building and testing each change done to your code automatically. Jenkins is a self-contained, open-source automation server which can be used to automate all sorts of tasks related to building, testing, and delivering or deploying software.

Our first job will execute the shell commands. The freestyle project provides enough options and features to build the complex jobs that you will need in your projects.

Example 1

Example 1.1: Deploying a freestyle app in Jenkins

Creating a job:

Start building your software project

Create a job



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Naming the job and setting it as freestyle:


Enter an item name


» Required field


**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**
Suitable for projects that need a large number of different configurations, such as testing on multiple environments, platform-specific builds, etc.

**Folder**
Creates a container that stores nested items in it. Useful for grouping things together. Unlike view, which is just a filter, a folder creates a separate namespace, so you can have multiple things of the same name as long as they are in different folders.

**Multibranch Pipeline**
Creates a set of Pipeline projects according to detected branches in one SCM repository.

**Organization Folder**
Creates a set of multibranch project subfolders by scanning for repositories.

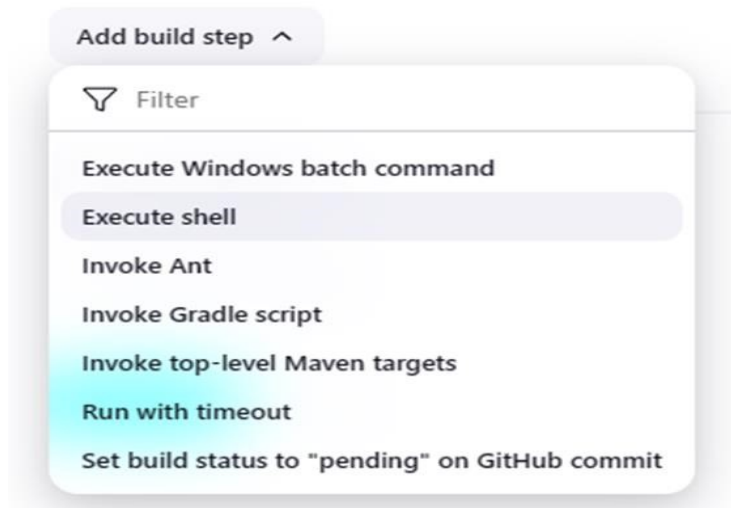
Selecting build type as “Execute shell”:

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Build Steps



Entering a simple command for the shell execution:

Build Steps



Applying and saving the project configuration:



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Building the project:

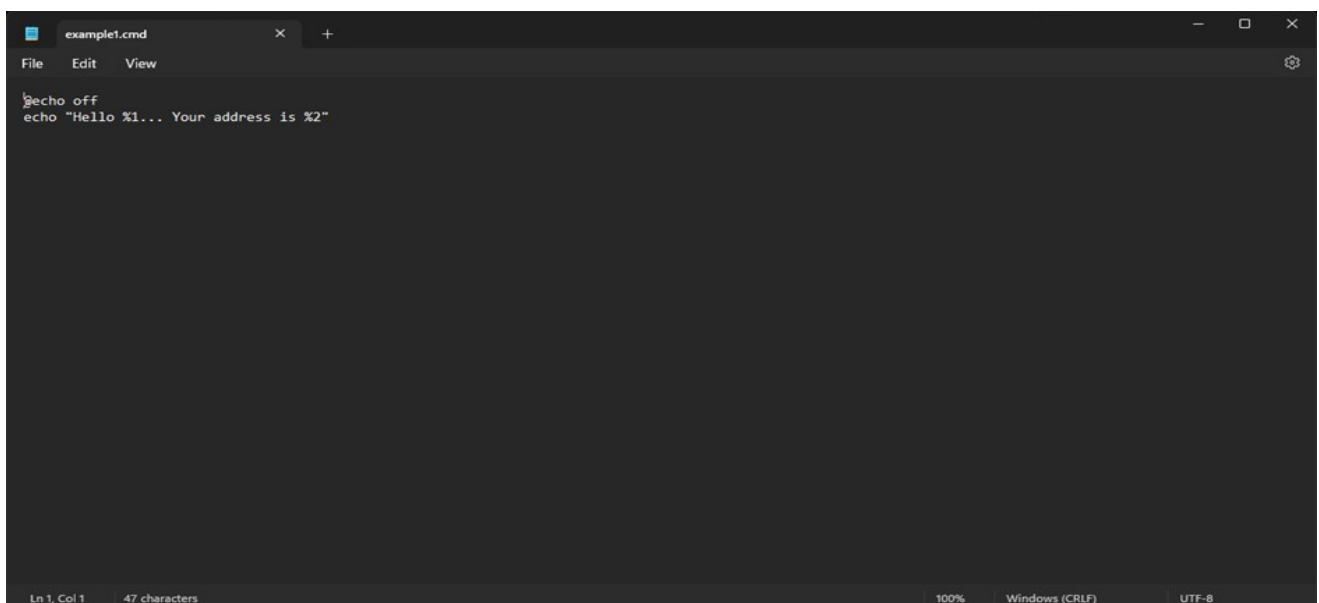


Console output (after building):



Example 1.2: Taking parameters through files

Contents of script example1.cmd:



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Executing script example1.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>C:\Admin\Academics\TSEC\Start3\SEPM>example1.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 ▾

Add build step ▾

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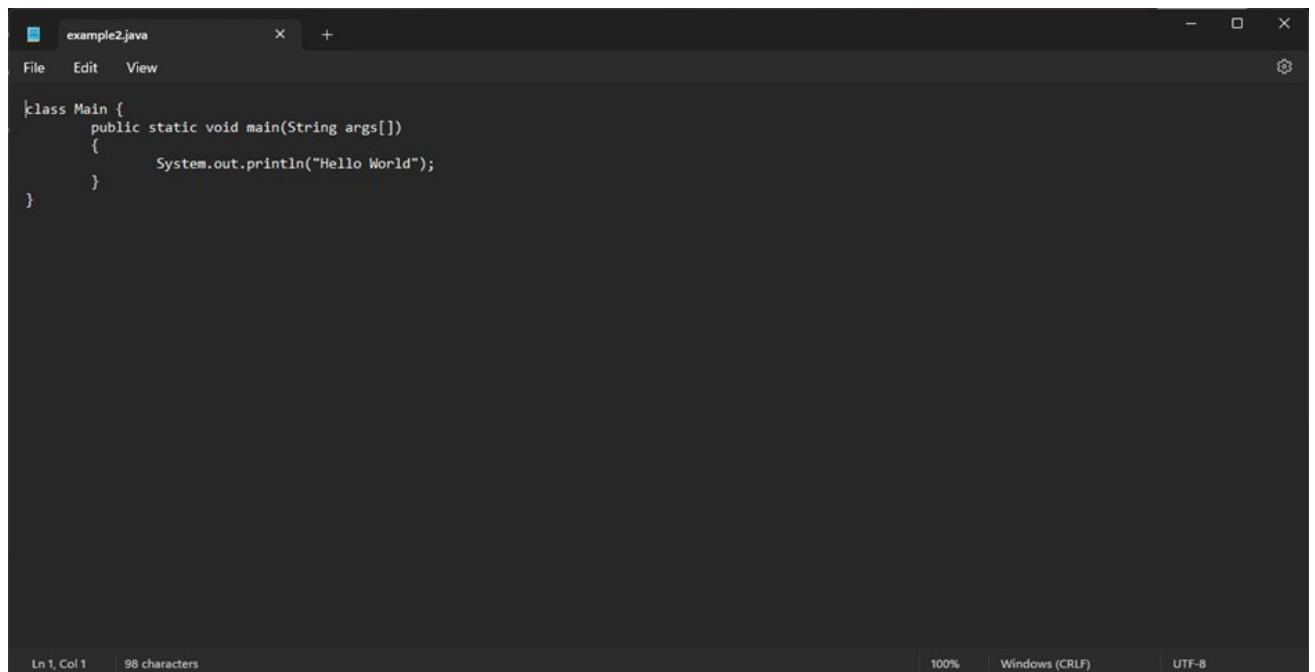
Console output after building the modified project:



Example 2

Example 2.1: Running a Java program under Jenkins

Creating a simple Java program:

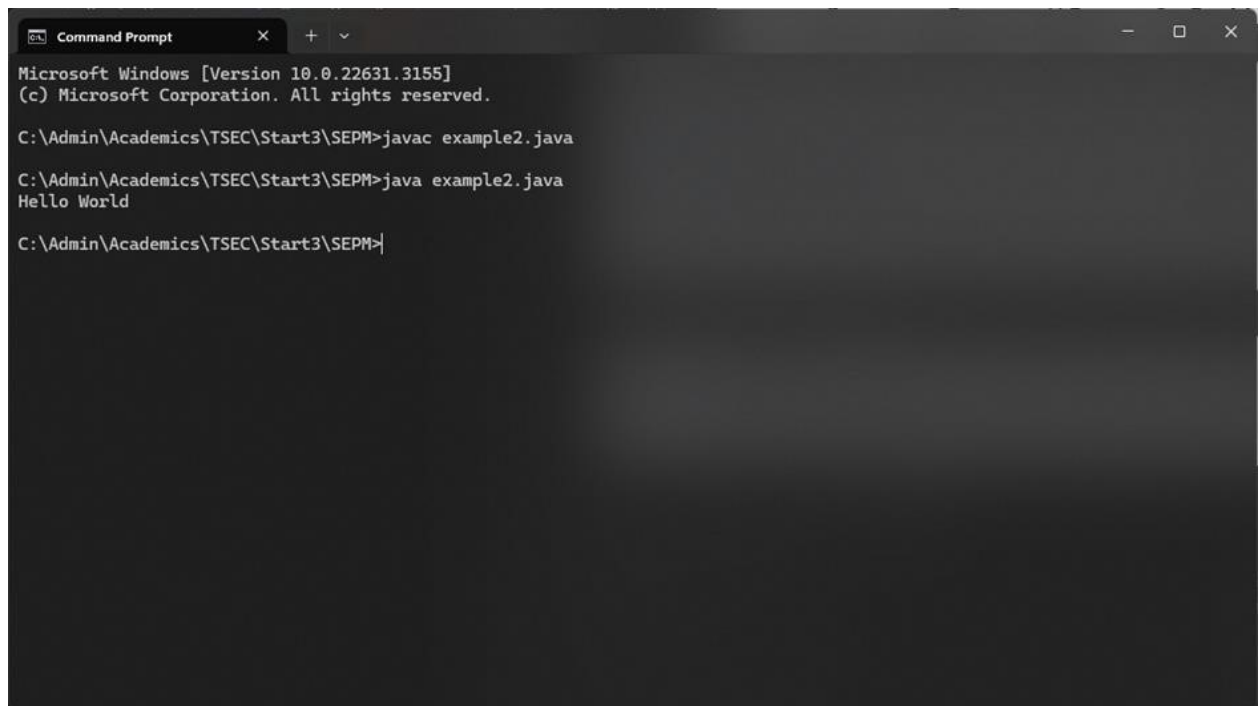


Compiling and running the program on the terminal:

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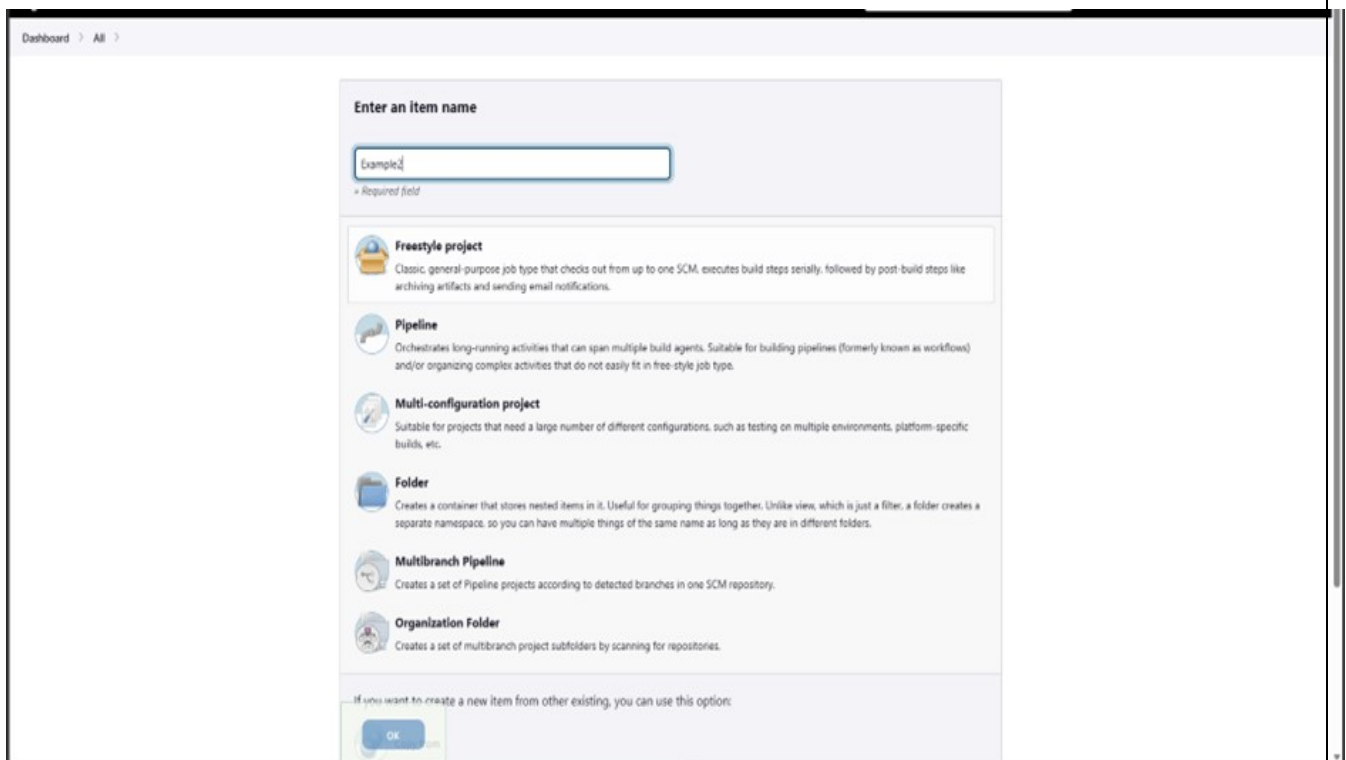
```
Microsoft Windows [Version 10.0.22631.3155]
(c) Microsoft Corporation. All rights reserved.

C:\Admin\Academics\TSEC\Start3\SEPM>javac example2.java

C:\Admin\Academics\TSEC\Start3\SEPM>java example2.java
Hello World

C:\Admin\Academics\TSEC\Start3\SEPM>|
```

Creating a new freestyle project:



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Configure new project:

Build Steps

≡ Execute Windows batch command ?

Command

See the list of available environment variables

```
javac C:\Admin\Academics\TSEC\Start3\SEPM\example2.java
java C:\Admin\Academics\TSEC\Start3\SEPM\example2.java
```

Advanced ▾

Add build step ▾

Console output after building:

✓ Console Output

```
Started by user Siddhant Chetlur
Running as SYSTEM
[EnvInject] - Loading node environment variables.
Building in workspace C:\ProgramData\Jenkins\jenkins\workspace\Example2
[Example2] $ cmd /c call C:\WINDOWS\TEMP\jenkins15296462484398614135.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 World

C:\ProgramData\Jenkins\jenkins\workspace\Example2>exit 0
Finished: SUCCESS
```

Example 3

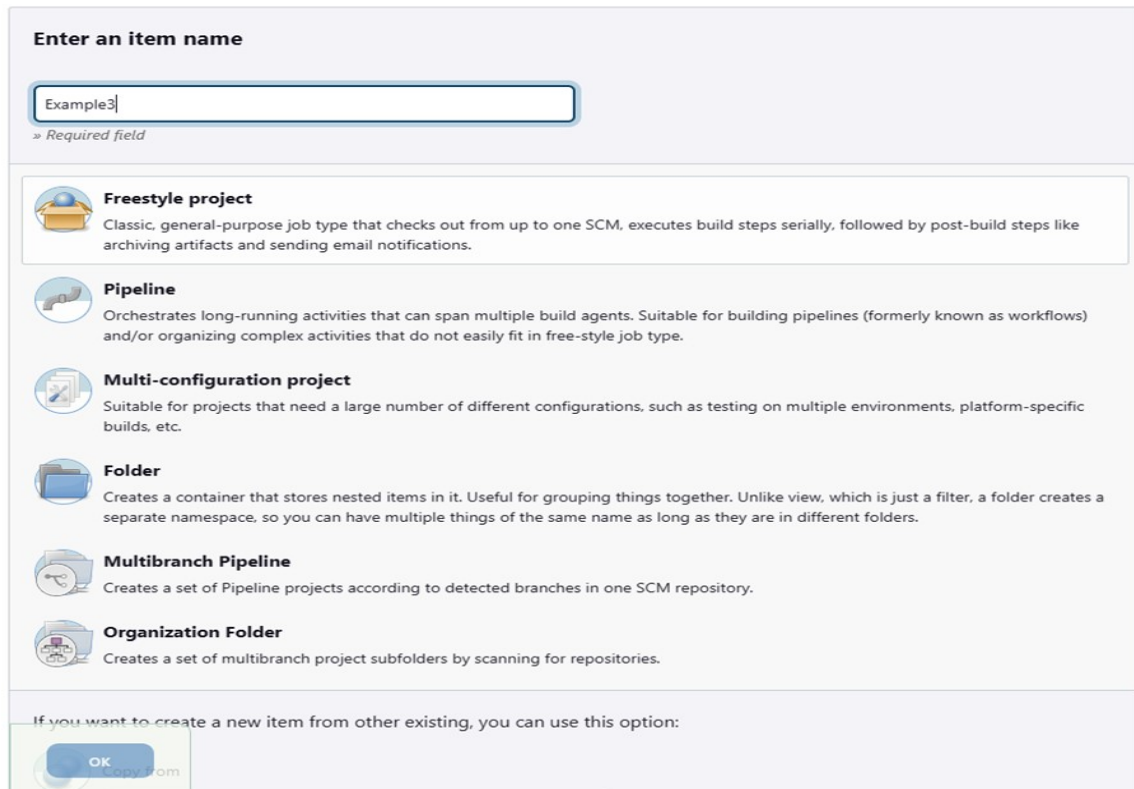
Example 3.1: Parameterise build

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Creating a new freestyle project:

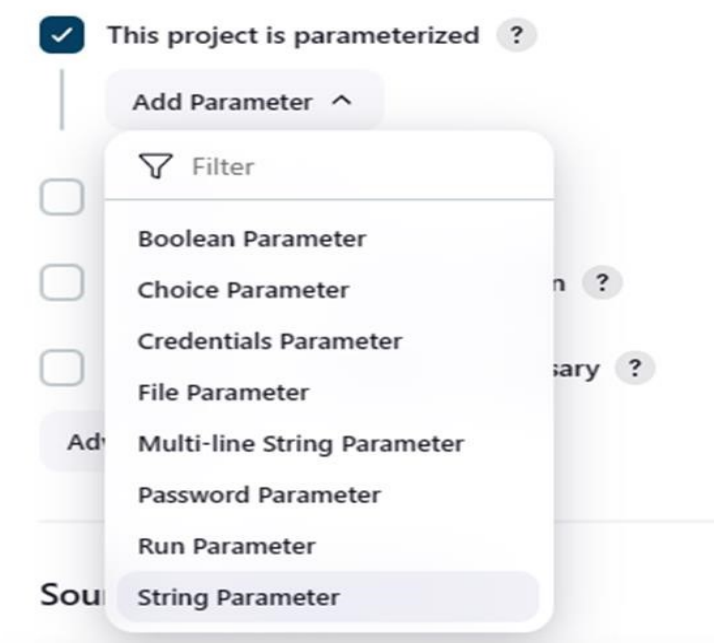


The screenshot shows the Jenkins 'Create new item' dialog. At the top, there is a text input field labeled 'Enter an item name' with the placeholder text 'Example3'. Below the input field is a small text link that says '» Required field'. The main area of the dialog lists several project types with icons and descriptions:

- 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**: Suitable for projects that need a large number of different configurations, such as testing on multiple environments, platform-specific builds, etc.
- Folder**: Creates a container that stores nested items in it. Useful for grouping things together. Unlike view, which is just a filter, a folder creates a separate namespace, so you can have multiple things of the same name as long as they are in different folders.
- Multibranch Pipeline**: Creates a set of Pipeline projects according to detected branches in one SCM repository.
- Organization Folder**: Creates a set of multibranch project subfolders by scanning for repositories.

At the bottom, there is a text link that says 'If you want to create a new item from other existing, you can use this option:'. Below this link is a button labeled 'OK' and a button labeled 'Copy from'.

Enabling parameterisation and adding a String parameter:



The screenshot shows the Jenkins 'Configure' page for a project. At the top, there is a checkbox labeled 'This project is parameterized' which is checked. To the right of the checkbox is a question mark icon. Below the checkbox is a button labeled 'Add Parameter' with an upward arrow. A dropdown menu is open below the 'Add Parameter' button, showing a list of parameter types:

- Filter
- Boolean Parameter
- Choice Parameter
- Credentials Parameter
- File Parameter
- Multi-line String Parameter
- Password Parameter
- Run Parameter
- String Parameter

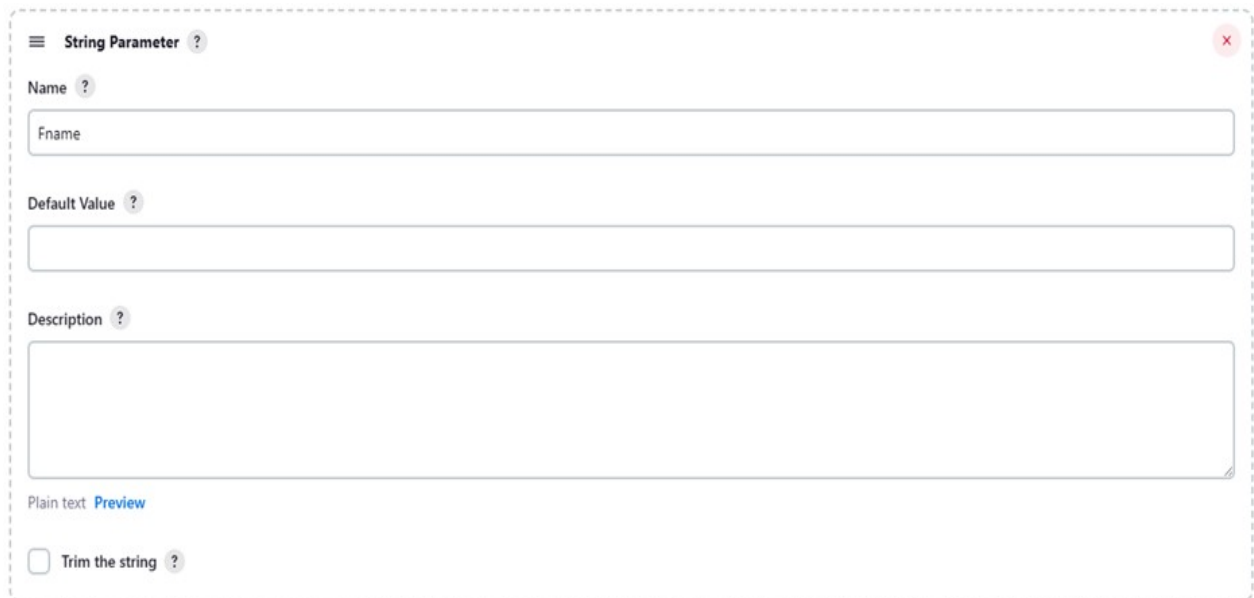
The 'String Parameter' option is highlighted at the bottom of the list.

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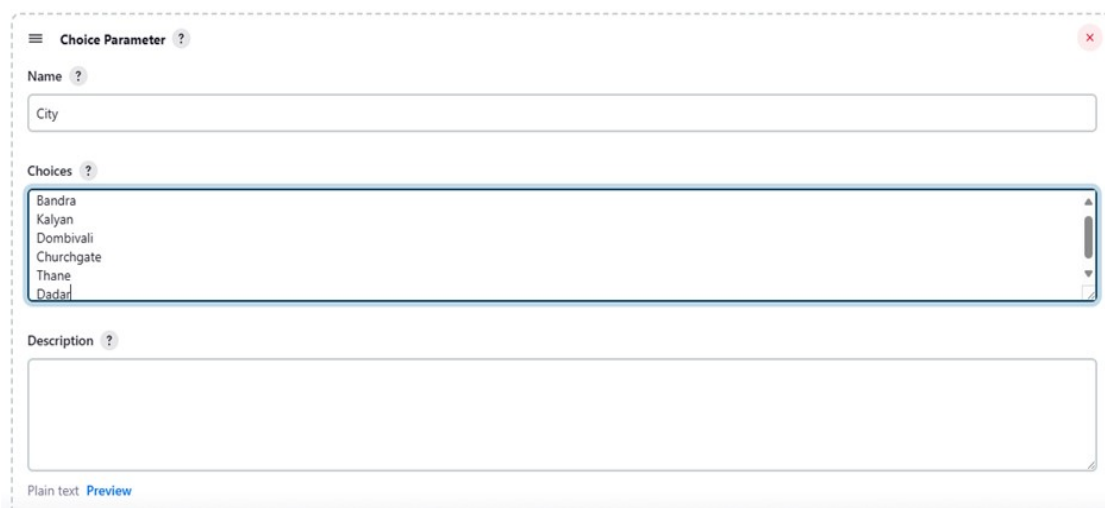
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Configuring the string parameter as Fname:



The screenshot shows the 'String Parameter' configuration dialog in Jenkins. It has a title bar with a hamburger menu, 'String Parameter', and a question mark. A red 'X' button is in the top right. The 'Name' field is labeled 'Fname'. The 'Default Value' field is empty. The 'Description' field is empty. Below the fields, there is a 'Plain text' label and a 'Preview' link. At the bottom, there is a checkbox labeled 'Trim the string' with a question mark.

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



The screenshot shows the 'Choice Parameter' configuration dialog in Jenkins. It has a title bar with a hamburger menu, 'Choice Parameter', and a question mark. A red 'X' button is in the top right. The 'Name' field is labeled 'City'. The 'Choices' field is a list box containing the following items: Bandra, Kalyan, Dombivli, Churchgate, Thane, and Dadar. The 'Description' field is empty. Below the fields, there is a 'Plain text' label and a 'Preview' link.

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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>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\SEPH|
```

Configuring build steps:

Build Steps

≡ Execute Windows batch command ?

Command

See [the list of available environment variables](#)

C:\Admin\Academics\TSEC\Start3\SEPM\example3.cmd %Fname% %City%

Advanced ▾

Add build step ▾

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Entering parameters for build:

Project Example3

This build requires parameters:

Fname

City

Console output after building:

✓ Console Output

```
Started by user Siddhant Chetlur
Running as SYSTEM
[EnvInject] - Loading node environment variables.
Building in workspace C:\ProgramData\Jenkins\.jenkins\workspace\Example3
[Example3] $ cmd /c call C:\WINDOWS\TEMP\jenkins14094536165150986151.bat

C:\ProgramData\Jenkins\.jenkins\workspace\Example3>C:\Admin\Academics\TSEC\Start3\SEPH\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:



```
class Main {
    public static void main(String[] args) {
        int i;
        int num = Integer.parseInt(args[0]);
        for (i = 1; i < 11; i++) {
            System.out.println(num + " * " + i + " = " + num * i);
        }
    }
}
```

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Testing the program on the terminal:

```
Command Prompt
Microsoft Windows [Version 10.0.22631.3155]
(c) Microsoft Corporation. All rights reserved.

C:\Admin\Academics\TSEC\Start3\SEPM>javac example3.java


C:\Admin\Academics\TSEC\Start3\SEPM>java example3.java 4
4 * 1 = 4
4 * 2 = 8
4 * 3 = 12
4 * 4 = 16
4 * 5 = 20
4 * 6 = 24
4 * 7 = 28
4 * 8 = 32
4 * 9 = 36
4 * 10 = 40


C:\Admin\Academics\TSEC\Start3\SEPM>|
```


Creating a new freestyle project:


Enter an item name


» Required field


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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**
Suitable for projects that need a large number of different configurations, such as testing on multiple environments, platform-specific builds, etc.

**Folder**
Creates a container that stores nested items in it. Useful for grouping things together. Unlike view, which is just a filter, a folder creates a separate namespace, so you can have multiple things of the same name as long as they are in different folders.

**Multibranch Pipeline**
Creates a set of Pipeline projects according to detected branches in one SCM repository.

**Organization Folder**
Creates a set of multibranch project subfolders by scanning for repositories.

If you want to create a new item from other existing, you can use this option:

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Aim: 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

Parameterise the project by adding a string parameter as follows:

☒ This project is parameterized ?

String Parameter ?

Name ?
num

Default Value ?

Description ?

Plain text [Preview](#)

☐ Trim the string ?

Add Parameter

Configure the build steps:

Build Steps

Execute Windows batch command ?

Command

See [the list of available environment variables](#)

```
javac C:\Admin\Academics\TSEC\Start3\SEPM\example3.java
java C:\Admin\Academics\TSEC\Start3\SEPM\example3.java %num%
```

Advanced

Add build step

Entering the parameter for the build:

Project Example4

This build requires parameters:

num

25

[Build](#) [Cancel](#)

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Aim: 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

Console output after building:

Console Output

```
Started by user Siddhant Chetlur
Running as SYSTEM
[EnvInject] - Loading node environment variables.
Building in workspace C:\ProgramData\Jenkins\jenkins\workspace\Example4
[Example4] $ cmd /c call C:\WINDOWS\TEMP\jenkins15119185770823247708.bat

C:\ProgramData\Jenkins\jenkins\workspace\Example4>javac C:\Admin\Academics\TSEC\Start3\SEPH\example3.java

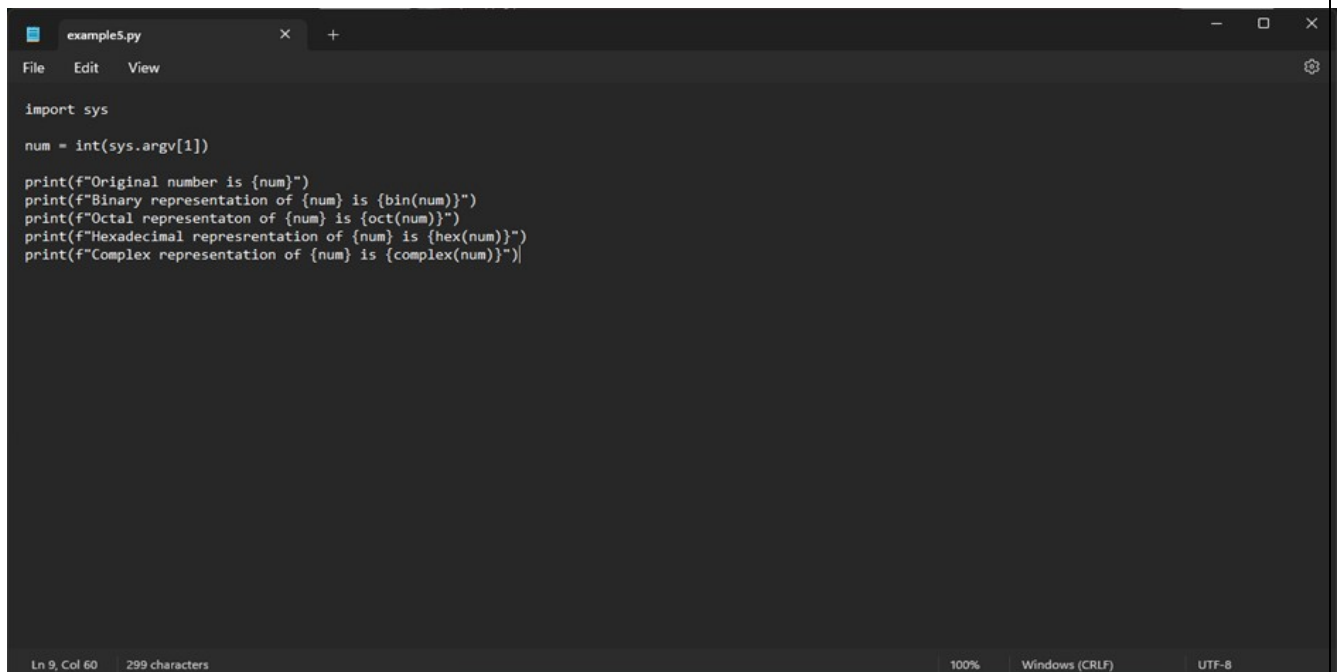
C:\ProgramData\Jenkins\jenkins\workspace\Example4>java C:\Admin\Academics\TSEC\Start3\SEPH\example3.java 25
25 * 1 = 25
25 * 2 = 50
25 * 3 = 75
25 * 4 = 100
25 * 5 = 125
25 * 6 = 150
25 * 7 = 175
25 * 8 = 200
25 * 9 = 225
25 * 10 = 250

C:\ProgramData\Jenkins\jenkins\workspace\Example4>exit 0
Finished: SUCCESS
```

Example 5

Example 5.1: Running a Python program

Creating a simple Python script:

A screenshot of a code editor window titled 'example5.py'. The editor has a dark theme and shows a Python script that takes a command-line argument and prints its various representations. The script is as follows:

```
import sys

num = int(sys.argv[1])

print(f"Original number is {num}")
print(f"Binary representation of {num} is {bin(num)}")
print(f"Octal representation of {num} is {oct(num)}")
print(f"Hexadecimal representation of {num} is {hex(num)}")
print(f"Complex representation of {num} is {complex(num)}")
```

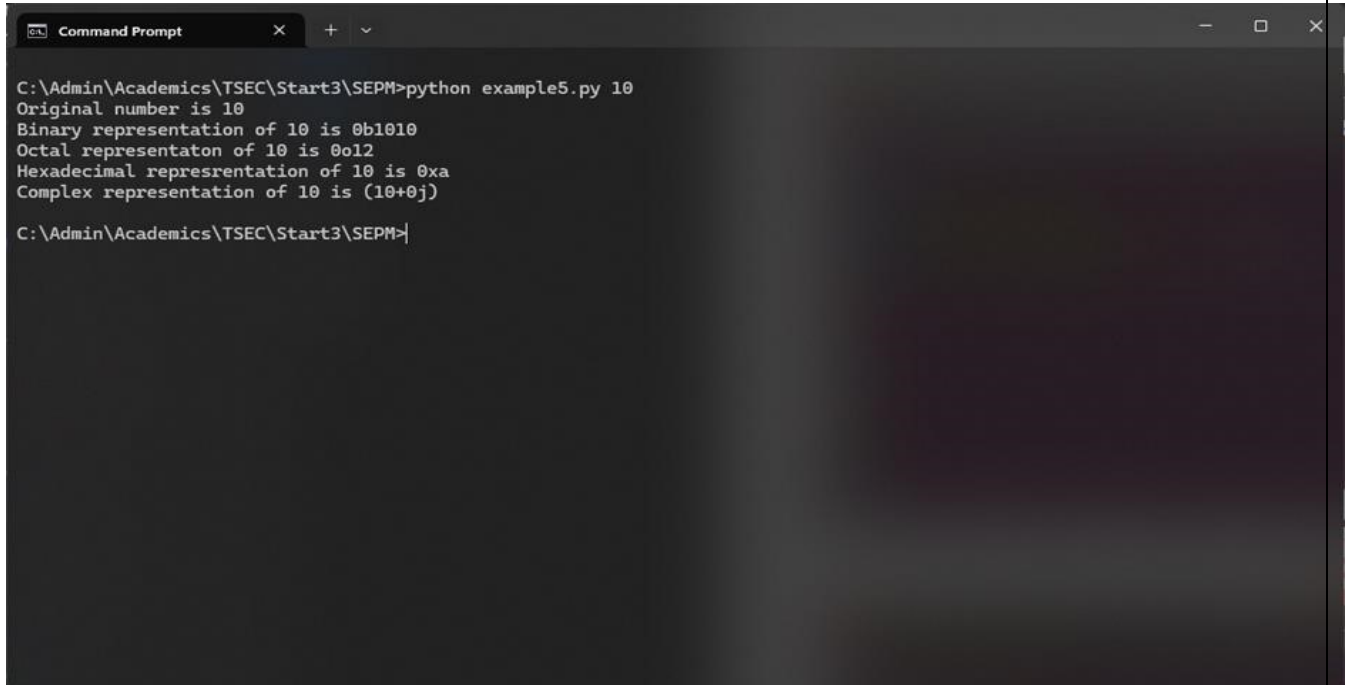
The status bar at the bottom indicates 'Ln 9, Col 60', '299 characters', '100%' zoom, 'Windows (CRLF)' line endings, and 'UTF-8' encoding.

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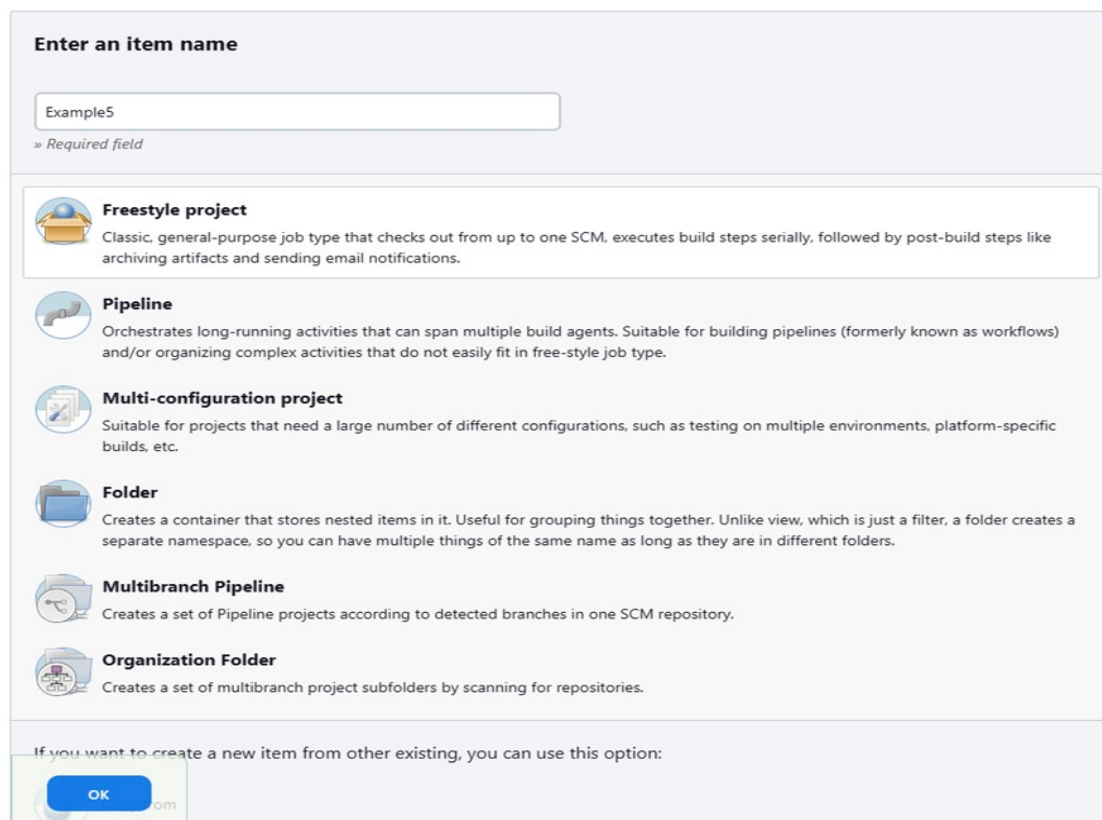
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Running the Python script on the terminal:



```
C:\Admin\Academics\TSEC\Start3\SEPM>python example5.py 10
Original number is 10
Binary representation of 10 is 0b1010
Octal representation of 10 is 0o12
Hexadecimal representation of 10 is 0xa
Complex representation of 10 is (10+0j)
C:\Admin\Academics\TSEC\Start3\SEPM>
```

Creating a new freestyle project:



Enter an item name

Example5

» Required field

- 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.
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Suitable for projects that need a large number of different configurations, such as testing on multiple environments, platform-specific builds, etc.
- Folder**
Creates a container that stores nested items in it. Useful for grouping things together. Unlike view, which is just a filter, a folder creates a separate namespace, so you can have multiple things of the same name as long as they are in different folders.
- Multibranch Pipeline**
Creates a set of Pipeline projects according to detected branches in one SCM repository.
- Organization Folder**
Creates a set of multibranch project subfolders by scanning for repositories.

If you want to create a new item from other existing, you can use this option:

OK

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Parameterising the project with a string parameter as follows:

☒ This project is parameterized ?

String Parameter ?

Name ?

Default Value ?

Description ?

Plain text [Preview](#)

☐ Trim the string ?

Add Parameter ▾

Configuring the build steps:

Build Steps

Execute Windows batch command ?

Command

See [the list of available environment variables](#)

```
python C:\Admin\Academics\TSEC\Start3\SEPM\example5.py %num%
```

Advanced ▾

Add build step ▾

Setting the parameter for the build:

Project Example5

This build requires parameters:

num

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Console output after building:

✓ Console Output

```
Started by user Siddhant Chetlur
Running as SYSTEM
[EnvInject] - Loading node environment variables.
Building in workspace C:\ProgramData\Jenkins\.jenkins\workspace\Example5
[Example5] $ cmd /c call C:\WINDOWS\TEMP\jenkins11157306491994478222.bat

C:\ProgramData\Jenkins\.jenkins\workspace\Example5>python C:\Admin\Academics\TSEC\Start3\SEPM\example5.py 10
Original number is 10
Binary representation of 10 is 0b1010
Octal representaton of 10 is 0o12
Hexadecimal representation of 10 is 0xa
Complex representation of 10 is (10+0j)

C:\ProgramData\Jenkins\.jenkins\workspace\Example5>exit 0
Finished: SUCCESS
```

Some Screenshots:

The screenshot shows the Jenkins 'Configure' page for a pipeline. The 'Pipeline' tab is selected. The 'Definition' is set to 'Pipeline script'. The script is as follows:

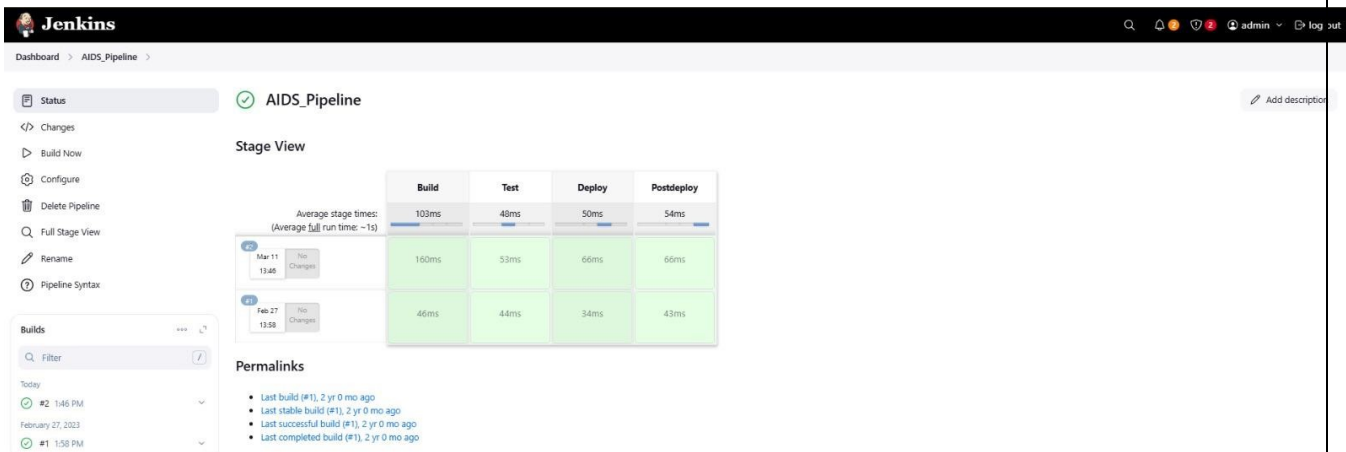
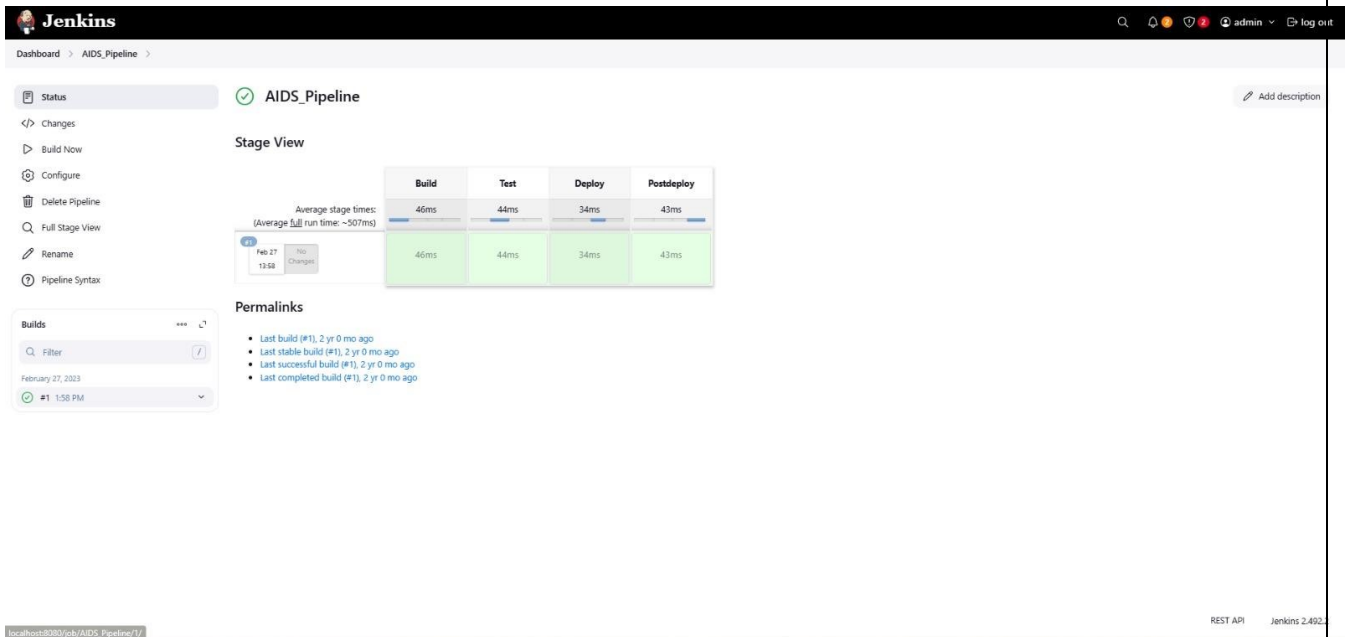
```
1 pipeline {
2   agent any
3
4   stages {
5     stage('Build') {
6       steps {
7         echo 'Building.. This is the build phase'
8       }
9     }
10    stage('Test') {
11      steps {
12        echo 'Testing.. This is the testing phase'
13      }
14    }
15    stage('Deploy') {
16      steps {
17        echo 'Deploying.... This is the deployment phase'
18      }
19    }
20    stage('PostDeploy') {
21      steps {
22        echo 'Postdeployment phase....'
23      }
24    }
25  }
26 }
27
```

Below the script, there is a checkbox for 'Use Groovy Sandbox' which is checked. At the bottom, there are 'Save' and 'Apply' buttons.

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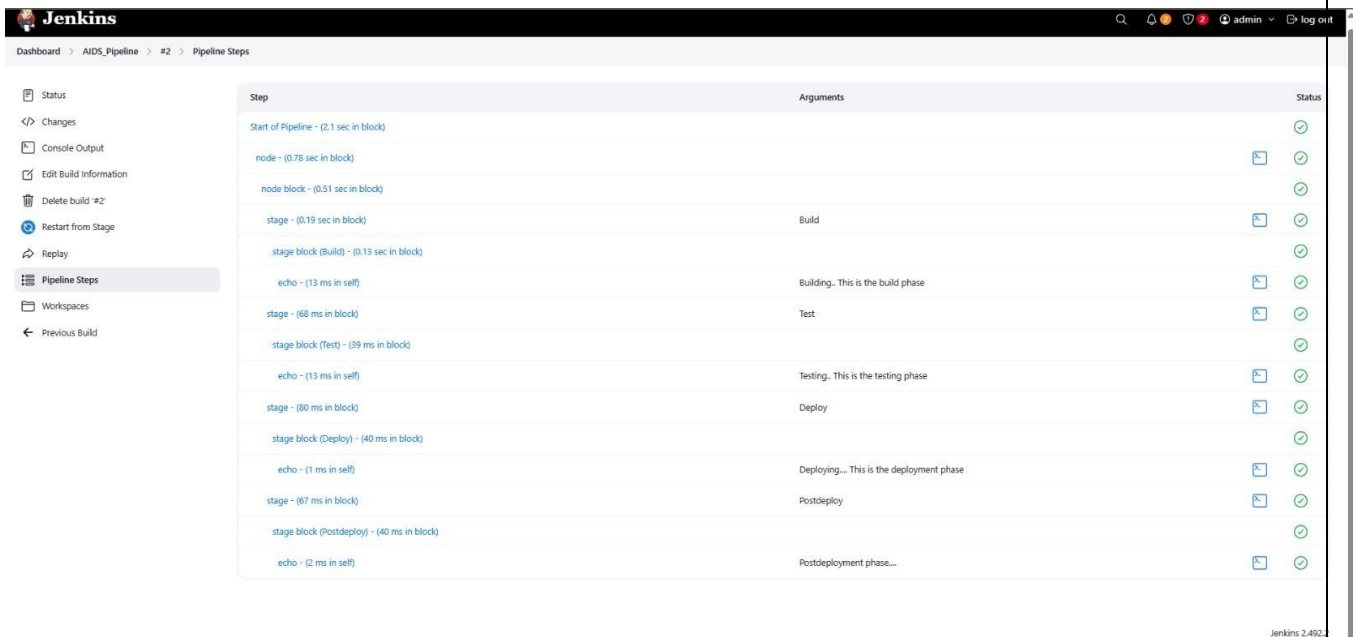
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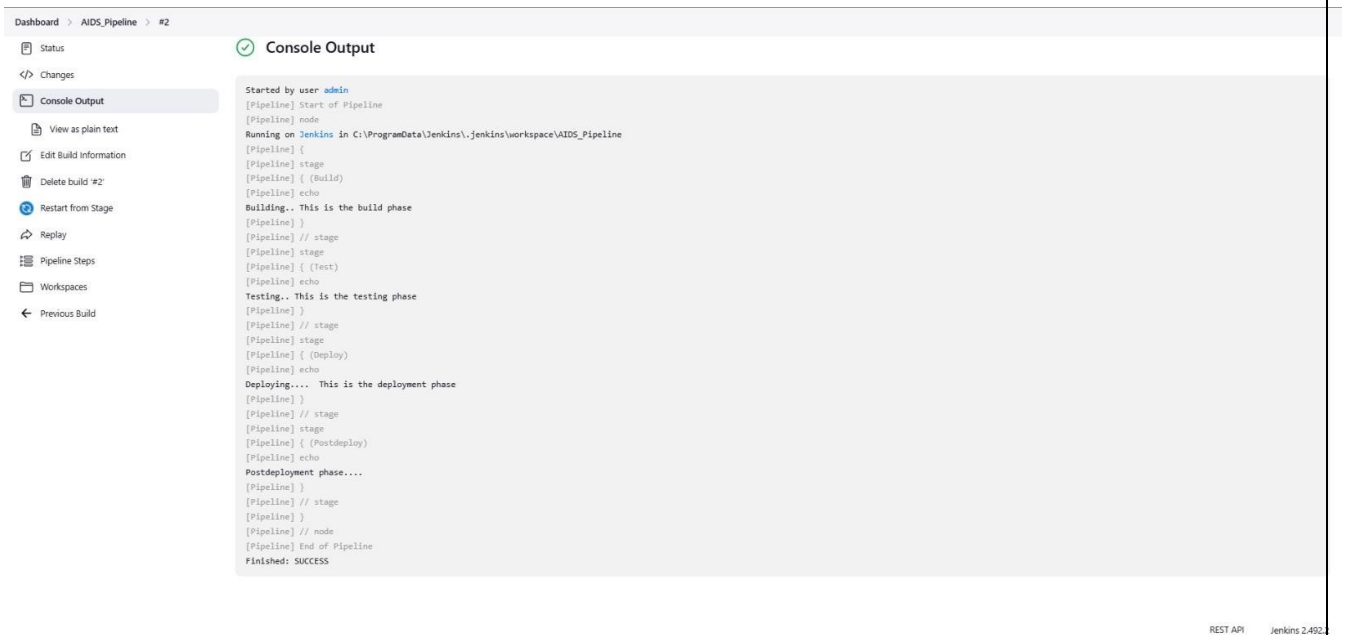
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The screenshot shows the Jenkins web interface for a pipeline named 'AIDS_Pipeline'. The 'Pipeline Steps' view displays a sequence of steps in a table. The steps include 'Start of Pipeline', 'node', 'node block', 'stage' (Build, Test, Deploy, Postdeploy), and 'echo' blocks. Each step has a status icon (green checkmark) and a duration. The 'Arguments' column shows the specific actions for each stage, such as 'Building.. This is the build phase' and 'Testing.. This is the testing phase'.

Step	Arguments	Status
Start of Pipeline - (2.1 sec in block)		✓
node - (0.78 sec in block)		✓
node block - (0.51 sec in block)		✓
stage - (0.19 sec in block)	Build	✓
stage block (Build) - (0.13 sec in block)		✓
echo - (13 ms in self)	Building.. This is the build phase	✓
stage - (68 ms in block)	Test	✓
stage block (Test) - (39 ms in block)		✓
echo - (13 ms in self)	Testing.. This is the testing phase	✓
stage - (80 ms in block)	Deploy	✓
stage block (Deploy) - (40 ms in block)		✓
echo - (1 ms in self)	Deploying.... This is the deployment phase	✓
stage - (67 ms in block)	Postdeploy	✓
stage block (Postdeploy) - (40 ms in block)		✓
echo - (2 ms in self)	Postdeployment phase...	✓



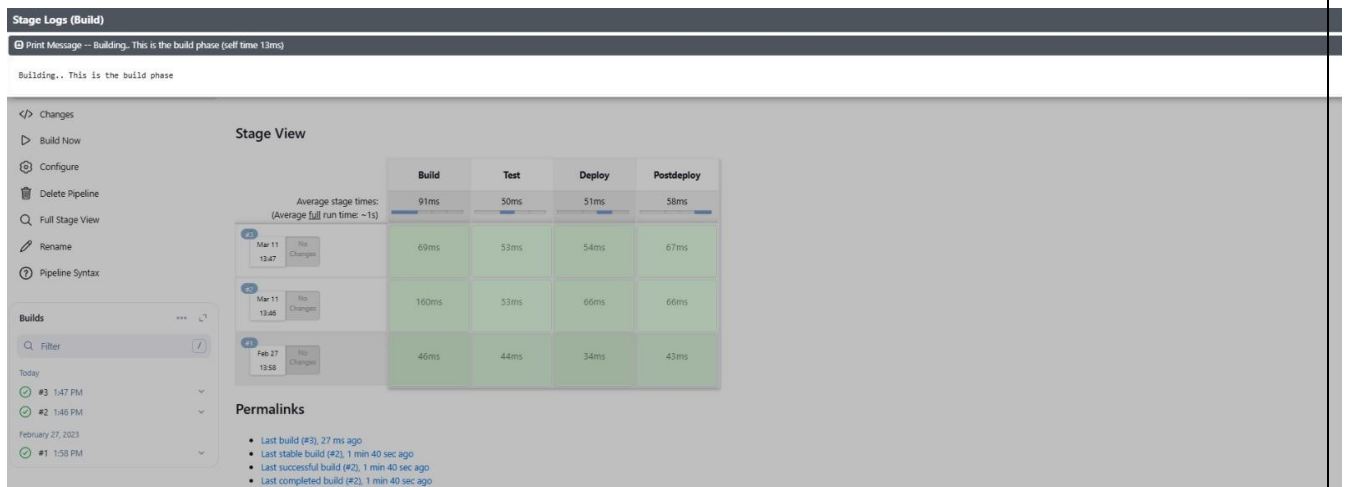
The screenshot shows the Jenkins web interface for the same pipeline, now displaying the 'Console Output'. The output text shows the pipeline's execution from start to finish, including the build, test, and deployment phases. The final status is 'Finished: SUCCESS'.

```
Started by user admin
[Pipeline] Start of Pipeline
[Pipeline] node
Running on Jenkins in C:\ProgramData\Jenkins\jenkins\workspace\AIDS_Pipeline
[Pipeline] {
[Pipeline] stage
[Pipeline] { (Build)
[Pipeline] echo
Building.. This is the build phase
[Pipeline] }
[Pipeline] // stage
[Pipeline] stage
[Pipeline] { (Test)
[Pipeline] echo
Testing.. This is the testing phase
[Pipeline] }
[Pipeline] // stage
[Pipeline] stage
[Pipeline] { (Deploy)
[Pipeline] echo
Deploying.... This is the deployment phase
[Pipeline] }
[Pipeline] // stage
[Pipeline] stage
[Pipeline] { (Postdeploy)
[Pipeline] echo
Postdeployment phase....
[Pipeline] }
[Pipeline] // stage
[Pipeline] // node
[Pipeline] End of Pipeline
Finished: SUCCESS
```

Software Engineering & Project Management Lab

Experiment No: - 05

Aim: 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



Conclusion: Thus, we have successfully Build the pipeline of jobs using Maven / Gradle / Ant in Jenkins, created a pipeline script to Test and deploy an application over the tomcat server.