SEPM EXP 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

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Theory :

1. 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.

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2. Installing and Configuring Jenkins

1. Download and Install Jenkins:
   - Download from Jenkins official site.
   - Install and start the Jenkins service.

   - 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.

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3. Creating a Jenkins Pipeline

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

3.1 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.

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4. Writing a Jenkins Pipeline Script

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

```
groovy CopyEdit 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'
```

```
            }
        }
    }
}
```

---

5. Configuring Jenkins for Deployment

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

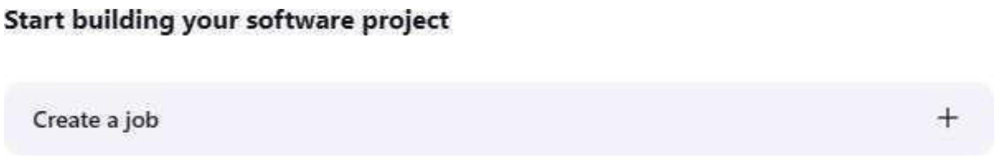
```
<role rolename="manager-gui"/>
<role rolename="manager-script"/>
<user username="admin" password="admin" roles="manager-gui,manager-script"/>
```
   - Restart Tomcat.

2. Set Up Jenkins Credentials:
   - Go to Manage Jenkins > Credentials. o Add a username/password credential for Tomcat deployment.

3. Run the Pipeline in Jenkins:
   - Click Build Now to execute the pipeline. o Verify the deployment at http://your-tomcat-server:8080/your-app.

Example 1 :

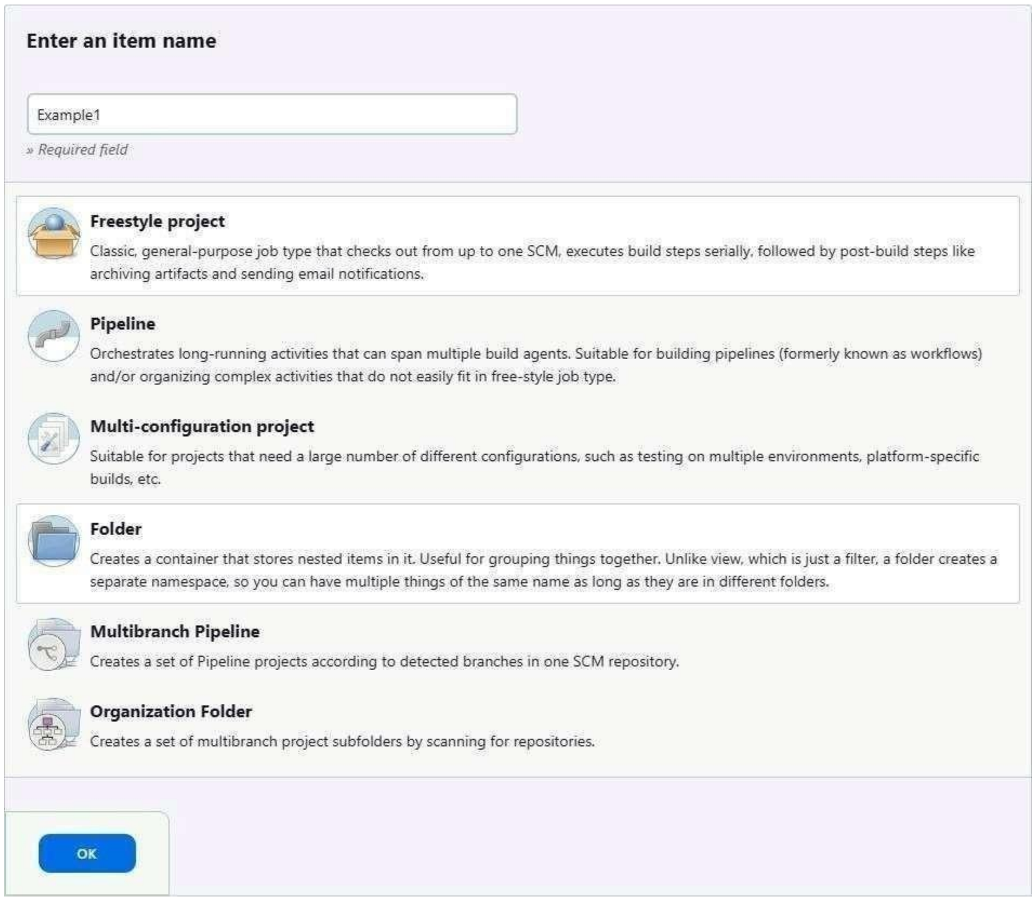
Creating a job:



Start building your software project

Create a job +

Naming the job and setting it as freestyle:


Enter an item name

Example1

» 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.

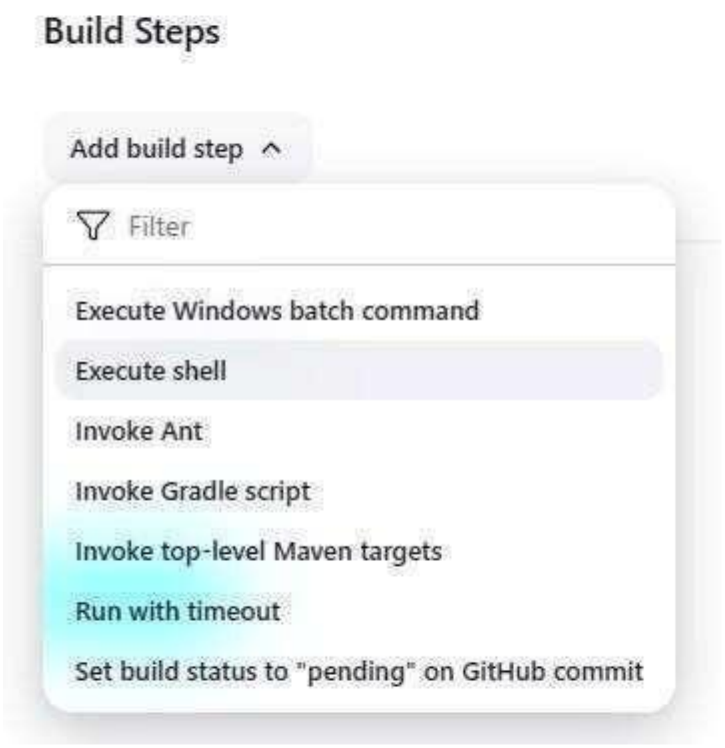
Multi-configuration project
Suitable for projects that need a large number of different configurations, such as testing on multiple environments, platform-specific builds, etc.

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.

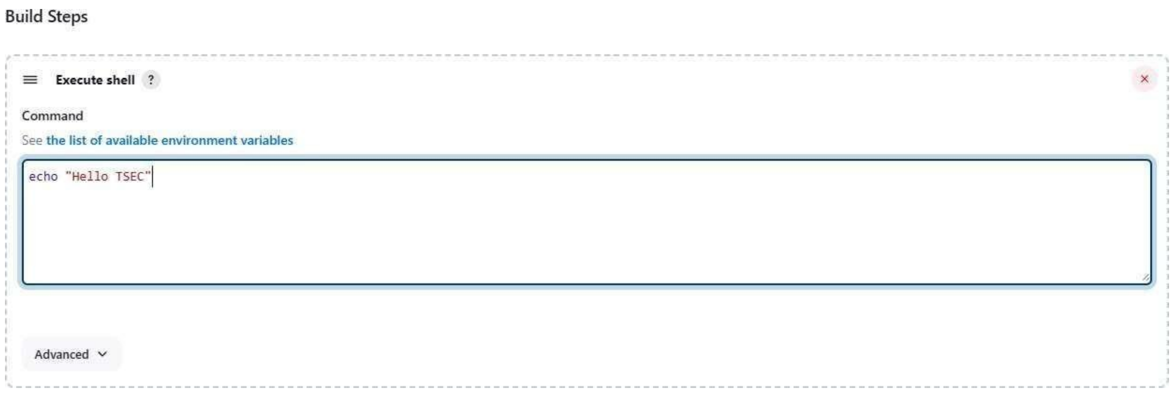
Multibranch Pipeline
Creates a set of Pipeline projects according to detected branches in one SCM repository.

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

Selecting build type as “Execute shell”:

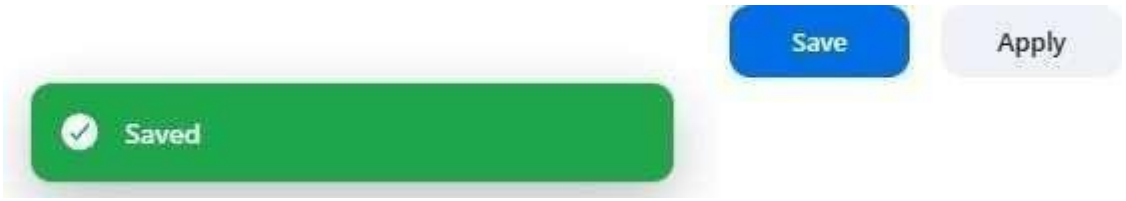

Build Steps
Add build step
Filter
Execute Windows batch command
Execute shell
Invoke Ant
Invoke Gradle script
Invoke top-level Maven targets
Run with timeout
Set build status to "pending" on GitHub commit

Entering a simple command for the shell execution:



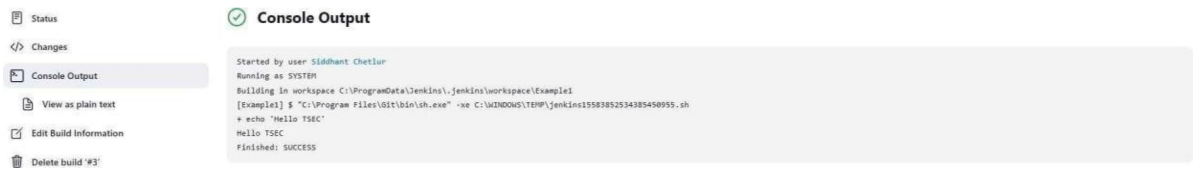
```
echo "Hello TSEC"
```

Applying and saving the project configuration:



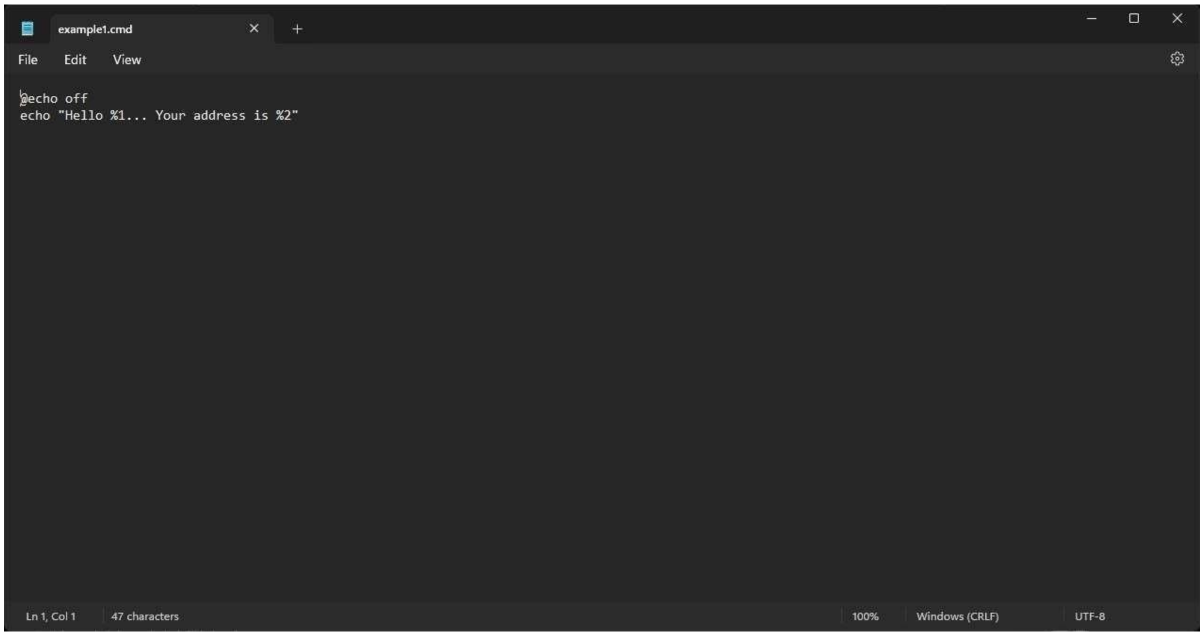
Building the project:

Console output (after building):



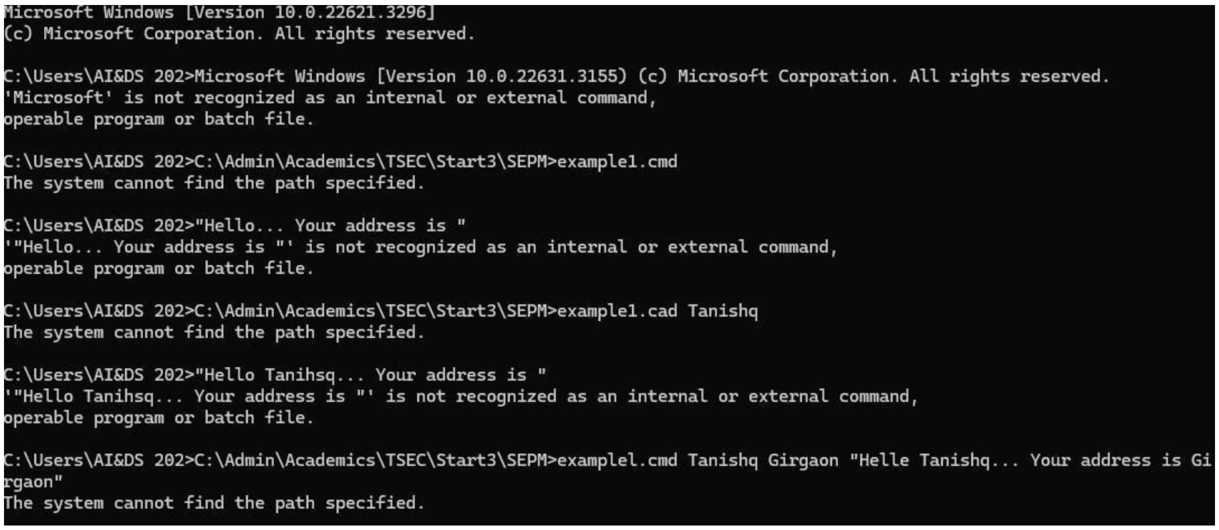
```
Started by user Siddhant Chetlur
Running as SYSTEM
Building in workspace C:\ProgramData\Jenkins\.jenkins\workspace\Example1
[Example1] $ "C:\Program Files\Git\bin\sh.exe" -xe C:\WINDOWS\TEMP\jenkins15583852534385450955.sh
+ echo 'Hello TSEC'
Hello TSEC
Finished: SUCCESS
```

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



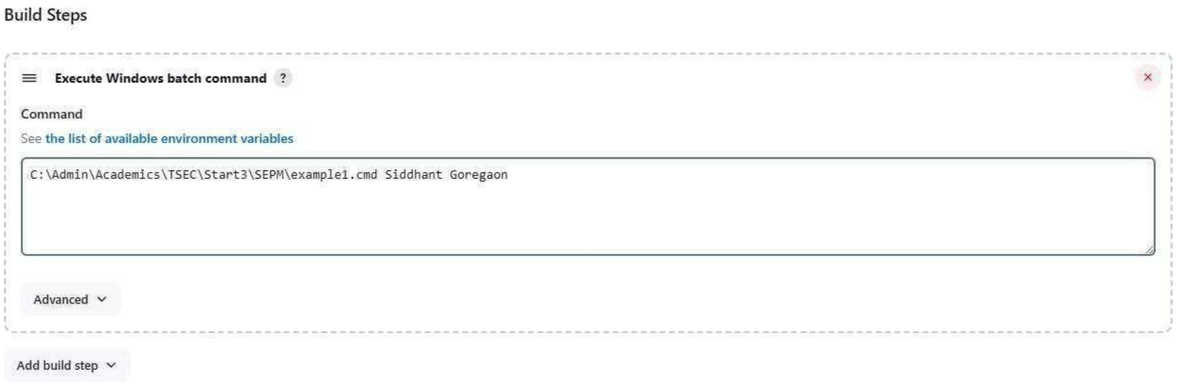
```
@echo off
echo "Hello %1... Your address is %2"
```

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>examplel.cmd Tanishq Girgaon "Helle Tanishq... Your address is Gi
rgaon"
The system cannot find the path specified.
```

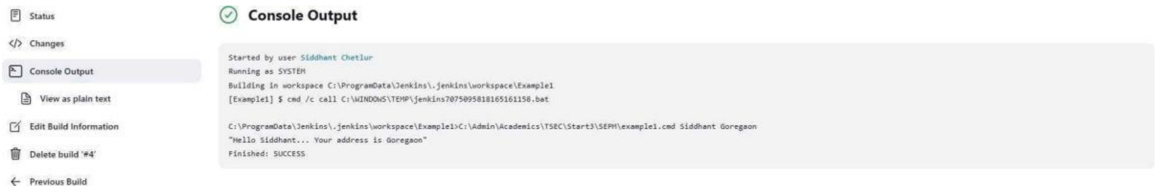
Modifying the Jenkins project to execute the script while supplying required parameters:



Build Steps
Execute Windows batch command
Command
See the list of available environment variables
Advanced
Add build step

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

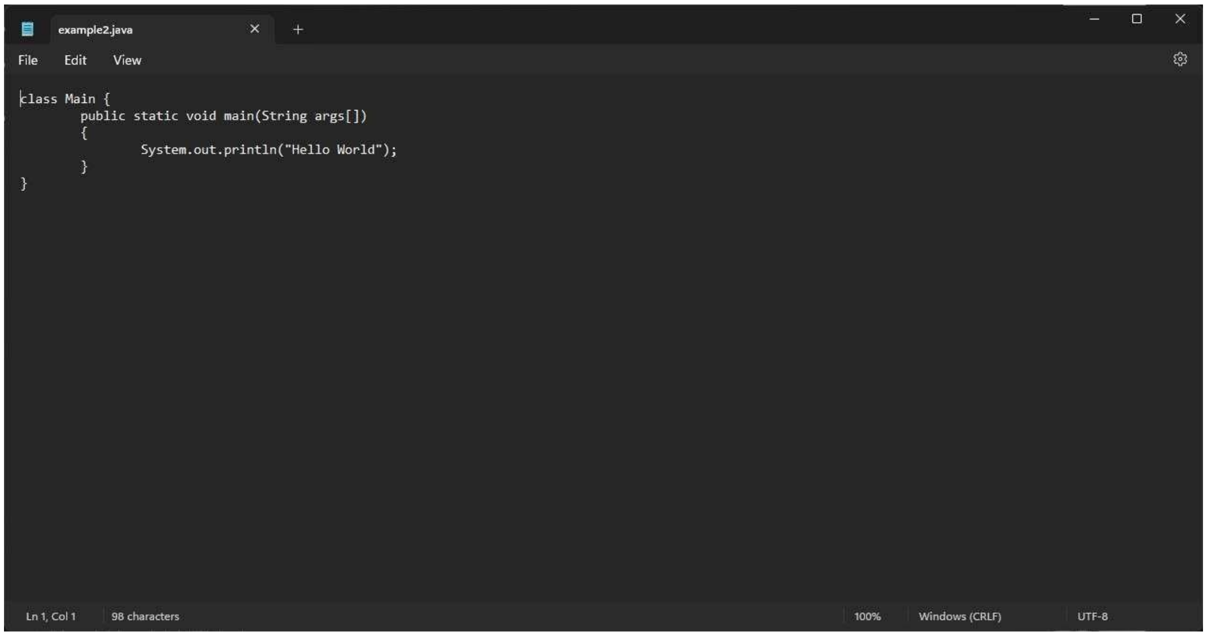
Console output after building the modified project:



```
Started by user Siddhant Chetlur
Running as SYSTEM
Building in workspace C:\ProgramData\Jenkins\.jenkins\workspace\Example1
[Example1] $ cmd /c call C:\WINDOWS\TEMP\jenkins7075095818165161158.bat

C:\ProgramData\Jenkins\.jenkins\workspace\Example1>C:\Admin\Academics\TSEC\Start3\SEPM\example1.cmd Siddhant Goregaon
"Hello Siddhant... Your address is Goregaon"
Finished: SUCCESS
```

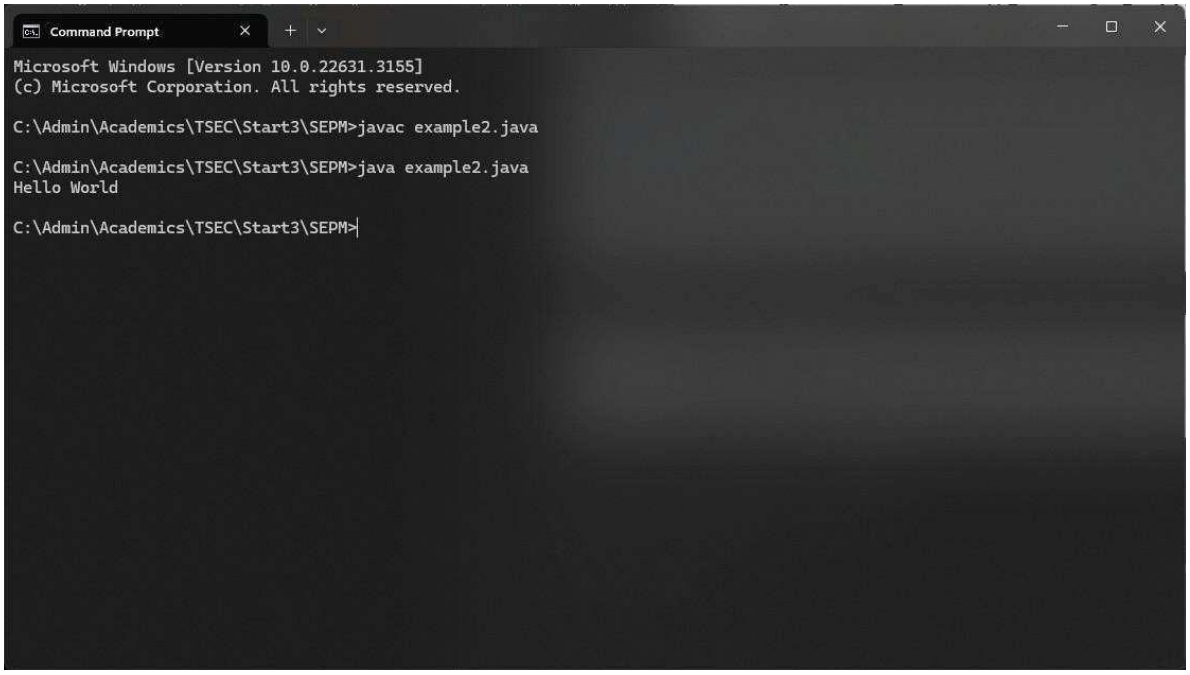
<u>Example 2 Example 2.1: Running a Java program under</u>

<u>Jenkins</u> Creating a simple Java program:



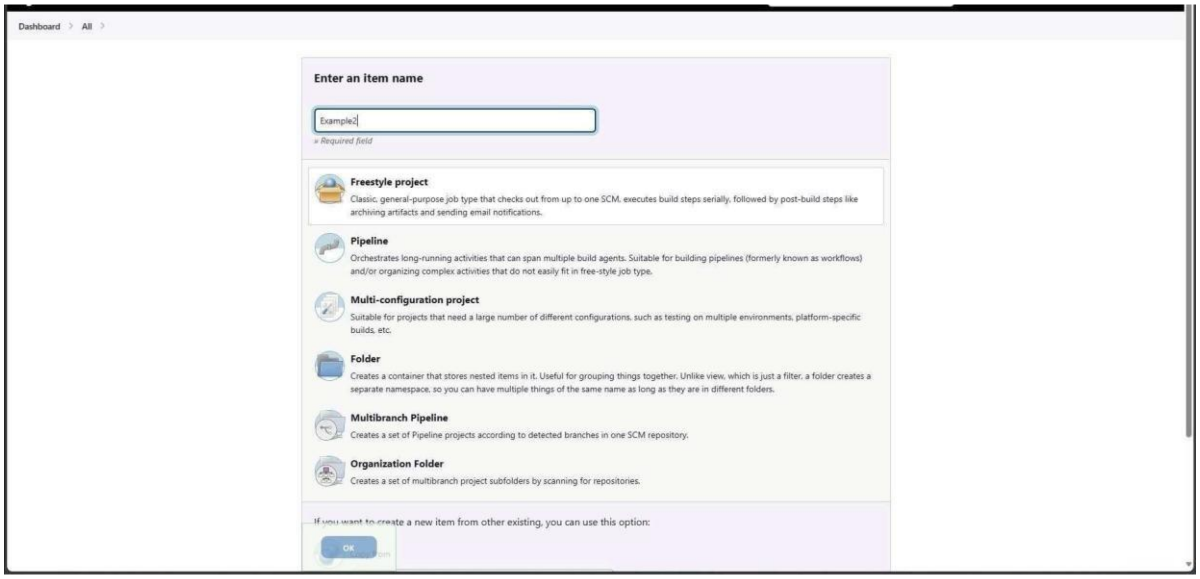
```
class Main {
        public static void main(String args[])
        {
                System.out.println("Hello World");
        }
}
```

Compiling and running the program on the terminal:



```
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:



Enter an item name

Example2

» 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
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Multibranch Pipeline
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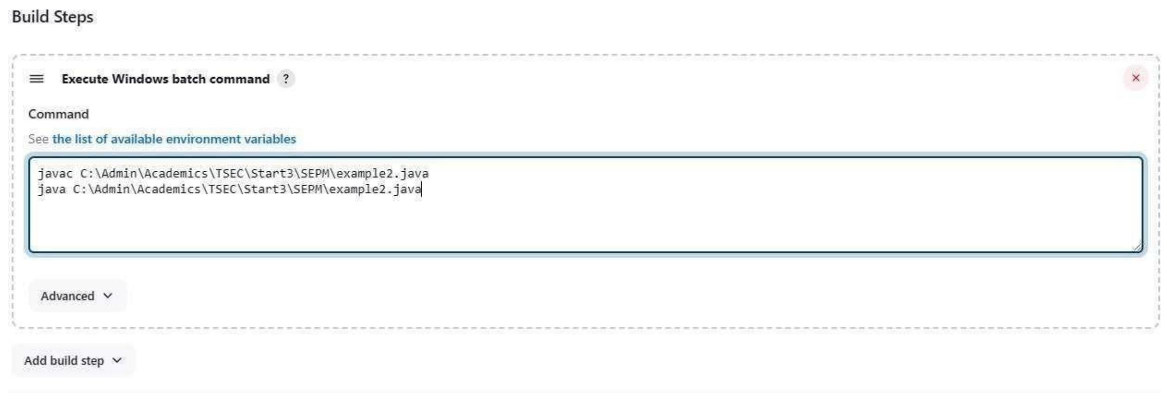
Organization Folder
Creates a set of multibranch project subfolders by scanning for repositories.

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

Configure new project:


Build Steps

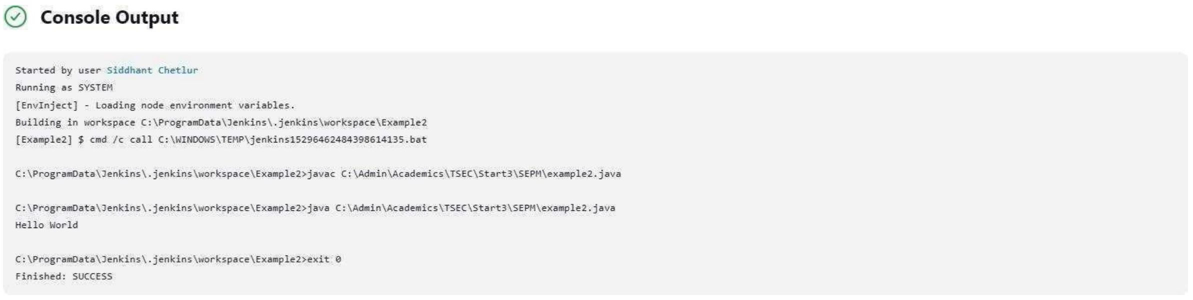
Execute Windows batch command

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
```

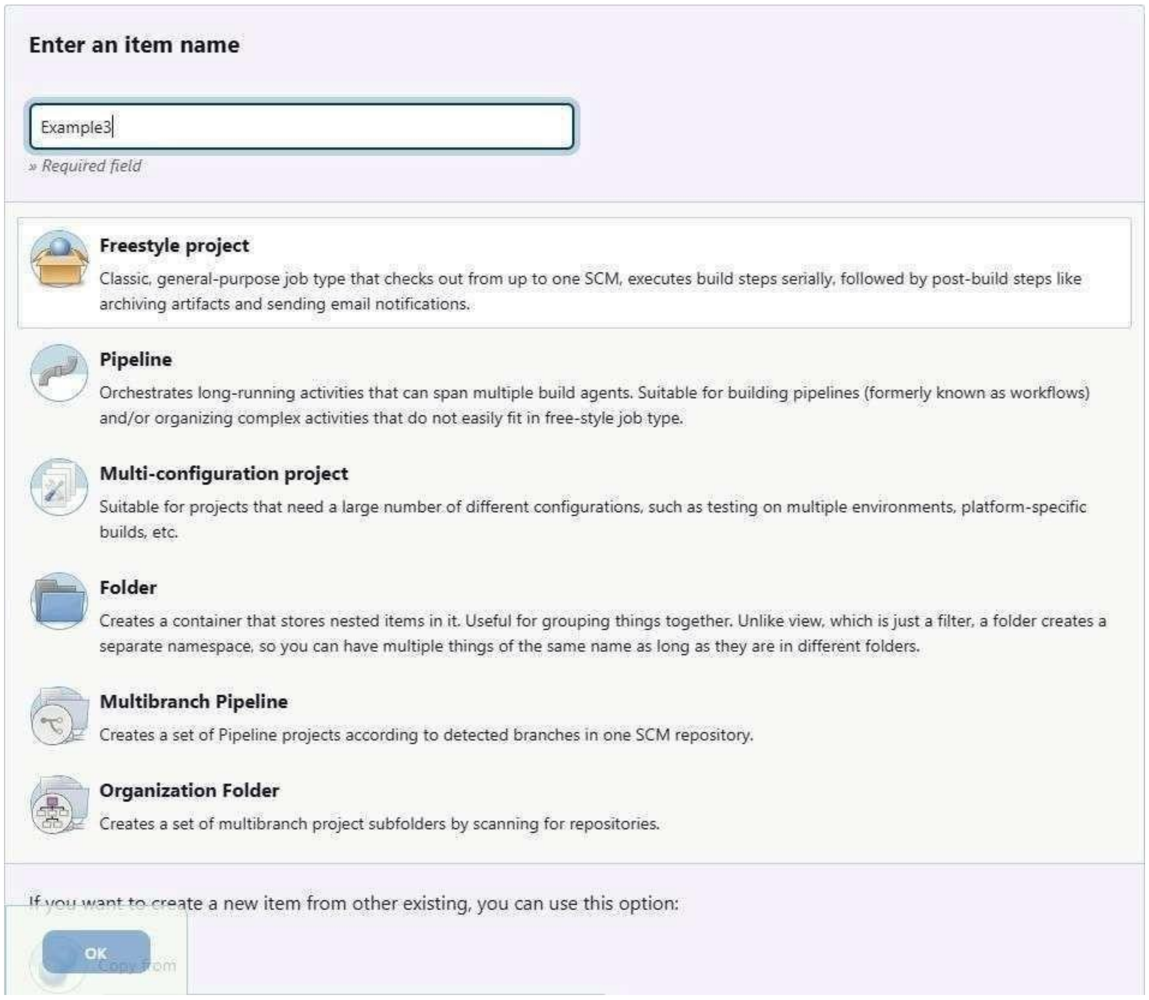
Console output after building:


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

Creating a new freestyle project:



Enter an item name

Example3

» Required field

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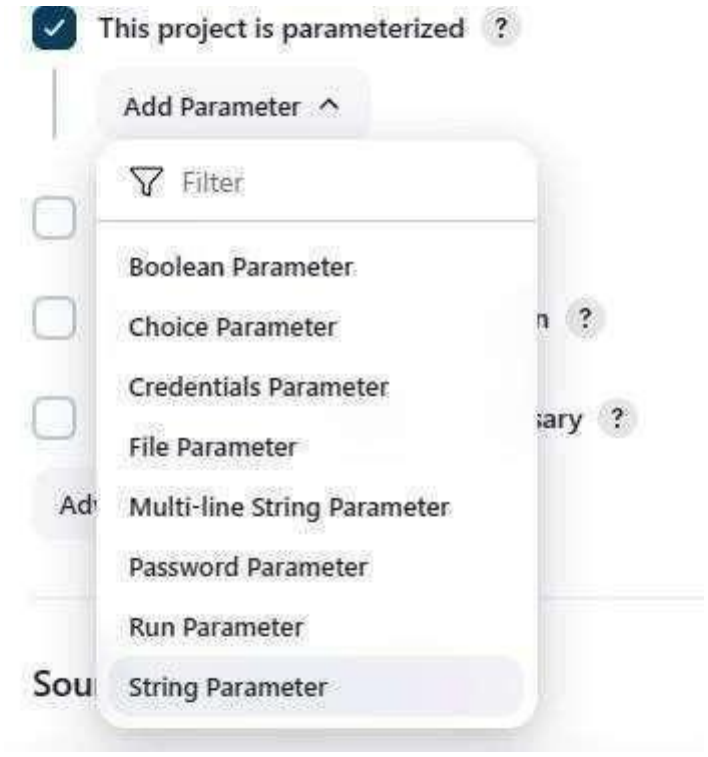
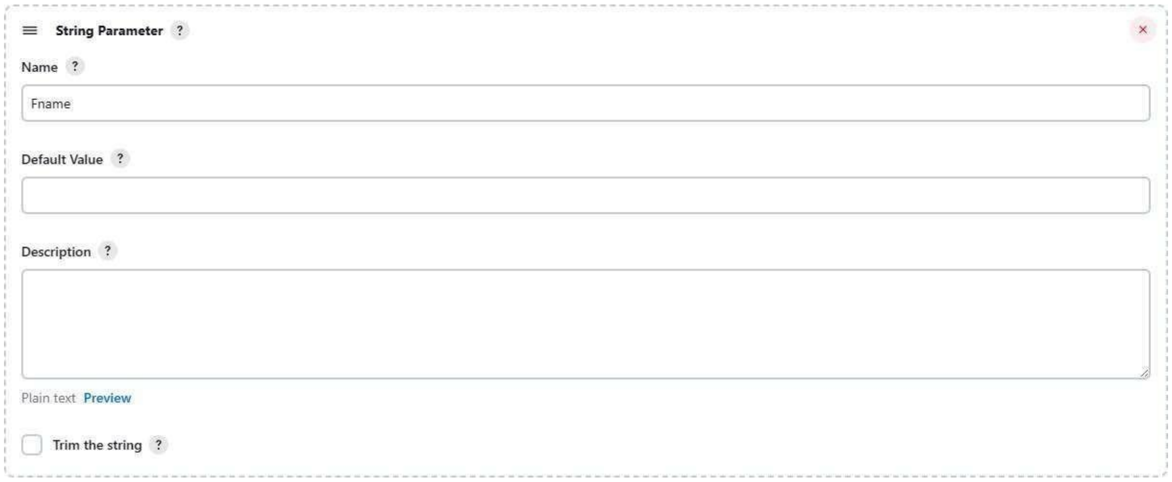
If you want to create a new item from other existing, you can use this option:

Enabling parameterisation and adding a String parameter:



Configuring the string parameter as Fname:


String Parameter

Name

Fname

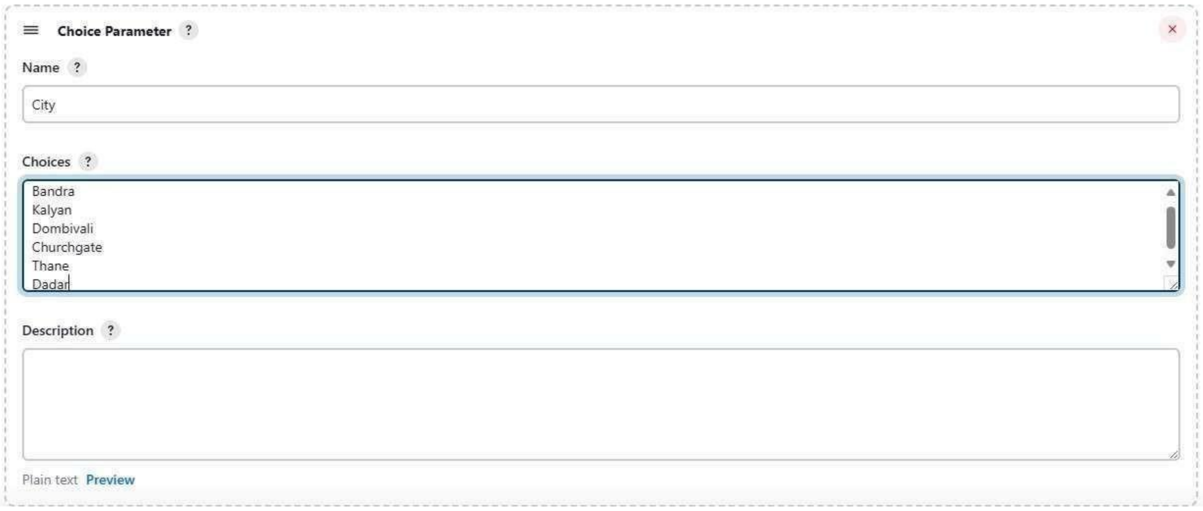
Default Value

Description

Plain text Preview

☐ Trim the string

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


Choice Parameter

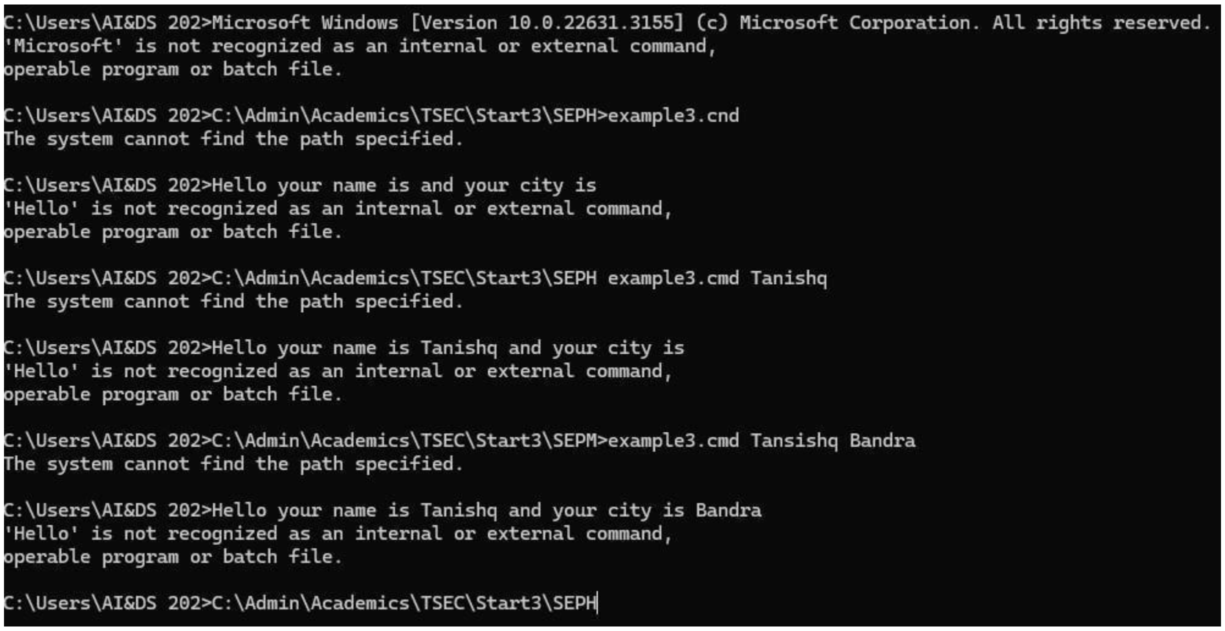
Name: City

Choices:
```
Bandra
Kalyan
Dombivali
Churchgate
Thane
Dadar
```

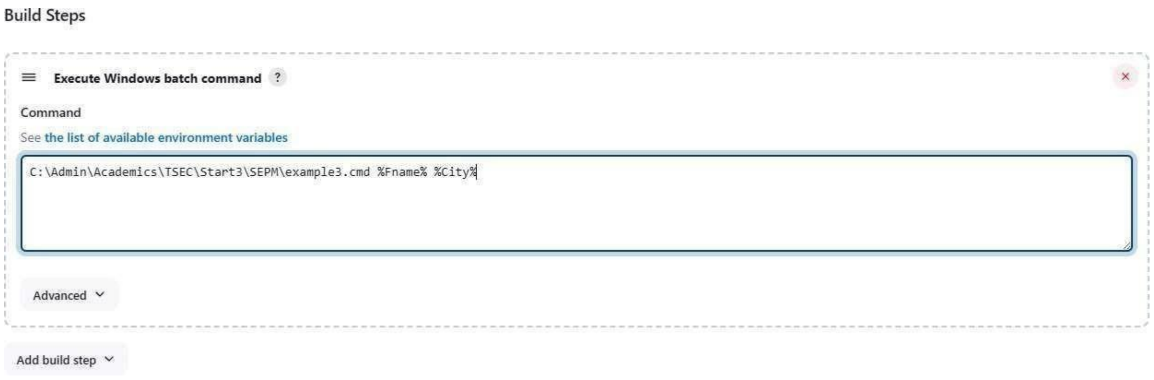
Description

Plain text Preview

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

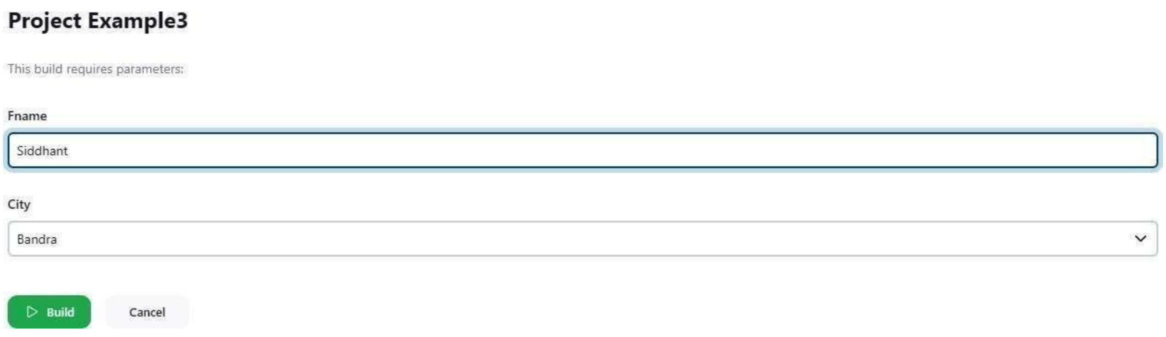
See the list of available environment variables

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

Advanced

Add build step

Entering parameters for build:



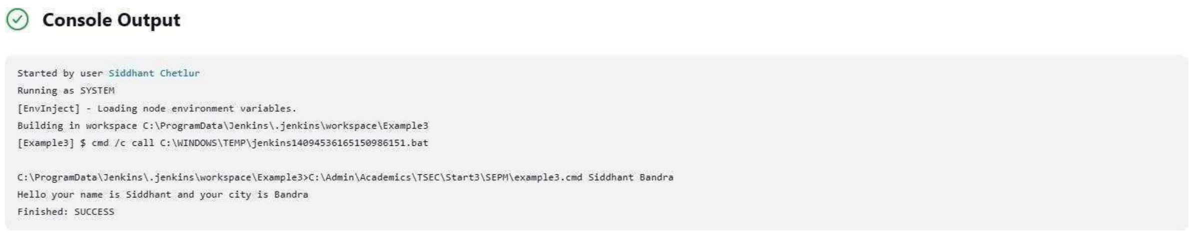
Project Example3

This build requires parameters:

Fname: Siddhant

City: Bandra

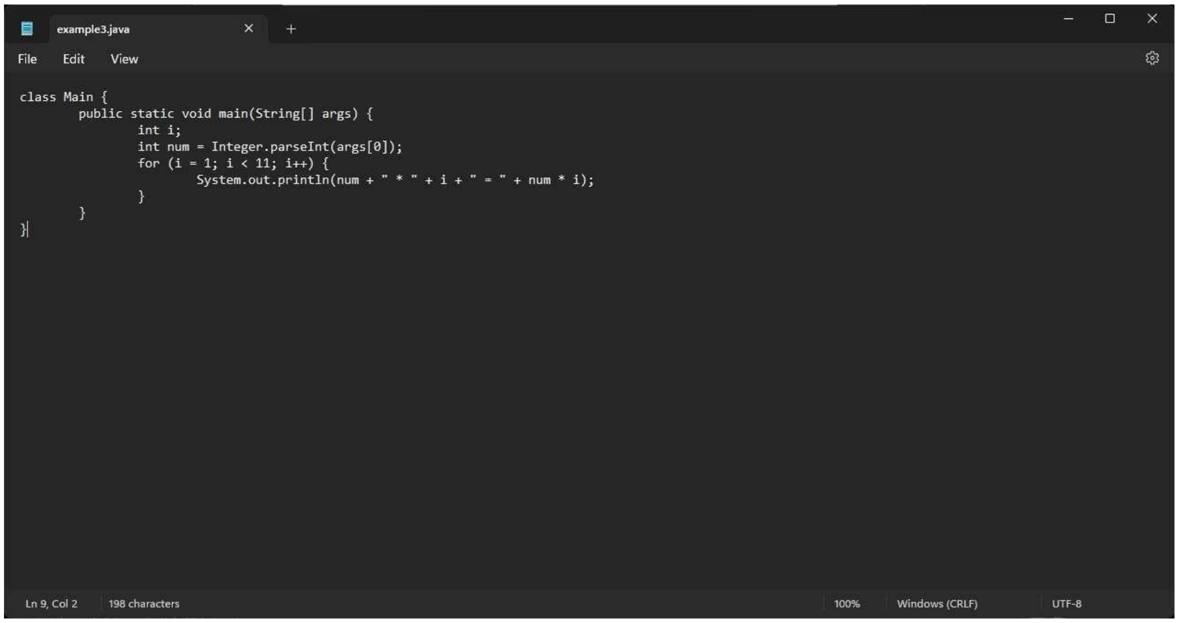
Console output after building:



Console Output

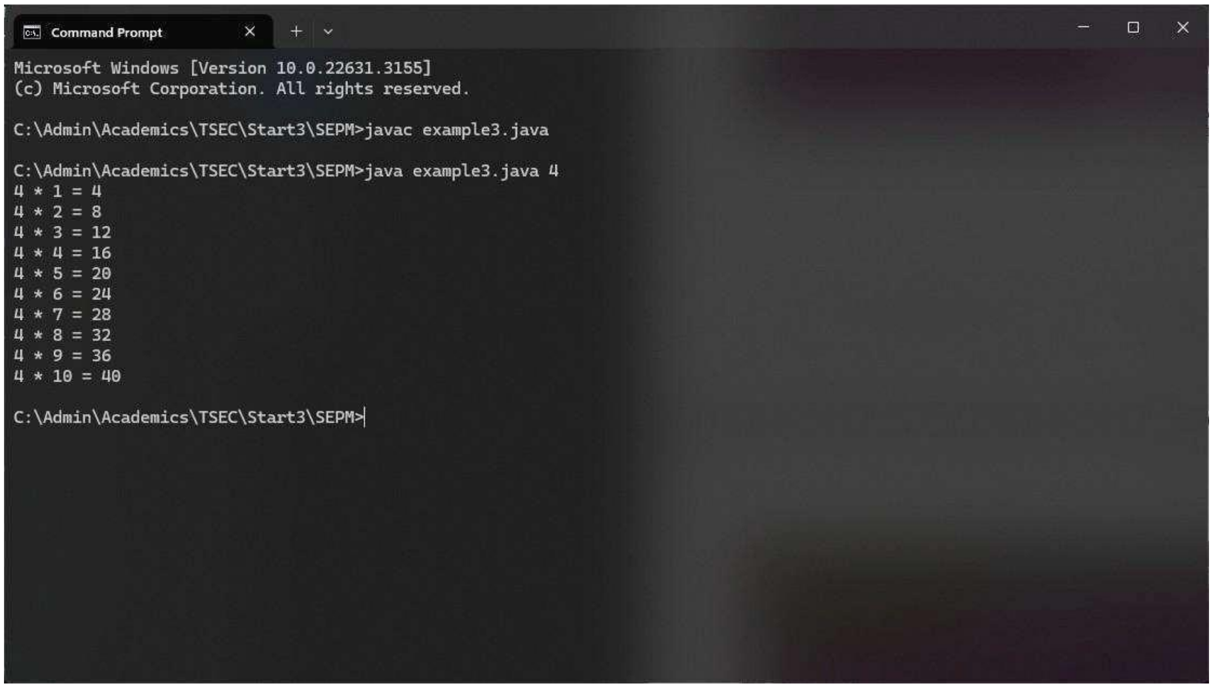
```
Started by user Siddhant Chetlur
Running as SYSTEM
[EnvInject] - Loading node environment variables.
Building in workspace C:\ProgramData\Jenkins\.jenkins\workspace\Example3
[Example3] $ cmd /c call C:\WINDOWS\TEMP\jenkins14094536165150986151.bat

C:\ProgramData\Jenkins\.jenkins\workspace\Example3>C:\Admin\Academics\TSEC\Start3\SEPM\example3.cmd Siddhant Bandra
Hello your name is Siddhant and your city is Bandra
Finished: SUCCESS
```

<u>Example 3.2: Running a Java program with parameters</u> Creating a Java program with an input argument:



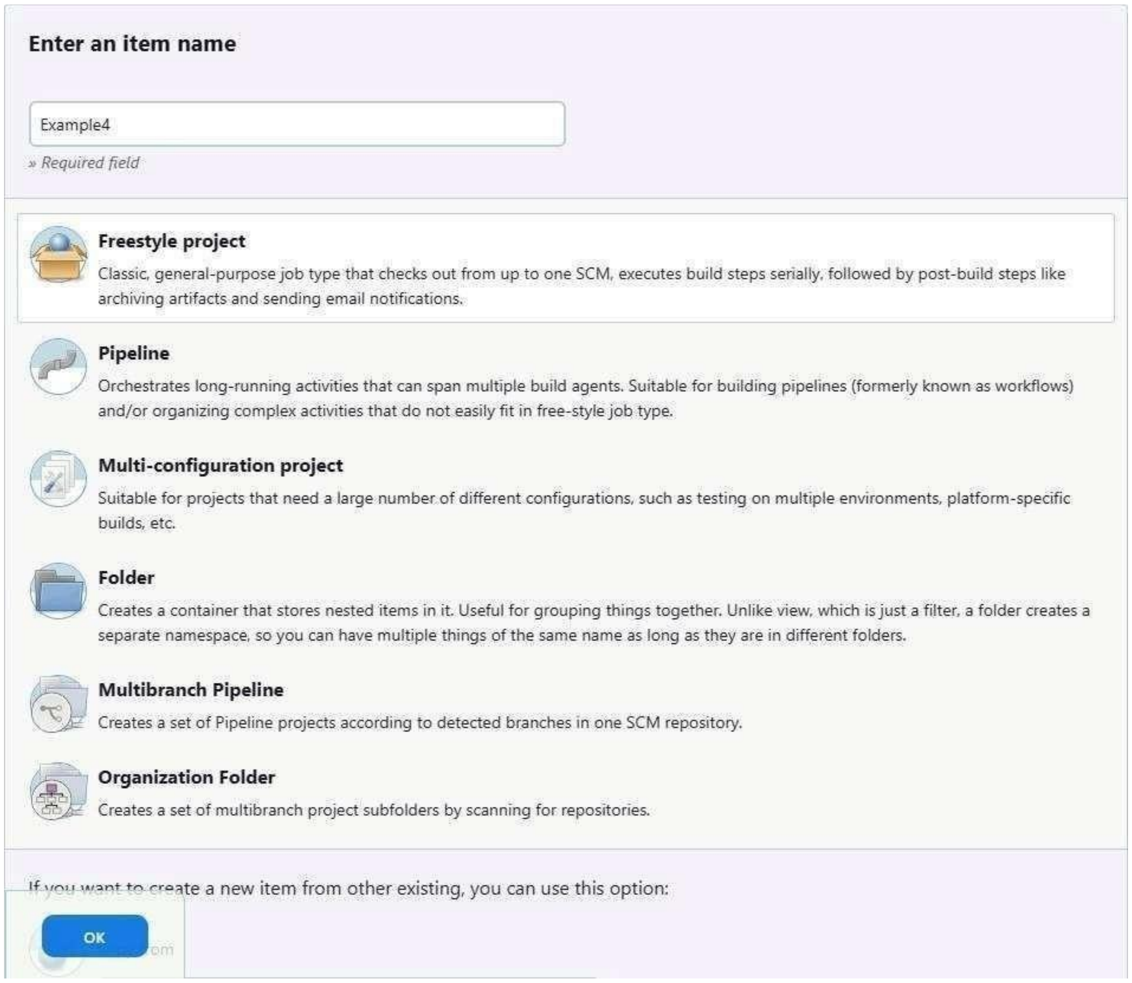
```
class Main {
        public static void main(String[] args) {
                int i;
                int num = Integer.parseInt(args[0]);
                for (i = 1; i < 11; i++) {
                        System.out.println(num + " * " + i + " = " + num * i);
                }
        }
}
```

Testing the program on the terminal:



```
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

Example4

» 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
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Multibranch Pipeline
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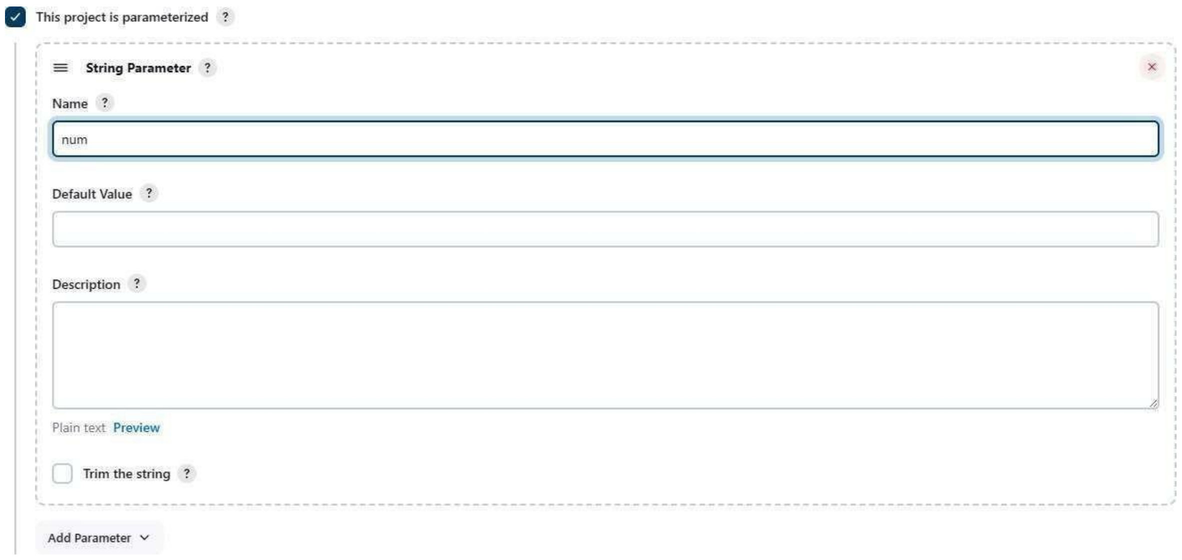
Organization Folder
Creates a set of multibranch project subfolders by scanning for repositories.

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

Parameterise the project by adding a string parameter as follows:



✓ This project is parameterized

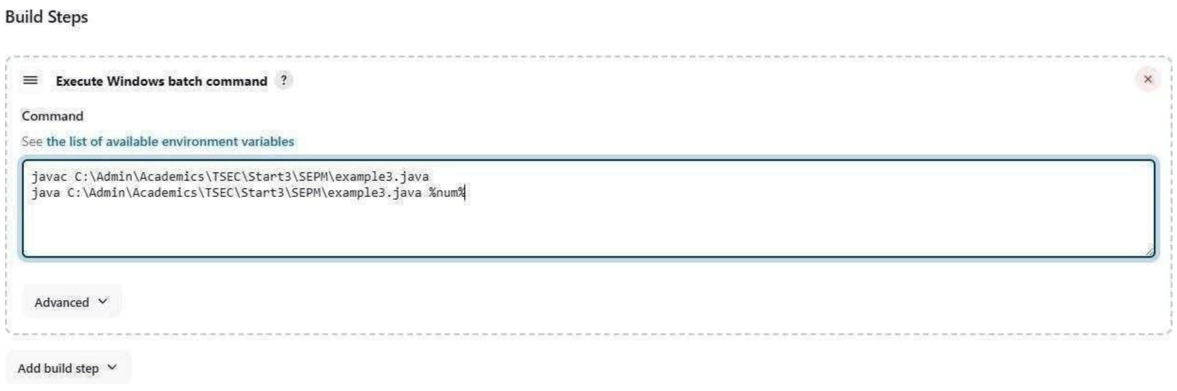
String Parameter

Name: num

Default Value:

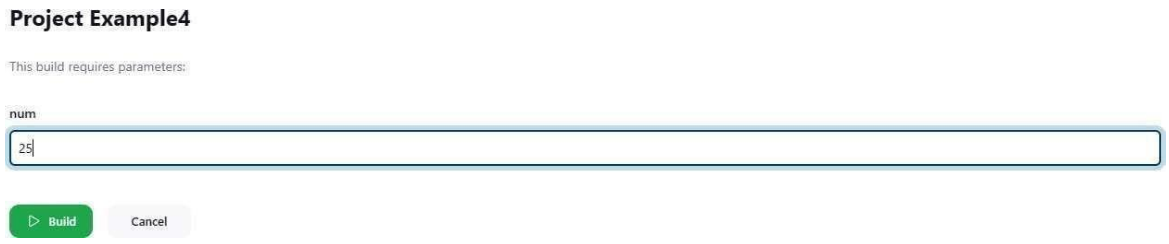
Description:

Configure the build steps:


Build Steps
Execute Windows batch command
?
Command
See the list of available environment variables
Advanced
Add build step

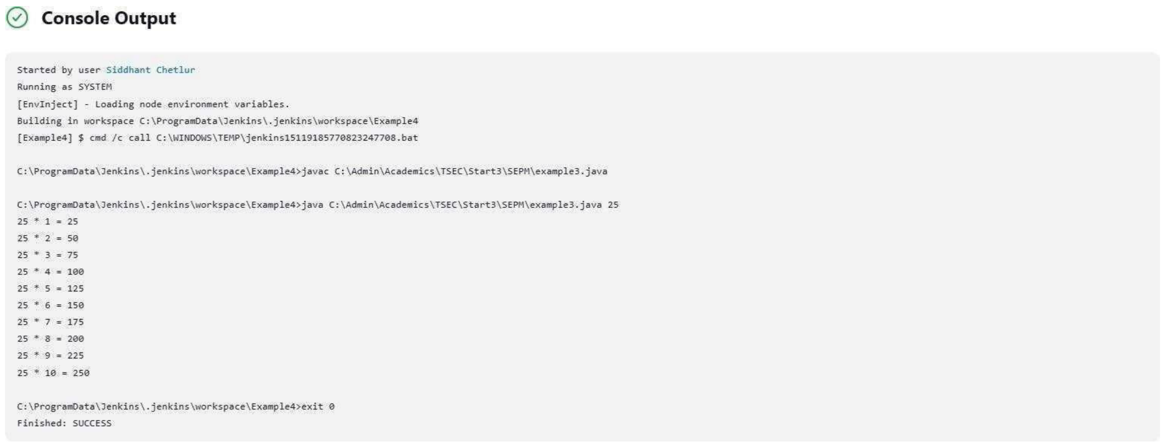
```
javac C:\Admin\Academics\TSEC\Start3\SEPM\example3.java
java C:\Admin\Academics\TSEC\Start3\SEPM\example3.java %num%
```

Entering the parameter for the build:



num: 25

Console output after building:

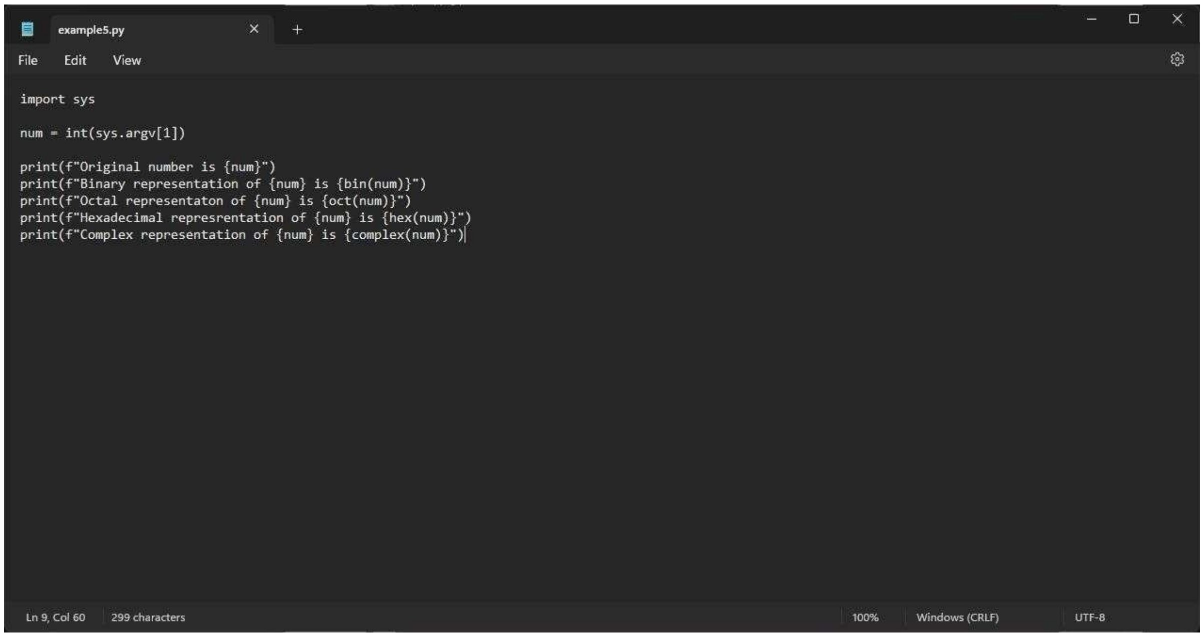


```
Started by user Siddhant Chetlur
Running as SYSTEM
[EnvInject] - Loading node environment variables.
Building in workspace C:\ProgramData\Jenkins\.jenkins\workspace\Example4
[Example4] $ cmd /c call C:\WINDOWS\TEMP\jenkins15119185770823247708.bat

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

C:\ProgramData\Jenkins\.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 * 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

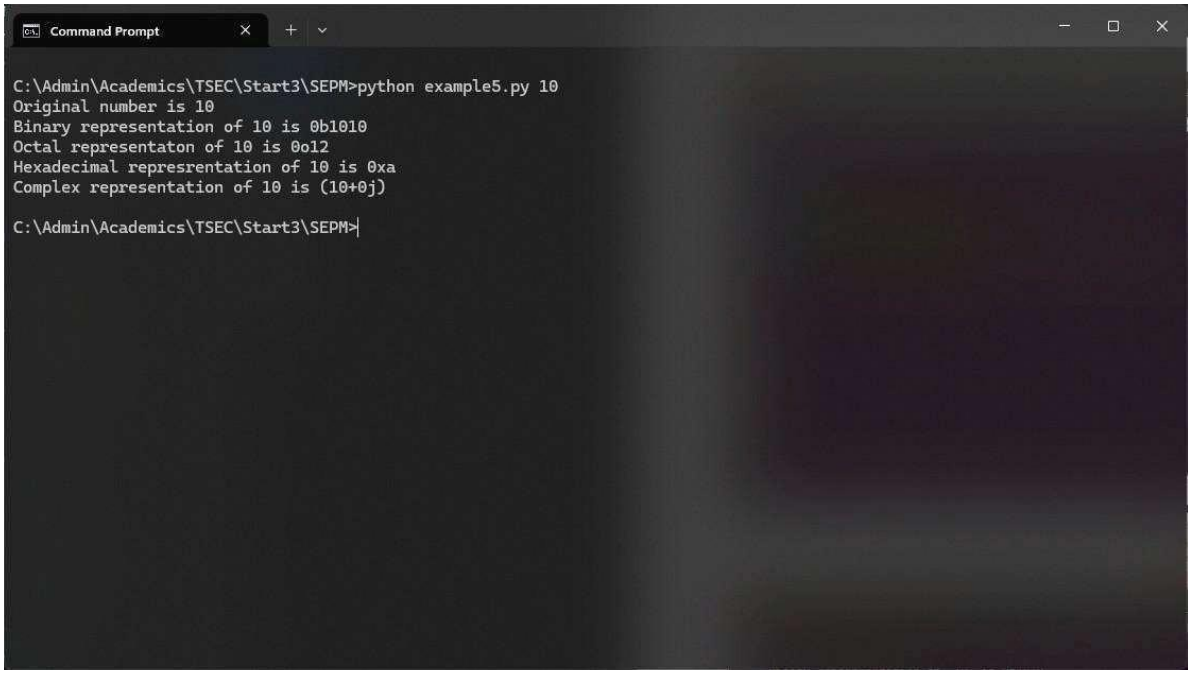
5.1: Running a Python program Creating a simple Python

script:



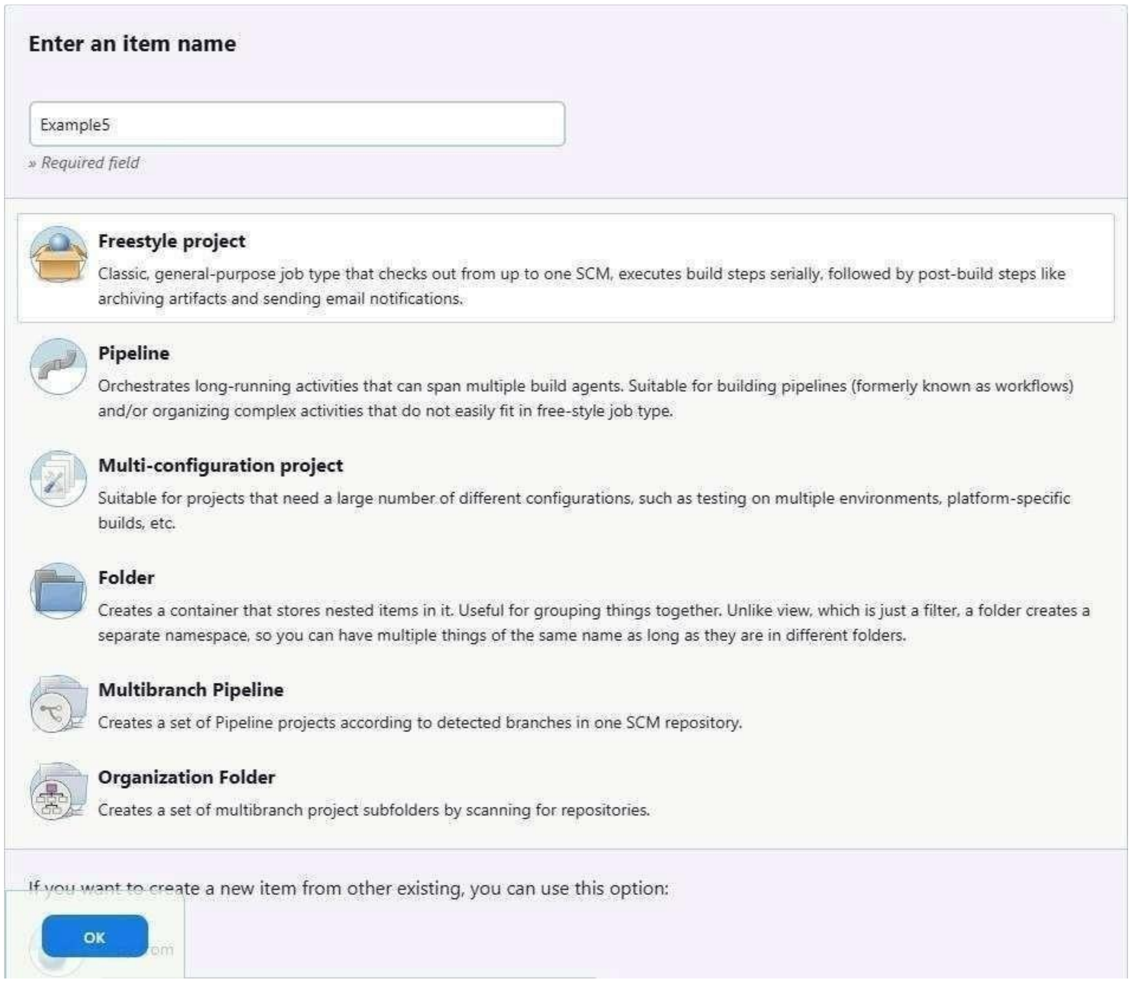
```
import sys

num = int(sys.argv[1])

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

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 representaton of 10 is 0o12
Hexadecimal represrentation 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.

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.

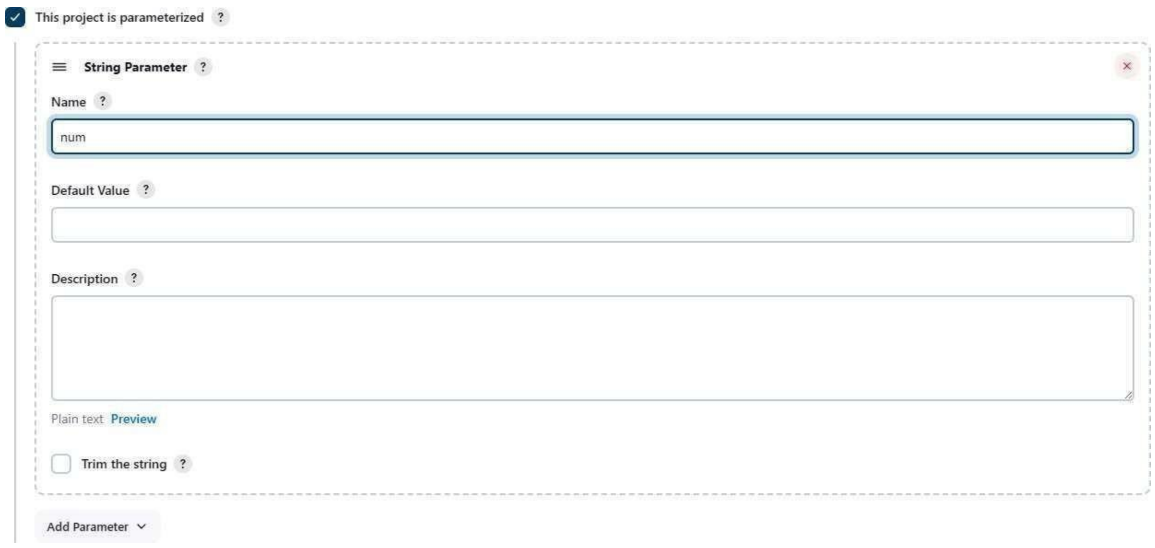
Folder
Creates a container that stores nested items in it. Useful for grouping things together. Unlike view, which is just a filter, a folder creates a separate namespace, so you can have multiple things of the same name as long as they are in different folders.

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:

Parameterising the project with a string parameter as follows:


[✓] This project is parameterized

String Parameter

Name: num

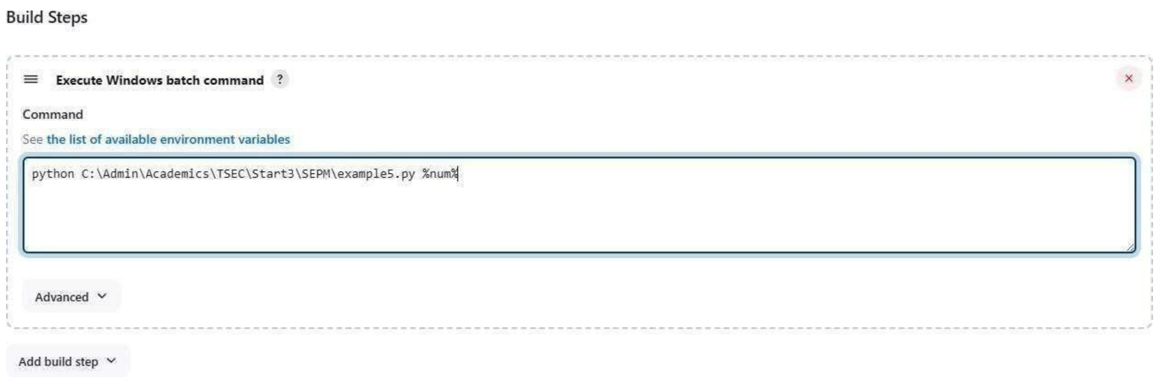
Default Value:

Description:

Plain text Preview

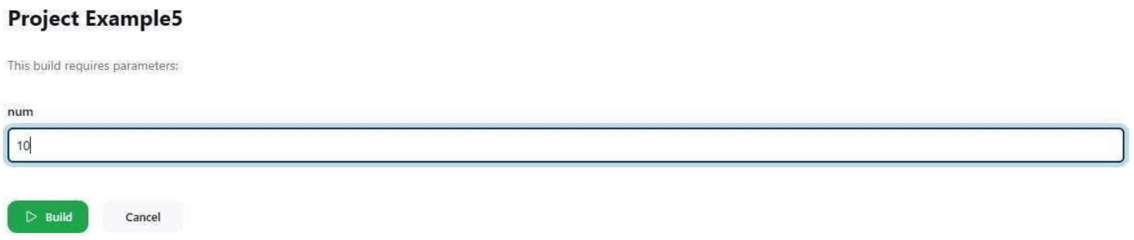
[ ] Trim the string

Configuring the build steps:


Build Steps
Execute Windows batch command
Command
See the list of available environment variables
Advanced
Add build step

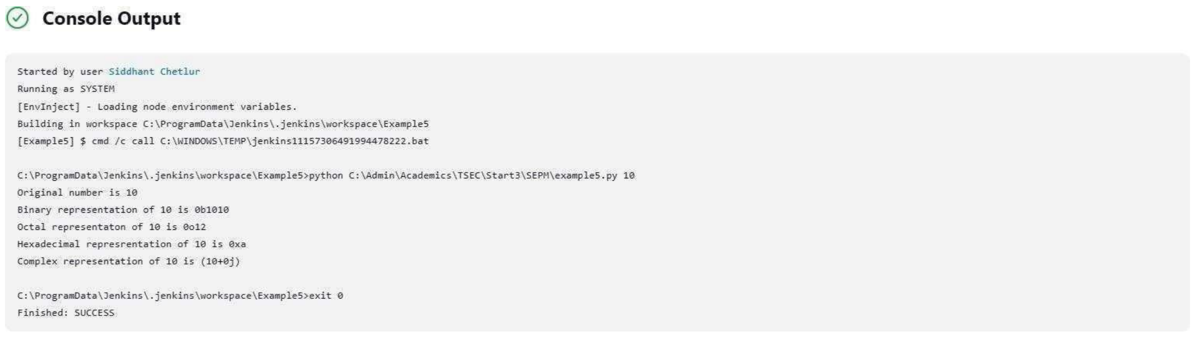
```
python C:\Admin\Academics\TSEC\Start3\SEPM\example5.py %num%
```

Setting the parameter for the build:



num: 10

Console output after building:



```
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 represrentation of 10 is 0xa
Complex representation of 10 is (10+0j)

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

Conclusion

This experiment demonstrated how to automate a software build and deployment process using Jenkins. By integrating Maven, Gradle, or Ant, we streamlined the compilation and testing of applications, while Jenkins facilitated continuous deployment to a Tomcat server.