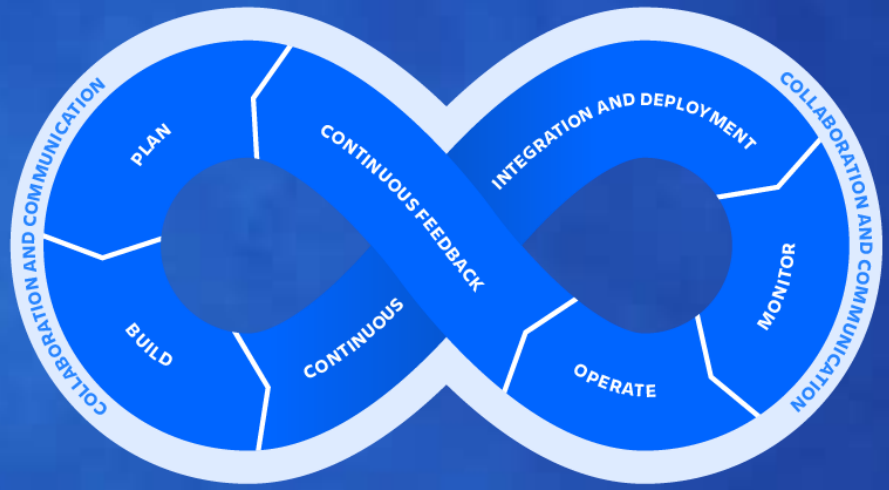


Session 8. Build Deployments

Ram N Sangwan

Agenda

- Understanding Deployment.
- Tomcat installation and configuration

Automate Deployments with Jenkins

- Jenkins automated deployments are one of the most popular software development techniques in use today.
- Any organization with a need to deploy applications quickly and efficiently can benefit from its core functionality.
- But with 1K+ plug-ins and counting available (including GitHub), there is a lot it can do.
- Building complex, automated development pipelines quickly requires knowledge of automation principles and the best practices for applying them to Jenkins use.

Continuous Deployment

- **Continuous Deployment** is the practice of automating the release of the changes integrated and tested during continuous delivery.

Why Do Continuous Deployment?

- **Faster Development**: For starters, automation increases the rate changes get implemented.
- In addition, the scope of each change is much smaller than when there is a long delay between releases. That minimizes the risk of mistakes.
- **Software Quality Increases**: By increasing the iteration of small changes to the codebase, problems get fixed faster.
- In addition, mistakes in development are smaller in scope, so they can be reverted or fixed faster.
- **Easier on Users**: With small frequent changes to an application, the UI remains as consistent as possible.
- Incremental improvement means the application's functionality appears to remain, even as it is continually revamped over the long-term.

Benefits of Continuous Deployment to Developer

- **Faster Development**: With less overhead and no manual interventions, features are out being used as soon as they are ready.
- With small incremental changes testing can be hyper-focused and performed very rapidly.
- **Quality Continues to Rise**: Bugs are identified faster, and the reduced volume of change means they are often easier to remediate or roll-back.

Benefits of Continuous Deployment to Business

- **Flexibility:** Developers making small incremental changes make it easier for an organization to change direction quickly without leaving lots of half-finished work.
- **Experimentation:** Small changes to the codebase can rapidly be A/B tested by users without a delay in data gathering to see what users prefer.
- **UI/UX:** Small rapid changes are often invisible to users, the product gradually gets better, creating a better user experience.
- **Innovation:** With experimentation, the business may be surprised by user-validated results that may lead to further changes or new opportunities in the market.

Stages of Continuous Deployment

Continuous Deployment using Jenkins

- Once you have code that you want to deploy, you need to check in the code to your version control system so that it becomes part of the codebase and the entire application can be built and tested.
- There are numerous options for version control, and most will work with Jenkins.
- Some examples that you may already be using are:
  - Git
  - GitHub
  - BitBucket
  - Mercurial

Do a Manual Build/Test/Deploy Process

- Run your current process first.
- No matter how you're currently deploying software you should run through the entire process through completion as a first step.
- The goal of this is to document everything about your process, so that when it's time to automate the deployments in Jenkins you have the information you'll need.
- Without this run you'll be guessing at information or may have to call in many different people to get the information you need.

How to Set Up Jenkins

1. Install Jenkins on a machine so that you and your team can use it first.
2. Install Plugins. Jenkins has more than 1000 plugins created by the Jenkins community so that you can customize Jenkins to do exactly what you need. The specific plugins you'll need to use will depend on your process. Some of the most popular ones are:
   - ***Dashboard View*** creates task dashboards for easy monitoring.
   - ***Folders Plugin*** organizes tasks in folders for ease of use and organization.
   - ***Kubernetes Plugin*** a must if you're using Kubernetes for your infrastructure.
   - ***Secure Jenkins*** and invite other team members. Making sure that other team members are involved in creating your Continuous Deployment in Jenkins is a necessity to ensure no important process are missed, as well as to give others visibility into the process.

Create a JenkinsFile - Pipeline

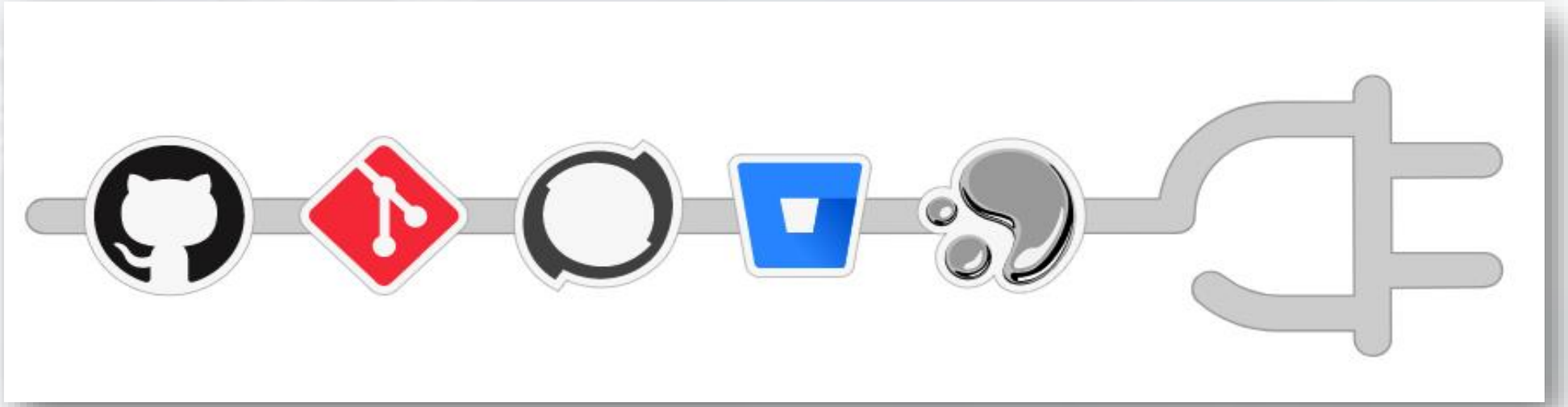
- Once a build happens in Jenkins that build artifact will move through a pipeline that will result in the deployment of the application, assuming the artifacts passes automated tests.
- These pipelines are created using JenkinsFiles.
- It’s a best practice to use a JenkinsFile to create your pipelines so that these files can be stored as code in source control.

JenkinsFile - Pipeline

- JenkinsFiles are broken into Stages (Build, Test, Staging, etc.), and the specific stages you create will be based on the manual process that you documented.
- Each Stage in your JenkinsFile will create environments to allocate resources to use during that stage's operations.
- Secrets and credentials (user names/passwords) can be used in a JenkinsFile in a stage or environment.
- Multiple agents can be used within a stage and environment to allow access across multiple platforms.
- Each Stage will end with a true/false check to ensure that the stage was run and returned the expected results.
- Parallel executions can be created in a JenkinsFile at a stage or environment so that multiple testing setups can be run at the same time and reduce testing time needed.
- A fail at any of the parallel executions would fail the entire stage and deployment.

Connect Jenkins to Your Version Control System

- To create a build in Jenkins, you need to hook it up to your version control system.
- Once Jenkins has access to your version control, it can use that access to create builds, either on a regular basis or when triggered by a code check-in.
- All major version control systems have Jenkins plug-ins.



Install and Configure Tomcat

- Installing Tomcat on CentOS 7 requires one simple command:

  # yum install tomcat tomcat-admin-webapps tomcat-docs-webapp

  This will install Tomcat and its dependencies, including Java and additional packages, which many users will find useful such as:

  - The Tomcat Web Admin Manager (tomcat-admin-webapps)
  - The official online Tomcat documentation (tomcat-docs-webapp)

- Start Tomcat and enable Tomcat to automatically start if the server is rebooted:

  # systemctl start tomcat && systemctl enable tomcat

Change Tomcat Port

- Change Tomcat Port so that it does not conflict with Jenkins. Say, 8081

  # vi /etc/tomcat/server.xml

```
    <!-- A "Connector" represents an endpoint by which requests are received
         and responses are returned. Documentation at :
         Java HTTP Connector: /docs/config/http.html (blocking & non-blocking)
         Java AJP  Connector: /docs/config/ajp.html
         APR (HTTP/AJP) Connector: /docs/apr.html
         Define a non-SSL HTTP/1.1 Connector on port 8080
    -->
    <Connector port="8081" protocol="HTTP/1.1"
               connectionTimeout="20000"
               redirectPort="8443" />
    <!-- A "Connector" using the shared thread pool-->
    <!--
    <Connector executor="tomcatThreadPool"
               port="8081" protocol="HTTP/1.1"
               connectionTimeout="20000"
               redirectPort="8443" />
    -->
```

Add User to Tomcat for Jenkins

- In order to use Tomcat's web management interface, you will need to create a user.
- Open the tomcat-users.xml file with the command and scroll down to below the line, which reads <tomcat-users>, and add the information for your user account.

 # vi /usr/share/tomcat/conf/tomcat-users.xml

<tomcat-users>

<user username="tomcatmanager" password="En4EW25eI0" roles="manager-gui"/>

<user username="deployer" password="En4EW25eI0" roles="manager-script"/>

- Save and exit the file.

```
-->
<tomcat-users>
<user username="tomcatmanager" password="En4EW25eI0" roles="manager-gui"/>
<user username="deployer" password="En4EW25eI0" roles="manager-script"/>

<!--
  NOTE:  By default, no user is included in the "manager-gui" role required
  to operate the "/manager/html" web application.  If you wish to use this app,
  you must define such a user - the username and password are arbitrary. It is
  strongly recommended that you do NOT use one of the users in the commented out
```

Purpose of the Users

- We are creating two usernames named ***tomcatmanager*** and ***deployer***.
- The ***deployer*** account would be used to deploy the WAR file over http.
- The ***manager-gui*** based ***tomcatmanager*** user would be used to manage the manager web application at http://10.10.0.100:8081/manager
- Open ports in Firewall

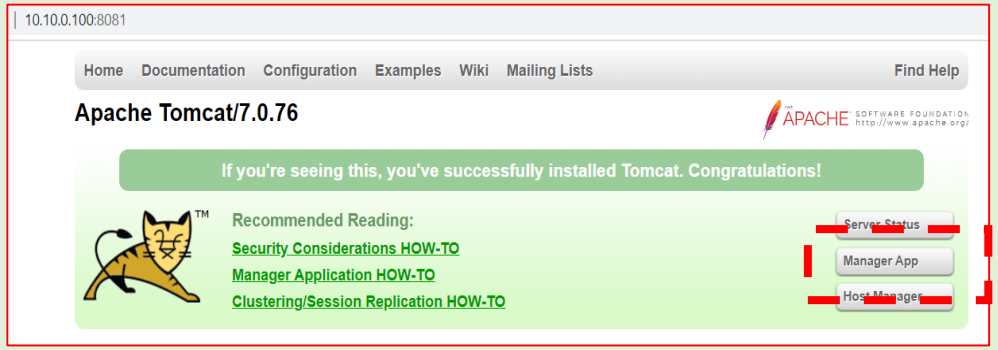
  # firewall-cmd --zone=public --permanent --add-port=8081/tcp

  # firewall-cmd --reload
- Restart the Tomcat service for the changes to take effect:

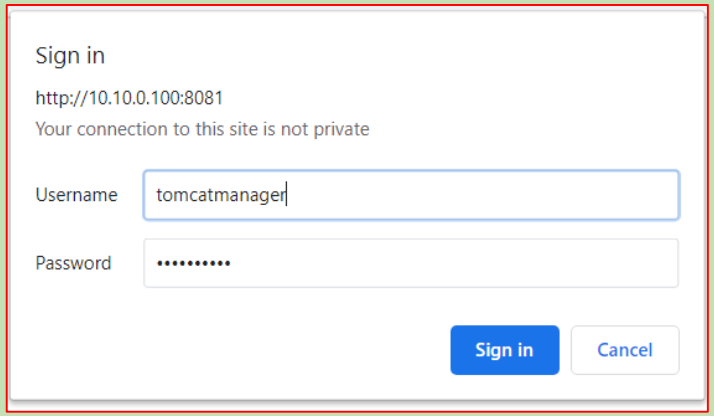
  # systemctl restart tomcat

Verify Tomcat Working

- In a browser, visit the URL http://10.10.0.100:8081 to see the Tomcat welcome page.



- Click the Manager App link. It will ask you Credentials. Enter User ID and Password as created in previous step.

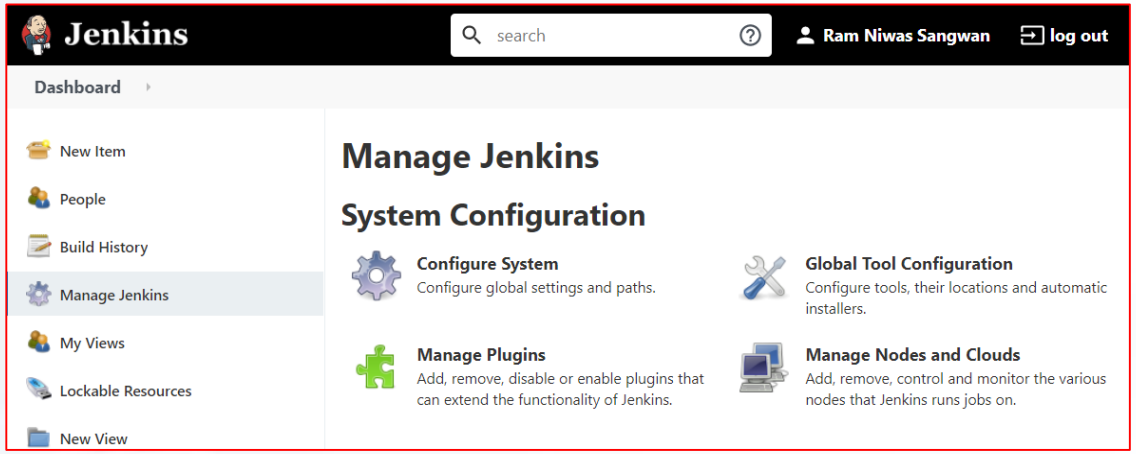


Configure Jenkins

- Now we are ready with the Tomcat Servlet Container aka Application server and it is ready to be connected from Jenkins.
- Log in to Jenkins as admin user.
- Go to ***Manage Jenkins*** -> ***Global Tool Configuration*** Section of Jenkins.
- Git is already installed by default.
- Maven is Manually installed in Lab 2. Check MAVEN_HOME with

  # echo $MAVEN_HOME

```
File  Edit  View  Search  Terminal  Help
[root@server ~]# echo $MAVEN_HOME
/opt/apache-maven
[root@server ~]#
```

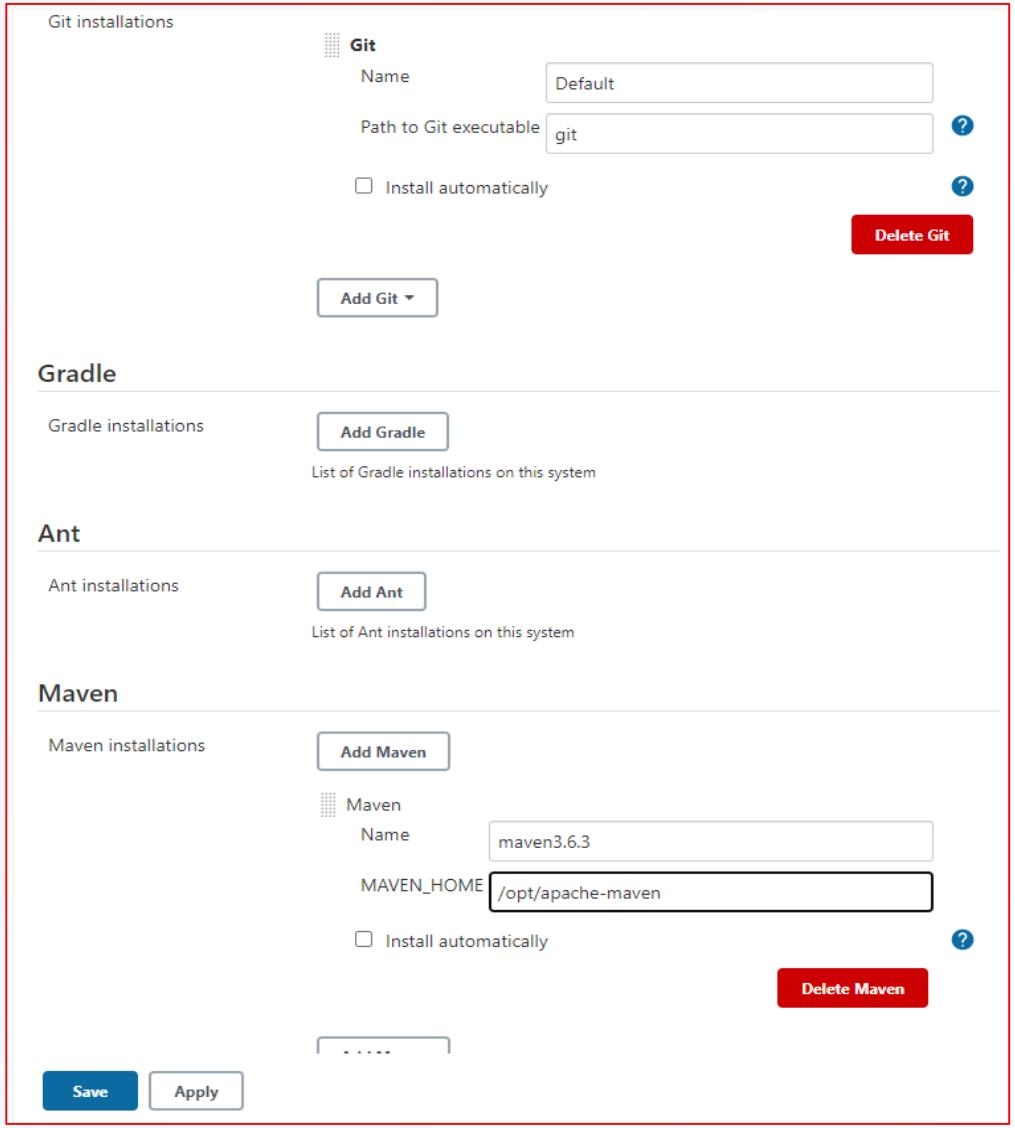


Fill Apache Maven Details

- Change the permissions on apache-maven directory so that it is accessible by jenkins

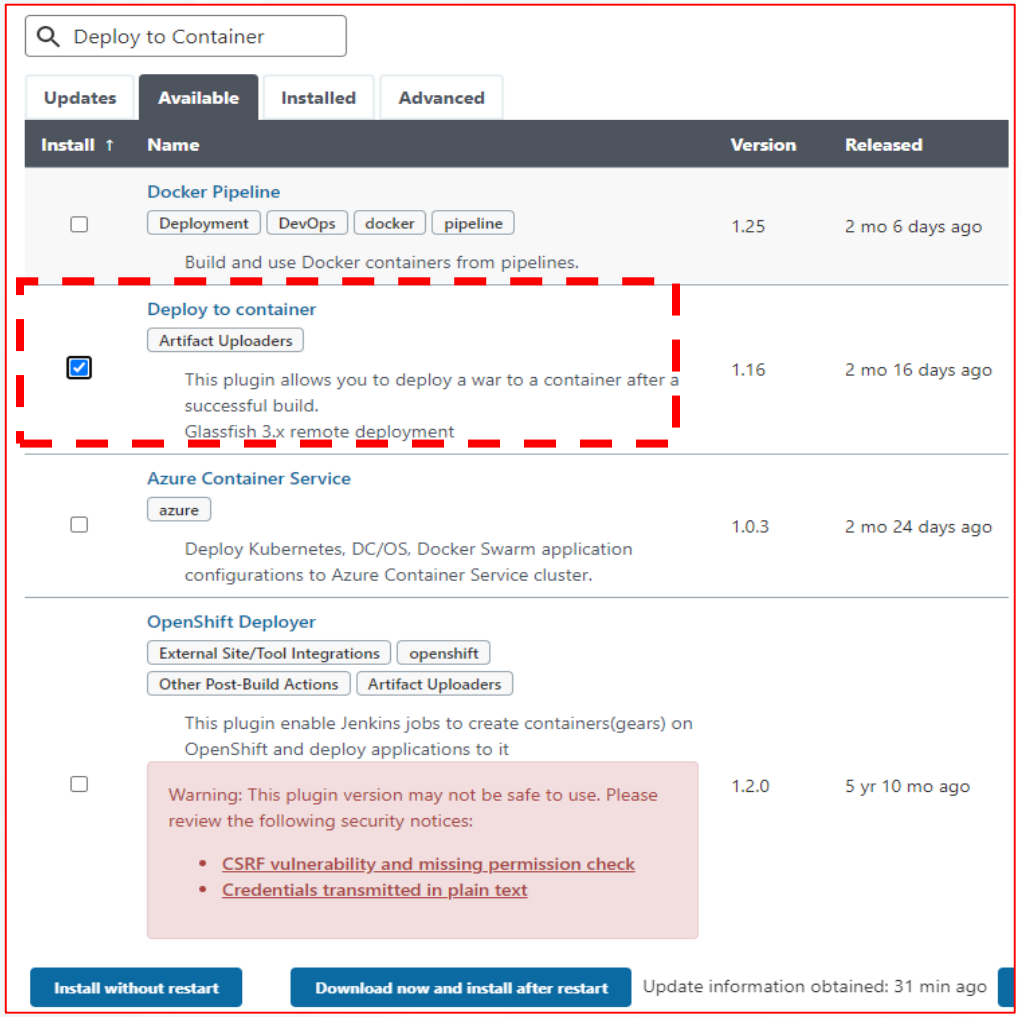
  # chmod 777 /opt/apache-maven/

- Use the same as shown in the Screen and Click Apply and Save.



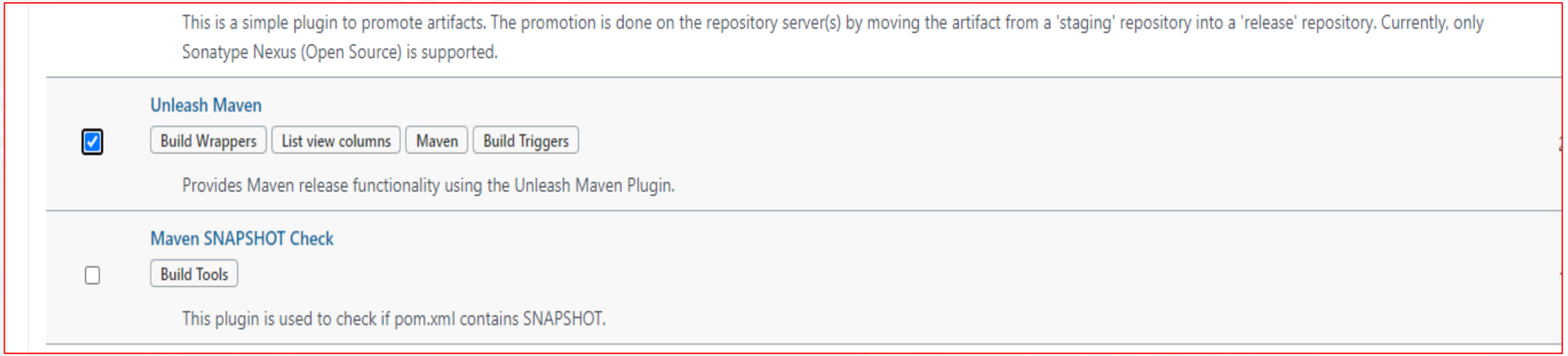
Deploy to Container Plugin

- Now **Install Deploy to Container Plugin**.
- Go to ***Manage Jenkins -> Manage Plugins -> Available -> Deploy to Container Plugin***



Unleash Maven for Maven Jobs

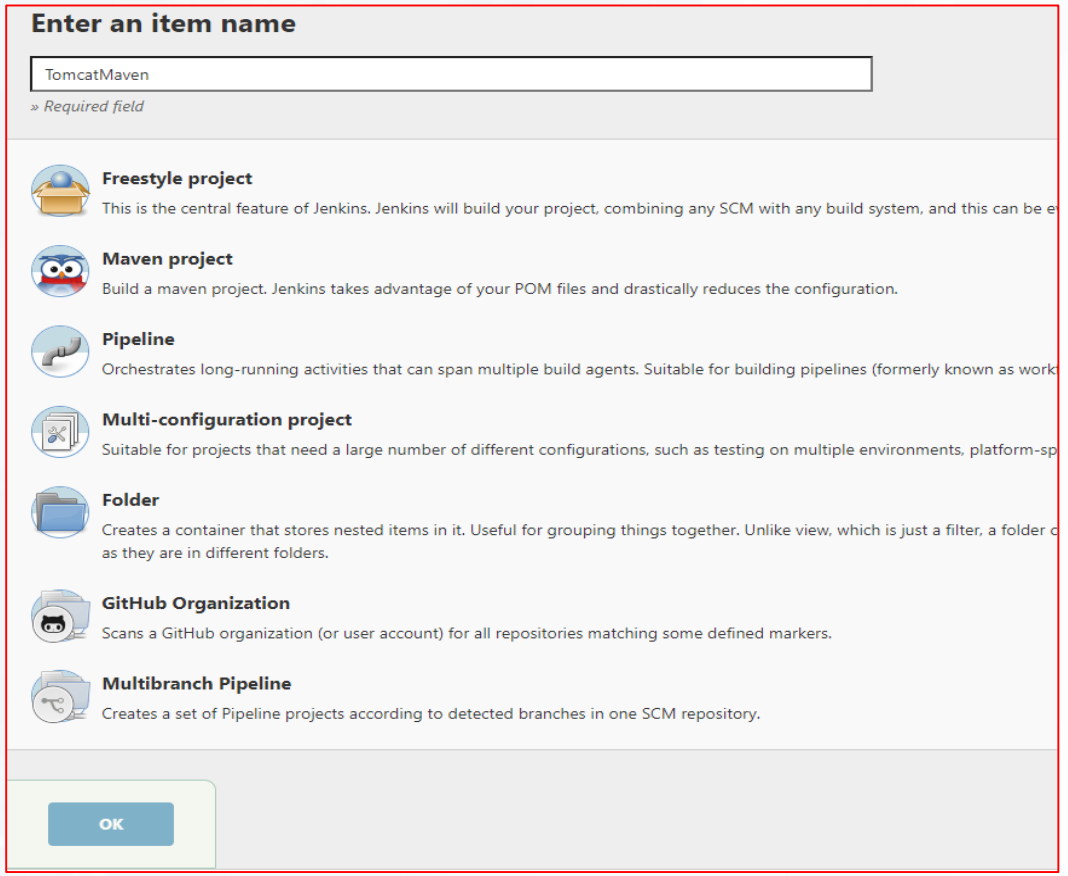
- Similarly, search for "Maven plugin" and you will get search result as "Unleash Maven Plugin", enable the check-box, click on "Download now and install after restart“
- This will help us to select a Maven Job as our Choice.



Create & Configure a Maven Job with Github

- From Menu on left select New Item -> Maven Project

- Enter Name of your Project “TomcatMaven” and Click OK



Fill in your GitHub Repo Details

- In the Configuration Section, Under Source Code Management Fill your Github Repository URL.
- For testing, use one of our Sample Application Named Tomcat Maven App from our Github public Repository.
- You can use this GITHUB Repository
- For private repositories, click on Add button displayed near the Credentials drop-down and enter the username and password of your SCM Repo and once it is saved, it would be available on the Dropdown for you to select.

Source Code Management

- None
- Git

Repositories

Repository URL: https://github.com/Sangwan70/tomcatmaven.git

Credentials: - none - | Add

Advanced...

Add Repository

Branches to build

Branch Specifier (blank for 'any'): */main

Add Branch

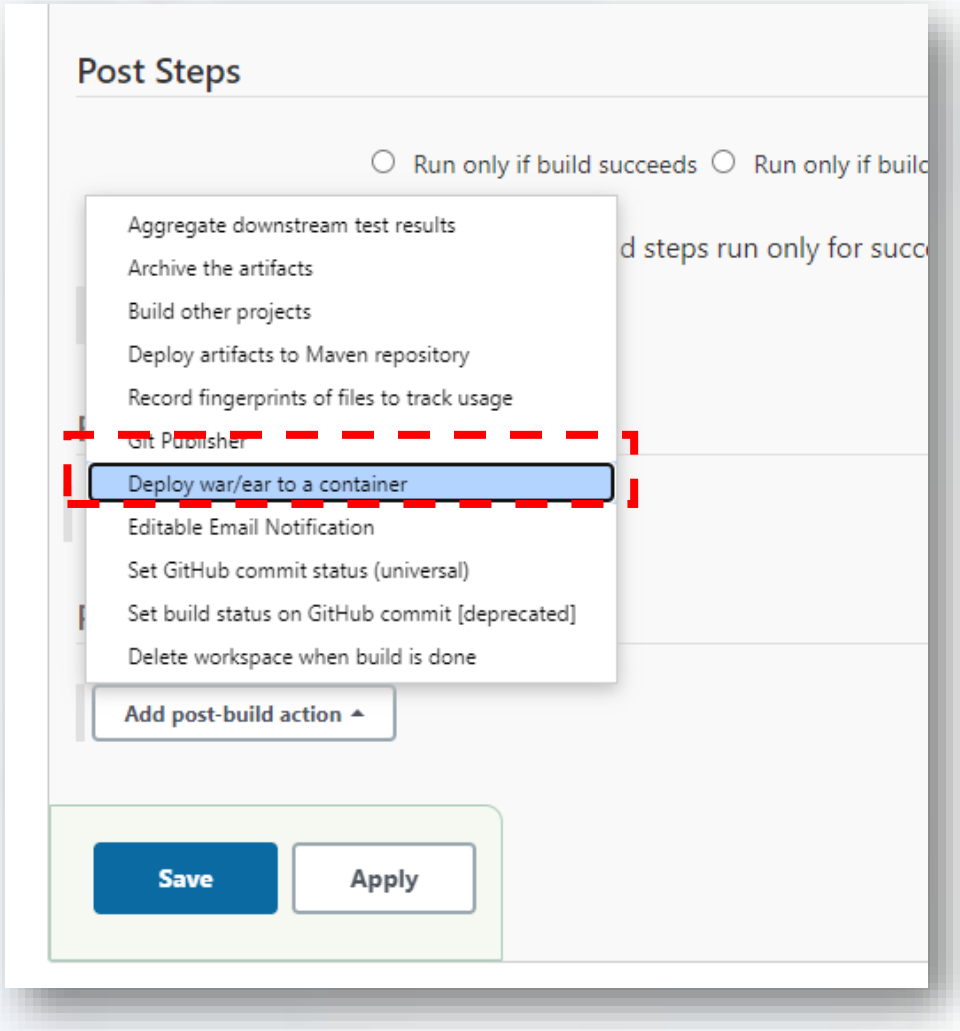
Repository browser: (Auto)

Additional Behaviours

Save | Apply

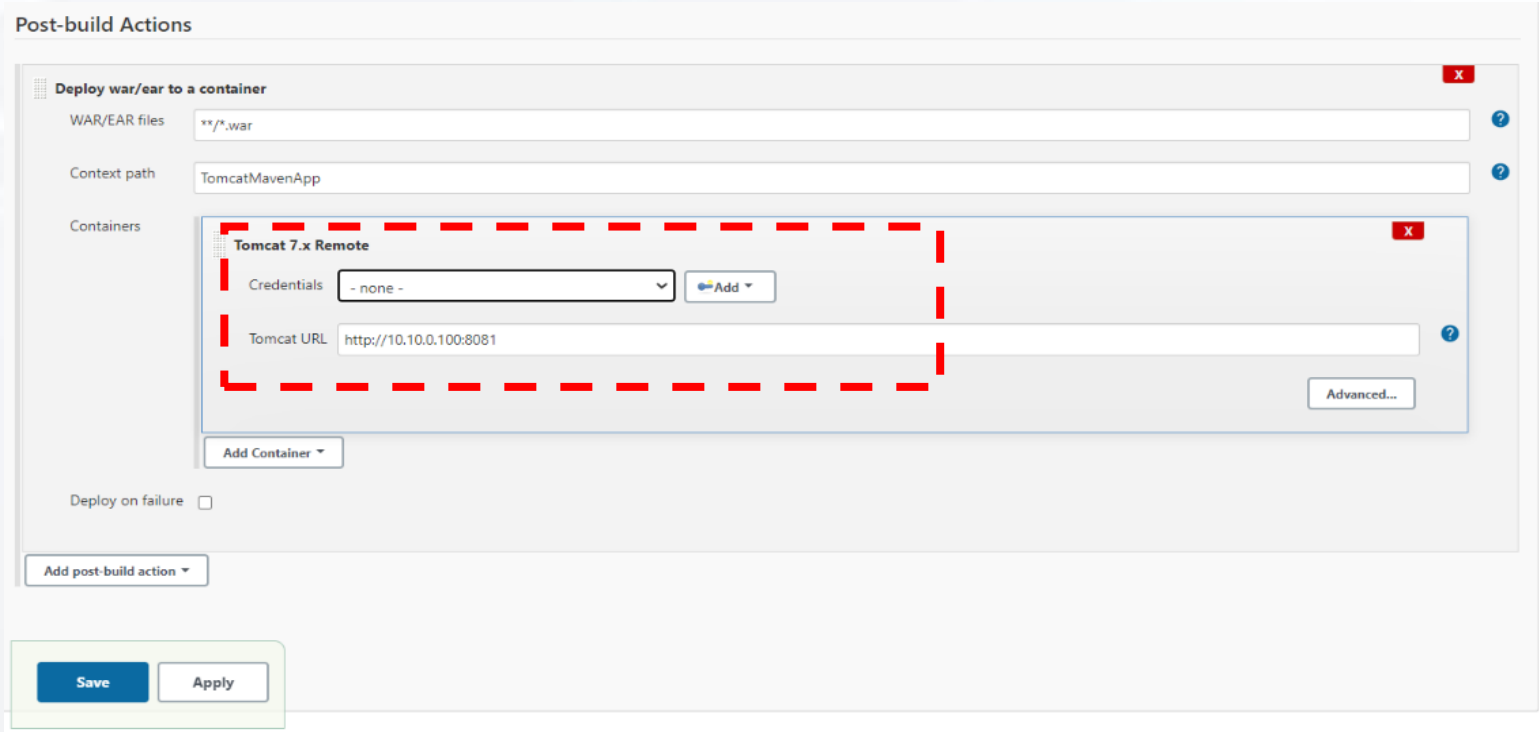
Post-build Action

- **Configure the Post-build Action and Specify the Tomcat Server Details**
  - Drag to the bottom and Go to the Post-build Actions section
  - Click on Add post-build action button
  - On the available options click on the Deploy war/ear to container



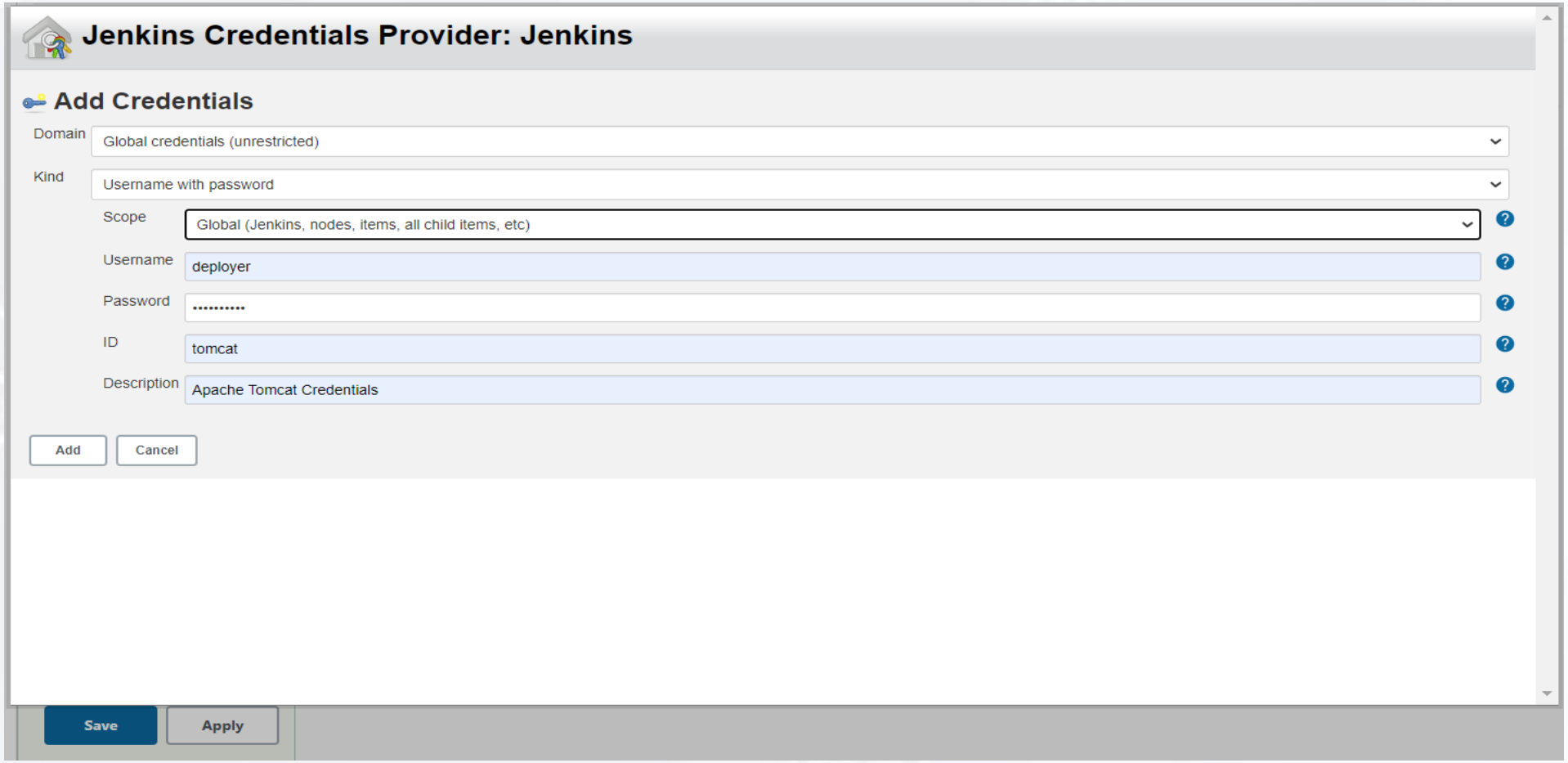
Fill the Details for WAR Deploy

- Fill the required parameters for the plugin. After entering these details, click on Add Icon in the screen shot to add tomcat Credentials.
  - WAR/EAR files: **/*.war
  - Context Path: TomcatMavenApp
  - Tomcat URL: http://10.10.0.100:8081



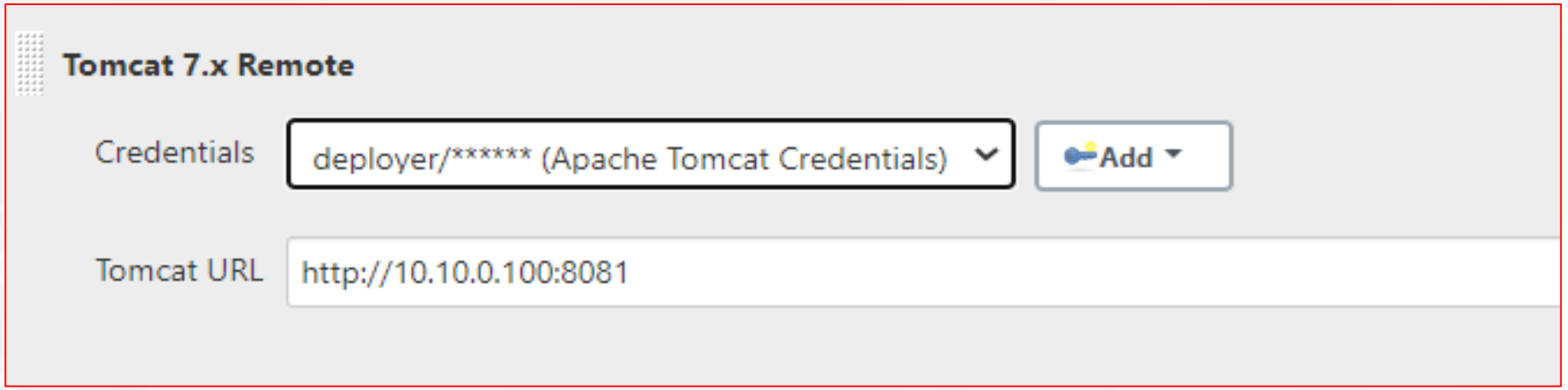
Add Tomcat Credentials for Jenkins

- Enter the details as given in the screen shot.



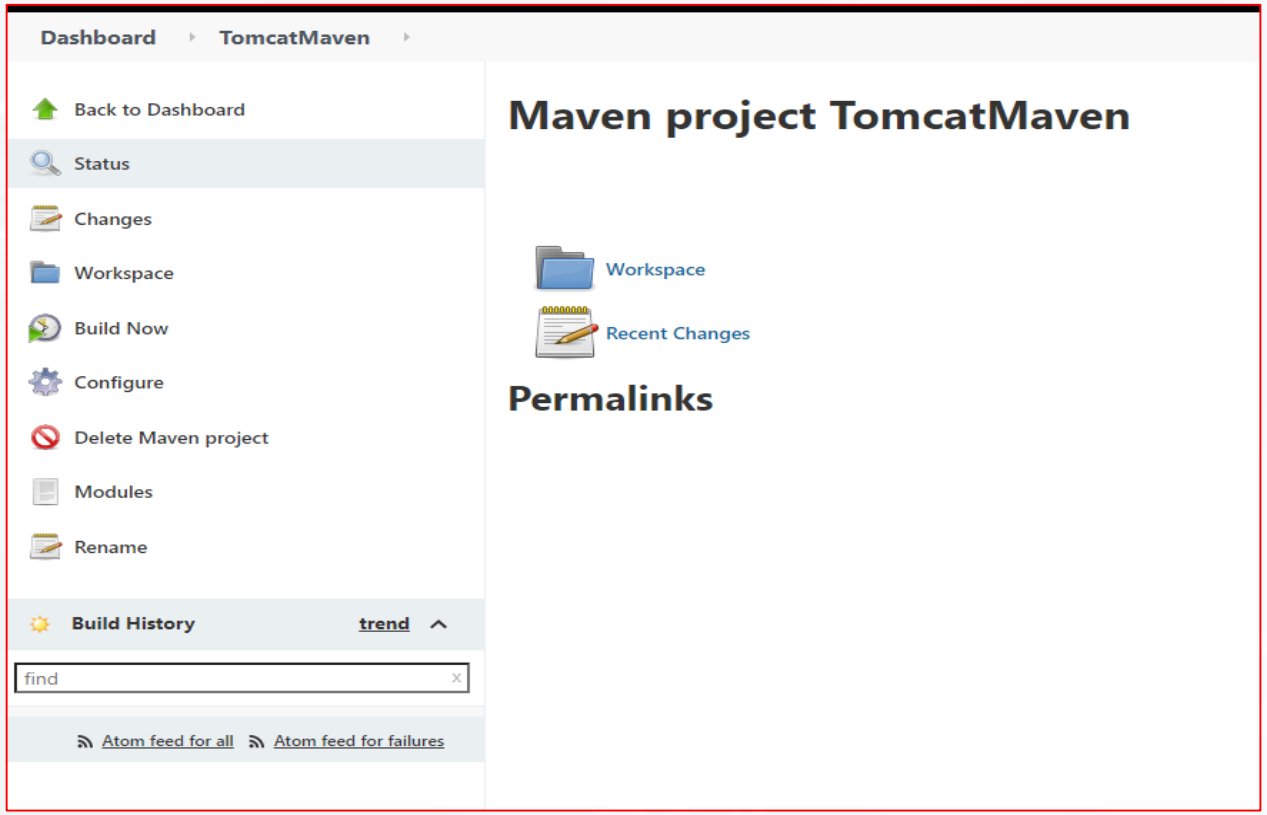
Use the Credentials Added

- Click on Add Button and select the credentials as given below.



Build the Job

- Finally Click Apply and Save.
- Execute the Job you have created by clicking on the **Build Now** button



Verify the Output in Console

- Click on Console Output after the Successful build.
- At the last line you can see that the WAR file has been generated and deployed on the remote server. in our case, http://10.10.0.100:8081/

```
[INFO] ------------------------------------------------------------------------
[INFO] Total time:  4.905 s
[INFO] Finished at: 2021-01-18T12:10:37-05:00
[INFO] ------------------------------------------------------------------------
Waiting for Jenkins to finish collecting data
[JENKINS] Archiving /var/lib/jenkins/workspace/TomcatMaven/pom.xml to com.sarav/TomcatMavenApp/2.0/TomcatMavenApp-2.0.pom
[JENKINS] Archiving /var/lib/jenkins/workspace/TomcatMaven/target/TomcatMavenApp-2.0.war to com.sarav/TomcatMavenApp/2.0/TomcatMavenApp-2.0.war
channel stopped
[DeployPublisher][INFO] Attempting to deploy 1 war file(s)
[DeployPublisher][INFO] Deploying /var/lib/jenkins/workspace/TomcatMaven/target/TomcatMavenApp-2.0.war to container Tomcat 7.x Remote with context TomcatMavenApp
  [/var/lib/jenkins/workspace/TomcatMaven/target/TomcatMavenApp-2.0.war] is not deployed. Doing a fresh deployment.
  Deploying [/var/lib/jenkins/workspace/TomcatMaven/target/TomcatMavenApp-2.0.war]
Finished: SUCCESS
```

Test the Application

- As the deployment is completed and the Jenkins Job ran Successfully without issues, let us test our application. In our case, the URL should be

  http://10.10.0.100:8081/TomcatMavenApp

Thank You