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# JENKINS DOCUMENTATION

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Mithun Technologies, +91 99809 23226, devopstrainingblr@gmail.com

A large, semi-transparent watermark of the Mithun Technologies logo. It features a stylized blue 'M' shape with a central flower-like symbol, and the company name 'Mithun Technologies' written vertically along the right side of the 'M'. The entire watermark is a light blue color.

Mithun  
Technologies

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## Jenkins

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- Continuous Delivery (CD)
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In Linux Server

### Create the a CICD flow for Java Web App using Freestyle Project type

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- Integrate the Urban Code Deploy server with Jenkins
- Deploy the App into IBM Cloud
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### Introduction

Jenkins, is an open source Continuous Integration, cross-platform tool written in Java. Kohsuke Kawaguchi is Creator of the Jenkins CI server in 2004. Initially, it was called Hudson, but in 2011 it was renamed to Jenkins because of disputes with Oracle.

The tool simplifies the process of integration of changes in to the project and delivery of fresh builds to users.

**Continuous Integration:** Continuous Integration (CI) is the process of automating the build and testing of code every time a team member commits changes to version control.

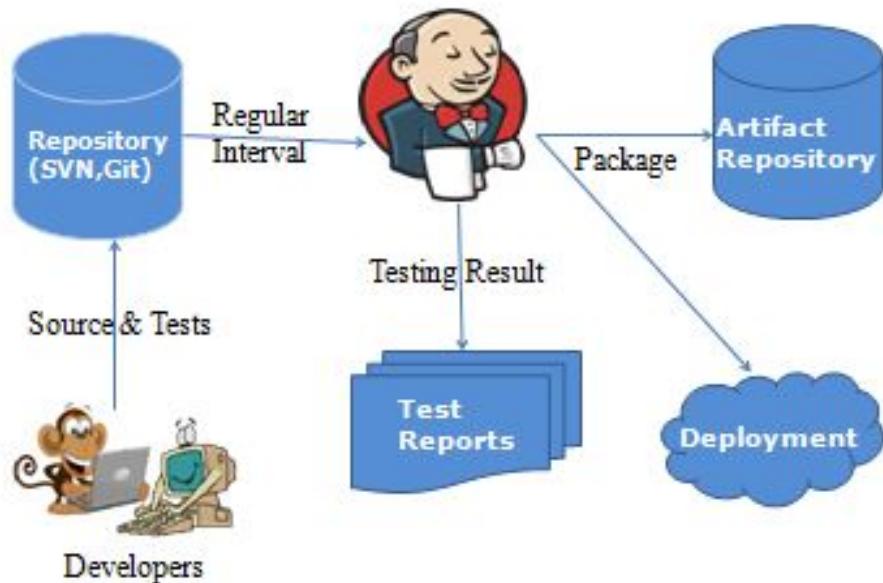
(OR)

Continuous Integration is a development practice where developers integrate their code into a shared remote repository frequently, preferably several times a day. Each integration is verified by an automated build (including test) to detect integration errors as quickly as possible.

### CI Flow

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Below diagram CI flow with Jenkins as Build tool.



#### CI – Benefits

- Immediate bug detection
- No integration step in the Software Development lifecycle
- A deployable system at any given point
- Record of evolution of the project

**Continuous Delivery:** Any and every successful build that has passed all the relevant automated tests and quality gates can potentially be deployed in to production via fully automated one click process.

**Continuous Deployment:** The practicing of automatically deploying every successful build directly into production without any manual steps knows as Continuous deployment.

**(OR)**

It is closely related to Continuous Integration and refers to keeping your application deployable at any point or even automatically releasing to a test or production environment if the latest version passes all automated tests.

# CONTINUOUS DELIVERY



# CONTINUOUS DEPLOYMENT



## What Jenkins can do?

- Integrate with many different Version Control Systems (GitHub, CVS, SVN, TFS ...)
- Generate test reports (JUnit)
- Push the builds to various artifact repositories
- Deploys directly to production or test environments
- Notify stakeholders of build status (Through Email)

## Benefits of Jenkins

- ✓ It's an open source tool with great community support.
- ✓ Easy to install and It has a simple configuration through a web-based GUI, which speeds up the Job
- ✓ It has around 1500+ plugins to ease your work. If a plugin does not exist, just code it up and share with the community (<https://plugins.jenkins.io/>).
- ✓ Its built with Java and hence, it is portable on all major platforms.
- ✓ Good documentation and enriched support articles/information available on internet which will help beginners to start easy.
- ✓ Specifically, for a test only project, it is used to schedule jobs for regression testing without manual intervention and hence monitor infrastructural and functional health of a application. It can be used like a scheduler for integration testing and also can be used to validate new deployments/environments on a single click on a Build now button.

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The diagram below depicts that Jenkins is integrating various DevOps stages:

TBD (ToBeDocument)

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### List of popular Continuous Integration tools

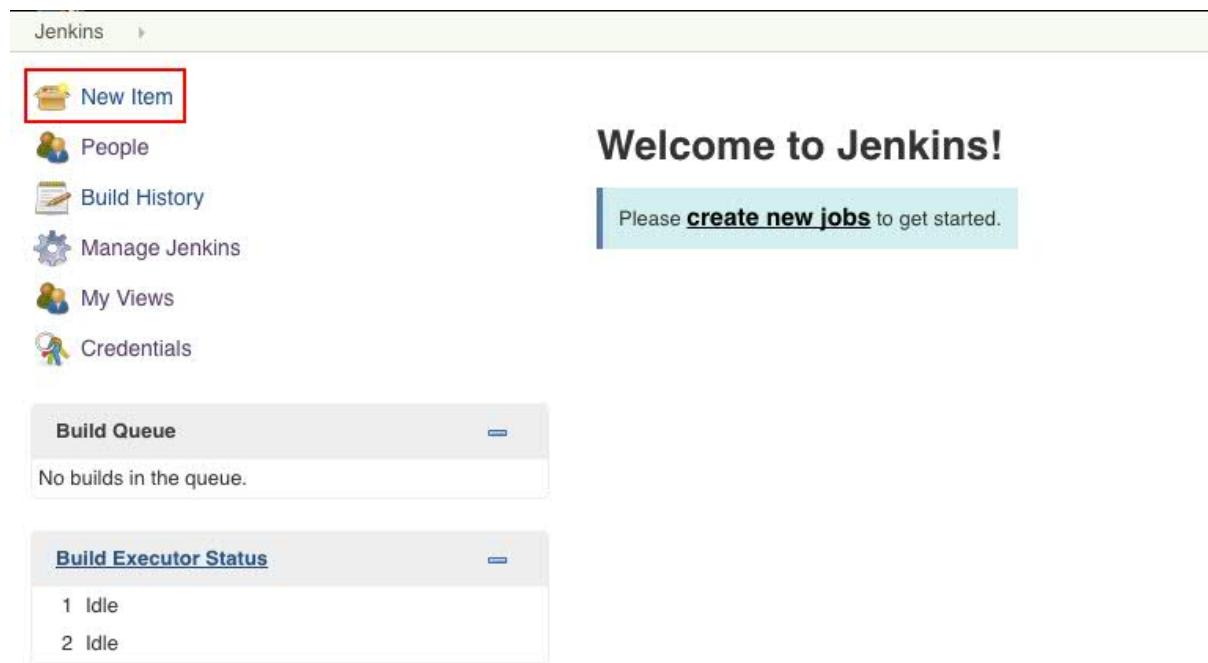
<u>SNo</u>	<u>Product</u>	<u>Is Open Source?</u>
1	Jenkins	Yes
2	Cloudbees Jenkins	No
2	Bamboo	No
3	Cruise Control	Yes
4	Travis CI	Yes and Paid also
5	Circle CI	Yes and Paid also
6	GitLab CI	Yes and Paid
7	TeamCity	Yes and Paid

### Jenkins Installation

- Jenkins is java based CI tool, so we need to install jdk/jre before installing.
  - **Pre-Requisite Software:** Java (Check weather java is installed or not with java -version command)
- 

### Create the project/job in Jenkins

**Step 1:** Login into the Jenkins, go to the Jenkins dashboard left side top corner, click on **New Item**.



The screenshot shows the Jenkins dashboard. On the left, there is a sidebar with links: New Item (highlighted with a red box), People, Build History, Manage Jenkins, My Views, and Credentials. The main area has a "Welcome to Jenkins!" message with a "create new jobs" button. Below it, there are two sections: "Build Queue" (empty) and "Build Executor Status" (showing 1 Idle and 2 Idle executors).

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**Step 2:** Enter the project name in **Enter an item name** input box and select the **Freestyle project** and click on **OK** Button.

**Enter an item name**

mithun-technologies

» 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.

**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.

**GitHub Organization**  
Scans a GitHub organization (or user account) for all repositories matching some defined markers.

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

**OK**

**Freestyle project:** This is the central feature of Jenkins. Jenkins will build your project combining any SCM and any build system.

A Free-Style project is a project that can incorporate almost any type of build. The Free-Style project is the more "generic" form of a project. You can execute shell/dos scripts, invoke ant, and a lot more. Majority of the plugins are written to use the free-style project.

**Maven project:** A maven project is a project that will analyze the pom.xml file in greater detail and produce a project that's geared towards the targets that are invoked. The maven project is smart enough to incorporate build targets like the javadoc or test targets and automatically setup the reports for those targets.

**Multi-configuration project:** The "multiconfiguration project" (also referred to as a "matrix project") lets you run the same build job in many different configurations. This powerful feature can be useful for testing an application in many different environments, with different databases, or even on different build machines. We will be looking at how to configure multiconfiguration build jobs later on in the book.

**Monitor an external job:** The "Monitor an external job" build job lets you keep an eye on non-interactive processes, such as cron jobs.

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**General**      Source Code Management      Build Triggers      Build Environment      Build      Post-build Actions

Description: This job is going to do a build and deploy web application which is using Maven as a build script. Mithun Technologies..

[Plain text] [Preview]

Discard old builds

Strategy: Log Rotation

Days to keep builds:

if not empty, build records are only kept up to this number of days

Max # of builds to keep:

if not empty, only up to this number of build records are kept

[Advanced...](#)

GitHub project

This build requires lockable resources

### Source Code Management

None

Git

**Repositories**

Repository URL:

Credentials: devopstrainingblr\*\*\*\*\* (GitHub Credentials) [Add](#)

[Advanced...](#)

[Add Repository](#)

**Branches to build**

Branch Specifier (blank for 'any'):

[Add Branch](#)

Specify when and how your build should be triggered. The following example polls the Git repository every 5 min. It triggers a build, if something has changed in the repo.

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The screenshot shows the Jenkins 'Build Triggers' configuration page. At the top, there are tabs: General, Source Code Management, Build Triggers (which is selected), Build Environment, Build, and Post-build Actions. Under 'Build Triggers', there is a section titled 'Build Triggers' with several options: Trigger builds remotely (e.g., from scripts), Build after other projects are built, Build periodically, GitHub hook trigger for GITScm polling, and Poll SCM. The 'Poll SCM' checkbox is checked and highlighted with a red box. Below this, there is a 'Schedule' field containing 'H/5 \* \* \* \*'. A note below the schedule says: 'Would last have run at Tuesday, 27 June, 2017 6:20:22 AM IST; would next run at Tuesday, 27 June, 2017 6:25:22 AM IST.' There is also an 'Ignore post-commit hooks' checkbox.

## Deploy the application into Tomcat

Install the “**Deploy to container**” plugin.

Open the job which you want to configure deploy, and click on Configure and in **Post-build actions** tab, click on **ADD POST-BUILD ACTION** and select the **Deploy war/ear to container** as follows.

The screenshot shows the Jenkins 'Post-build Actions' configuration page. At the top, there are tabs: General, Source Code Management, Build Triggers, Build Environment, Artifactory Configuration, Build, and Post-build Actions (which is selected). Under 'Post-build Actions', there is a list of actions: Aggregate downstream test results, Archive the artifacts, Build other projects, Publish JUnit test result report, Publish Javadoc, Push to Cloud Foundry, Record fingerprints of files to track usage, Git Publisher, Deploy war/ear to a container (which is selected and highlighted with a blue box), E-mail Notification, Editable Email Notification, Set GitHub commit status (universal), Set build status on GitHub commit [deprecated], Trigger the build of other projects based on the Ivy dependency management system, and Delete workspace when build is done. At the bottom, there are 'Save' and 'Apply' buttons.

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**Post-build Actions**

**Deploy war/ear to a container**

WAR/EAR files `**/*.war`

Context path `SampleAntProject`

Containers

Tomcat 8.x	Credentials <code>admin/*****</code>	Add
Tomcat URL	<code>http://mithuntechnologies.com:8083</code>	

Add Container

Deploy on failure

Add post-build action

**Save** **Apply**

### Error:

```

Caused by: org.codehaus.cargo.container.tomcat.internal.TomcatManagerException: The username you provided is
not allowed to use the text-based Tomcat Manager (error 403)
    at org.codehaus.cargo.container.tomcat.internal.TomcatManager.invoke(TomcatManager.java:704)
    at org.codehaus.cargo.container.tomcat.internal.TomcatManager.list(TomcatManager.java:876)
    at org.codehaus.cargo.container.tomcat.internal.TomcatManager.getStatus(TomcatManager.java:889)
    at
org.codehaus.cargo.container.tomcat.internal.AbstractTomcatManagerDeployer.redeploy(AbstractTomcatManagerDeplo
yer.java:173)
    ... 17 more
Caused by: java.io.IOException: Server returned HTTP response code: 403 for URL:
http://localhost:8085/manager/text/list
    at sun.net.www.protocol.http.HttpURLConnection.getInputStream0(HttpURLConnection.java:1894)
    at sun.net.www.protocol.http.HttpURLConnection.getInputStream(HttpURLConnection.java:1492)
    at org.codehaus.cargo.container.tomcat.internal.TomcatManager.invoke(TomcatManager.java:571)
    ... 20 more

```

**Solution:** Need to add rule in tomcat-users.xml file as follows.

```
<user username="admin" password="passw0rd" roles="admin-gui,manager-gui,manager-script">
```

### Enable email notification

Step 1) Install Email Extension Plugin as follows.

Manage Jenkins ---> Manage Plugins ---> Install “**Email Extension Plugin**”

Step 2) Add the smtp server host as follows.

Click on Manage Jenkins ---> Configure System --->

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SMTP server	<input type="text" value="smtp.gmail.com"/>
Default user E-mail suffix	<input type="text"/>
<input checked="" type="checkbox"/> Use SMTP Authentication	
User Name	<input type="text" value="devopstrainingblr@gmail.com"/>
Password	<input type="password" value="....."/>
Use SSL	<input checked="" type="checkbox"/>
SMTP port	<input type="text" value="465"/>
Charset	<input type="text" value="UTF-8"/>
Default Content	<pre>\$PROJECT_NAME - Build # \$BUILD_NUMBER - \$BUILD_STATUS:  Check console output at \$BUILD_URL to view the results.</pre>
Default Pre-send Script	<input type="text"/>
Default Post-send Script	<input type="text"/>
Additional groovy classpath	<input type="button" value="Add"/>
<input type="checkbox"/> Enable Debug Mode	
<input type="checkbox"/> Require Administrator for Template Testing	
<input type="checkbox"/> Enable watching for jobs	
Content Token Reference	<input type="button" value="Default Triggers..."/>

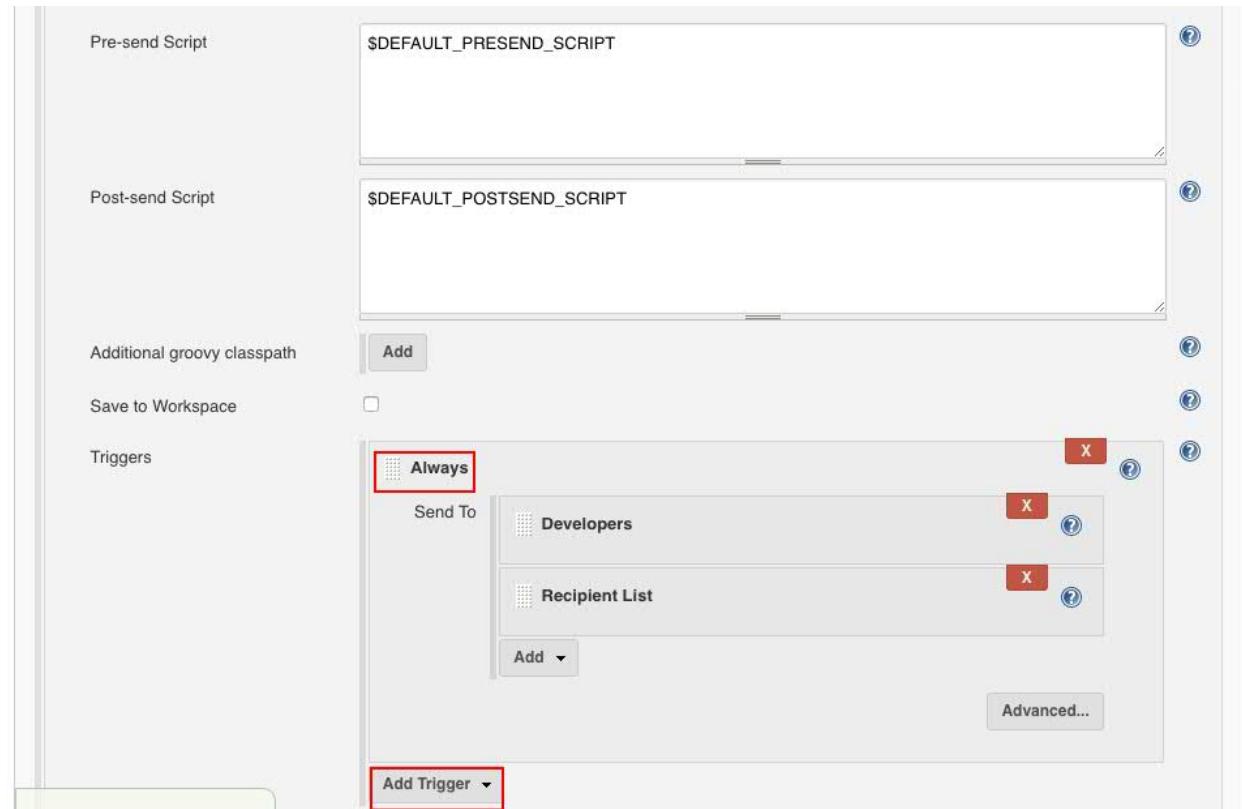
---

Step 3: In Job configure Editable Email as follows.

Select any Job, which we need to configure Email notification ---> Click on Configure ---> Select the **Post-build Actions** section.

Click on Advanced Settings ...  
It will expand and will show more settings and click on **Add Trigger** and select the **Always**.

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We can enable to attach the build logs while sending mail, as follows.



Output mail is like below.



Output mail is like below.

### How to enable the Poll SCM in Jenkins?

**Step 1:** Install the “Git plugin” in Jenkins.

**Step 2:** Select the job which you need to enable hook and click on Configure ---> In Build Triggers Section enable the Poll SCM  
And provide the values as follows.

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**Build Triggers**

Trigger builds remotely (e.g., from scripts)  
 Build after other projects are built  
 Build periodically  
 GitHub hook trigger for GITScm polling  
 Poll SCM

Schedule 0 \*/\*22 \* \* \*

⚠ Spread load evenly by using 'H \*/22 \* \* \*' rather than '0 \*/22 \* \* \*'  
 Would last have run at Thursday, 6 July, 2017 12:00:07 AM IST; would next run at Thursday, 6 July, 2017 10:00:07 PM IST.

Ignore post-commit hooks

### GitHub webhook

Login into GitHub and select the repository for which repo we need to enable.

- Open your repository on GitHub.
- Click ‘**Settings**’ on the navigation bar on the right-hand side of the screen.
- Click ‘**Webhooks**’ on the navigation bar on the left-hand side of the screen.
- Click ‘**Add webhook**’ to add the webhook.

Once you click on Add webhook url, it will ask the Payload URL, give the Jenkins url and Content type as follows.

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Webhooks / Manage webhook

We'll send a POST request to the URL below with details of any subscribed events. You can also specify which data format you'd like to receive (JSON, x-www-form-urlencoded, etc). More information can be found in [our developer documentation](#).

Payload URL \*

Content type

Secret

Which events would you like to trigger this webhook?

Just the push event.

Send me everything.

Let me select individual events.

Click on ‘Add webhook’.

Once you have configured successfully, you will see as follows.

## Webhooks

Add webhook

Webhooks allow external services to be notified when certain events happen. When the specified events happen, we'll send a POST request to each of the URLs you provide. Learn more in our [Webhooks Guide](#).

We will also send events from this repository to your [organization webhooks](#).

<input checked="" type="checkbox"/> <a href="http://13.233.230.247:8080/github-webhook/">http://13.233.230.247:8080/github-webhook/ (push)</a>	Edit	Delete
--	------	--------

**Configuring Jenkins Project :** We now have Jenkins configured to run builds automatically when code is pushed to central repositories. However, Jenkins doesn't run all builds for all projects. To specify which project builds need to run, we have to modify the project configuration.

- In Jenkins, go to the **project configuration** of the project for which you want to run an automated build.
- In the ‘Build Triggers’ section, select '**Github hook trigger for GITScm Polling**'.
- **Save your project.**

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### To restart Jenkins manually, you can use either of the following URLs:

(jenkins\_url)/safeRestart - Allows all running jobs to complete. New jobs will remain in the queue to run after the restart is complete.

Ex: <http://13.233.230.247:8080/safeRestart>

(jenkins\_url)/restart - Forces a restart without waiting for builds to complete.

Ex: <http://13.233.230.247:8080/restart>

(OR)

You can install one plug called **SafeRestart**, once installed it will give one option Jenkins dashboard as follows.




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### Disable Build:

A disabled Build will not be executed until you enable it again. This option often comes in handy to suspend a build during maintenance work or major refactoring.

Once the project is configured in Jenkins then all future builds are automated. It has basic reporting features like status and weather reports (job health).

Status of the build	Description
🔴	Failed
🟡	Unstable
🟢	Success
⚪	Pending
🟠	Disabled
🟠	Aborted

Figure a: Build status

Job health	Description
☀️	No recent builds failed
☁️	20-40% of recent builds failed
🌧️	40-60% of recent builds failed
⛈️	60-80% of recent builds failed
⚡	All recent builds failed
	Unknown status

Figure b: Weather reports

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### Jenkins Directory Structure

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**jenkins** : This is the default Jenkins home directory (may be .hudson in older installations) and it will be placed in user's home directory (C:\Users\MITHUN\_ADMIN\ ---> Windows & /Users/mithunreddy/ ---> MAC and /var/lib/jenkins → Linux).

Jenkins home directory contains the below sub directories and configuration files (.xml).

#### + jobs

- + [JOBNAME] : Sub directory for each job
  - + config.xml : Job configuration file
  - + latest : Symbolic link to the last successful build)
  - + builds
    - + [BUILD\_ID] : for each build one build id
      - + build.xml : build result summary
      - + log : log file
      - + changelog.xml (change log)

#### + logs ()

#### + nodes ()

+ plugins : This directory contains all the plugins that you have installed.

#### + secrets ()

+ updates : This is an internal directory used by Jenkins to store information about available plugin updates.

+ userContent : You can use this directory to place your own custom content onto your Jenkins server. You can access files in this directory at <http://localhost/jenkins/userContent> (if

you are running Jenkins on an application server) or

<http://localhost:8080/userContent> (if you are running in stand-alone mode).

#### + users

: If you are using the native Jenkins user database, user accounts will be stored in this directory.

#### + war

: This directory contains the expanded web application. When you start Jenkins as a stand-alone application, it will extract the web application into this directory.

+ config.xml (jenkins root configuration)

+ \*.xml (other site-wide configuration files)

+ fingerprints (stores fingerprint records)

+workspace: This directory contains all jobs source code.

<http://localhost:8080/configure>

**Home directory:** By default, Jenkins stores all of its data in this directory on the file system. Under the Advanced section, you can choose to store build workspaces and build records elsewhere.

There are a few ways to change the Jenkins home directory:

- Edit the JENKINS\_HOME variable in your Jenkins configuration file (e.g. /etc/sysconfig/jenkins on Red Hat Linux).
- Use your web container's admin tool to set the JENKINS\_HOME environment variable.

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- Set the environment variable **JENKINS\_HOME** before launching your web container, or before launching Jenkins directly from the WAR file.
- Set the **JENKINS\_HOME** Java system property when launching your web container, or when launching Jenkins directly from the WAR file.
- Modify **web.xml** in **jenkins.war** (or its expanded image in your web container). This is not recommended.

This value cannot be changed while Jenkins is running.  
It is shown here to help you ensure that your configuration is taking effect.

Ex: /Users/BhaskarReddy/.jenkins is for my Jenkins which is installed in my local MAC.

**Workspace Root Directory:** Specifies where Jenkins will store workspaces for builds that are executed on the master.

**Build Record Root Directory:** Specifies where Jenkins will store build records on the file system. This includes the console output and other metadata generated by a build.

**System Message:** This message will be displayed at the top of the Jenkins main page.

**# of executors:** It shows how many builds run at a time. E.g.: If give 2, here two builds are running.

#### Labels:

**Usage:** Controls how Jenkins schedules builds on this node.

#### Quiet period:

#### SCM checkout retry count:

#### Restrict project naming:

#### Naming Strategy

##### Strategy

Default ---> This is the default configuration and allows the user to choose any name they like.

Pattern ----> Define a pattern (regular expression) to check whether the job name is valid or not. Forcing the check on existing jobs, will allow you to enforce a naming convention on existing jobs - e.g. even if the user does not change the name, it will be validated with the given pattern at every submit and no updates can be made until the name confirms.

This option does not affect the execution of jobs with non-compliant names. It just controls the validation process when saving job configurations.

#### Global properties

Environment variables

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Tool Locations  
**SonarQube servers**

etc....

### **To Install any Jenkins Plugin, follow below steps**

Manage Jenkins ---> Manage Plugins ---> Select the Plugin name ---> Install Without Restart

### **Plugin Management**

- Safe Restart
- Next Build Number
- Email Extension
- SonarQube Scanner
- Maven Integration
- Schedule Build
- Artifactory Plugin
- Cloud Foundry
- Blue Ocean
- Deploy to container
- Maven Integration
- JACOC
- SSH Agent
- Publish Over SSH
- ThinBackup
- Build Name Setter
- Convert To Pipeline
- **JobConfigHistory:** This plugin saves a copy of the configuration file of a job (config.xml) for every change made and of the system configuration. You can also see what changes have been made by which user if you configured a security policy.
- Repository browser
- Role-based Authorization Strategy:
- Slack Notification Plugin:
- Cobertura Plugin: In UI we will see as Coverage Trend.
- Hudson global-build-stats plugin:
- Delivery Pipeline View:
- Enable project-based security

Install Plugin using Jenkins CLI.

```
java -jar jenkins-cli.jar -s http://52.66.245.44:8080/ -auth mithuntechnologies:passw0rd install-plugin
http://updates.jenkins-ci.org/download/plugins/audit-log/1.0/audit-log.hpi
```

### **Port number change for Jenkins**

By default, 8080 is the default port, change from 8080 something like 8082 as follow.

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In Ubuntu update the below file.

```
#vi /etc/default/jenkin
```

then restart the service with below command.

```
service jenkins restart
```

In RHEL/CentOS update the below file.

```
#vi /etc/sysconfig/jenkins
```

```
## Type: integer(0:65535)
## Default: 8080
## ServiceRestart: jenkins
#
# Port Jenkins is listening on.
# Set to -1 to disable
#
JENKINS_PORT="8080"
```

Once you change the port, restart the jenkins service by using below command.

```
#service jenkins restart
```

### Create the Maven project/job in Jenkins

#### Method 1:

Install the **Maven Integration Plugin** and follow the below steps.

Create the Job using Freestyle project and in the Build section click on Add build step and select the Invoke Top level Maven targets.



#### Method 2:

Install the **Maven Integration plugin** and follow the below steps.

Create the New Item as follows.

Provide the item name and select the Maven project and click on OK.

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## Enter an item name

» 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.



### Maven project

Build a maven project. Jenkins takes advantage of your POM files and drastically reduces the configuration.



### Pipeline

Orchestrates long-running activities that can span multiple build slaves. Suitable for building pipelines (formerly known as workflows) and/or organizing complex activities that do not easily fit in free-style job type.



### External Job

This type of job allows you to record the execution of a process run outside Jenkins, even on a remote machine. This is designed so that you can use Jenkins as a dashboard of your existing automation system.



### 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.

Trans a GitHub organization (or user account) for all repositories matching some defined markers.

Once you click on OK, you will come to jobs configuration page as follows.

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

Post-build Actions

Maven project name: Maven-Web-ProjectName

Description:

[Plain text] [Preview](#)

Discard old builds      [?](#)  
 GitHub project      [?](#)  
 This project is parameterized      [?](#)  
 Throttle builds      [?](#)  
 Disable this project      [?](#)  
 Execute concurrent builds if necessary      [?](#)

[Advanced...](#)

---

**Source Code Management**

None

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

Post-build Actions

**Pre Steps**

Add pre-build step ▾

**Build**

Root POM: pom.xml      [?](#)  
Goals and options: clean install      [?](#)

[Advanced...](#)

**Post Steps**

Run only if build succeeds       Run only if build succeeds or is unstable       Run regardless of build result

Should the post-build steps run only for successful builds, etc.

Add post-build step ▾

Once you provide all the details click on Save.

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<http://localhost:8080/configureTools/>

Maven

Maven installations

Maven	Name <input type="text" value="maven"/>
<input checked="" type="checkbox"/> Install automatically	
Install from Apache	
Version <input type="button" value="3.5.0"/>	

[Delete Maven](#) [Delete Installer](#)

[Add Maven](#) [Add Installer](#)

List of Maven installations on this system

## Possible Errors

```
[ERROR] COMPILATION ERROR :
[INFO] -----
[ERROR] No compiler is provided in this environment. Perhaps you are running on a JRE rather than a JDK?
```

### Solution1

Set the class path for Java.

### Solution2

Go to the Jenkins Dashboard ---> Click on Manage Jenkins ---> Global Tool Configuration ---> in JDK section give the full path where u have installed the Java.

JDK

JDK installations

JDK	Name <input type="text" value="Java"/>
JAVA_HOME <input type="text" value="C:\Program Files\Java\jdk1.8.0_162"/>	
<input type="checkbox"/> Install automatically	

[Delete JDK](#)

## Jenkins - Security

### How to create the users in Jenkins?

Click on Manage Jenkins ---> Manage Users ---> Create User ---> Provide the below details

Username:

Password:

Confirm password:

Full name:

E-mail address:

Click on Create User

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--	--	--------------------	--

Jenkins > Jenkins' own user database

Back to Dashboard

Manage Jenkins

Create User

Create User

### How to see the list of Users in Jenkins?

Once you logged into Jenkins Dashboard  
 Go to Left Side Navigation Bar ---> Click on People  
 You will see list of users available in Jenkins.



Includes all known "users", including login identities which the current security realm can enumerate, as well as people mentioned in commit messages in recorded changelogs.

User Id	Name	Last Commit Activity	On ↓
bhaskar0504	Bhaskar Reddy L	N/A	
MANAGE_DOMAINS	MANAGE_DOMAINS	N/A	
devops	DevOps Engineer	N/A	

Icon: S M L

### How to remove/delete the User in Jenkins?

Click on Manage Jenkins ---> Manage Users ---> click on below Gear icon one circle with cross symbol

It will ask Are you sure about deleting the user from Jenkins? confirmation message Click on ---> Yes

Now User is deleted successfully.

### How to change the password for existing users?

Note: TBD

Project-based Matrix Authorization Strategy is an authorization method using which we can define which user or group can do what actions on which job. This gives us a fine-grained control over user/group permissions per project.

To Enable the Project-based Matrix Authorization Strategy need to configure in Jenkins as follows.

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**Step 1:** Click on Manage Jenkins and choose the ‘Configure Global Security’ option.

**Step 2:** Click on Enable Security option.

As an example, let's assume that we want Jenkins to maintain its own database of users, so in the Security Realm, Select the radio button of ‘Jenkins’ own user database’.

**Step 3:** Under Authorization, select “Project-based Matrix Authorization Strategy” and add 2 or 3 users, one administrator (say devops) and a regular user (say user1 and user2).

Enable security

TCP port for JNLP agents  Fixed :   Random  Disable

[Agent protocols...](#)

Disable remember me

Access Control

**Security Realm**

- Delegate to servlet container
- Github Authentication Plugin
- Gitlab Authentication Plugin
- HTTP Header by reverse proxy
- Jenkins' own user database
- Allow users to sign up

LDAP

Unix user/group database

**Authorization**

- Anyone can do anything

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All the checkboxes present besides users are for setting global permissions. Select all checkboxes against admin user to give admin full permissions.

For user1, we are selecting read permissions under jobs. With this, user1 would now have read permission to view all jobs which we would be creating later on.

We have to provide read permission under “Overall” category to any regular user otherwise the user won’t be able to see anything after login.

All the checkboxes present besides users are for setting global permissions. Select all checkboxes against admin user to give admin full permissions. For user1, we are selecting read permissions under jobs. With this, user1 would now have read permission to view all jobs which we would be creating later on. We have to provide read permission under “Overall” category to any regular user otherwise the user won’t be able to see anything after login.

Finally, you can click on Save button.

---

Below scenario will applicable in Matrix based security

**Error : Access Denied**

**<<User>> is missing the Overall/Read permission**

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If you get this error, Please follow below steps.

#### Solution:

Click on Manage Jenkins ---> Configure Global Security ---> User/group to add: Enter the user Name and click on Add button and --->

Enable the appropriate feature ---> Click on Save Button.

#### Jenkins Build Status Icon Colours

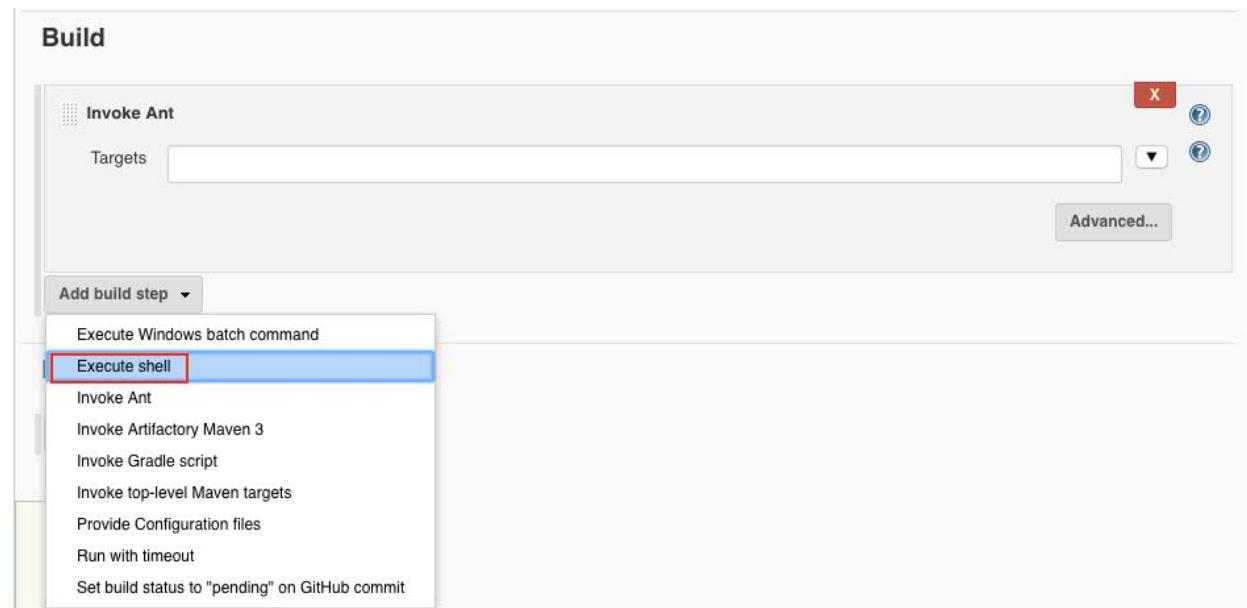
Status of the build	Description
🔴	Failed
🟡	Unstable
🟢	Success
🟠	Pending
🟤	Disabled
🟧	Aborted

Figure a: Build status

Job health	Description
☀️	No recent builds failed
⛅️	20-40% of recent builds failed
☁️	40-60% of recent builds failed
🌧️	60-80% of recent builds failed
⛈️	All recent builds failed
?	Unknown status

Figure b: Weather reports

#### Deploy the Application Through Script



The screenshot shows the Jenkins 'Build' configuration screen. In the 'Add build step' dropdown menu, the 'Execute shell' option is selected and highlighted with a red box. Other options listed include 'Invoke Ant', 'Invoke Artifactory Maven 3', 'Invoke Gradle script', 'Invoke top-level Maven targets', 'Provide Configuration files', 'Run with timeout', and 'Set build status to "pending" on GitHub commit'.

Add the below script in **Execute shell**

#### Linux/MAC for Tomcat

```
#!/bin/sh
echo "Starting to copy the build artifact"
```

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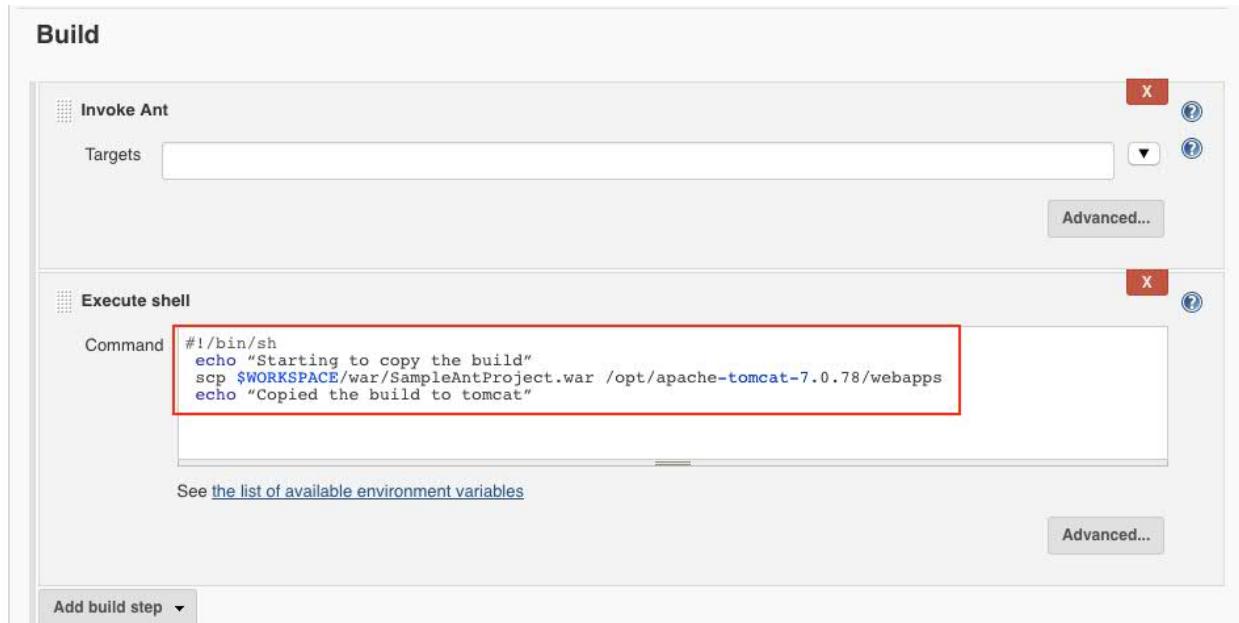
```
cp $WORKSPACE/war/SampleAntProject.war
/Users/bhaskarreddyl/BhaskarReddyL/Softwares/Running/apache-tomcat-9.0.6/webapps/
echo "Deployed the build artifact into tomcat server successfully"
```

### Windows

```
echo "Starting to copy the build"
copy %WORKSPACE%\war\SampleAntProject.war C:\\apache-tomcat-8.5.23\webapps\
echo "Copied the build to tomcat"
```

### Linux/MAC for WildFly

```
#Deploy in WildFly server
#!/bin/sh
echo "Starting to copy the build"
cp $WORKSPACE/war/SampleAntProject.war
/Users/bhaskarreddyl/BhaskarReddyL/Softwares/Running/wildfly11.0.0.Final/standalone/deployment
s/
echo "Copied the build to WildFly successfully"
```



**Note:** If we want to deploy in Tomcat, which is installed in any remote machine, use below lines of code.

```
scp $WORKSPACE/war/SampleAntProject.war <<User Name>>@<<ServerIP>>:/opt/apache-tomcat-7.0.78/webapps
```

---

```
cp %JENKINS_HOME%\jobs%\JOB_NAME%\builds%\BUILD_NUMBER%\log
C:\Users\windows7\Downloads\newfolder\
```

---

### Integrate JFrog Artifactory with Jenkins

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Install “**Artifactory Plugin**” plugin.

Got to the Manage Jenkins ---> Configure System --->  
In the **Artifactory** section fill the below details and click on Save.

**Note:** Once you entered all the details click on **TEST CONNECTION**. IF connection is succeeded you will see the message like **Found Artifactory <<Version>>**.

### Jenkins – Metrics and Trends

There are various plugins which are available in Jenkins to showcase metrics for builds which are carried out over a period of time. These metrics are useful to understand your builds and how frequently they fail/pass over time. As an example, let's look at the '**Build History Metrics plugin**'. This plugin calculates the following metrics for all of the builds once installed

- Mean Time To Failure (MTTF)
- Mean Time To Recovery (MTTR)
- Standard Deviation of Build Times

### Enable LDAP security to Jenkins

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<http://www.scmgalaxy.com/tutorials/complete-guide-to-use-jenkins-cli-command-line>

### **Jenkins CLI**

Jenkins has a built-in command line interface (CLI) that allows users and administrators to access Jenkins from a script or shell environment. This can be convenient for scripting of routine tasks, bulk updates, troubleshooting, and more.

#### **Advantages of Jenkins CLI:**

- Easier
- Faster
- Memory management
- Automation tasks.

#### **Pre-Requisites**

- a) Jenkins server should run.
- b) Enable security as follows.

Go to Jenkins dashboard in Home page ( e.g <http://localhost:8080/> ) -> Manage Jenkins

-> Configure Global Security -> Click on “Enable security” checkbox

You can also configure “Access Control” and “Authorization” option in Global Security page.

Download the Jenkins CLI jar file as follows.

#### **Method 1**

Open the below url

<http://localhost:8080/cli/>



#### **Jenkins CLI**

You can access various features in Jenkins through a command-line tool. See [the documentation](#) for more details of this feature. To get started, download [jenkins-cli.jar](#) and run it as follows:

```
java -jar jenkins-cli.jar -s http://localhost:8080/ help
```

Click on Jenkins-cli.jar.

#### **Method 2**

Click on below url, it will automatically download the jar file.

<http://<<Jenkins Server URL>>/jnlpJars/jenkins-cli.jar>

Example: <http://localhost:8080/jnlpJars/jenkins-cli.jar>

Here

Copy into any folder as follows

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```
#cp jenkins-cli.jar /opt/jenkins/
```

Go to the directory where Jenkins-cli.jar is there and run the below command to get the help.

### **Login Jenkins using username and Password**

```
# java -jar jenkins-cli.jar -s http://localhost:8080/ -auth mithuntechnologies:passw0rd help
```

### **Get the Version of Jenkins**

```
#java -jar jenkins-cli.jar -s http://localhost:8080/ -auth mithuntechnologies:passw0rd version
```

### **Get all the jobs of Jenkins**

```
#java -jar jenkins-cli.jar -s http://localhost:8080/ -auth mithuntechnologies:passw0rd version list-jobs
```

### **Delete the Job**

```
#java -jar jenkins-cli.jar -s http://localhost:8080/ -auth mithuntechnologies:passw0rd version delete-job ant-java-job-dev
```

```
#java -jar jenkins-cli.jar -s http://localhost:8080/ -auth mithuntechnologies:passw0rd version disable-job ant-web-job-dev
```

## **Jenkins Pipeline Project**

In Jenkins Pipeline project, we will use one file called Jenkinsfile, in this file we will write groovy code to build process.

We will write Jenkinsfile in 2 ways.

- 1) Declarative way
- 2) Scripted way.

- 1) **Scripted Pipeline Syntax**
- 2) **Declarative Pipeline Syntax**

## **Jenkins Multi Branch Pipeline Project**

Required Plugins

- 1) Pipeline: Multibranch

## **Blue Ocean Plugin**

## **Jenkins Master-Slave setup**

Manage Jenkins --> Manage Nodes --> New Node

Provide the Node name and click on **OK** button.

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Jenkins

Nodes

Node name: Node1-Mithun-Technologies

Permanent Agent

Adds a plain, permanent agent to Jenkins. This is called "permanent" because Jenkins doesn't provide higher level of integration with these agents, such as dynamic provisioning. Select this type if no other agent types apply — for example such as when you are adding a physical computer, virtual machines managed outside Jenkins, etc.

OK

Provide all the details as follows and click on **Save** button.

Name: Node1-Mithun-Technologies

Description: This Node is used to build for Java Projects.

# of executors: 1

Remote root directory: /Users/bhaskarreddyl/BhaskarReddyL/Softwares/Running/jenkins/node1/

Labels: Node1-Mithun-Technologies

Usage: Use this node as much as possible

Launch method: Launch agent via Java Web Start

Disable WorkDir:

Custom WorkDir path: /Users/bhaskarreddyl/BhaskarReddyL/Softwares/Running/jenkins/node1/workdirectory

If defined, a custom Remoting work directory will be used instead of the Agent Root Directory. This option has no environment variable resolution so far, it is recommended to use only absolute paths.

Internal data directory: remoting

Fail if workspace is missing:

Availability: Keep this agent online as much as possible

Node Properties:

- Enable node-based security
- Environment variables
- Tool Locations

Save

**Note:** Suppose if you don't see "Launch agent via Java Web Start" option, do the below configurations.

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Manage Jenkins ---> Configure Global Security ---> enable the TCP port for JNLP agents (by default, it is Disabled.)

## Agents

TCP port for JNLP agents  Fixed : 50000  Random  Disable

[Agent protocols...](#)

Once you click on Save you will see the Nodes and Master detail, and select the Node which we have created and click on configure.

S	Name ↓	Architecture	Clock Difference	Free Disk Space	Free Swap Space	Free Temp Space	Response Time	
	master	Mac OS X (x86_64)	In sync	144.97 GB	1.36 GB	144.97 GB	0ms	
	Node1-Mithun-Technologies		N/A	N/A	N/A	N/A	N/A	
			ms	6 ms	4 ms	16 min	1 ms	0 ms

[Delete Agent](#) [Configure](#) [Build History](#) [Load Statistics](#) [Log](#) [Open Blue Ocean](#) [Refresh status](#)

You will see below screen and click download the slave.jar file.

Agent Node1-Mithun-Technologies (This Node is used to build for Java Projects. ) [Mark this node temporarily offline](#)

Connect agent to Jenkins one of these ways:

- [Launch](#) Launch agent from browser
- Run from agent command line:

```
java -jar slave.jar -jnlpUrl http://localhost:8080/computer/Node1-Mithun-Technologies/slave-agent.jnlp
-secret 8e6c24c3e977342073d2184d051b1fb87f30d57acd0c63ae0a913008e65ad86f -workDir
"/Users/bhaskarreddyl/BhaskarReddyL/Softwares/Running/jenkins/node1/workdirectory"
```

**Projects tied to Node1-Mithun-Technologies**

None

Copy slave.jar file into any directory  
(/Users/bhaskarreddyl/BhaskarReddyL/Softwares/Running/jenkins/node1)

Go to the path where slave.jar copied and run the below command.

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java -jar agent.jar -jnlpUrl http://localhost:8080/computer/Node1-Mithun-Technologies/slave-agent.jnlp -secret 8e6c24c3e977342073d2184d051b1fb87f30d57acd0c63ae0a913008e65ad86f -workDir "/Users/bhaskarreddy/BhaskarReddyL/Softwares/Running/jenkins/node1/workdirectory"

```
Bhaskars-MacBook-Air:node1 bhaskarreddy$ java -jar slave.jar -jnlpUrl http://localhost:8080/computer/Node1-Mithun-Technologies/slave-agent.jnlp -secret 8e6c24c3e977342073d2184d051b1fb87f30d57acd0c63ae0a913008e65ad86f -workDir "/Users/bhaskarreddy/BhaskarReddyL/Softwares/Running/jenkins/node1/workdirectory"
Nov 26, 2017 9:48:30 PM org.jenkinsci.remoting.engine.WorkDirManager initializeWorkDir
INFO: Using /Users/bhaskarreddy/BhaskarReddyL/Softwares/Running/jenkins/node1/workdirectory/remoting as a remoting work directory
Both error and output logs will be printed to /Users/bhaskarreddy/BhaskarReddyL/Softwares/Running/jenkins/node1/workdirectory/remoting
Nov 26, 2017 9:48:31 PM hudson.remoting.jnlp.Main createEngine
INFO: Setting up slave: Node1-Mithun-Technologies
Nov 26, 2017 9:48:31 PM hudson.remoting.jnlp.Main$CuiListener <init>
INFO: Jenkins agent is running in headless mode.
Nov 26, 2017 9:48:31 PM org.jenkinsci.remoting.engine.WorkDirManager initializeWorkDir
INFO: Using /Users/bhaskarreddy/BhaskarReddyL/Softwares/Running/jenkins/node1/workdirectory/remoting as a remoting work directory
Nov 26, 2017 9:48:31 PM hudson.remoting.jnlp.Main$CuiListener status
INFO: Locating server among [http://localhost:8080/]
Nov 26, 2017 9:48:31 PM org.jenkinsci.remoting.engine.JnlpAgentEndpointResolver resolve
INFO: Remoting server accepts the following protocols: [JNLP4-connect, JNLP-connect, Ping, JNLP2-connect]
Nov 26, 2017 9:48:31 PM hudson.remoting.jnlp.Main$CuiListener status
INFO: Agent discovery successful
Agent address: localhost
Agent port: 50000
Identity: 96:6e:10:60:c1:c4:f2:e8:7e:4c:d9:c7:01:b3:e1:a3
Nov 26, 2017 9:48:31 PM hudson.remoting.jnlp.Main$CuiListener status
INFO: Handshaking
Nov 26, 2017 9:48:31 PM hudson.remoting.jnlp.Main$CuiListener status
INFO: Connecting to localhost:50000
Nov 26, 2017 9:48:31 PM hudson.remoting.jnlp.Main$CuiListener status
INFO: Trying protocol: JNLP4-connect
Nov 26, 2017 9:48:31 PM hudson.remoting.jnlp.Main$CuiListener status
INFO: Remote identity confirmed: 96:6e:10:60:c1:c4:f2:e8:7e:4c:d9:c7:01:b3:e1:a3
Nov 26, 2017 9:48:32 PM hudson.remoting.jnlp.Main$CuiListener status
INFO: Connected
```

Now slave become communicating to node and it is live.

Now you can use this slave for job creation.

Create one Freestyle project/any kind of project and select the Restrict where this project can be run and select the Node which you have created.

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The screenshot shows the Jenkins General configuration page for a slave node. Under the 'Restrict where this project can be run' section, the checkbox 'Restrict where this project can be run' is checked. Below it, the 'Label Expression' field contains 'Node1-Mithun-Technologies'. A yellow warning message at the bottom states: 'There's no agent/cloud that matches this assignment. Did you mean 'master' instead of 'Node'?'.

Provide the Git url and click on **Save** button.

### Jenkins Home Directory Change in RHEL 7.5 Version

By Default, Jenkins home directory will be in /var/lib/jenkins in RHEL.

We can change the Jenkins default home directory to your custom directory(/opt/mithuntechnologies/jenkins).

Stop the Jenkins service if it is running.

```
sudo su -
service jenkins status
service jenkins stop
```

Create a directory mithuntechnologies in opt dir as follows.

```
#mkdir -p /opt/mithuntechnologies
```

```
## Copy the jenkins dir to
```

```
cp -r /var/lib/jenkins/ /opt/mithuntechnologies/
```

```
##Change the ownership as follows.
```

```
chown -R jenkins:jenkins /opt/mithuntechnologies/jenkins/
```

```
##Change the permissions as follows.
```

```
chmod -R 775 /opt/mithuntechnologies/jenkins/
```

```
##Start the jenkins service as follows.
```

```
service jenkins start
```

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### **Possible Errors and Solutions:**

#### **Issue:**

The screenshot shows the Jenkins 'Source Code Management' configuration page. Under the 'Repositories' section, there is a single repository entry with the URL <https://github.com/MithunTechnologiesDevOps/ant-web-application.git>. A red error box highlights the message: 'Failed to connect to repository : Error performing command: git ls-remote -h https://github.com/MithunTechnologiesDevOps/ant-web-application.git HEAD'. Below the URL input field, there is a dropdown for 'Credentials' set to '- none -' and a 'Add' button.

#### **Solution – Windows OS**

Go to the Jenkins dashboard, Click on Manage Jenkins → Global Tool Configuration

In Git option,

Give the Gitbash installed path in **Path to Git executable** text filed as follows.

The screenshot shows the Jenkins 'Global Tool Configuration' page under the 'Git' tab. It lists a single 'Git' installation named 'Default'. The 'Path to Git executable' field is highlighted with a red box and contains the value 'C:\Program Files\Git\bin\git.exe'. Below the field is a checkbox for 'Install automatically'. At the bottom, there are 'SAVE' and 'APPLY' buttons, and a 'DELETE GIT' button.

#### **Solution – Linux**

Install the git.

#### **Issue:**

```
Commit message: "Update home.jsp"
First time build. Skipping changelog.
ERROR: Unable to find build script at /var/lib/jenkins/workspace/flipkart-dev/build.xml
Finished: FAILURE
```

In Build step, give the build file name as in below screen shot.

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## Build

The screenshot shows the Jenkins build configuration interface. A specific step named 'Invoke Ant' is selected. The configuration fields are as follows:

- Ant Version: Ant-1.10.5
- Targets: (empty)
- Build File: build-**mt.xml** (highlighted with a red box)
- Properties: (empty)
- Java Options: (empty)

At the bottom left, there is a button labeled 'Add build step ▾'.

### Issue:

While building if you see below error

```
[Test] $ ant -file build-mt.xml
ERROR: command execution failed.Maybe you need to configure the job to choose one of your Ant installations?
Finished: FAILURE
```

### Solution:

Go to the Manage Jenkins ---> Global Tool Configuration ---> Ant ---> Ant Installations...

The screenshot shows the Jenkins Global Tool Configuration for Ant. It lists one installed Ant version:

- Ant installations:
  - Name: **ANT\_HOME** (highlighted with a red box)
  - Install automatically
  - Install from Apache
    - Version: **1.10.5** (highlighted with a red box)

Buttons at the bottom include 'Delete Installer' (red), 'Add Installer ▾', 'Delete Ant' (red), and 'Add Ant'.

and in Job, select the Ant Versions as follows.

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		Web site	<a href="http://mithuntechnologies.com">http://mithuntechnologies.com</a>



### Installation Issues:

#### Issue 1: Offline

Offline

## Offline

This Jenkins instance appears to be offline.

For information about installing Jenkins without an internet connection, see the [Offline Jenkins Installation Documentation](#).

You may choose to continue by configuring a proxy or skipping plugin installation.

[Configure Proxy](#)

[Skip Plugin Installations](#)

### Solution

jenkinshomedir/hudson.model.UpdateCenter.xml and change url to use **http** instead of **https**.

Once you changed from https to http, you need to restart the Jenkins.

### Issue

```
+refs/heads/*:refs/remotes/origin/*" returned status code 128:  
stdout:  
stderr: remote: Password authentication is not available for Git operations.  
remote: You must use a personal access token or SSH key.
```

### Solution

If you see this error, generate SSH or PAT and use these keys instead of password.

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## Issue Jenkins Start

#service Jenkins start

```
[root@ip-172-31-17-1 jenkins]# service jenkins start
Starting jenkins (via systemctl): Job for jenkins.service failed because the control process exited with error code. See "systemctl status jenkins.service" and "journalctl -xe" for details.
[FAILED]
[root@ip-172-31-17-1 jenkins]#
```

#journalctl -xe

```
Mar 10 11:33:17 ip-172-31-17-1.ap-south-1.compute.internal sshd[3035]: Disconnected from 218.92.0.198 port 44310 [preauth]
Mar 10 11:33:33 ip-172-31-17-1.ap-south-1.compute.internal sshd[3039]: Connection closed by 218.92.0.198 port 19055 [preauth]
Mar 10 11:33:51 ip-172-31-17-1.ap-south-1.compute.internal polkitd[465]: Registered Authentication Agent for unix-process:3057:17319042 (system bus name :1.10)
Mar 10 11:33:51 ip-172-31-17-1.ap-south-1.compute.internal systemd[1]: Starting LSB: Jenkins Automation Server...
-- Subject: Unit jenkins.service has begun start-up
-- Defined-By: systemd
-- Support: http://lists.freedesktop.org/mailman/listinfo/systemd-devel
--
-- Unit jenkins.service has begun starting up.
Mar 10 11:33:51 ip-172-31-17-1.ap-south-1.compute.internal runuser[3068]: pam_unix(runuser:session): session opened for user jenkins by (uid=0)
Mar 10 11:33:51 ip-172-31-17-1.ap-south-1.compute.internal jenkins[3063]: Starting Jenkins bash: /usr/bin/java: No such file or directory
Mar 10 11:33:51 ip-172-31-17-1.ap-south-1.compute.internal runuser[3068]: pam_unix(runuser:session): session closed for user jenkins
Mar 10 11:33:51 ip-172-31-17-1.ap-south-1.compute.internal systemd[1]: jenkins.service: control process exited, code=exited status=1
Mar 10 11:33:51 ip-172-31-17-1.ap-south-1.compute.internal jenkins[3063]: [FAILED]
Mar 10 11:33:51 ip-172-31-17-1.ap-south-1.compute.internal systemd[1]: Failed to start LSB: Jenkins Automation Server.
-- Subject: Unit jenkins.service has failed
-- Defined-By: systemd
-- Support: http://lists.freedesktop.org/mailman/listinfo/systemd-devel
--
-- Unit jenkins.service has failed.
--
-- The result is failed.
```

## Solution

Install the java.

## Issue:

```
Cloning repository https://github.com/MithunTechnologiesDevOps/ant-web-application.git
> git init /var/lib/jenkins/workspace/Test # timeout=10
ERROR: Error cloning remote repo 'origin'
hudson.plugins.git.GitException: Could not init /var/lib/jenkins/workspace/Test
    at org.jenkinsci.plugins.gitclient.CliGitAPIImpl$5.execute(CliGitAPIImpl.java:813)
    at org.jenkinsci.plugins.gitclient.CliGitAPIImpl$2.execute(CliGitAPIImpl.java:605)
    at hudson.plugins.git.GitSCM.retrieveChanges(GitSCM.java:1152)
    at hudson.plugins.git.GitSCM.checkout(GitSCM.java:1192)
    at hudson.scm.SCM.checkout(SCM.java:504)
    at hudson.model.AbstractProject.checkout(AbstractProject.java:1208)
    at hudson.model.AbstractBuild$AbstractBuildExecution.defaultCheckout(AbstractBuild.java:574)
    at jenkins.scm.SCMCheckoutStrategy.checkout(SCMCheckoutStrategy.java:86)
    at hudson.model.AbstractBuild$AbstractBuildExecution.run(AbstractBuild.java:499)
    at hudson.model.Run.execute(Run.java:1810)
    at hudson.model.FreeStyleBuild.run(FreeStyleBuild.java:43)
    at hudson.model.ResourceController.execute(ResourceController.java:97)
    at hudson.model.Executor.run(Executor.java:429)
Caused by: hudson.plugins.git.GitException: Error performing command: git init /var/lib/jenkins/workspace/Test
    at org.jenkinsci.plugins.gitclient.CliGitAPIImpl.launchCommandIn(CliGitAPIImpl.java:2049)
    at org.jenkinsci.plugins.gitclient.CliGitAPIImpl.launchCommandIn(CliGitAPIImpl.java:2010)
    at org.jenkinsci.plugins.gitclient.CliGitAPIImpl.launchCommandIn(CliGitAPIImpl.java:2006)
    at org.jenkinsci.plugins.gitclient.CliGitAPIImpl.launchCommand(CliGitAPIImpl.java:1638)
    at org.jenkinsci.plugins.gitclient.CliGitAPIImpl$5.execute(CliGitAPIImpl.java:811)
    ... 12 more
Caused by: java.io.IOException: Cannot run program "git" (in directory "/var/lib/jenkins/workspace/Test"): error=2, No such file or directory
```

## Solution:

Install the Git.

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### Issue:

There is insufficient memory for the Java Runtime Environment to continue.

### Solution:

Increase the JVM size as follows.

```
vi /etc/sysconfig/jenkins

## Type: string
## Default:      "-Djava.awt.headless=true"
## ServiceRestart: jenkins
#
# Options to pass to java when running Jenkins.
#
JENKINS_JAVA_OPTIONS="-Djava.awt.headless=true -Xmx1024m -XX:MaxPermSize=512m"
```

---

### Resources:

<https://jenkins.io/> ---> Download software

<https://wiki.jenkins-ci.org/display/JENKINS/Installing+Jenkins+as+a+Windows+service>

<http://www.tothenew.com/blog/jenkins-implementing-project-based-matrix-authorization-strategy/> ---> User Access

<https://support.cloudbees.com/hc/en-us/articles/216118748-How-to-Start-Stop-or-Restart-your-Instance>

<https://www.jdev.it/deploying-your-war-file-from-jenkins-to-tomcat/> ---> Deploy into Tomcat