

St. Francis Institute of Technology, Mumbai-400 103
Department Of Information Technology

A.Y. 2023-2024

Class: TE-ITA/B, Semester: V

Subject: **DevOps Lab**

Experiment – 4: To understand Continuous Integration, install and configure Jenkins with Maven/Ant/Gradle to setup a build Job.

1. **Aim:** To understand Continuous Integration, install and configure Jenkins with Maven
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:**
 - **What is Jenkins?**
 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.

 Jenkins can be installed through native system packages, Docker, or even run standalone by any machine with a Java Runtime Environment (JRE) installed
 - **Why use Jenkins?**
 Jenkins is a highly extensible product whose functionality can be extended through the installation of plugins.
 There are a vast array of plugins available to Jenkins. However, the documentation covered in the Guided Tour, Tutorials, Solution pages and User Handbook of this documentation are based on a Jenkins installation with the Blue Ocean plugins installed, as well as the "suggested plugins", which are specified when running through the Post-installation setup wizard.
 - b. **Execute following (Refer the shared material) and attach screenshots:**
 - Install Jenkins
 - Configure Jenkins with Maven and ANT
 - Build 4 basic projects in Jenkins
8. **Post-Experiments Exercise**
 - A. **Extended Theory:**

Nil

B. Questions:

- What are the system requirements to install Jenkins?
- Give some important plugins in Jenkins.
- What is Maven and ANT?

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://www.edureka.co/blog/interview-questions/jenkins-interview-questions/>

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Experiment – 4: To understand Continuous Integration, install and configure Jenkins with Maven/Ant/Gradle to setup a build Job

List of screenshots to be included in this experiment

7b. Execute following (Refer the shared material) and attach screenshots:

- Install Jenkins

1.



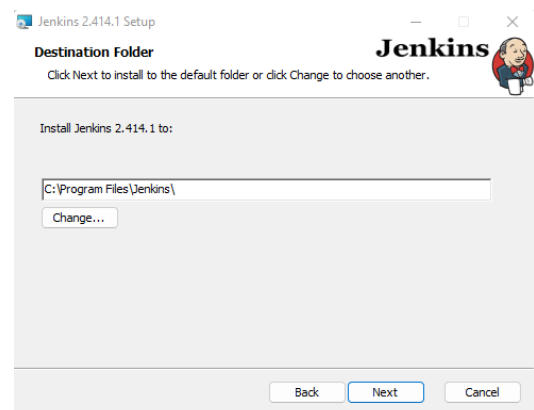
2.



3.



4.



5.



6.

Thank you for downloading Windows Stable installer
Download hasn't started? [Click this link](#)

Changing boot configuration
By default, your Jenkins runs at <https://localhost:8080/>. This can be changed by editing `jenkins.xml`, which is located in your installation directory. This file is also the place to change other boot configuration parameters, such as JVM options, HTTPS setup, etc.

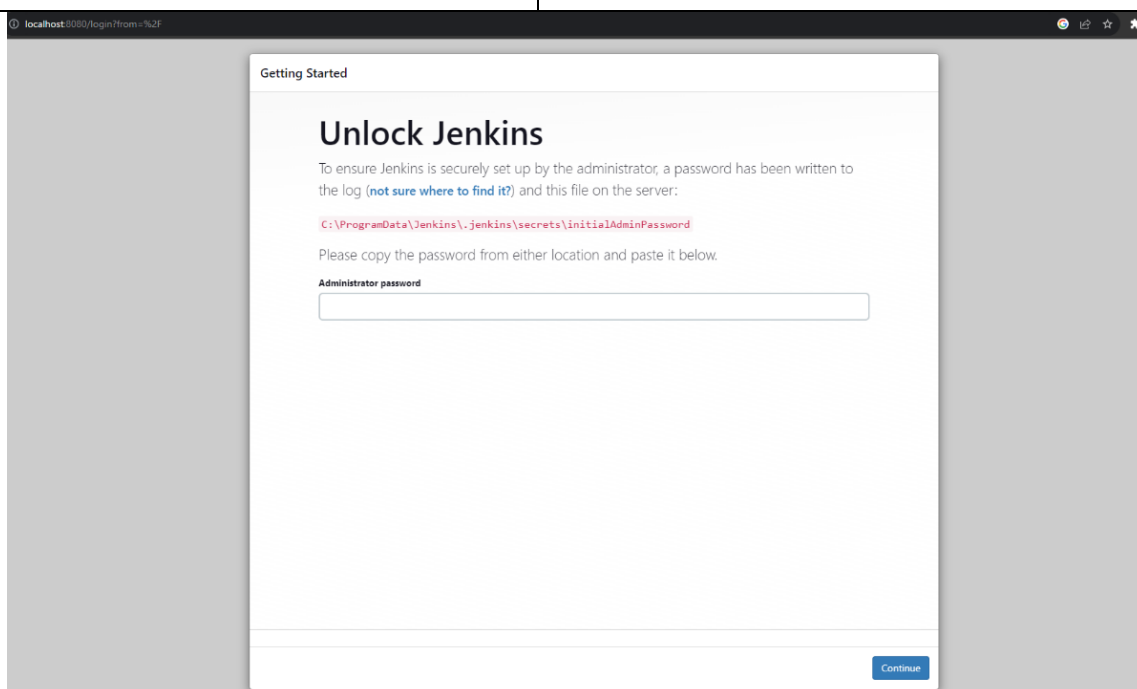
Starting/stopping the service
Jenkins is installed as a Windows service, and it is configured to start automatically upon boot. To start/stop them manually, use the service manager from the control panel, or the `sc` command line tool.

Inheriting your existing Jenkins installation
If you'd like your new installation to take over your existing Jenkins data, copy your old data directory into the new `JENKINS_HOME` directory.

See Also

- [Running Jenkins behind Internet Information Server \(IIS\)](#)
- [Running Jenkins behind nginx](#)
- [Running Jenkins behind Apache](#)

7.



8.

Getting Started

Customize Jenkins

Plugins extend Jenkins with additional features to support many different needs.

Install suggested plugins

Install plugins the Jenkins community finds most useful.

Select plugins to install

Select and install plugins most suitable for your needs.

9.

Getting Started

Create First Admin User

Username

Admin

Password

....

Confirm password

....

Full name

Sherwin Rienzo

E-mail address

sherwin.rienzo@student.sfit.ac.in

Jenkins 2.414.1

Skip and continue as admin

Save and Continue

10.

Getting Started

Getting Started

✓ Folders	✓ OWASP Markup Formatter	✓ Build Timeout	✓ Credentials Binding	** Ionicons API
🔍 Timestamper	🔄 Workspace Cleanup	🔍 Ant	🔄 Gradle	Folders
🔄 Pipeline	🔍 GitHub Branch Source	🔄 Pipeline: GitHub Groovy Libraries	🔄 Pipeline: Stage View	OWASP Markup Formatter
🔍 Git	🔍 SSH Build Agents	🔄 Matrix Authorization Strategy	🔄 PAM Authentication	** Struts
🔄 LDAP	🔄 Email Extension	🔍 Mailer		** bouncycastle API
				** Instance Identity
				** JavaBeans Activation Framework (JAF) API
				** JavaMail API
				** Pipeline: Step API
				** Token Macro
				Build Timeout
				** Credentials
				** Plain Credentials
				** Trilead API
				** SSH Credentials
				Credentials Binding
				** - required dependency

Jenkins 2.414.1

Getting Started

11.

Instance Configuration

Jenkins URL:

The Jenkins URL is used to provide the root URL for absolute links to various Jenkins resources. That means this value is required for proper operation of many Jenkins features including email notifications, PR status updates, and the `BUILD_URL` environment variable provided to build steps.

The proposed default value shown is **not saved yet** and is generated from the current request, if possible. The best practice is to set this value to the URL that users are expected to use. This will avoid confusion when sharing or viewing links.

Jenkins 2.414.1

Not now

Save and Finish

Getting Started

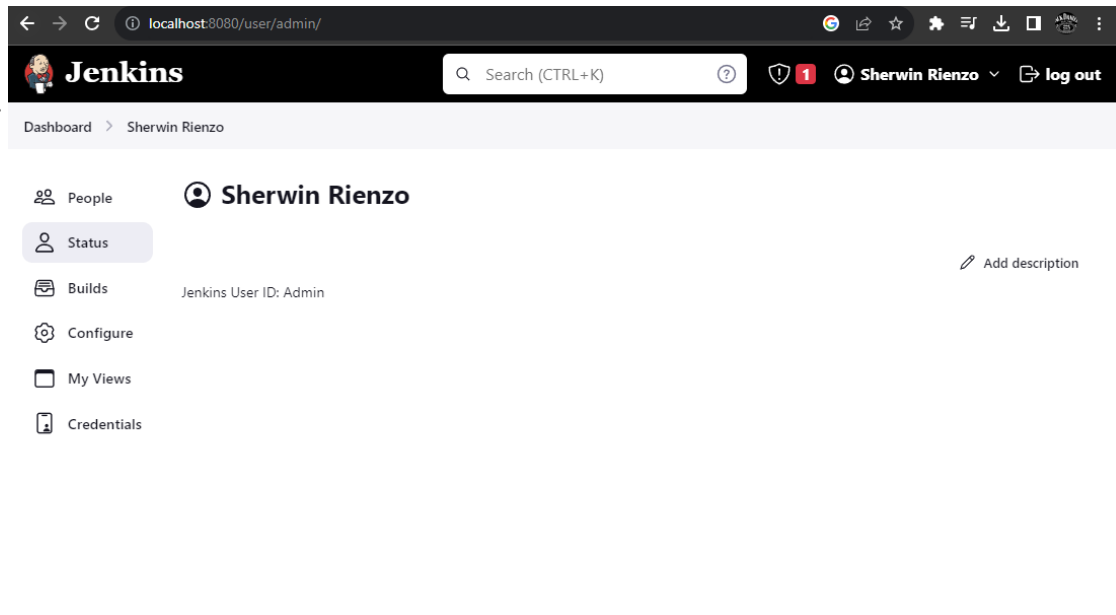
12.

Jenkins is ready!

Your Jenkins setup is complete.

Start using Jenkins

13.



- Configure Jenkins with Maven/Ant/Gradle – Global tool configuration, manage plugins



Welcome to Jenkins!

Sign in

☒ Keep me signed in

The screenshot shows the Jenkins Dashboard at localhost:8080. The left sidebar contains links for New Item, People, Build History, Selenium Grid, Manage Jenkins, My Views, and New View. The main area displays a table of build history for the 'aditishirke_43' project. The table has columns for Status (S), Webhook (W), Name, Last Success, Last Failure, and Last Duration. The builds are listed as follows:

S	W	Name	Last Success	Last Failure	Last Duration
✓	⚙️	aditi1	1 day 20 hr #1	N/A	0.39 sec
✓	⚙️	aditi2	1 day 20 hr #1	N/A	0.34 sec
✓	⚙️	aditi3	1 day 20 hr #8	1 day 20 hr #7	0.96 sec
✓	⚙️	aditi4	1 day 19 hr #1	N/A	0.78 sec
✗	⚙️	DeGods	N/A	12 days #14	0.61 sec
✓	⚙️	exp4.1	18 hr #1	N/A	0.32 sec
✓	⚙️	exp4.2	18 hr #1	N/A	0.34 sec
✓	⚙️	exp4.3	18 hr #1	N/A	0.99 sec
✓	☁️	exp4.4	18 hr #2	18 hr #1	0.84 sec

Below the table, there are sections for 'Build Queue' (No builds in the queue) and 'Build Executor Status' (2 idle).

Jenkins Configuration Setup

Login on Jenkins as “admin” user and you will get the following home page

The screenshot shows the Jenkins Welcome page at localhost:8080/jenkins/. The page features a 'Welcome to Jenkins!' message and a button to 'create new jobs'. The left sidebar contains links for New Item, People, Build History, Manage Jenkins, My Views, and Credentials. The main area also shows the 'Build Queue' (No builds in the queue) and 'Build Executor Status' (2 idle).

Click on “Manage Jenkins => Global Tools Configurations” where we will configure java, ant, maven and gradle with Jenkins

By Default, Jenkins has following

The screenshot shows the Jenkins Global Tool Configuration page at localhost:8080/jenkins/configureTools/. The page has a breadcrumb trail: Jenkins > Global Tool Configuration. There are links for 'Back to Dashboard' and 'Manage Jenkins'. The main section is titled 'Global Tool Configuration' and contains the following sections:

- Maven Configuration:**
 - Default settings provider: Use default maven settings
 - Default global settings provider: Use default maven global settings
- JDK:**
 - JDK installations...
- Git:**
 - Git installations: Add Git
- Gradle:**
 - Gradle installations...
- Ant:**
 - Ant installations...
- Maven:**
 - Maven installations...

At the bottom, there are 'Save' and 'Apply' buttons.

Configure Java:

- Click on JDK Installation
- By Default, "Install Automatically" is checked and you can install from java.sun.com. but we will avoid downloading as most of the systems are Java enabled.

JDK

JDK Installations

JDK Name: Jenkins_Java

☒ Install automatically

Install from java.sun.com

Version: Java SE Development Kit 8u121

☐ I agree to the Java SE Development Kit License Agreement

Installing JDK requires Oracle account. Please enter your username/password

Delete Installer

Add Installer

Add JDK

List of JDK installations on this system

- Uncheck "Install automatically" and provide the JDK Name and JDK Path in JAVA_HOME as shown in below

JDK

JDK Installations

JDK Name: Jenkins_Java

JAVA_HOME: C:\Program Files\Java\jdk1.8.0_102

☐ Install automatically

Delete JDK

Add JDK

List of JDK installations on this system

Download the ANT, Maven and Gradle bin folders to local folder like shown below

Computer > jey (D:) > jenkins

Name	Date modified	Type	Size
apache-ant-1.10.1	02-02-2017 20:00	File folder	
apache-maven-3.3.9	10-11-2015 11:44	File folder	
gradle-3.4.1	03-03-2017 19:53	File folder	

Configure Gradle

- click on Gradle Installation
- Uncheck "Install Automatically" and provide the GRADLE_HOME to to Gradle folder as shown in below

Gradle

Gradle Installations

Gradle name: jenkins_gradle

GRADLE_HOME: D:\jenkins\gradle-3.4.1

☐ Install automatically

Delete Gradle

Add Gradle

List of Gradle installations on this system

Configure Maven and Ant

- click on Maven and ANT Installation
- Uncheck “Install Automatically” and set the MVN_HOME and ANT_HOME like shown below:

Ant

Ant installations

Ant Name: jenkins_ant

ANT_HOME: D:\jenkins\apache-ant-1.10.1

☐ Install automatically

[Delete Ant](#)

[Add Ant](#)

List of Ant installations on this system

Maven

Maven installations

Maven Name: jen_maven

MAVEN_HOME: D:\jenkins\apache-maven-3.3.9

☐ Install automatically

[Delete Maven](#)

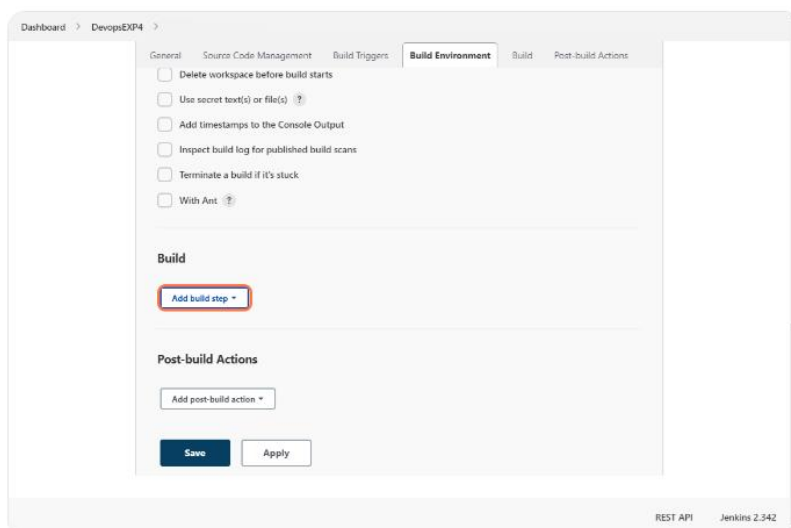
[Add Maven](#)

Click on Apply and Save. Now Jenkins is configured with Java, Gradle, ANT and Maven

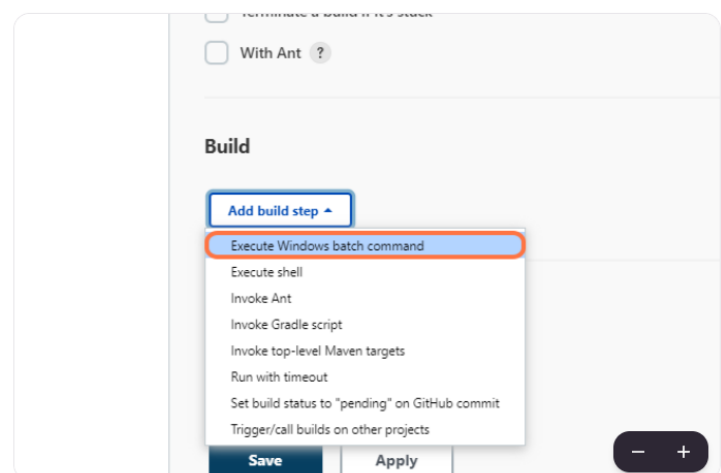
• Build jobs in Jenkins

1. Freestyle project (Simple Windows batch command) – echo

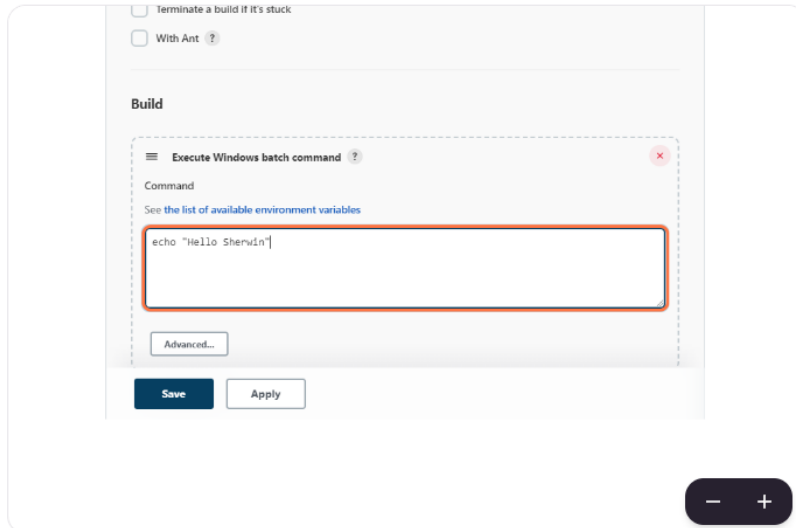
1 Click on Add build step



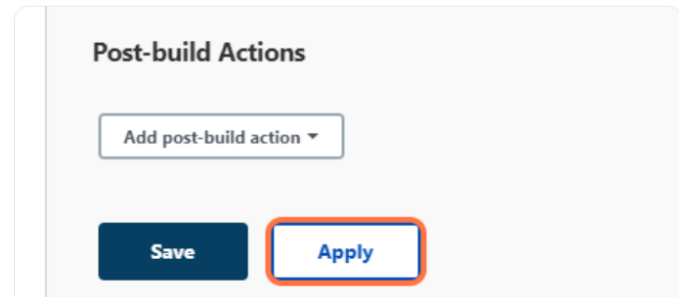
2 Click on Execute Windows batch command



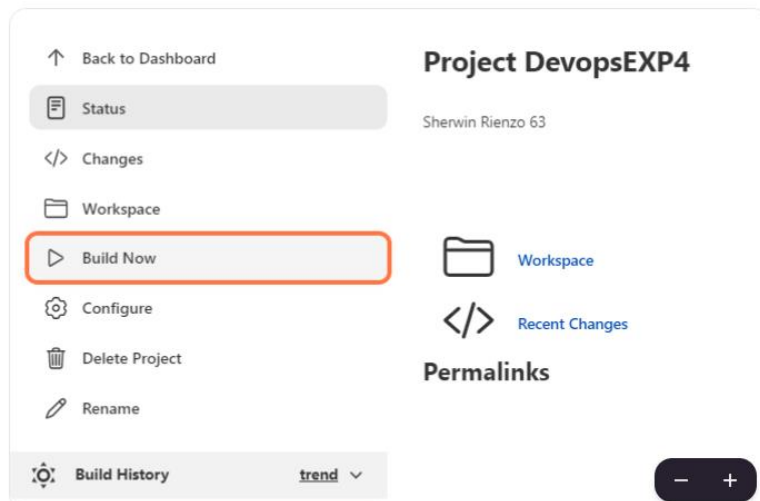
3 Click on command



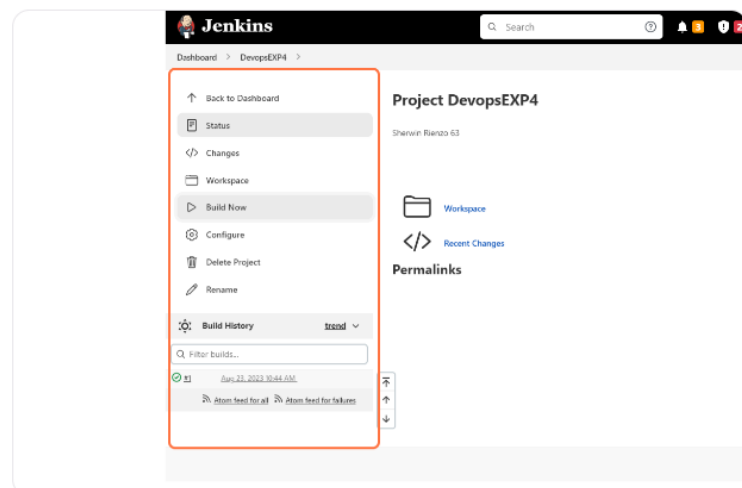
4 Click on Apply



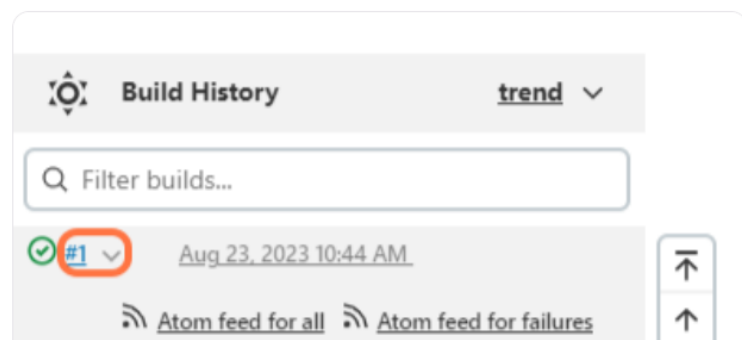
5 Click on Build Now



6 Click on Back to Dashboard...



7 Click on #1



8 Click on Console Output...



The screenshot shows the Jenkins web interface. The 'Console Output' tab is selected in the left sidebar. The main area displays the console output for a build, which includes the following text:

```
Started by user admin
Running as SYSTEM
Building in workspace C:\ProgramData\Jenkins\workspace\DevopsEXP4
[DevopsEXP4] $ cmd /c call C:\Windows\TEMP\jenkins5638495577933675920.bat

C:\ProgramData\Jenkins\workspace\DevopsEXP4>echo "Hello Sherwin"
"Hello Sherwin"

C:\ProgramData\Jenkins\workspace\DevopsEXP4>exit 0
Finished: SUCCESS
```

The console output is highlighted with a red border. The Jenkins logo and search bar are visible at the top. The bottom right corner shows 'REST API' and 'Jenkins 2.342'.

2. Freestyle parameterized project (Windows batch command) string, Boolean and choice parameters with echo

9 Click on New Item



The screenshot shows the Jenkins Dashboard. The 'New Item' button is highlighted with a red border. The dashboard includes a search bar, a list of items (People, Build History, Selenium Grid, Manage Jenkins), and a table of recent builds.

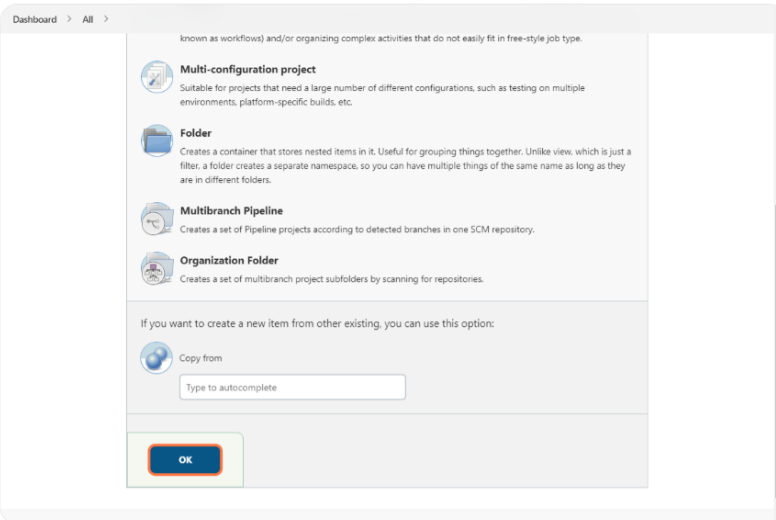
S	W	Name	Last Success
✓	⚙️	aditi1	1 day 21 h
✓	⚙️	aditi2	1 day 20 h

10 Type "SherwinRienzo"

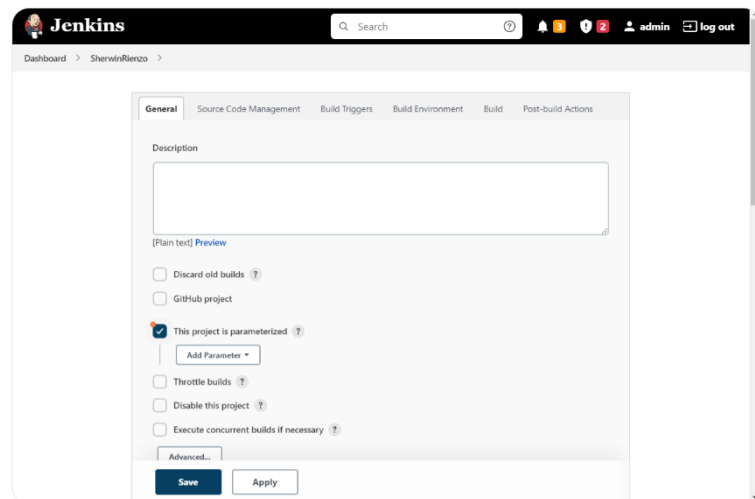


The screenshot shows the 'Enter an Item name' dialog in Jenkins. The text 'SherwinRienzo' is entered in the input field, which is highlighted with a red border. Below the input field, there are several project type options: Freestyle project, Maven project, Pipeline, Multi-configuration project, and Folder. The 'Freestyle project' option is selected.

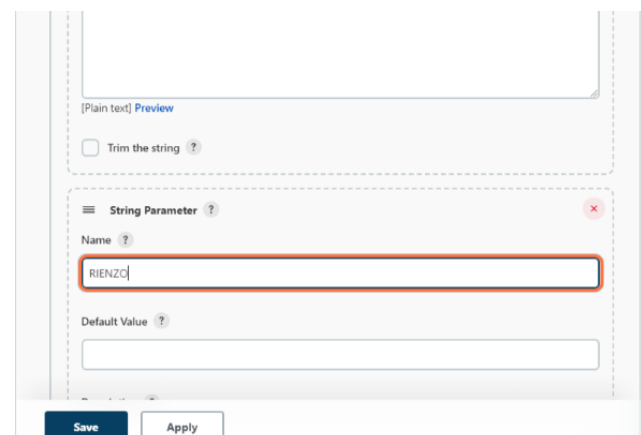
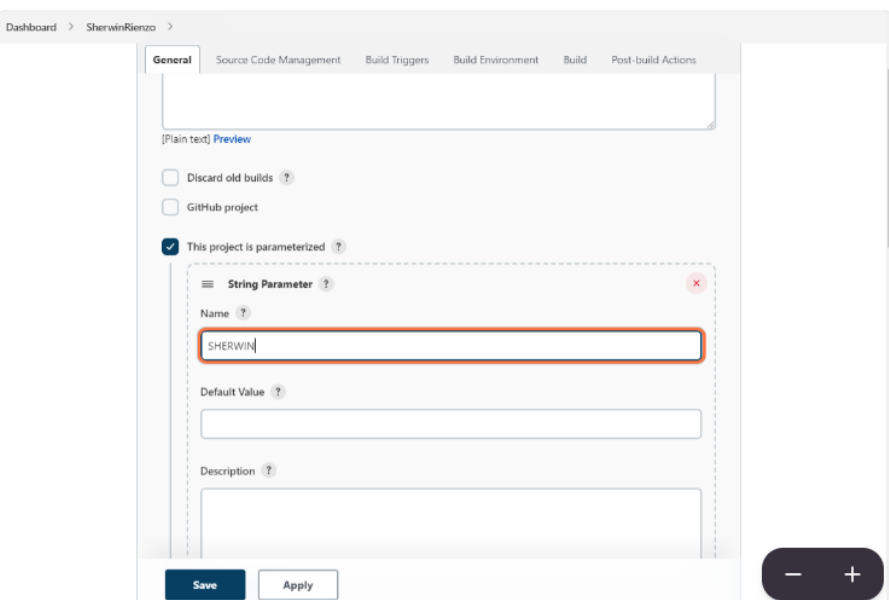
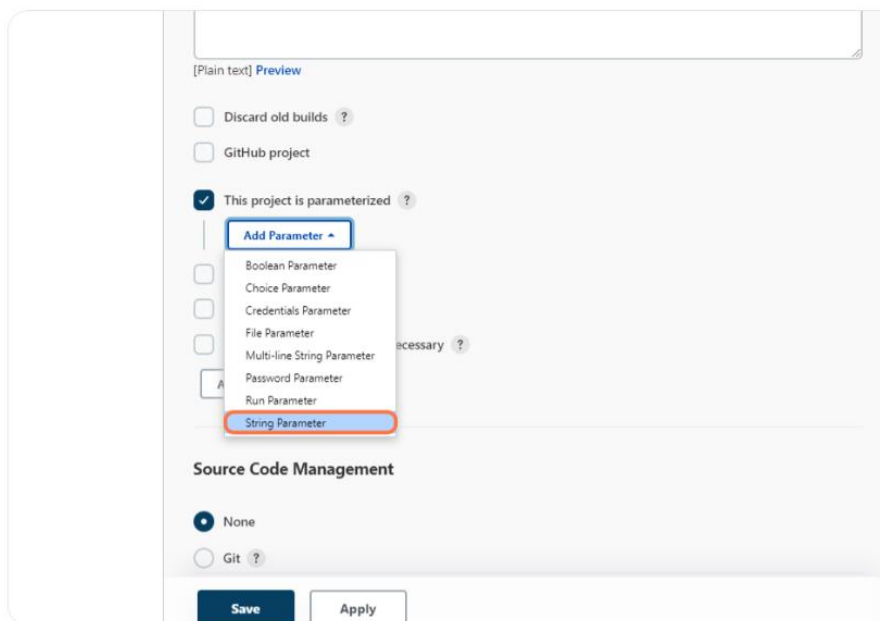
12 Click on OK



13 Check specified



15 Click on String Parameter one for NAME and another string parameter for SURNAME



20 Click on Add Parameter



21 Click on Boolean Parameter



23 Check parameter.defaultValue



24 Click on Add Parameter



25 Click on Choice Parameter

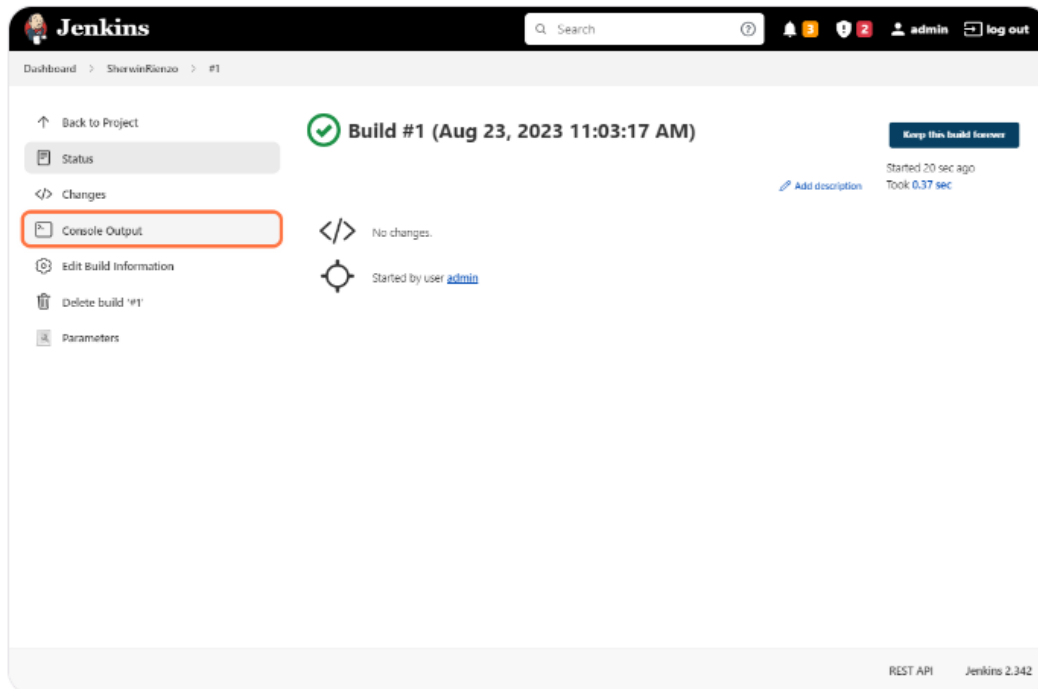


26 Type "CITY"



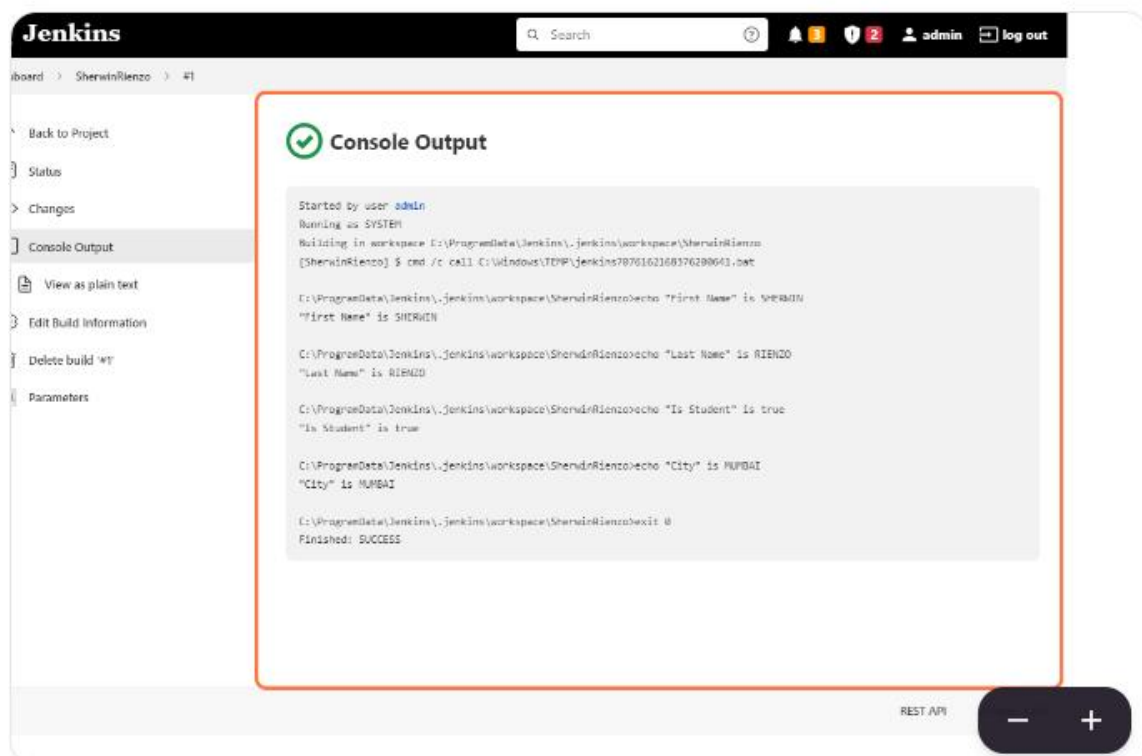


38 Click on Console Output

The screenshot shows the Jenkins web interface for a build named 'Build #1 (Aug 23, 2023 11:03:17 AM)'. The left sidebar contains a list of links: 'Back to Project', 'Status', 'Changes', 'Console Output' (highlighted with a red box), 'Edit Build Information', 'Delete build #1', and 'Parameters'. The main content area shows the build status as 'Success' with a green checkmark. It also displays 'Started 20 sec ago' and 'Took 0.37 sec'. A 'Keep this build forever' button is visible. Below the status, there are two sections: 'No changes' and 'Started by user admin'. The bottom right corner shows 'REST API' and 'Jenkins 2.342'.

39 Click on Console Output...

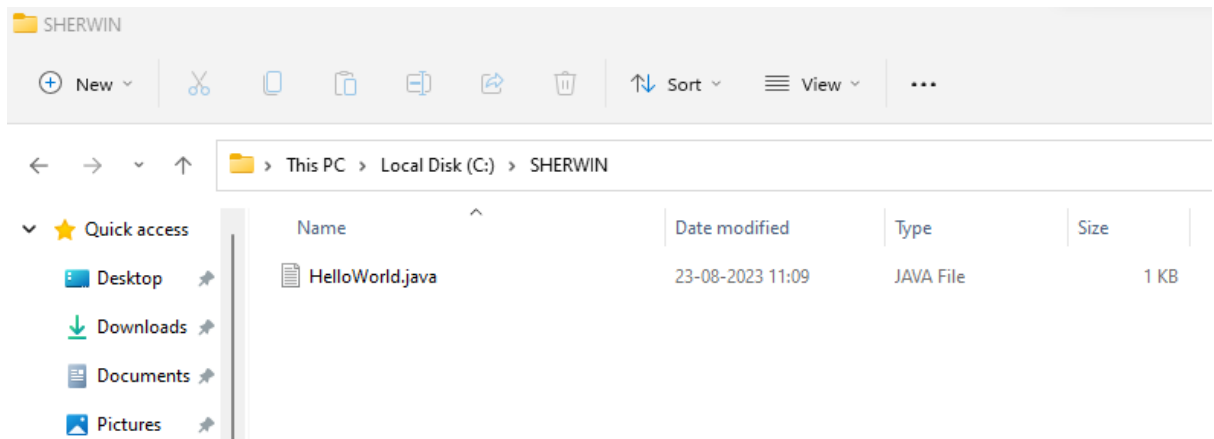
The screenshot shows the Jenkins web interface with the 'Console Output' view expanded. The left sidebar is the same as in the previous screenshot, but 'Console Output' is now selected. The main content area displays the console output text, which includes the build's execution details and the output of a script. The text is as follows:

```

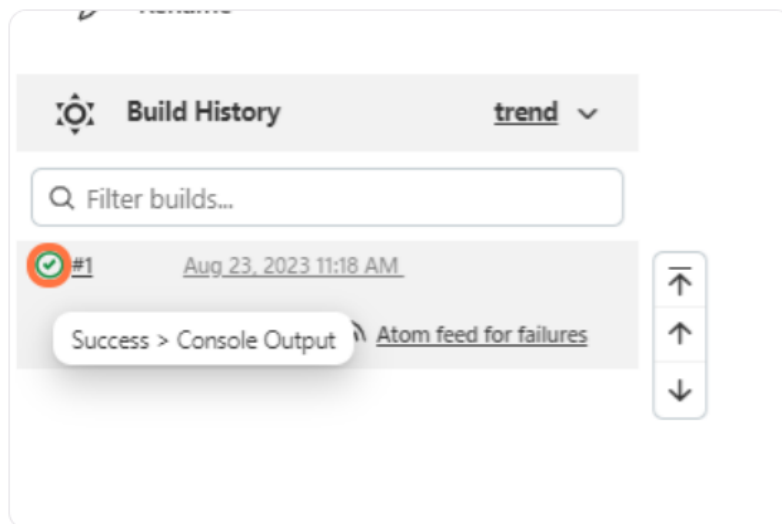
Started by user admin
Running as SYSTEM
Building in workspace C:\ProgramData\jenkins\workspace\SherwinRienzo
[SherwinRienzo] $ cmd /c call C:\Windows\TEMP\jenkins7076162168376290641.bat
C:\ProgramData\jenkins\workspace\SherwinRienzo>echo "First Name" is SHERWIN
"First Name" is SHERWIN
C:\ProgramData\jenkins\workspace\SherwinRienzo>echo "Last Name" is RIENZO
"Last Name" is RIENZO
C:\ProgramData\jenkins\workspace\SherwinRienzo>echo "Is Student" is true
"Is Student" is true
C:\ProgramData\jenkins\workspace\SherwinRienzo>echo "City" is MUMBAI
"City" is MUMBAI
C:\ProgramData\jenkins\workspace\SherwinRienzo>exit 0
Finished: SUCCESS
    
```

The console output is enclosed in a red box. At the bottom right, there are 'REST API' and a zoom control with minus and plus buttons.

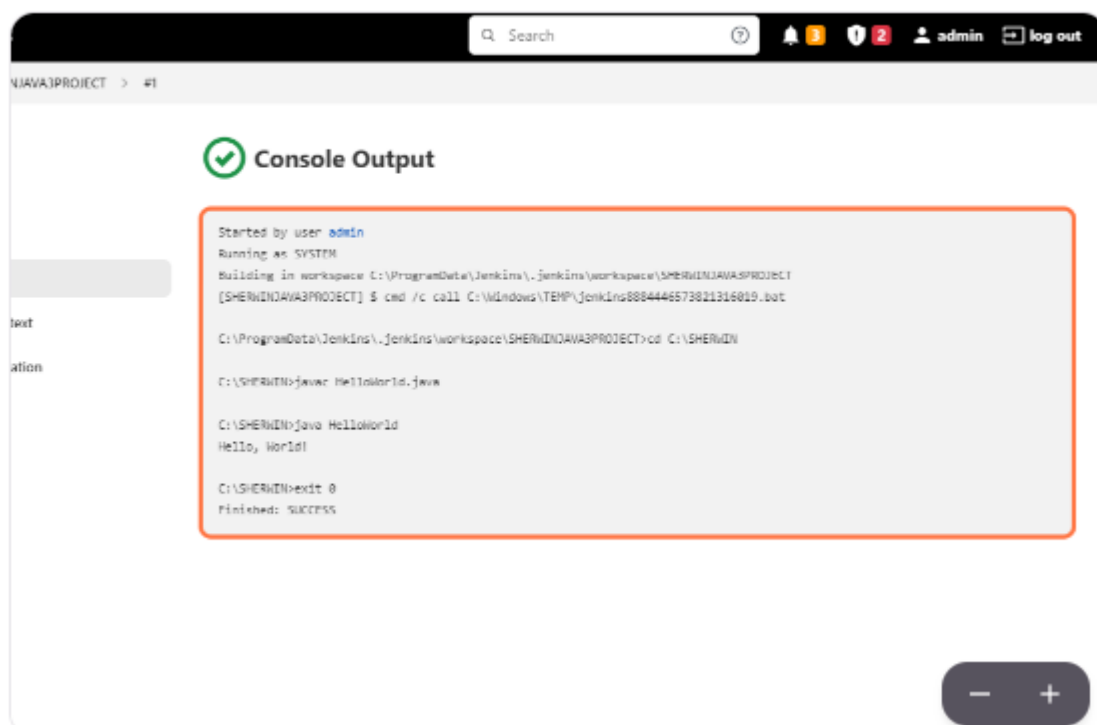
3. Java freestyle project -Hello world



1 Click on highlight

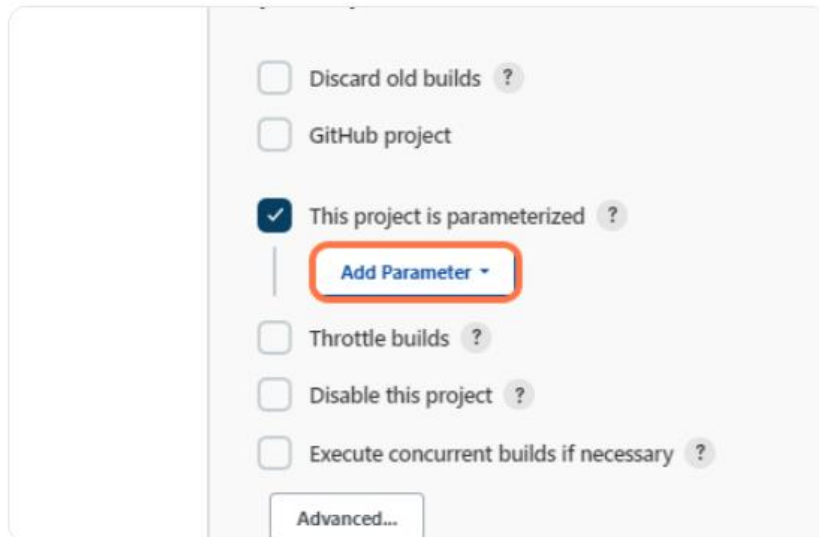


2 Click on Started by user admin...

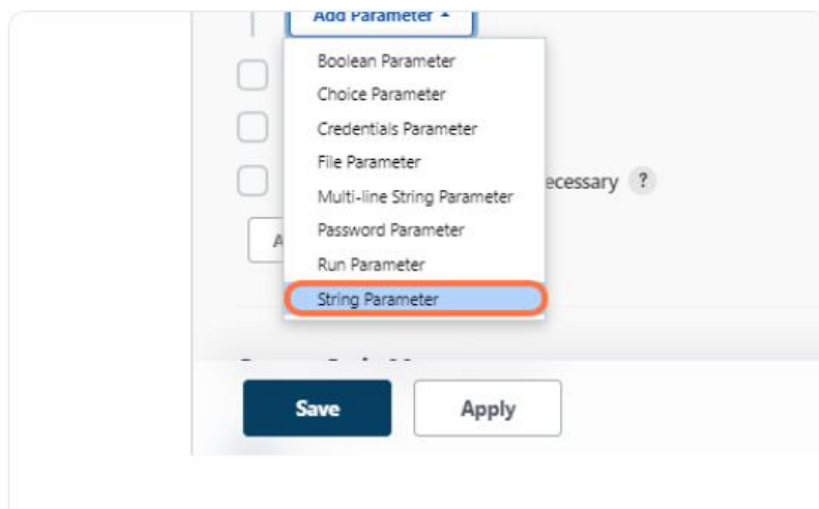


Managing Parameters and Running Windows Batch Commands in Project

1 Click on Add Parameter



2 Click on String Parameter



General

Source Code Management

Build Triggers

Build Environment

Build

Post-build Actions

[Plain text] Preview

Discard old builds ?

GitHub project

This project is parameterized ?

String Parameter ?

Name ?

F_NAME

Default Value ?

Description ?

[Plain text] Preview

Trim the string ?

String Parameter ?

Name ?

L_NAME

Default Value ?

Description ?

[Plain text] Preview

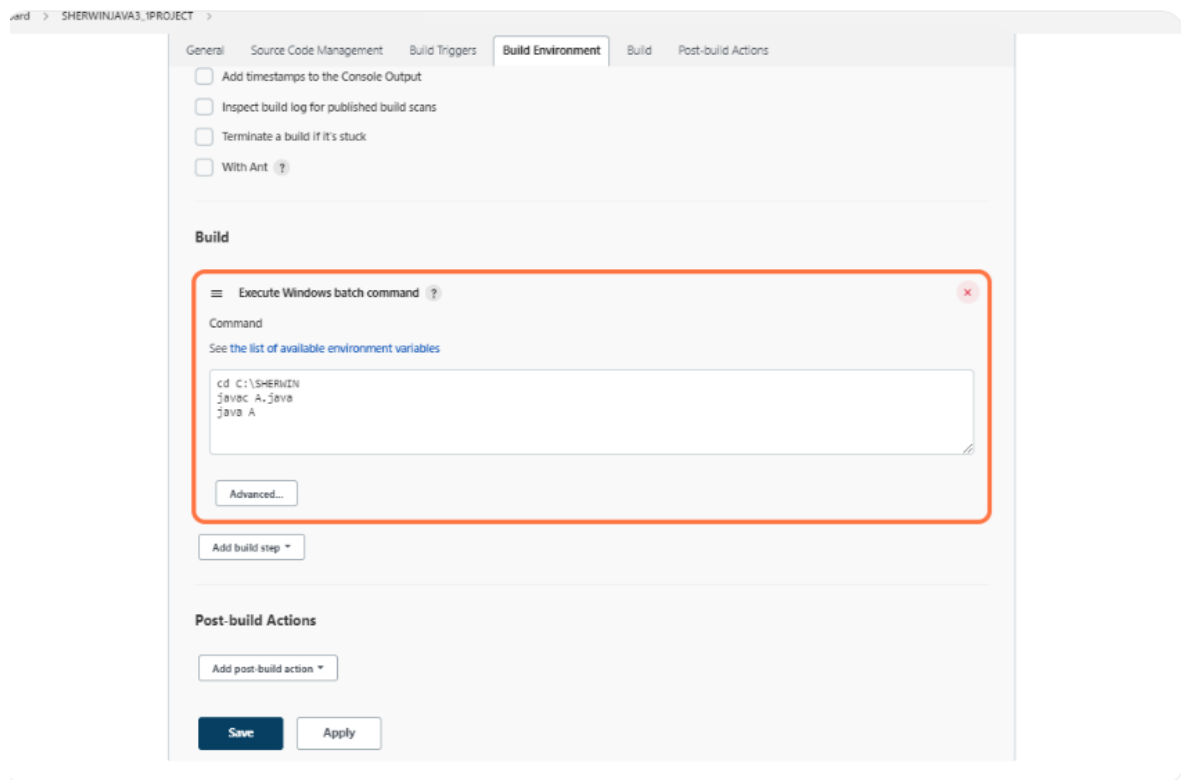
Trim the string ?

Add Parameter +

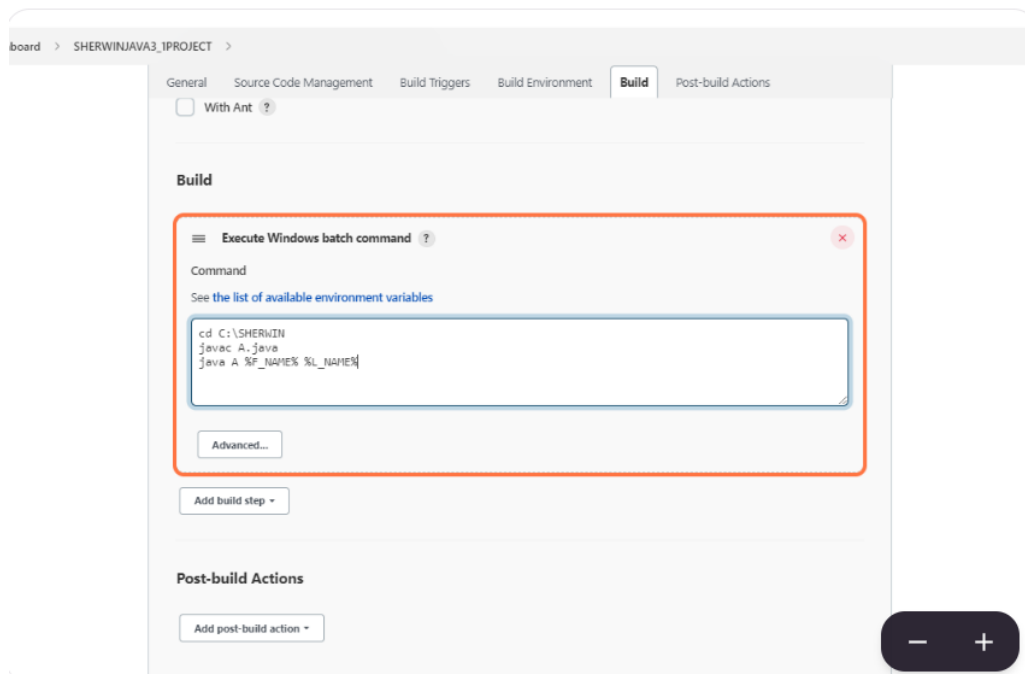
Save

Apply

5 Click on Execute Windows batch command...



6 Click on Execute Windows batch command...



7 Click on Project SHERWINJAVA3_1PROJECT...

Jenkins Search ? 3 2 admin log out

board > SHERWINJAVA3_1PROJECT >

Back to Dashboard
Status
Changes
Workspace
Build with Parameters
Configure
Delete Project
Rename

Build History trend ▾
ter builds...
No builds
Atom feed for all Atom feed for failures

Project SHERWINJAVA3_1PROJECT
This build requires parameters:
F_NAME
Sherwin
L_NAME
Rienzo
Build

Jenkins 2.342

8 Click on Build



Sherwin

L_NAME

Rienzo

Build

9 Click on Dashboard...

Jenkins Search ? 3 2 admin log out

Dashboard > SHERWINJAVA3_1PROJECT > #3

Back to Project
Status
Changes
Console Output
View as plain text
Edit Build Information
Delete build '#3'
Parameters
Previous Build

Console Output

```
Started by user admin
Running as SYSTEM
Building in workspace C:\ProgramData\Jenkins\jenkins\workspace\SHERWINJAVA3_1PROJECT
[SHERWINJAVA3_1PROJECT] $ cmd /c call C:\Windows\TEMP\jenkins8571436807728324263.bat

C:\ProgramData\Jenkins\jenkins\workspace\SHERWINJAVA3_1PROJECT>cd C:\SHERWIN

C:\SHERWIN>javac A.java

C:\SHERWIN>java A Sherwin Rienzo
Your name : Sherwin
Your Surname : Rienzo

C:\SHERWIN>exit 0
Finished: SUCCESS
```