Lesson 07 Demo 01

Configuring Deploy Plugin for Performing Automated CD

Objective: To configure a CI/CD pipeline in Jenkins for deploying a Java application to Tomcat Apache

Tools required: GitHub, Jenkins, and Tomcat Apache

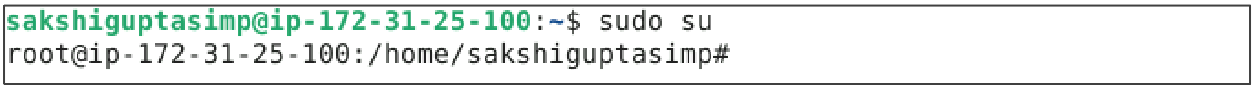
Prerequisites: You need to have a Jenkins up and running.

Steps to be followed:

1. Install Tomcat Apache 9 on Ubuntu VM
2. Log in to the Jenkins CI tool and install the Deploy to container plugin
3. Configure the deployment stage in the Jenkins pipeline

Step 1: Install Tomcat Apache 9 on Ubuntu VM

1.1 Open the terminal in your lab and use the following command to switch to the root user:
sudo su

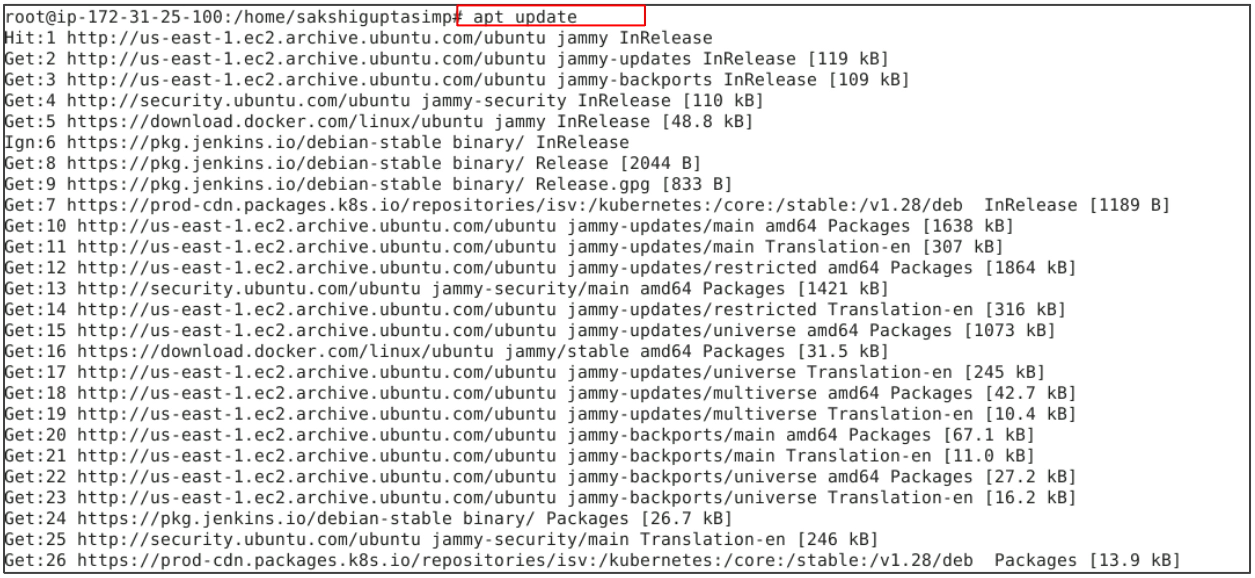


```
sakshiguptasimp@ip-172-31-25-100:~$ sudo su
root@ip-172-31-25-100:/home/sakshiguptasimp#
```

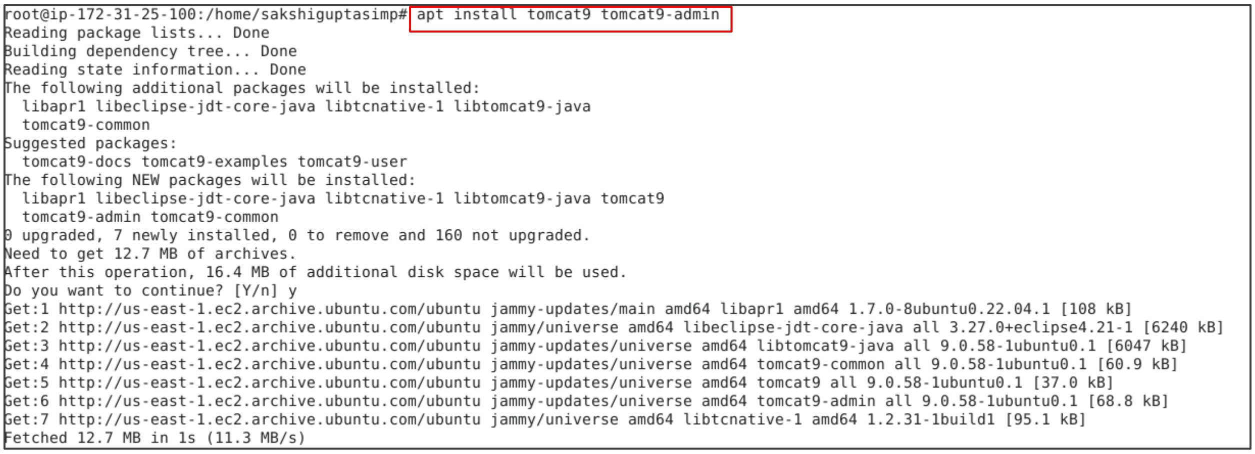
1.2 Install Tomcat Apache and other required packages using the following command:

apt update

apt install tomcat9 tomcat9-admin



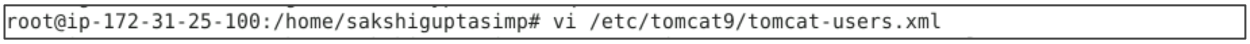
```
root@ip-172-31-25-100:/home/sakshiguptasimp# apt update
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease [119 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease [109 kB]
Get:4 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Get:5 https://download.docker.com/linux/ubuntu jammy InRelease [48.8 kB]
Ign:6 https://pkg.jenkins.io/debian-stable binary/ InRelease
Get:8 https://pkg.jenkins.io/debian-stable binary/ Release [2044 B]
Get:9 https://pkg.jenkins.io/debian-stable binary/ Release.gpg [833 B]
Get:7 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/stable:/v1.28/deb  InRelease [1189 B]
Get:10 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [1638 kB]
Get:11 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main Translation-en [307 kB]
Get:12 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 Packages [1864 kB]
Get:13 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [1421 kB]
Get:14 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted Translation-en [316 kB]
Get:15 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [1073 kB]
Get:16 https://download.docker.com/linux/ubuntu jammy/stable amd64 Packages [31.5 kB]
Get:17 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe Translation-en [245 kB]
Get:18 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packages [42.7 kB]
Get:19 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse Translation-en [10.4 kB]
Get:20 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/main amd64 Packages [67.1 kB]
Get:21 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/main Translation-en [11.0 kB]
Get:22 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe amd64 Packages [27.2 kB]
Get:23 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe Translation-en [16.2 kB]
Get:24 https://pkg.jenkins.io/debian-stable binary/ Packages [26.7 kB]
Get:25 http://security.ubuntu.com/ubuntu jammy-security/main Translation-en [246 kB]
Get:26 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/stable:/v1.28/deb  Packages [13.9 kB]
```



```
root@ip-172-31-25-100:/home/sakshiguptasimp# apt install tomcat9 tomcat9-admin
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  libapr1 libeclipse-jdt-core-java libtcnative-1 libtomcat9-java
  tomcat9-common
Suggested packages:
  tomcat9-docs tomcat9-examples tomcat9-user
The following NEW packages will be installed:
  libapr1 libeclipse-jdt-core-java libtcnative-1 libtomcat9-java tomcat9
  tomcat9-admin tomcat9-common
0 upgraded, 7 newly installed, 0 to remove and 160 not upgraded.
Need to get 12.7 MB of archives.
After this operation, 16.4 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libapr1 amd64 1.7.0-8ubuntu0.22.04.1 [108 kB]
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 libeclipse-jdt-core-java all 3.27.0+eclipse4.21-1 [6240 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 libtomcat9-java all 9.0.58-1ubuntu0.1 [6047 kB]
Get:4 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 tomcat9-common all 9.0.58-1ubuntu0.1 [60.9 kB]
Get:5 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 tomcat9 all 9.0.58-1ubuntu0.1 [37.0 kB]
Get:6 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 tomcat9-admin all 9.0.58-1ubuntu0.1 [68.8 kB]
Get:7 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 libtcnative-1 amd64 1.2.31-1build1 [95.1 kB]
Fetched 12.7 MB in 1s (11.3 MB/s)
```

1.3 Once the installation is complete, open the **tomcat-users.xml** file using the following command:

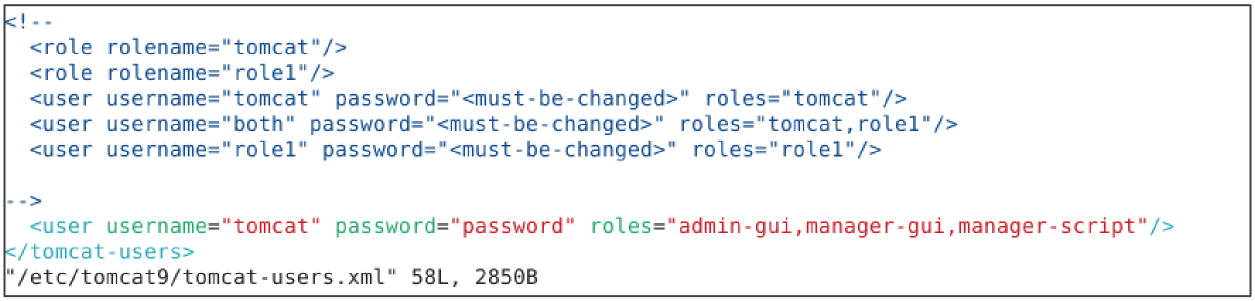
vi /etc/tomcat9/tomcat-users.xml



```
root@ip-172-31-25-100:/home/sakshiguptasimp# vi /etc/tomcat9/tomcat-users.xml
```

1.4 Add the following content in **tomcat-users.xml** file:

<user username="tomcat" password="password" roles="admin-gui,manager-gui,manager-script"/>



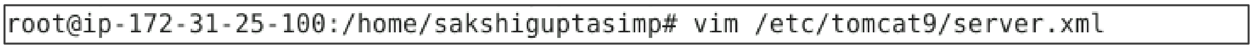
```
<!--
  <role rolename="tomcat"/>
  <role rolename="role1"/>
  <user username="tomcat" password="<must-be-changed>" roles="tomcat"/>
  <user username="both" password="<must-be-changed>" roles="tomcat,role1"/>
  <user username="role1" password="<must-be-changed>" roles="role1"/>

-->
  <user username="tomcat" password="password" roles="admin-gui,manager-gui,manager-script"/>
</tomcat-users>
"/etc/tomcat9/tomcat-users.xml" 58L, 2850B
```

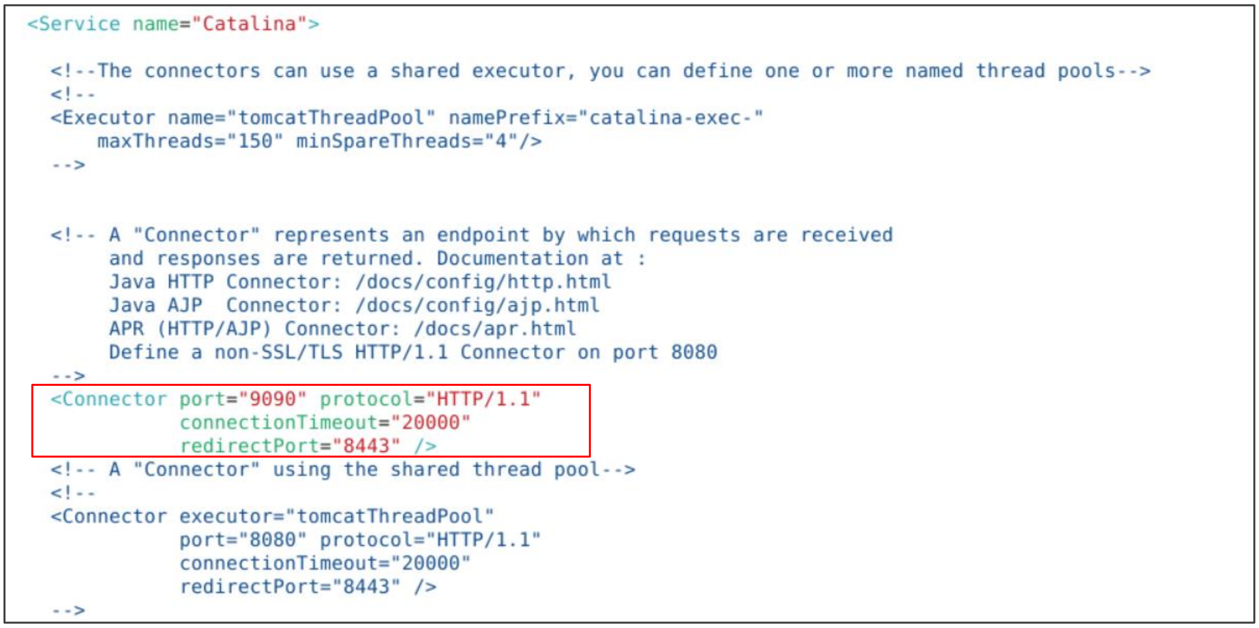
Note: To save the file and exit, press **Esc**, then type **:wq**, and press **Enter**

1.5 Open the **server.xml** file using the following command and scroll down to change the connector port number of Tomcat to **9090**:

vim /etc/tomcat9/server.xml



```
root@ip-172-31-25-100:/home/sakshiguptasimp# vim /etc/tomcat9/server.xml
```



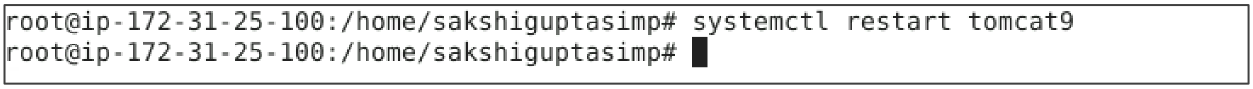
```
  <Service name="Catalina">

    <!--The connectors can use a shared executor, you can define one or more named thread pools-->
    <!--
    <Executor name="tomcatThreadPool" namePrefix="catalina-exec-"
        maxThreads="150" minSpareThreads="4"/>
    -->


    <!-- A "Connector" represents an endpoint by which requests are received
         and responses are returned. Documentation at :
         Java HTTP Connector: /docs/config/http.html
         Java AJP  Connector: /docs/config/ajp.html
         APR (HTTP/AJP) Connector: /docs/apr.html
         Define a non-SSL/TLS HTTP/1.1 Connector on port 8080
    -->
    <Connector port="9090" protocol="HTTP/1.1"
               connectionTimeout="20000"
               redirectPort="8443" />
    <!-- A "Connector" using the shared thread pool-->
    <!--
    <Connector executor="tomcatThreadPool"
               port="8080" protocol="HTTP/1.1"
               connectionTimeout="20000"
               redirectPort="8443" />
    -->
```

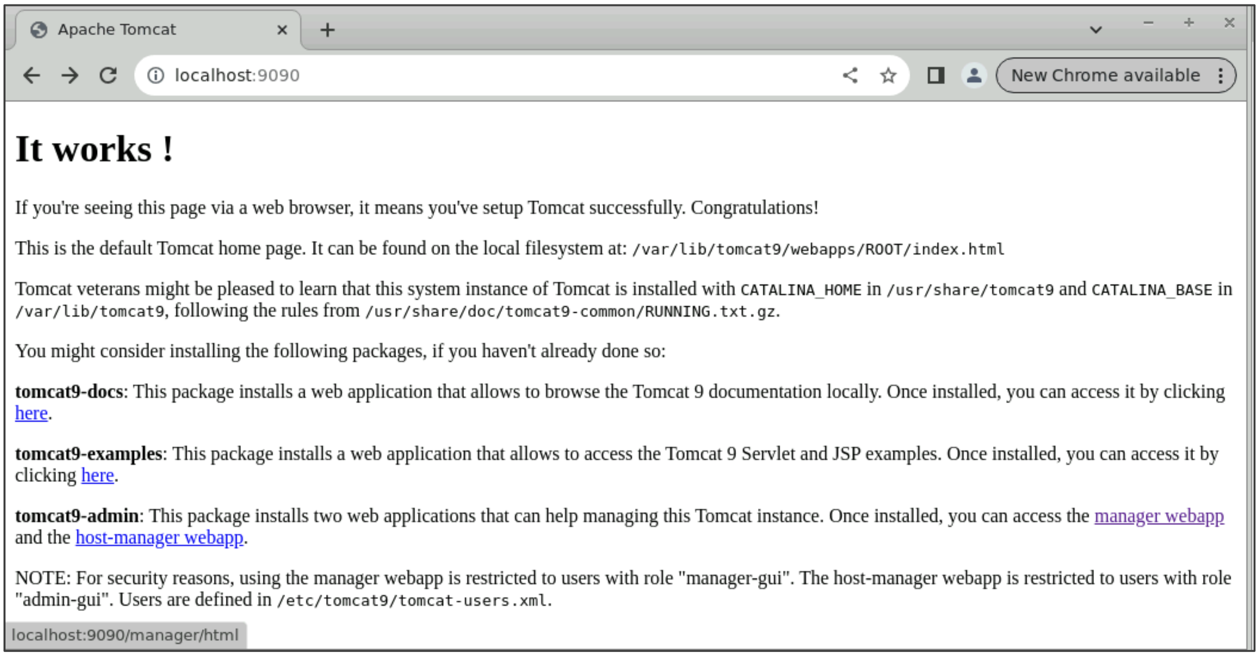
Note: To save the file and exit, press **Esc**, then type **:wq**, and press **Enter**

1.6 Restart Tomcat using the following command:
systemctl restart tomcat9



```
root@ip-172-31-25-100:/home/sakshiguptasimp# systemctl restart tomcat9
root@ip-172-31-25-100:/home/sakshiguptasimp# 
```

1.7 Navigate to **localhost:9090** in your web browser and access Tomcat



It works !

If you're seeing this page via a web browser, it means you've setup Tomcat successfully. Congratulations!

This is the default Tomcat home page. It can be found on the local filesystem at: `/var/lib/tomcat9/webapps/ROOT/index.html`

Tomcat veterans might be pleased to learn that this system instance of Tomcat is installed with `CATALINA_HOME` in `/usr/share/tomcat9` and `CATALINA_BASE` in `/var/lib/tomcat9`, following the rules from `/usr/share/doc/tomcat9-common/RUNNING.txt.gz`.

You might consider installing the following packages, if you haven't already done so:

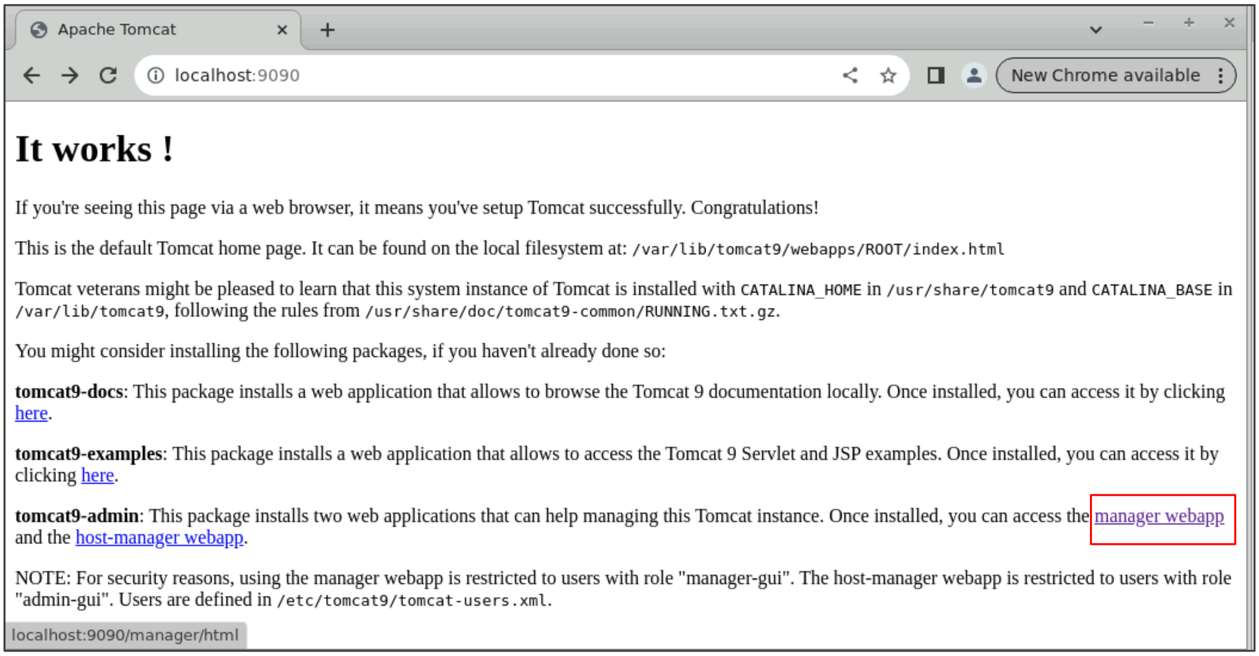
tomcat9-docs: This package installs a web application that allows to browse the Tomcat 9 documentation locally. Once installed, you can access it by clicking here.

tomcat9-examples: This package installs a web application that allows to access the Tomcat 9 Servlet and JSP examples. Once installed, you can access it by clicking here.

tomcat9-admin: This package installs two web applications that can help managing this Tomcat instance. Once installed, you can access the manager webapp and the host-manager webapp.

NOTE: For security reasons, using the manager webapp is restricted to users with role "manager-gui". The host-manager webapp is restricted to users with role "admin-gui". Users are defined in `/etc/tomcat9/tomcat-users.xml`.

1.8 Click and access **manager webapp** to make sure the Tomcat setup is complete



It works !

If you're seeing this page via a web browser, it means you've setup Tomcat successfully. Congratulations!

This is the default Tomcat home page. It can be found on the local filesystem at: `/var/lib/tomcat9/webapps/ROOT/index.html`

Tomcat veterans might be pleased to learn that this system instance of Tomcat is installed with `CATALINA_HOME` in `/usr/share/tomcat9` and `CATALINA_BASE` in `/var/lib/tomcat9`, following the rules from `/usr/share/doc/tomcat9-common/RUNNING.txt.gz`.

You might consider installing the following packages, if you haven't already done so:

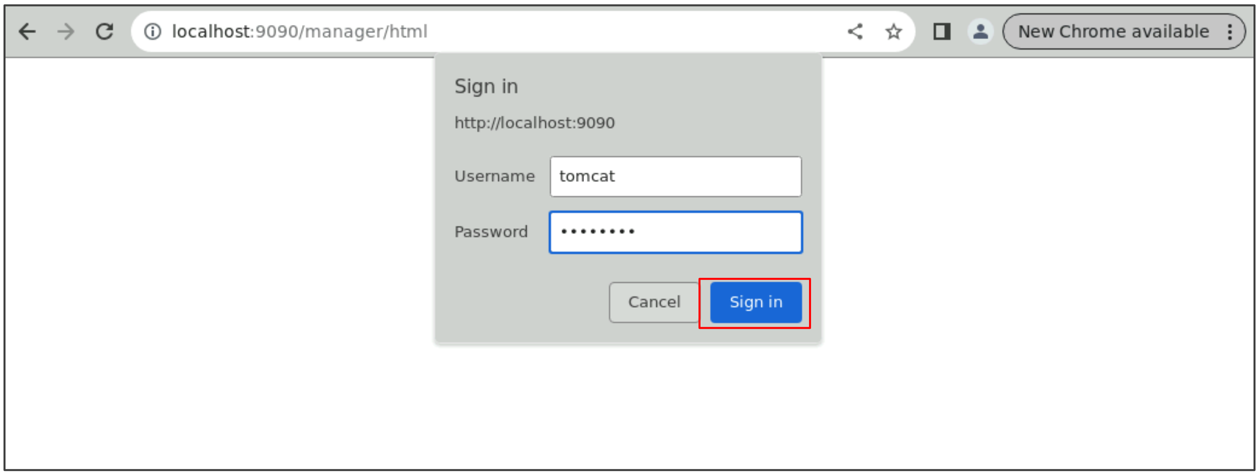
tomcat9-docs: This package installs a web application that allows to browse the Tomcat 9 documentation locally. Once installed, you can access it by clicking here.

tomcat9-examples: This package installs a web application that allows to access the Tomcat 9 Servlet and JSP examples. Once installed, you can access it by clicking here.

tomcat9-admin: This package installs two web applications that can help managing this Tomcat instance. Once installed, you can access the manager webapp and the host-manager webapp.

NOTE: For security reasons, using the manager webapp is restricted to users with role "manager-gui". The host-manager webapp is restricted to users with role "admin-gui". Users are defined in `/etc/tomcat9/tomcat-users.xml`.

1.9 Enter the credentials and click on **Sign in**



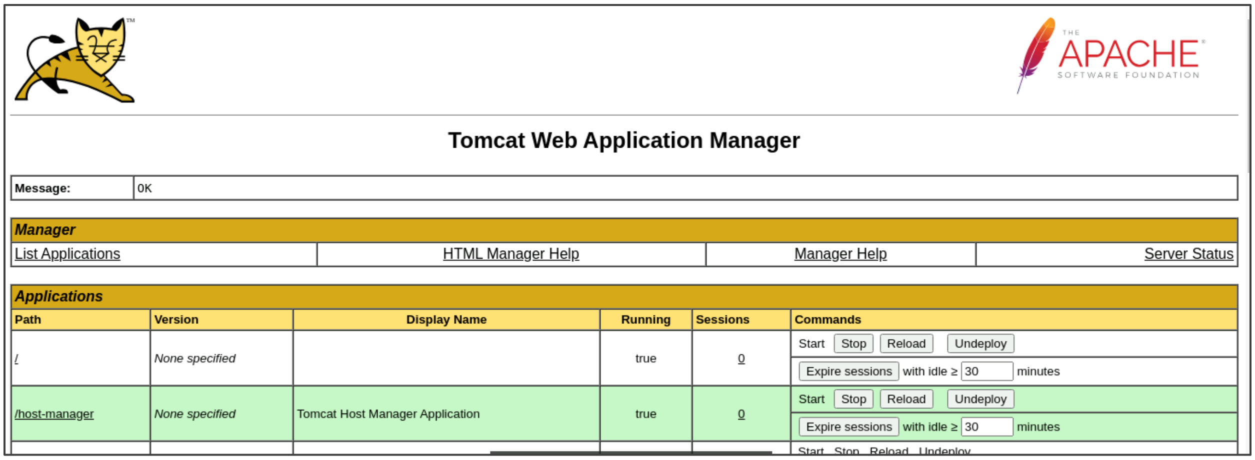
Sign in

http://localhost:9090

Username: tomcat

Password: •••••••••

Note: The credentials for accessing Tomcat manager web app are Username: **tomcat** and Password: **password**.



Tomcat Web Application Manager

Message:	OK

Manager

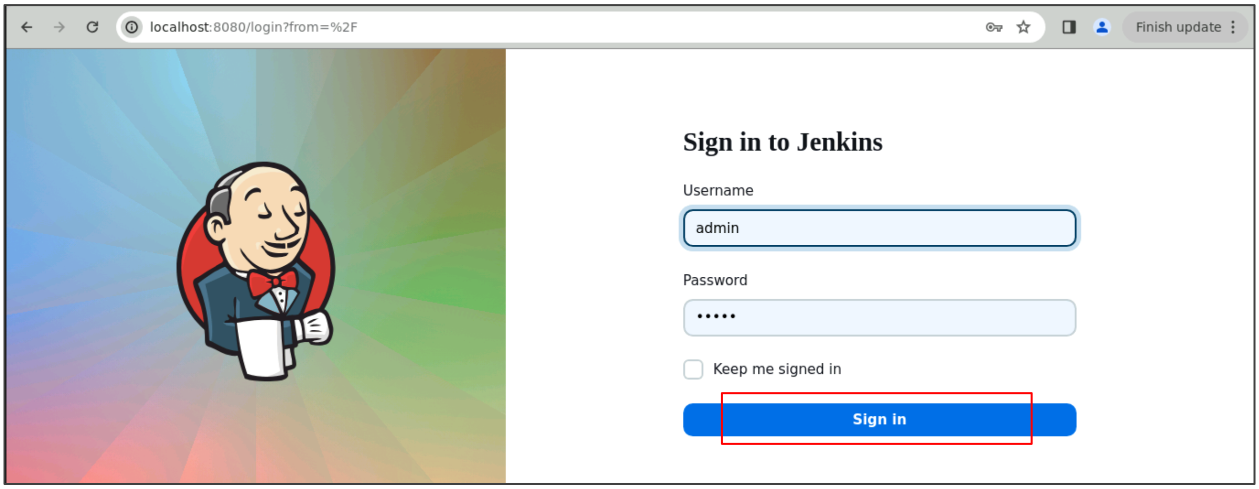
List Applications	HTML Manager Help	Manager Help	Server Status

Applications

Path	Version	Display Name	Running	Sessions	Commands
/	*None specified*		true	0	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes
/host-manager	*None specified*	Tomcat Host Manager Application	true	0	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes
					Start Stop Reload Undeploy

Step 2: Log in to Jenkins CI tool and install Deploy to container plugin

2.1 Navigate to **localhost:8080** in your web browser, enter your credentials, and click on **Sign in**



Sign in to Jenkins

Username: admin

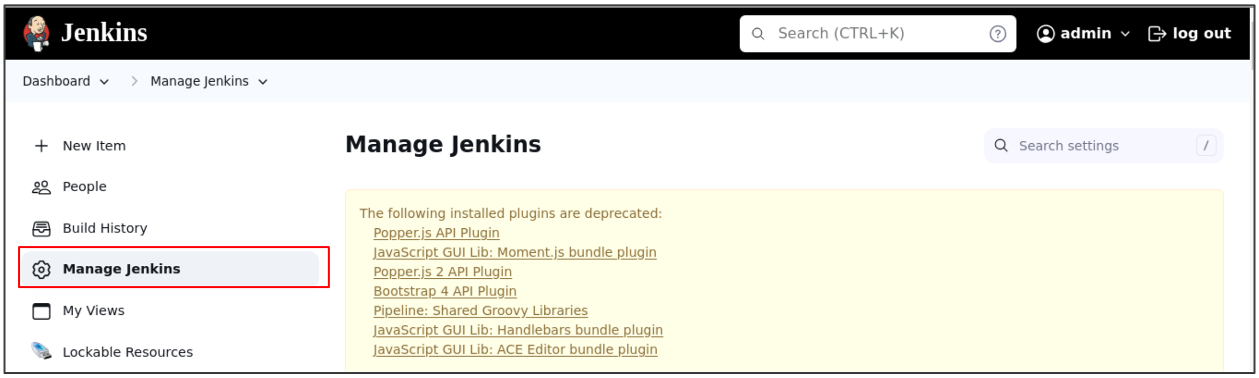
Password: •••••

□ Keep me signed in

Sign in

Note: The credentials for accessing Jenkins in the lab are Username: **admin** and Password: **admin**.

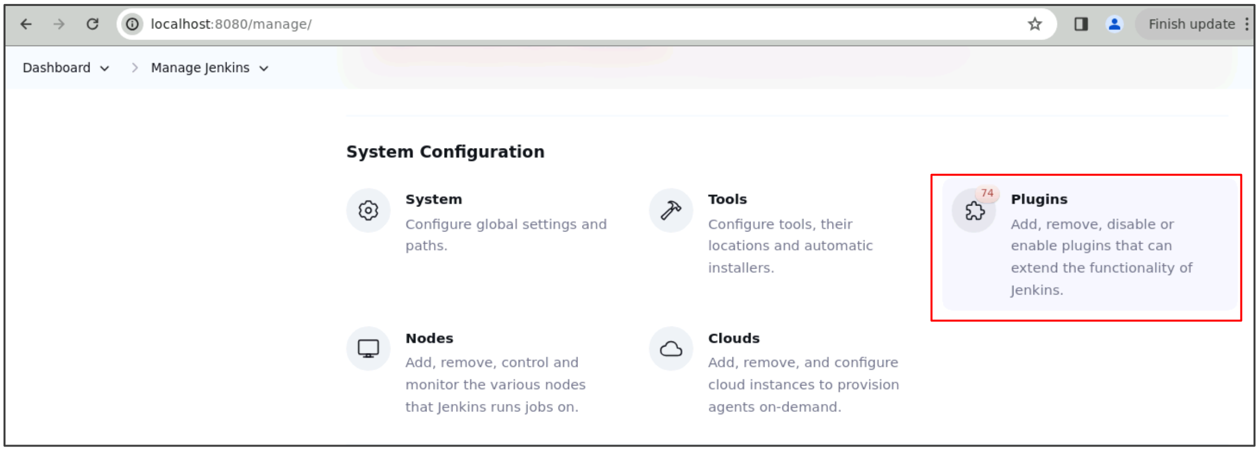
2.2 Click on **Manage Jenkins** on the Jenkins dashboard



Manage Jenkins

The following installed plugins are deprecated:
- Popper.js API Plugin
- JavaScript GUI Lib: Moment.js bundle plugin
- Popper.js 2 API Plugin
- Bootstrap 4 API Plugin
- Pipeline: Shared Groovy Libraries
- JavaScript GUI Lib: Handlebars bundle plugin
- JavaScript GUI Lib: ACE Editor bundle plugin

2.3 Scroll down and click on **Plugins** under **System Configuration**



System Configuration

System Configure global settings and paths.

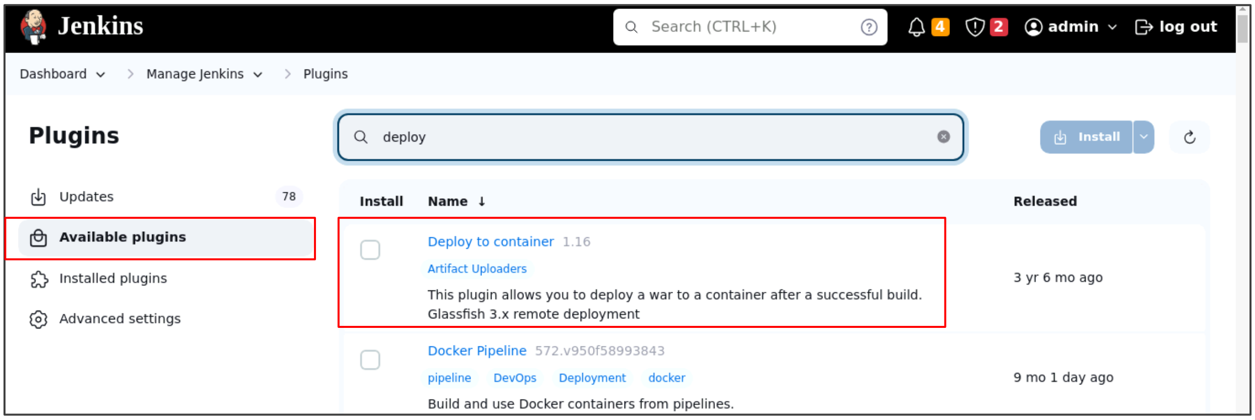
Tools Configure tools, their locations and automatic installers.

Plugins Add, remove, disable or enable plugins that can extend the functionality of Jenkins.

Nodes Add, remove, control and monitor the various nodes that Jenkins runs jobs on.

Clouds Add, remove, and configure cloud instances to provision agents on-demand.

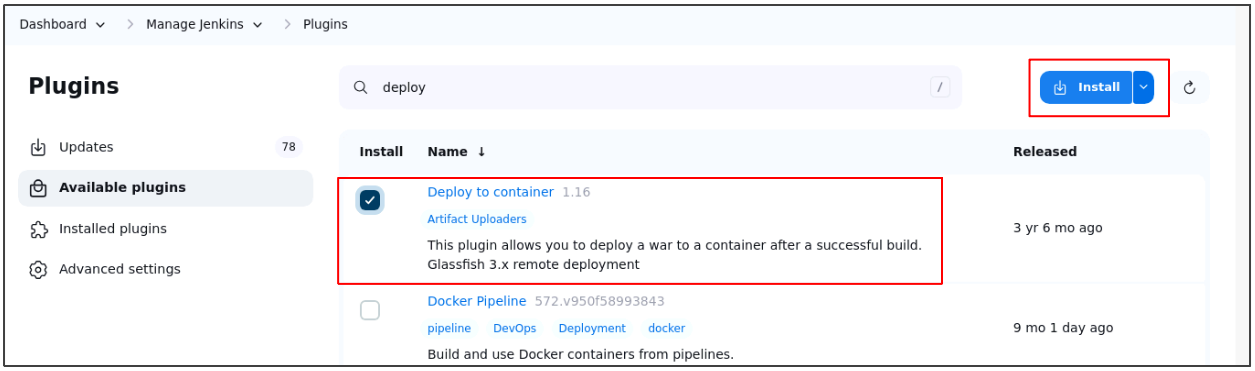
2.4 Navigate to **Available plugins** and search for **Deploy to container** plugin



deploy

Install	Name ↓	Released
□	Deploy to container 1.16 Artifact Uploaders This plugin allows you to deploy a war to a container after a successful build. Glassfish 3.x remote deployment	3 yr 6 mo ago
□	Docker Pipeline 572.v950f58993843 pipeline DevOps Deployment docker Build and use Docker containers from pipelines.	9 mo 1 day ago

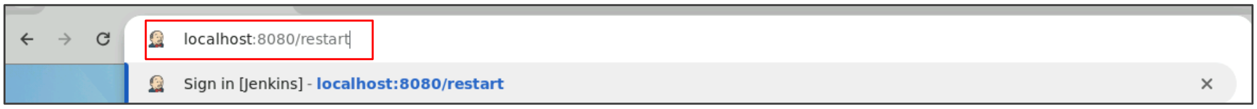
2.5 Select **Deploy to container** plugin, click on **Install**



Plugins

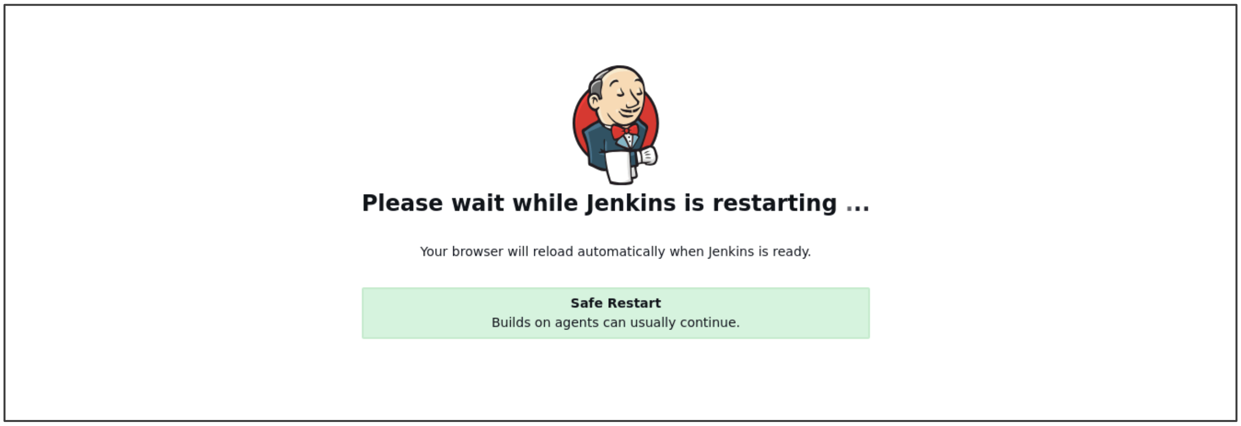
Install	Name ↓	Released
☑	Deploy to container 1.16 Artifact Uploaders This plugin allows you to deploy a war to a container after a successful build. Glassfish 3.x remote deployment	3 yr 6 mo ago
□	Docker Pipeline 572.v950f58993843 pipeline DevOps Deployment docker Build and use Docker containers from pipelines.	9 mo 1 day ago

2.6 After installation, navigate to the following URL to restart Jenkins:
http://localhost:8080/restart



localhost:8080/restart

Sign in [Jenkins] - **localhost:8080/restart**



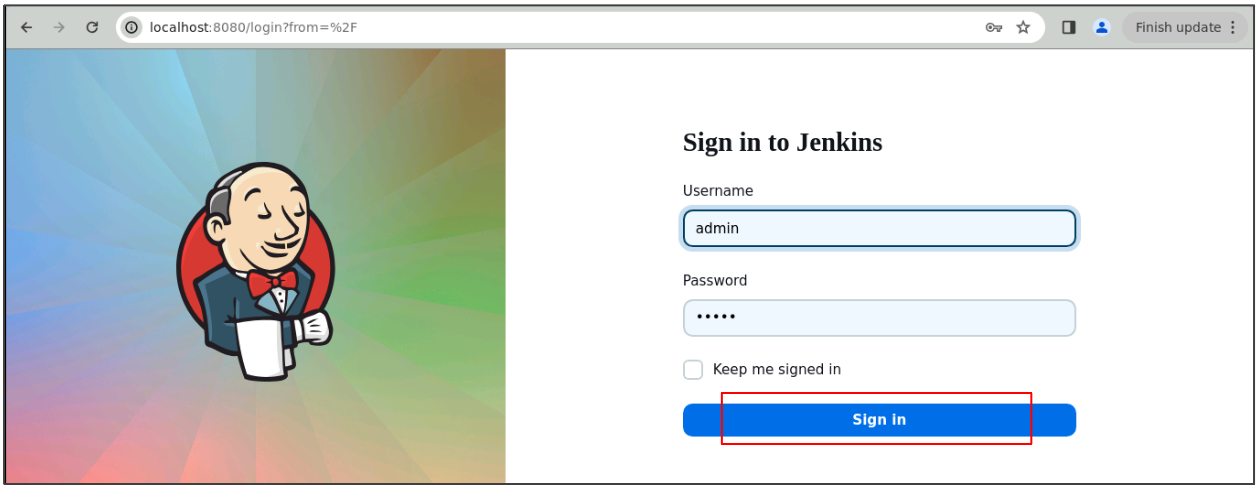
Please wait while Jenkins is restarting ...

Your browser will reload automatically when Jenkins is ready.

Safe Restart
Builds on agents can usually continue.

Step 3: Configure the deployment stage in the Jenkins pipeline

3.1 Enter your credentials and **Sign in** to Jenkins CI tool



localhost:8080/login?from=%2F

Sign in to Jenkins

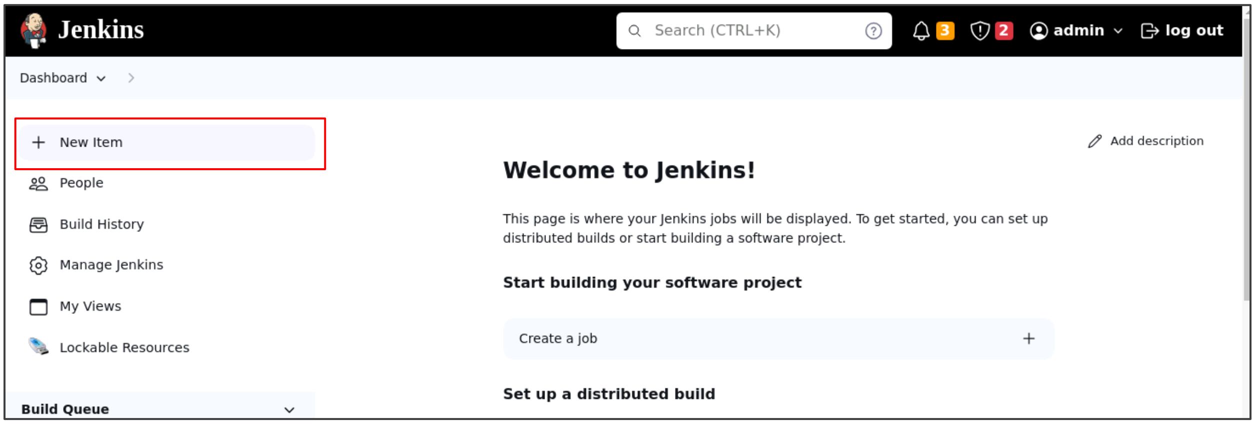
Username: admin

Password: •••••

☐ Keep me signed in

Note: The credentials for accessing Jenkins in the lab are Username: **admin** and Password: **admin**.

3.2 Click on **New Item** to create new Jenkins job



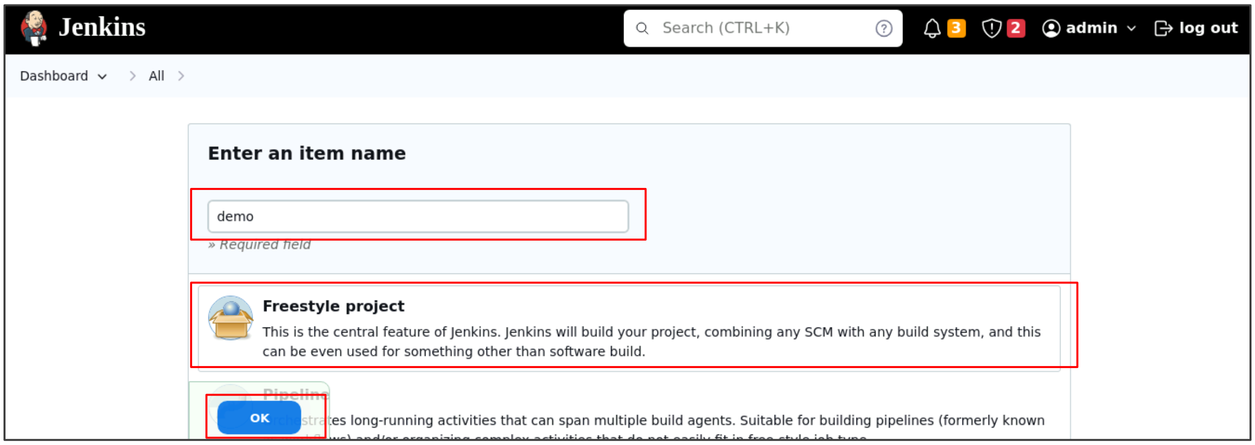
Welcome to Jenkins!

This page is where your Jenkins jobs will be displayed. To get started, you can set up distributed builds or start building a software project.

Start building your software project

Set up a distributed build

3.3 Select **Freestyle project** while creating Jenkins job and provide a custom job name, then click on **OK** to continue



Enter an item name

demo

» Required field

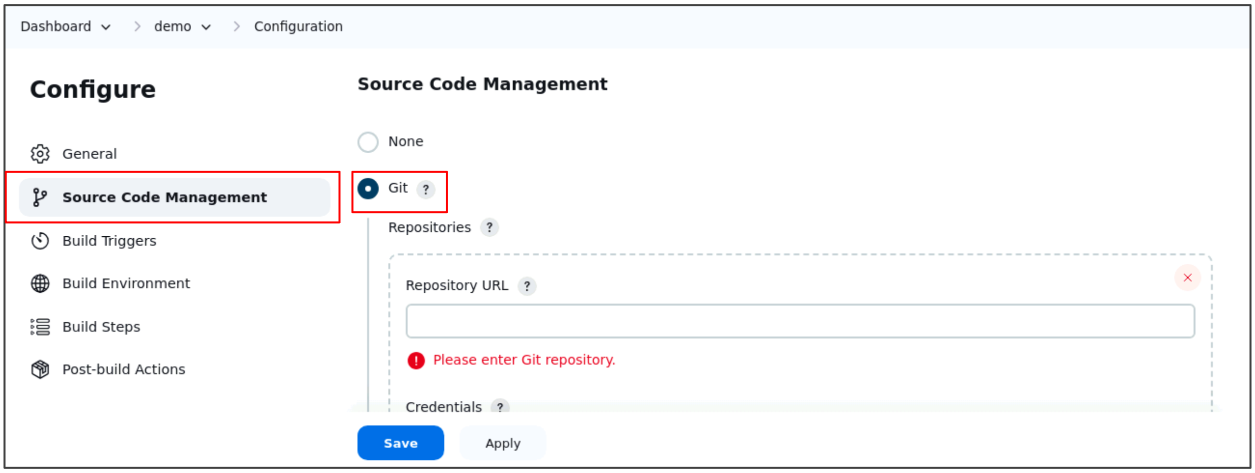
Freestyle project

This is the central feature of Jenkins. Jenkins will build your project, combining any SCM with any build system, and this can be even used for something other than software build.

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.

3.4 Go to **Source Code Management** and select **Git**



Source Code Management

○ None

● Git ?

Repositories ?

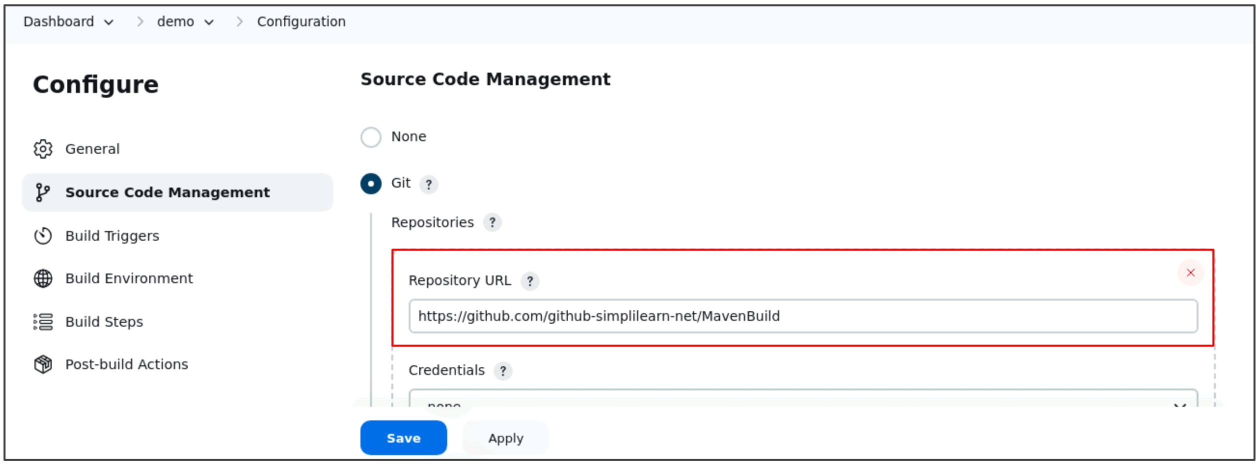
Repository URL ?

Please enter Git repository.

Credentials ?

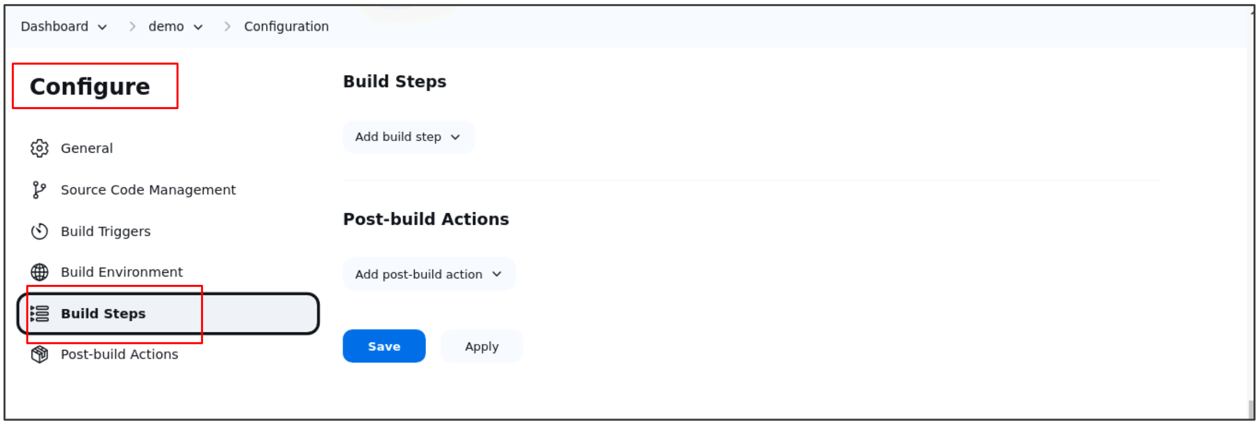
3.5 Enter the following **Repository URL**:

https://github.com/github-simplilearn-net/MavenBuild

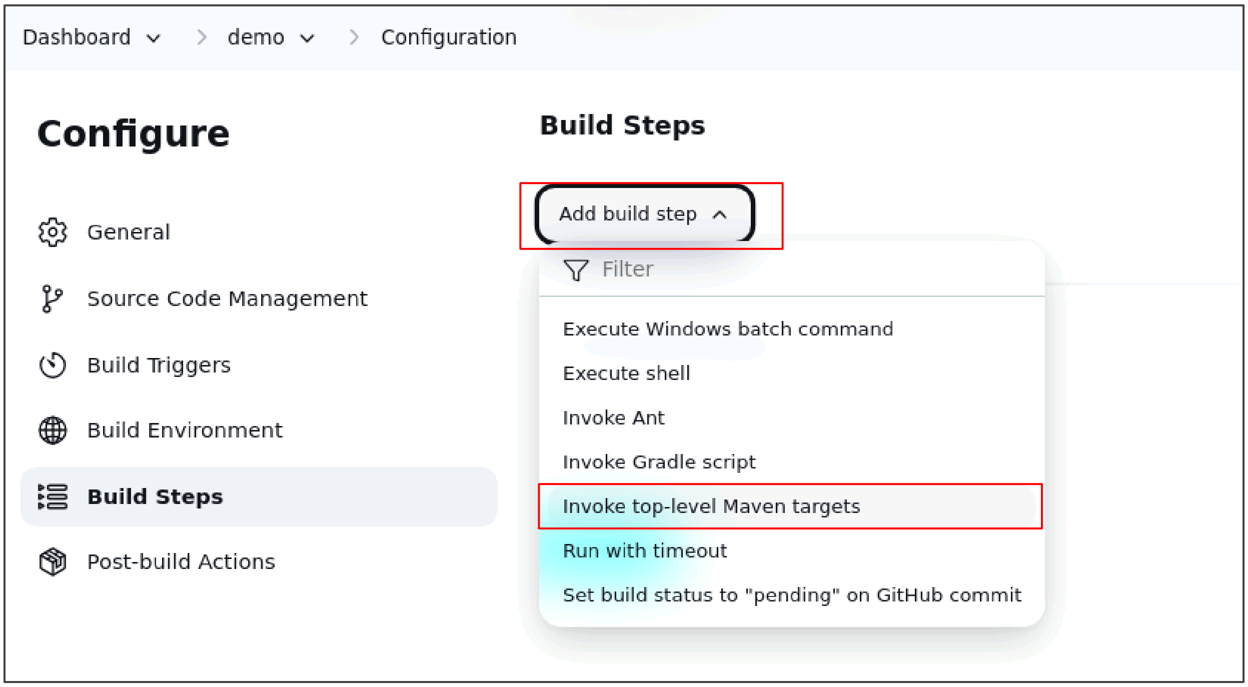


Repository URL: https://github.com/github-simplilearn-net/MavenBuild

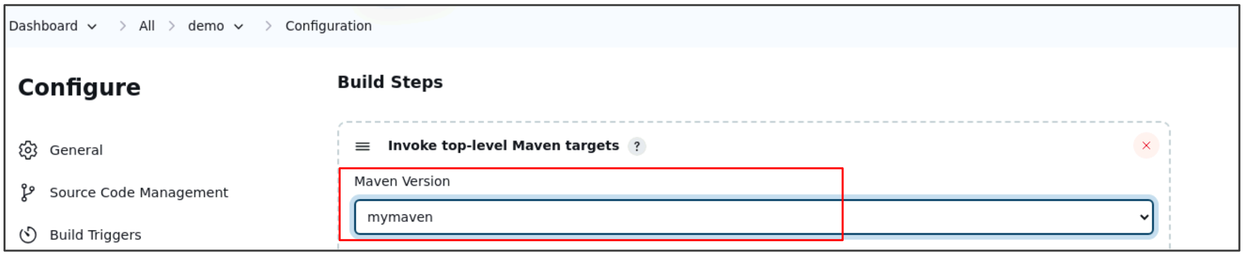
3.6 Go to **Build Steps** under **Configure**:



3.7 Click on **Add build step** and select **Invoke top-level Maven targets**



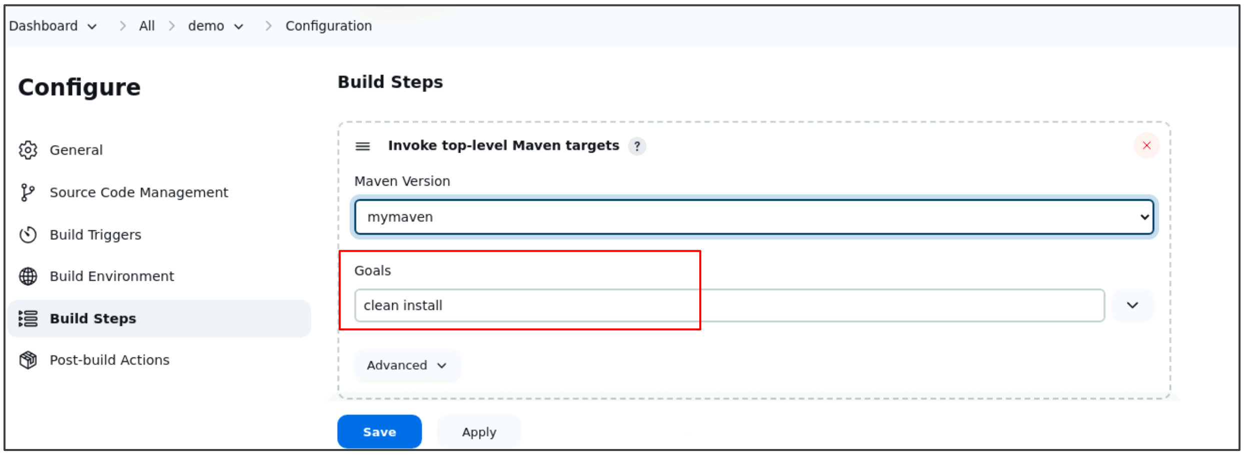
3.8 Enter the following **Maven Version**:
mymaven



Maven Version: mymaven

3.9 Enter the following **Goals**:

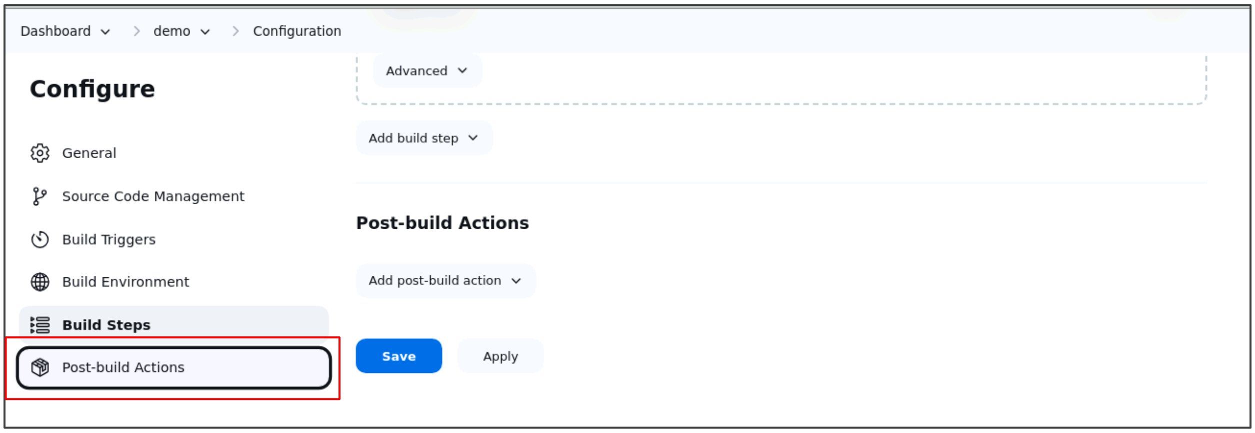
clean install



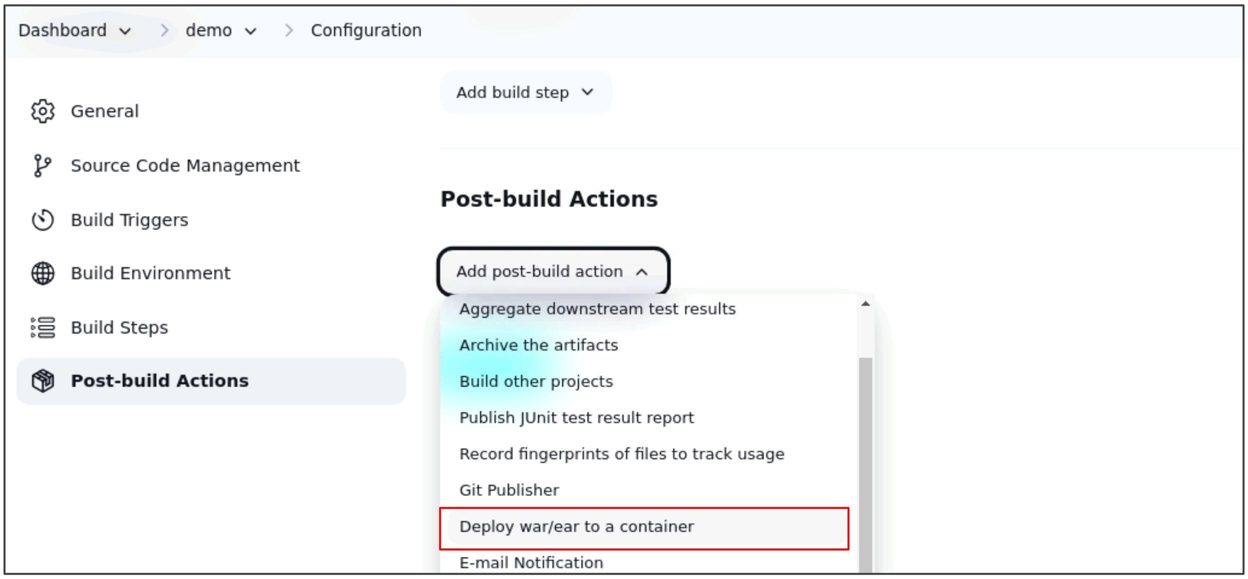
Maven Version: mymaven

Goals: clean install

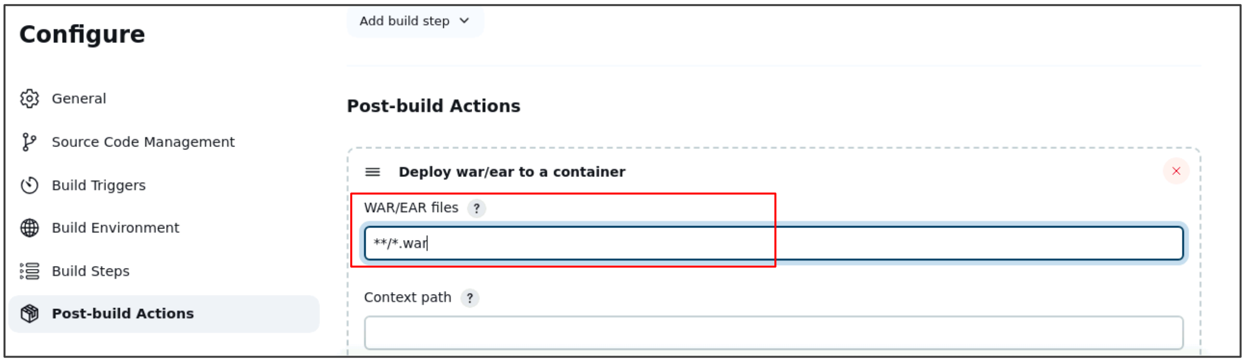
3.10 Go to **Post-build Actions**



3.11 Click on **Add post-build action** and select **Deploy war/ear to a container**

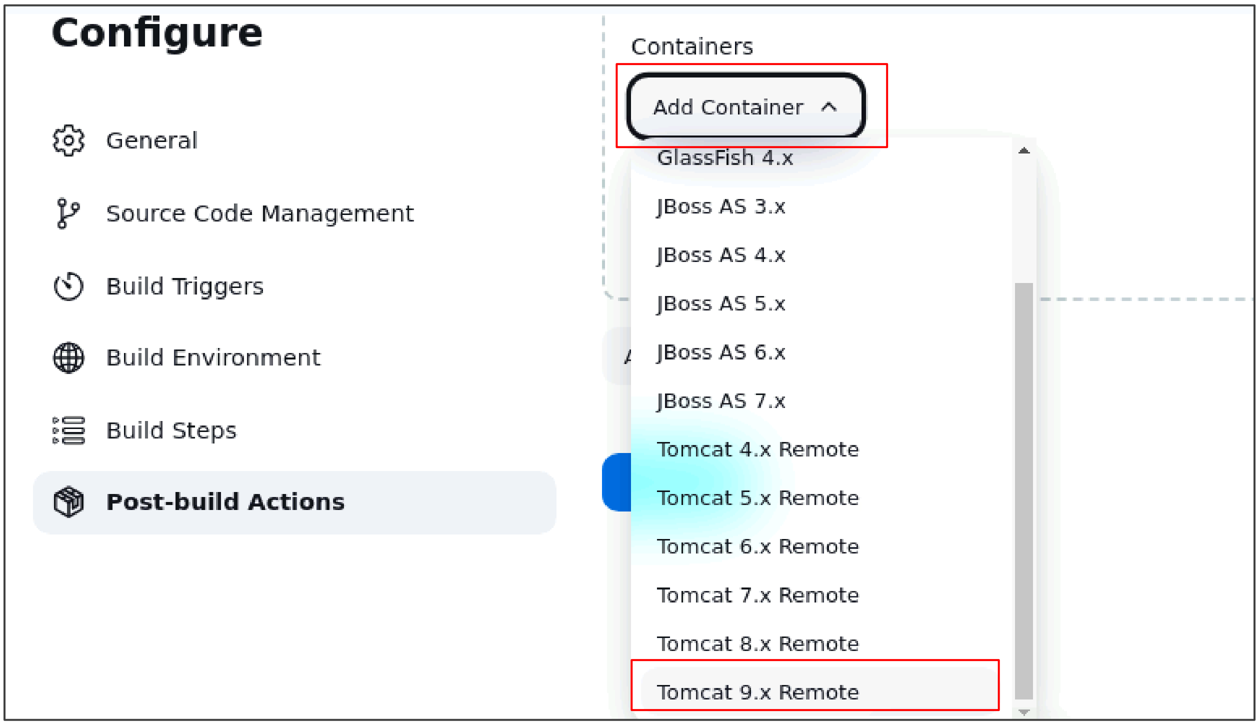


3.12 Enter the following path under **WAR/EAR files**:
****/*.war**

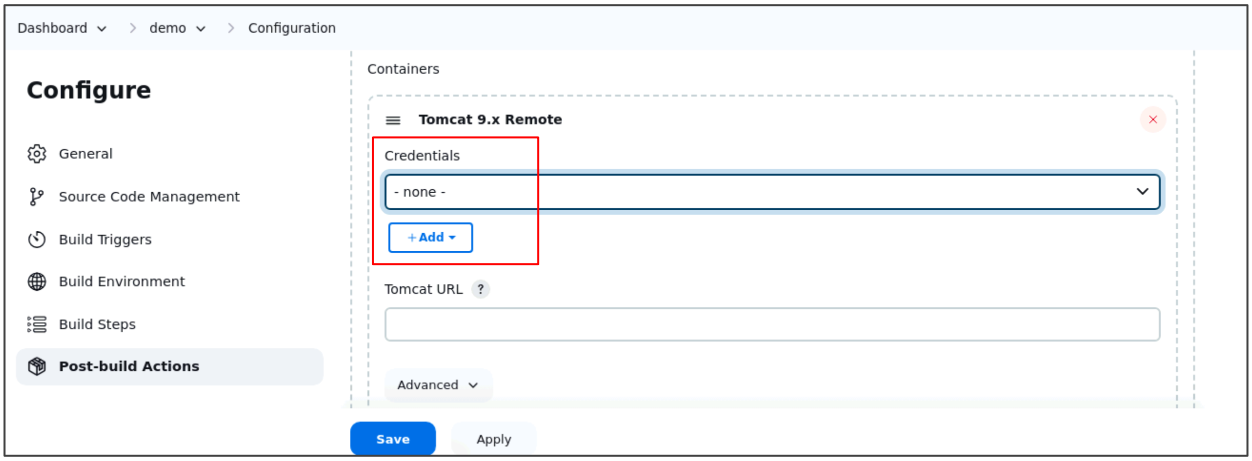


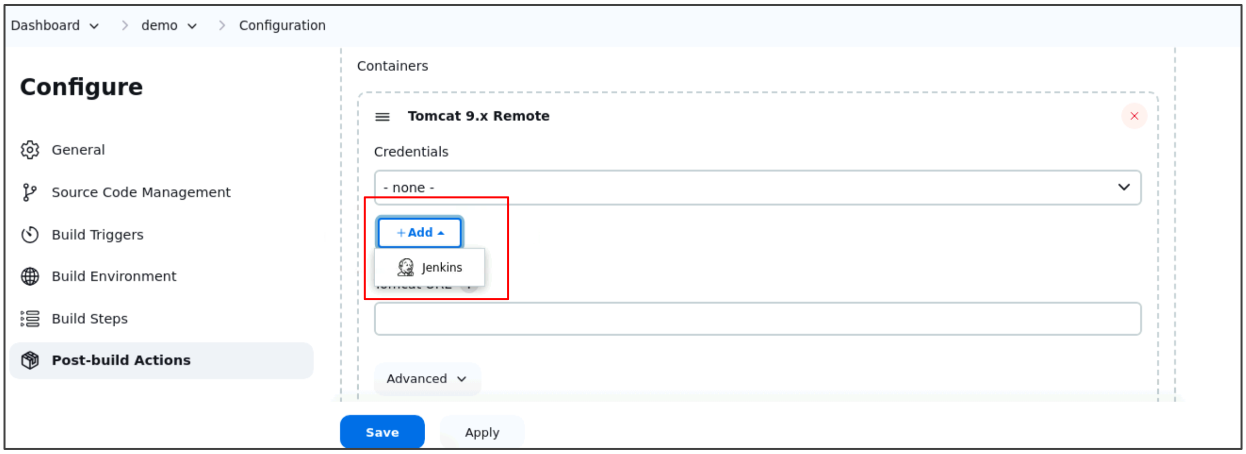
WAR/EAR files: **/*.war

3.13 Click on **Add Container** and select **Tomcat 9.x Remote**



3.14 Click on **Add** under **Credentials** and select **Jenkins** to add the Tomcat credentials





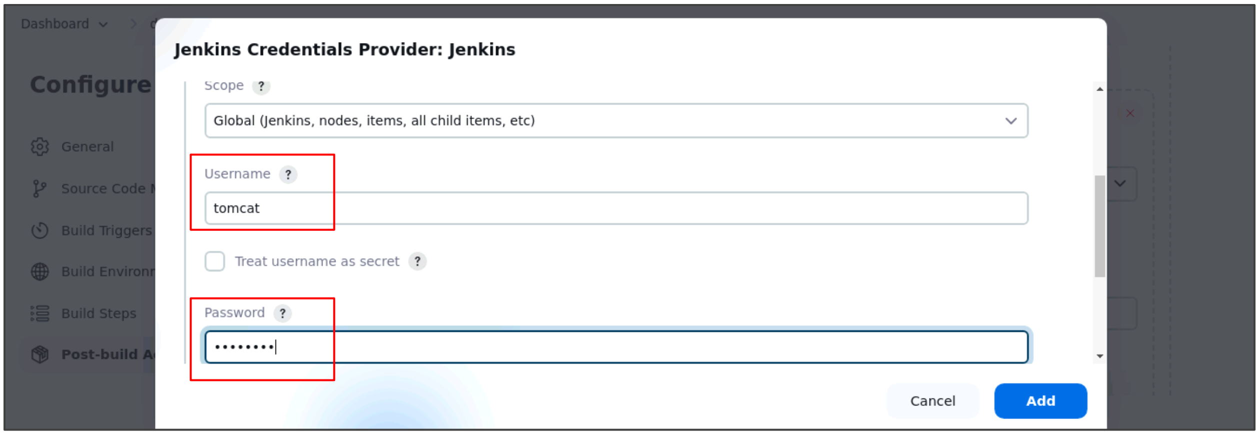
3.15 Scroll down and enter the following details:

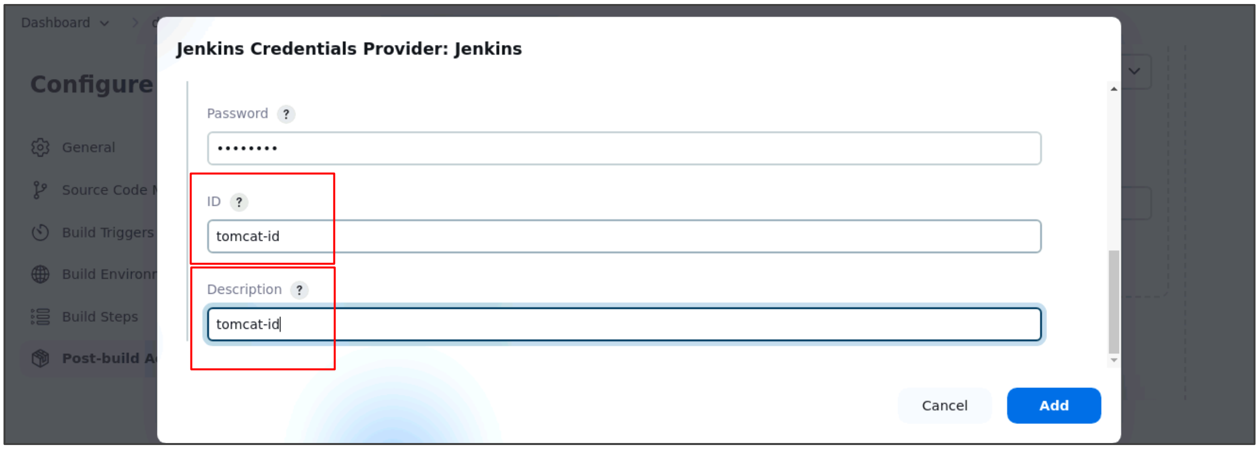
Username: tomcat

Password: password

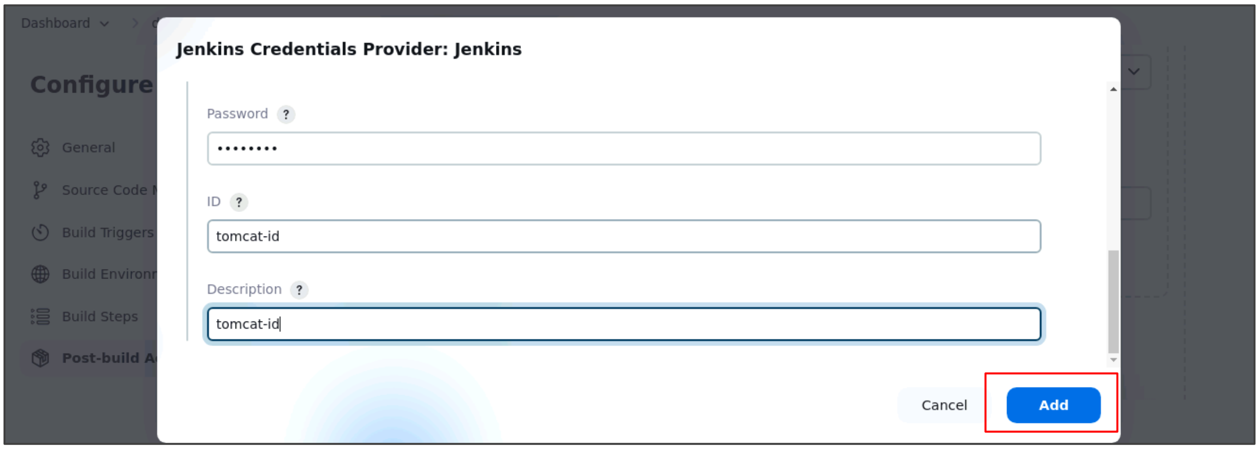
ID: tomcat-id

Description: tomcat-id


Jenkins Credentials Provider: Jenkins
Scope
Global (Jenkins, nodes, items, all child items, etc)
Username
tomcat
□ Treat username as secret
Password
••••••••
Cancel
Add



3.16 Click on **Add** to save the credentials



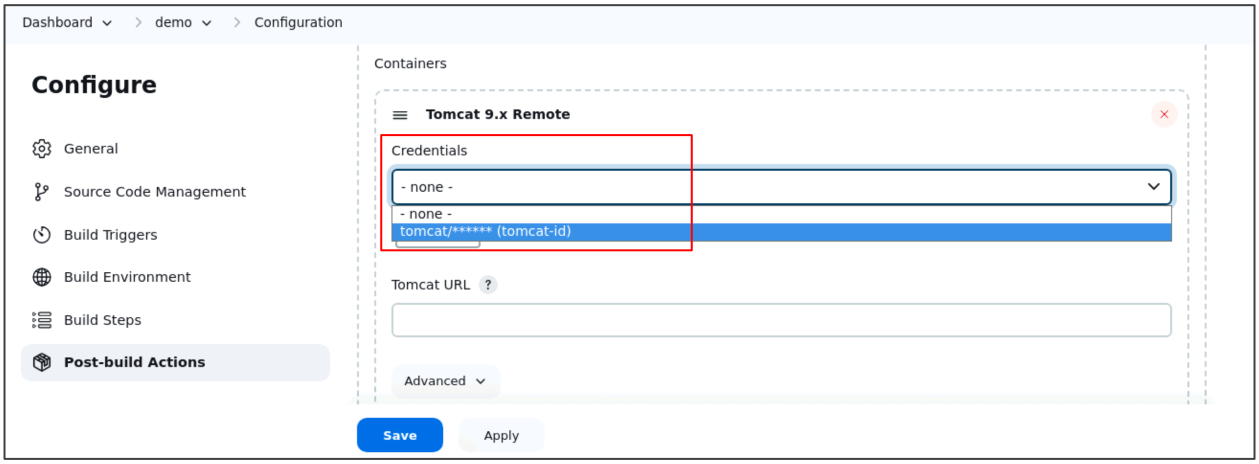
Jenkins Credentials Provider: Jenkins

Password: ••••••••

ID: tomcat-id

Description: tomcat-id

3.17 In the **Credentials** dropdown menu, select the added credentials



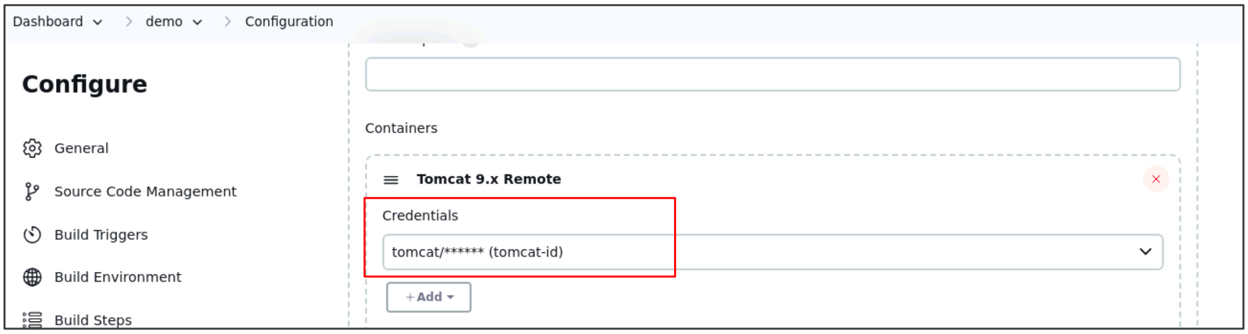
Containers

Tomcat 9.x Remote

Credentials: - none -

- none -
- tomcat/****** (tomcat-id)

Tomcat URL:

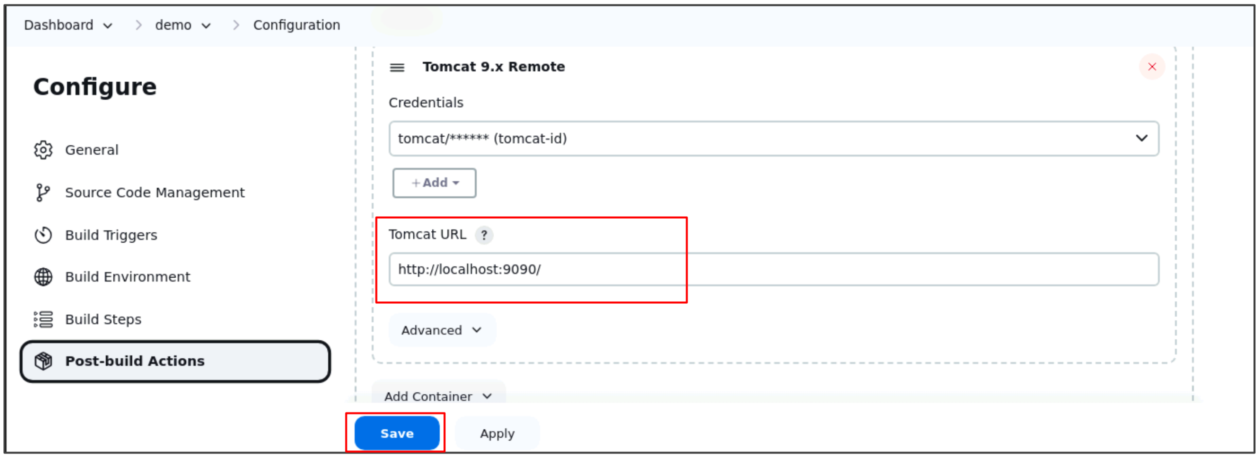


Containers

Tomcat 9.x Remote

Credentials: tomcat/****** (tomcat-id)

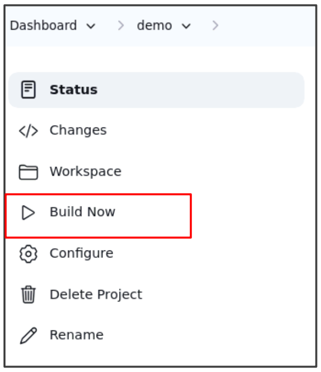
3.18 Enter the following **Tomcat URL** and **Save** the job:
http://localhost:9090/

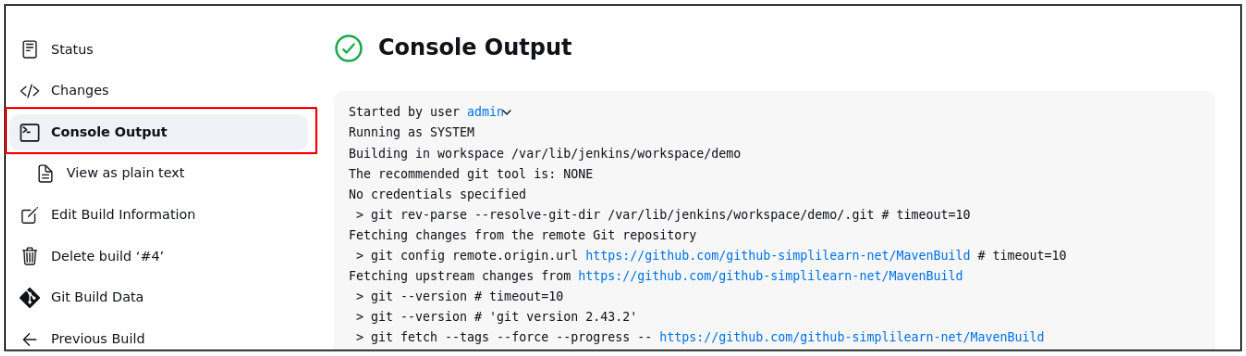


Credentials: tomcat/****** (tomcat-id)

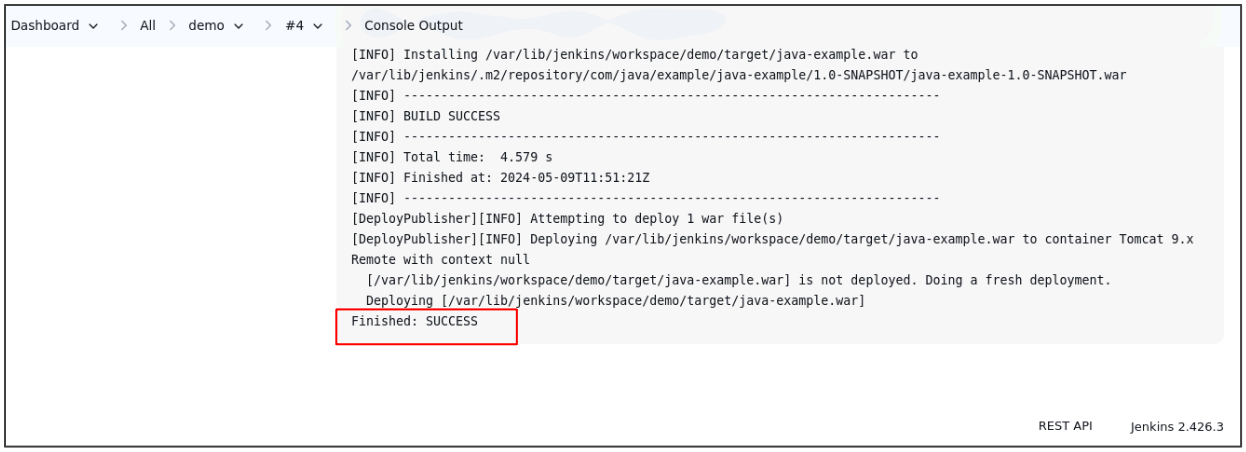
Tomcat URL: http://localhost:9090/

3.19 Click on **Build Now** and then select **Console Output** to check the output



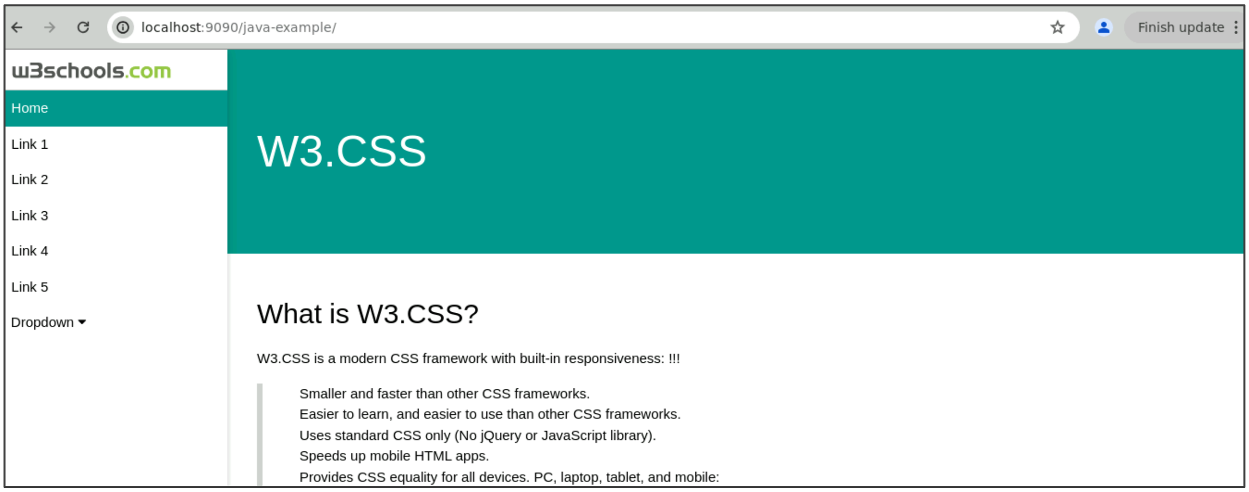


```
Started by user admin
Running as SYSTEM
Building in workspace /var/lib/jenkins/workspace/demo
The recommended git tool is: NONE
No credentials specified
 > git rev-parse --resolve-git-dir /var/lib/jenkins/workspace/demo/.git # timeout=10
Fetching changes from the remote Git repository
 > git config remote.origin.url https://github.com/github-simplilearn-net/MavenBuild # timeout=10
Fetching upstream changes from https://github.com/github-simplilearn-net/MavenBuild
 > git --version # timeout=10
 > git --version # 'git version 2.43.2'
 > git fetch --tags --force --progress -- https://github.com/github-simplilearn-net/MavenBuild
```



```
[INFO] Installing /var/lib/jenkins/workspace/demo/target/java-example.war to
/var/lib/jenkins/.m2/repository/com/java/example/java-example/1.0-SNAPSHOT/java-example-1.0-SNAPSHOT.war
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time:  4.579 s
[INFO] Finished at: 2024-05-09T11:51:21Z
[INFO] ------------------------------------------------------------------------
[DeployPublisher][INFO] Attempting to deploy 1 war file(s)
[DeployPublisher][INFO] Deploying /var/lib/jenkins/workspace/demo/target/java-example.war to container Tomcat 9.x
Remote with context null
  [/var/lib/jenkins/workspace/demo/target/java-example.war] is not deployed. Doing a fresh deployment.
  Deploying [/var/lib/jenkins/workspace/demo/target/java-example.war]
Finished: SUCCESS
```

3.20 Access the deployed application in your web browser with the following URL: **http://localhost:9090/java-example/**



W3.CSS

What is W3.CSS?

W3.CSS is a modern CSS framework with built-in responsiveness: !!!

> Smaller and faster than other CSS frameworks.
> Easier to learn, and easier to use than other CSS frameworks.
> Uses standard CSS only (No jQuery or JavaScript library).
> Speeds up mobile HTML apps.
> Provides CSS equality for all devices. PC, laptop, tablet, and mobile:

By following these steps, you have successfully configured a CI/CD pipeline in Jenkins for deploying a Java application to Apache Tomcat.