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Building a CI/CD Pipeline with Jenkins.

DESCRIPTION

Use Jenkins to set up a CI/CD pipeline that will compile and test a Maven project and deploy it to a Tomcat Server.

Background of the problem statement:

You're a DevOps engineer at Pied Piper, a software company that provides web and mobile app development services. Your team is tasked with building a web app for an online book shop named Bookzy. The developers have decided to use Springboot to generate the project, Maven for compilation, and Git as the Source Code Management system for the project. You're required to set up a Jenkins pipeline that involves three different freestyle jobs for code compilation, testing, and deployment respectively. Your Pipeline has to poll the SCM nightly for commits, build the project, and trigger the test job if the build is stable. The test job has to run unit tests, publish the JUnit test report, and trigger the freestyle job for deployment. The deployment job is required to package the Maven project, deploy the war file to a Tomcat server, and notify you via email if deployment failed.

You must use the following:

- **Java:** To create the website
- **Git:** As a version control system for the program
- **Jenkins:** To create the build pipeline
- **Spring boot:** To create the Maven app
- **Maven:** To compile the program
- **Tomcat:** To host the website
- **AWS EC2:** To run Tomcat
- **JUnit:** To run tests and publish results

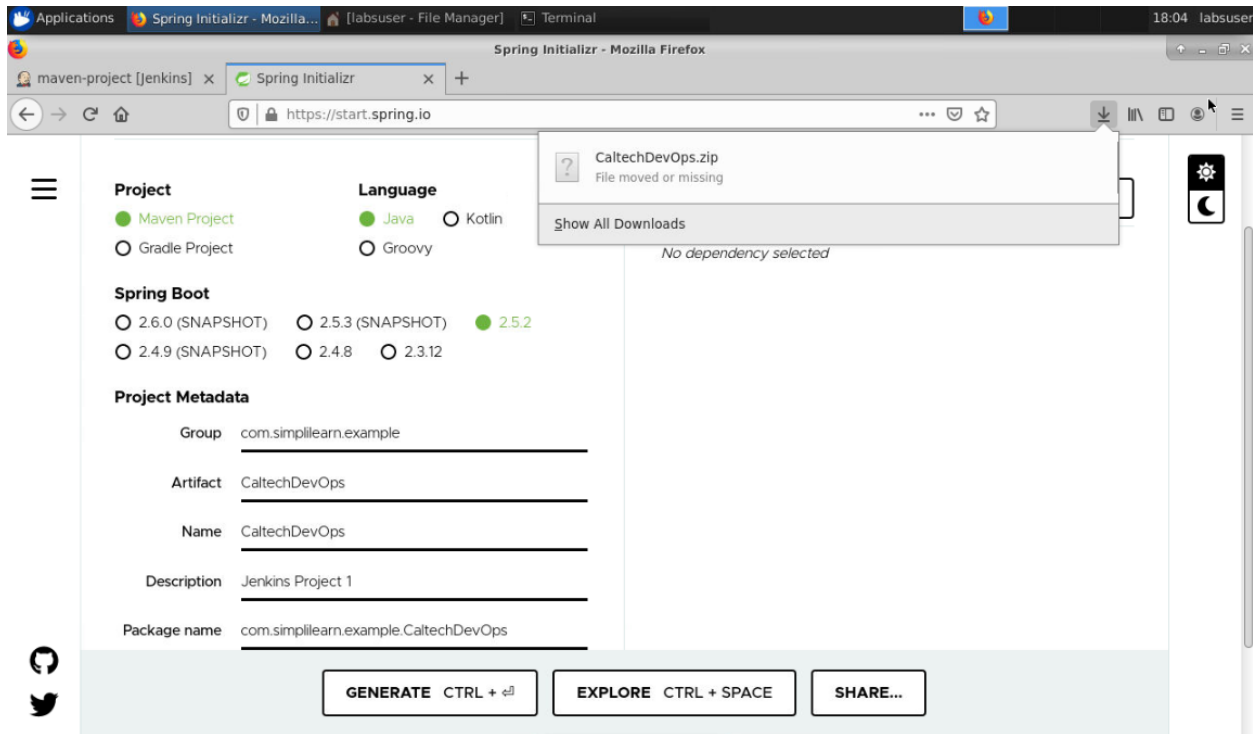
The following requirements should be met:

- The app should be built with Maven.
- The Tomcat server should allow remote deployment.
- The pipeline should consist of three freestyle jobs for compilation, test, and deployment respectively.

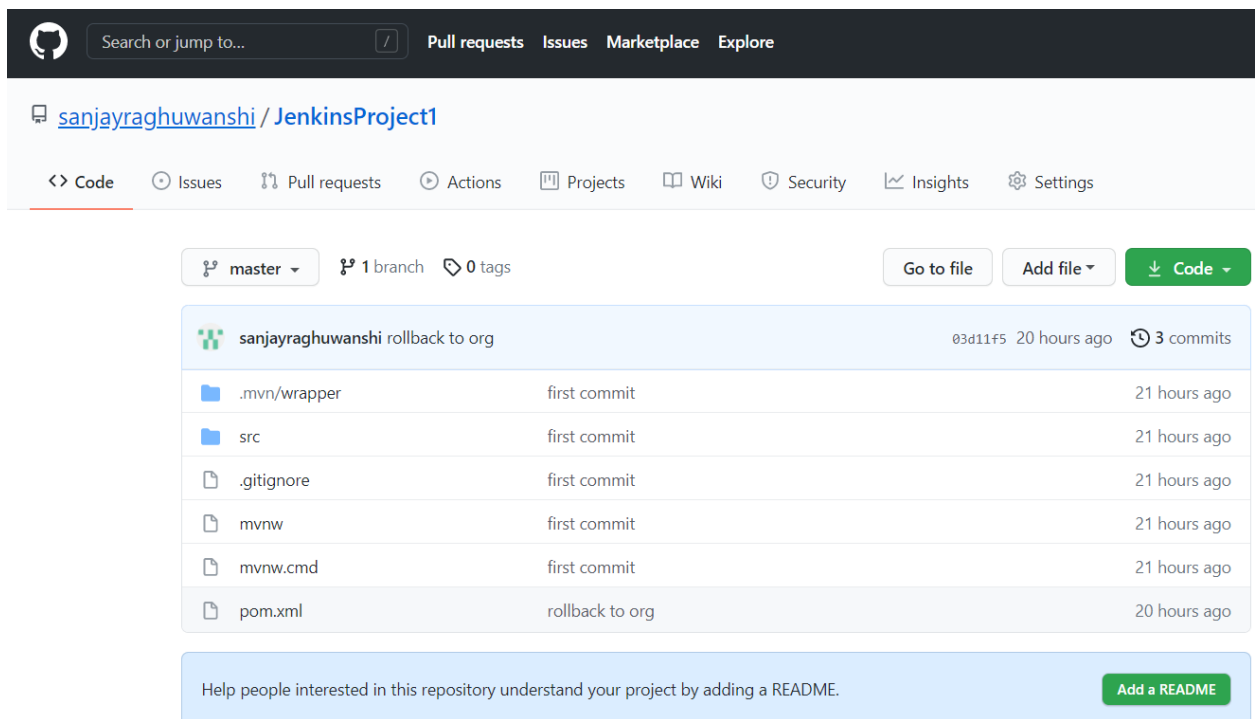
Prerequisite:

To create the Maven project, go to start.spring.io/ and select Maven as the project type. Enter Group and Artifact values and click on Generate.

1. Build the maven project using <https://start.spring.io> –



2. Setup GitHub repository for the project –



3. Login to Jenkins –



Welcome to Jenkins!

Sign in

☐ Keep me signed in

4. Setting up Global Tool Configuration for Git, Java and Maven –

Global Tool Configuration

Use default maven settings

Default global settings provider

Use default maven global settings

JDK

JDK installations

Add JDK

JDK

Name

myjava

JAVA_HOME

/usr/lib/jvm/java-11-openjdk-amd64/

☐ Install automatically

Add JDK

List of JDK installations on this system

Git

Git installations

Git

Name

git

Path to Git executable [?](#)

/usr/bin/git

Maven

Maven installations

Add Maven

Maven

Name

mymaven

MAVEN_HOME

/usr/share/maven

☐ Install automatically

5. Setting up email notification in manage-configure system –

The screenshot shows a web browser window with the URL `localhost:8081/configure`. The page is titled "Dashboard > configuration". The "E-mail Notification" section is active, showing the following configuration:

- Content Token Reference: [empty field]
- SMTP server: `smtp.gmail.com`
- Default user e-mail suffix: [empty field]
- ☒ Use SMTP Authentication
 - User Name: `DevOpsDemo2021@gmail.com`
 - Password: [Concealed] [Change Password](#)
- ☒ Use SSL
- ☐ Use TLS
- SMTP Port: `465`

Buttons: [Save](#) [Apply](#)

6. Created an EC2 AWS instance for tomcat installation –

Instances (1) Info									
<input type="text" value="Filter instances"/>									
<input type="checkbox"/>	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS	Public IPv4 ...
<input type="checkbox"/>	tomcat	i-0b6d3ef51579c5979	Running	t2.micro	2/2 checks passed	No alarms	us-east-1d	ec2-54-166-164-213.co...	54.166.164.213

7. Setting user/permissions in tomcat-users.xml for auto deployment –

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

8. Configuring poll SCM for every 5 minute –

The screenshot shows the Jenkins configuration page for 'maven-project' with the 'Build Triggers' tab selected. Under 'Post-build Actions', the 'Poll SCM' checkbox is checked. The 'Schedule' field contains the cron expression 'H/5 * * * *'. A message at the bottom indicates the last run was on Tuesday, June 29, 2021 at 6:03:30 PM and the next run is at 6:08:30 PM. 'Save' and 'Apply' buttons are at the bottom.

9. Post build action for email notification in case of build failure –

The screenshot shows the Jenkins configuration page for 'maven-project' with the 'Build' tab selected. Under 'Post Steps', the radio button 'Run regardless of build result' is selected. Under 'Build Settings', the 'E-mail Notification' checkbox is checked, and the 'Recipients' field contains 'raghu1c.sanjay@gmail.com'. The 'Send e-mail for every unstable build' checkbox is also checked. 'Save' and 'Apply' buttons are at the bottom.

10. Post build action for deploy to container (auto deployment) –

maven-project

General Source Code Management Build Triggers Build Environment Pre Steps Build Post Steps Build Settings

Post-build Actions

Deploy war/ear to a container

WAR/EAR files ?

**/*.war

Context path ?

Containers

Tomcat 9.x Remote

Credentials

sanjay/***** Add

Tomcat URL ?

http://ec2-54-166-164-213.compute-1.amazonaws.com:8080

Advanced...

Add Container

Save Apply

11. Build success logs –

```
[INFO] Installing /home/labsuser/jenkins/workspace/maven-project/target/JenkinsProject1-0.0.1-SNAPSHOT.war to
/home/labsuser/.m2/repository/com/caltech/example/JenkinsProject1/0.0.1-SNAPSHOT/JenkinsProject1-0.0.1-SNAPSHOT.war
[INFO] Installing /home/labsuser/jenkins/workspace/maven-project/pom.xml to
/home/labsuser/.m2/repository/com/caltech/example/JenkinsProject1/0.0.1-SNAPSHOT/JenkinsProject1-0.0.1-SNAPSHOT.pom
```

```
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 23.611 s
[INFO] Finished at: 2021-06-30T13:31:53Z
[INFO] -----
```

Waiting for Jenkins to finish collecting data

```
[JENKINS] Archiving /home/labsuser/jenkins/workspace/maven-project/pom.xml to com.caltech.example/JenkinsProject1/0.0.1-
SNAPSHOT/JenkinsProject1-0.0.1-SNAPSHOT.pom
[JENKINS] Archiving /home/labsuser/jenkins/workspace/maven-project/target/JenkinsProject1-0.0.1-SNAPSHOT.war to
com.caltech.example/JenkinsProject1/0.0.1-SNAPSHOT/JenkinsProject1-0.0.1-SNAPSHOT.war
```

channel stopped

[DeployPublisher][INFO] Attempting to deploy 1 war file(s)

[DeployPublisher][INFO] Deploying /home/labsuser/jenkins/workspace/maven-project/target/JenkinsProject1-0.0.1-SNAPSHOT.war to container Tomcat 9.x Remote with context null

[/home/labsuser/jenkins/workspace/maven-project/target/JenkinsProject1-0.0.1-SNAPSHOT.war] is not deployed. Doing a fresh deployment.

Deploying [/home/labsuser/jenkins/workspace/maven-project/target/JenkinsProject1-0.0.1-SNAPSHOT.war]

Finished: SUCCESS

12. Auto deployment successful –

```
ubuntu@ip-172-31-94-31:~/apache-tomcat-9.0.48/bin$  
ubuntu@ip-172-31-94-31:~/apache-tomcat-9.0.48/bin$ ls -ltrh ../webapps/  
total 17M  
drwxr-x--- 3 ubuntu ubuntu 4.0K Jun 30 17:23 ROOT  
drwxr-x--- 15 ubuntu ubuntu 4.0K Jun 30 17:23 docs  
drwxr-x--- 7 ubuntu ubuntu 4.0K Jun 30 17:23 examples  
drwxr-x--- 6 ubuntu ubuntu 4.0K Jun 30 17:23 host-manager  
drwxr-x--- 6 ubuntu ubuntu 4.0K Jun 30 17:23 manager  
-rw-r----- 1 ubuntu ubuntu 17M Jun 30 17:41 JenkinsProject1-0.0.1-SNAPSHOT.war  
drwxr-x--- 5 ubuntu ubuntu 4.0K Jun 30 17:41 JenkinsProject1-0.0.1-SNAPSHOT  
ubuntu@ip-172-31-94-31:~/apache-tomcat-9.0.48/bin$  
ubuntu@ip-172-31-94-31:~/apache-tomcat-9.0.48/bin$  
ubuntu@ip-172-31-94-31:~/apache-tomcat-9.0.48/bin$
```

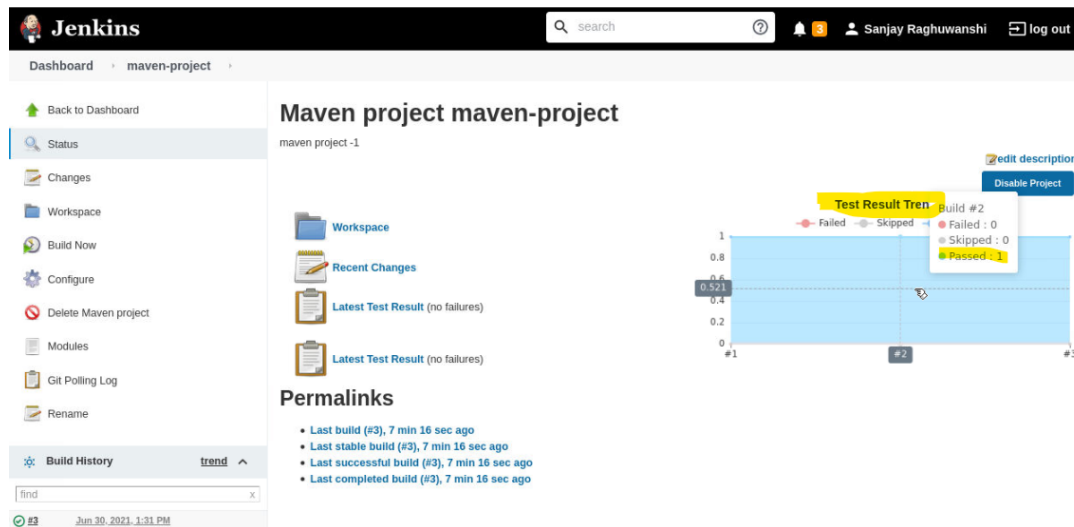
13. War file deployed in tomcat –

The screenshot shows the Tomcat Web Application Manager interface in a web browser. The browser address bar shows the URL: `ec2-54-166-164-213.compute-1.amazonaws.com:8080/manager/html`. The page title is "Tomcat Web Application Manager". Below the title, there is a "Message:" field. The main content area is divided into two sections: "Manager" and "Applications". The "Manager" section has links for "List Applications", "HTML Manager Help", and "Manager Help". The "Applications" section is a table with columns: Path, Version, Display Name, Running, Sessions, and Commands. The table lists several applications, including "JenkinsProject1-0.0.1-SNAPSHOT", "docs", "examples", "host-manager", and "manager". The "JenkinsProject1-0.0.1-SNAPSHOT" application is highlighted in green, indicating it is running. The "Commands" column for each application contains links for "Start", "Stop", "Reload", "Undeploy", "Expire sessions", and "with idle x 30 minutes".

Path	Version	Display Name	Running	Sessions	Commands
/	None specified	Welcome to Tomcat	true	0	Start Stop Reload Undeploy Expire sessions with idle x 30 minutes
JenkinsProject1-0.0.1-SNAPSHOT	None specified		true	0	Start Stop Reload Undeploy Expire sessions with idle x 30 minutes
/docs	None specified	Tomcat Documentation	true	0	Start Stop Reload Undeploy Expire sessions with idle x 30 minutes
/examples	None specified	Servlet and JSP Examples	true	0	Start Stop Reload Undeploy Expire sessions with idle x 30 minutes
/host-manager	None specified	Tomcat Host Manager Application	true	0	Start Stop Reload Undeploy Expire sessions with idle x 30 minutes
/manager	None specified	Tomcat Manager Application	true	2	Start Stop Reload Undeploy Expire sessions with idle x 30 minutes

Deploy
Deploy directory or WAR file located on server

14. Publishing test results –



15. Email Notifications for failed builds –

Build failed in Jenkins: maven-project #1 Inbox x



address not configured yet <devopsdemo2021@gmail.com>

to me

See <http://localhost:8080/job/maven-project/1/display/redirect>

Changes:

```
-----
Started by user Sanjay Raghuvanshi
Running as SYSTEM
Building in workspace <http://localhost:8080/job/maven-project/ws/>
The recommended git tool is: NONE
No credentials specified
Cloning the remote Git repository
Cloning repository https://github.com/sanjayraghuwanshi/JenkinsProject1.git
> /usr/bin/git init <http://localhost:8080/job/maven-project/ws/> # timeout=10
Fetching upstream changes from https://github.com/sanjayraghuwanshi/JenkinsProject1.git
> /usr/bin/git --version # timeout=10
> git --version # 'git version 2.25.1'
> /usr/bin/git fetch --tags --force --progress -- https://github.com/sanjayraghuwanshi/JenkinsProject1.git +refs/heads/*:refs/remotes/origin/* # timeout=10
> /usr/bin/git config remote.origin.url https://github.com/sanjayraghuwanshi/JenkinsProject1.git # timeout=10
> /usr/bin/git config --add remote.origin.fetch +refs/heads/*:refs/remotes/origin/* # timeout=10
Avoid second fetch
> /usr/bin/git rev-parse refs/remotes/origin/master^{commit} # timeout=10
Checking out Revision 43038a9da5406f79c32a9cef8033073f47711c39 (refs/remotes/origin/master)
> /usr/bin/git config core.sparsecheckout # timeout=10
> /usr/bin/git checkout -f 43038a9da5406f79c32a9cef8033073f47711c39 # timeout=10
Commit message: "first commit"
First time build. Skipping changelog.
ERROR: Maven Home /home/sraghuw/Desktop/apache-maven-3.8.1 doesnt exist
[DeployPublisher][INFO] Build failed, project not deployed
```