# **Jenkins From Scratch**



By: Eng. Mohamed ElEmam

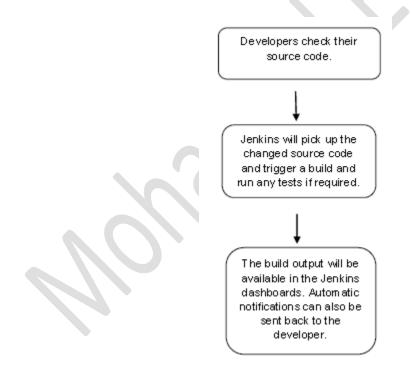
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# Jenkins

Jenkins is a powerful application that allows continuous integration and continuous delivery of projects, regardless of the platform you are working on. It is a free source that can handle any kind of build or continuous integration. You can integrate Jenkins with a number of testing and deployment technologies. In this tutorial, we would explain how you can use Jenkins to build and test your software projects continuously.

## Why Jenkins?

Jenkins is a software that allows **continuous integration**. Jenkins will be installed on a server where the central build will take place. The following flowchart demonstrates a very simple workflow of how Jenkins works.



Along with Jenkins, sometimes, one might also see the association of **Hudson**. Hudson is a very popular open-source Java-based continuous integration tool developed by Sun Microsystems which was later acquired by Oracle. After the acquisition of Sun by Oracle, a fork was created from the Hudson source code, which brought about the introduction of Jenkins.

#### What is Continuous Integration?

Continuous Integration is a development practice that requires developers to integrate code into a shared repository at regular intervals. This concept was meant to remove the problem of finding later occurrence of issues in the build lifecycle. Continuous integration requires the developers to have frequent builds. The common practice is that whenever a code commit occurs, a build should be triggered.

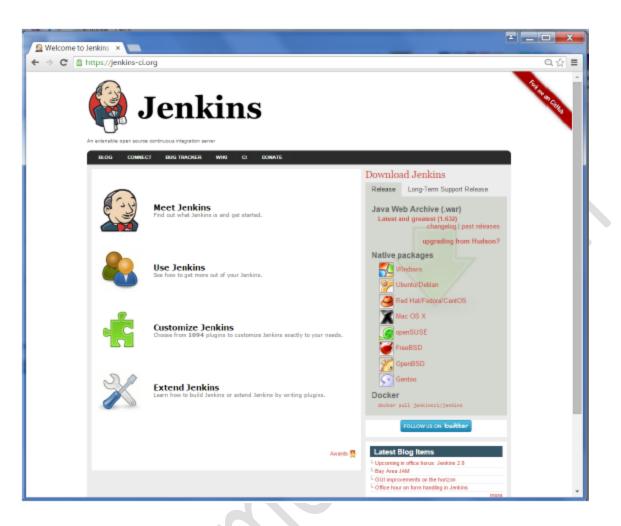
#### **System Requirements**

JDK 1.5 or above
2 GB RAM (recommended)
No minimum requirement. Note that since all builds will be
stored on the Jenkins machines, it has to be ensured that
sufficient disk space is available for build storage.
Jenkins can be installed on Windows, Ubuntu/Debian, Red
Hat/Fedora/CentOS, Mac OS X, openSUSE, FReeBSD,
OpenBSD, Gentoo or Docker or AWS
The WAR file can be run in any container that supports
Servlet 2.4/JSP 2.0 or later.(An example is Tomcat 5).

# Jenkins - Installation

#### **Download Jenkins**

The official website for Jenkins is <u>Jenkins</u>. If you click the given link, you can get the home page of the Jenkins official website as shown below.



By default, the latest release and the Long-Term support release will be available for download. The past releases are also available for download. Click the Long-Term Support Release tab in the download section.



Click the link "Older but stable version" to download the Jenkins war file.

#### **Starting Jenkins**

Open the command prompt. From the command prompt, browse to the directory where the jenkins.war file is present. Run the following command

D:\>Java –jar Jenkins.war

After the command is run, various tasks will run, one of which is the extraction of the war file which is done by an embedded webserver called winstone.

D:\>Java –jar Jenkins.war

Running from: D:\jenkins.war Webroot: \$user.home/ .jenkins Sep 29, 2015 4:10:46 PM winstone.Logger logInternal INFO: Beginning extraction from war file

Once the processing is complete without major errors, the following line will come in the output of the command prompt.

INFO: Jenkins is fully up and running

#### **Accessing Jenkins**

Once Jenkins is up and running, one can access Jenkins from the link - http://localhost:8080

This link will bring up the Jenkins dashboard.

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## Jenkins – Tomcat Setup

The following prerequisites must be met for Jenkins Tomcat setup.

#### **Step 1: Verifying Java Installation**

To verify Java installation, open the console and execute the following java command.

OS	Task	Command
Windows	Open command console	<pre>\&gt;java -version</pre>
Linux	Open command terminal	\$java –version

If Java has been installed properly on your system, then you should get one of the following outputs, depending on the platform you are working on.

OS	Output
Windows	Java version "1.7.0_60"
	Java (TM) SE Run Time Environment (build 1.7.0_60-b19) Java Hotspot (TM) 64-bit Server VM (build 24.60-b09, mixed mode)
Linux	java version "1.7.0_25"
	Open JDK Runtime Environment (rhel-2.3.10.4.el6_4-x86_64)
	Open JDK 64-Bit Server VM (build 23.7-b01, mixed mode)

We assume the readers of this tutorial have Java 1.7.0\_60 installed on their system before proceeding for this tutorial.

In case you do not have Java JDK, you can download it from the link Oracle

#### **Step 2: Verifying Java Installation**

Set the JAVA\_HOME environment variable to point to the base directory location where Java is installed on your machine. For example,

OS	Output
Windows	Set Environmental variable JAVA_HOME to C:\ProgramFiles\java\jdk1.7.0_60
Linux	export JAVA_HOME=/usr/local/java-current

Append the full path of the Java compiler location to the System Path.

OS	Output
Windows	Append the String; C:\Program Files\Java\jdk1.7.0_60\bin to the end of the system variable PATH.
Linux	export PATH=\$PATH:\$JAVA_HOME/bin/

Verify the command java-version from command prompt as explained above.

#### Step 3: Download Tomcat

The official website for tomcat is <u>Tomcat</u>. If you click the given link, you can get the home page of the tomcat official website as shown below.



Browse to the link <u>https://tomcat.apache.org/download-70.cgi</u> to get the download for tomcat.

Go to the 'Binary Distributions' section. Download the 32-bit Windows zip file.

Then unzip the contents of the downloaded zip file.

#### **Step 4: Jenkins and Tomcat Setup**

Copy the Jenkis.war file which was downloaded from the previous section and copy it to the webapps folder in the tomcat folder.

Now open the command prompt. From the command prompt, browse to the directory where the tomcat7 folder is location. Browse to the bin directory in this folder and run the start.bat file

E:\Apps\tomcat7\bin>startup.bat

Once the processing is complete without major errors, the following line will come in the output of the command prompt.

INFO: Server startup in 1302 ms

Open the browser and go to the link – **http://localhost:8080/jenkins**. Jenkins will be up and running on tomcat.

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## Jenkins - Git Setup

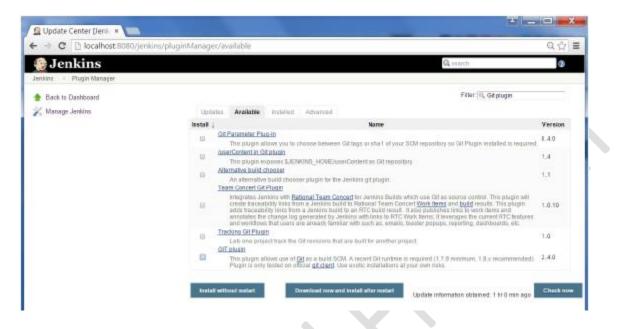
For this exercise, you have to ensure that Internet connectivity is present from the machine on which Jenkins is installed. In your Jenkins Dashboard (Home screen), click the Manage Jenkins option on the left hand side.

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In the next screen, click the 'Manage Plugins' option.



In the next screen, click the Available tab. This tab will give a list of plugins which are available for downloading. In the 'Filter' tab type 'Git plugin'



The list will then be filtered. Check the Git Plugin option and click on the button 'Install without restart'

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		AuserContent in Git plugin This plugin exposes \$JENKINS_HOMEAuserContent as Git repository.	1.4
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	8	Integrates Jenkins with Batenal Team Corcect for Jenkins Builds which use Git as source centrol. This plugin will create traceability links from a Jenkins build to Rational Team Concert Work Itens and build results. This plugin adds traceability links from a Jenkins build to an RTC build result. Tatagorubishas links the work terms and annotates the charge log generated by Jenkins with links to RTC Work Iterns; It leverages the current IRTC restures and workflows that users are already familiar with such as emails (naster popular, reporting, dashboards, etc.	1.0.10
		Tracking Git Plugin Lets one project track the Git revisions that are built for another project.	1.0
	8	GIT plugin This plugin allows use of <u>G8</u> as a build SCM. A recent Git runtime is required (1.7.9 minimum, 1.8.x recommended). Plugin is only instated on official <u>of client</u> : Use exodic installations at your own risks.	2.4.0

The installation will then begin and the screen will be refreshed to show the status of the download.

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	Restart Jenkins when	installation is complete and no jobs are running		

Once all installations are complete, restart Jenkins by issue the following command in the browser. **http://localhost:8080/jenkins/restart** 

After Jenkins is restarted, Git will be available as an option whilst configuring jobs. To verify, click on New Item in the menu options for Jenkins. Then enter a name for a job, in the following case, the name entered is 'Demo'. Select 'Freestyle project' as the item type. Click the Ok button.

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In the next screen, if you browse to the Source code Management section, you will now see 'Git' as an option.

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	Add post-build action *		
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# Jenkins – Maven Setup

#### Step 1: Downloading and Setting Up Maven

The official website for maven is <u>Apache Maven</u>. If you click the given link, you can get the home page of the maven official website as shown below.



While browsing to the site, go to the Files section and download the link to the Binary.zip file.

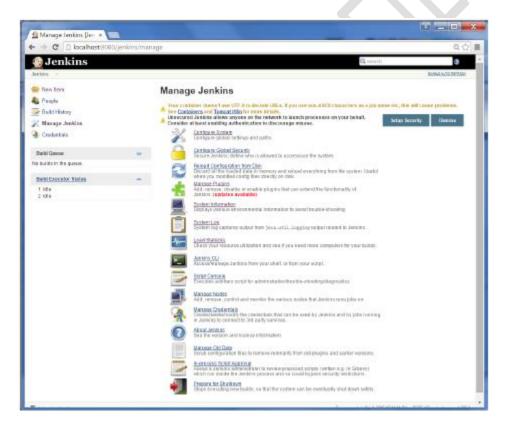
Once the file is downloaded, extract the files to the relevant application folder. For this purpose, the maven files will be placed in E:\Apps\apache-maven-3.3.3.

#### Step 2: Setting up Jenkins and Maven

In the Jenkins dashboard (Home screen), click Manage Jenkins from the left-hand side menu.

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Then, click on 'Configure System' from the right hand side.



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In the Configure system screen, scroll down till you see the Maven section and then click on the 'Add Maven' button.

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Uncheck the 'Install automatically' option.

Add any name for the setting and the location of the MAVEN\_HOME.

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Then, click on the 'Save' button at the end of the screen.

You can now create a job with the 'Maven project' option. In the Jenkins dashboard, click the New Item option.

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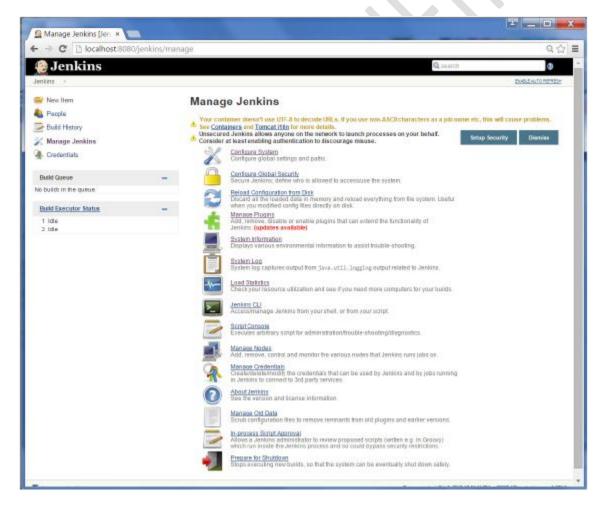
# **Jenkins - Configuration**

You probably would have seen a couple of times in the previous exercises wherein we had to configure options within Jenkins. The following shows the various configuration options in Jenkins.

So one can get the various configuration options for Jenkins by clicking the 'Manage Jenkins' option from the left hand menu side.

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You will then be presented with the following screen –



Click on Configure system. Discussed below are some of the Jenkins configuration settings which can be carried out.

#### **Jenkins Home Directory**

Jenkins needs some disk space to perform builds and keep archives. One can check this location from the configuration screen of Jenkins. By default, this is set to ~/.jenkins, and this location will initially be stored within your user profile location. In a proper environment, you need to change this location to an adequate location to store all relevant builds and archives. Once can do this in the following ways

- Set "JENKINS\_HOME" environment variable to the new home directory before launching the servlet container.
- Set "JENKINS\_HOME" system property to the servlet container.
- **4** Set JNDI environment entry "JENKINS\_HOME" to the new directory.

The following example will use the first option of setting the "JENKINS\_HOME" environment variable.

First create a new folder E:\Apps\Jenkins. Copy all the contents from the existing ~/.jenkins to this new directory.

Set the JENKINS\_HOME environment variable to point to the base directory location where Java is installed on your machine. For example,

OS	Output
Windows	Set Environmental variable JENKINS_HOME to you're the location you desire. As
	an example you can set it to E:\Apps\Jenkins
Linux	export JENKINS_HOME =/usr/local/Jenkins or the location you desire.

In the Jenkins dashboard, click Manage Jenkins from the left hand side menu. Then click on 'Configure System' from the right hand side.

In the Home directory, you will now see the new directory which has been configured.

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#### **# of executors**

This refers to the total number of concurrent job executions that can take place on the Jenkins machine. This can be changed based on requirements. Sometimes the recommendation is to keep this number the same as the number of CPU on the machines for better performance.

#### **Environment Variables**

This is used to add custom environment variables which will apply to all the jobs. These are key-value pairs and can be accessed and used in Builds wherever required.

### **Jenkins URL**

By default, the Jenkins URL points to localhost. If you have a domain name setup for your machine, set this to the domain name else overwrite localhost with IP of machine. This will help in setting up slaves and while sending out links using the email as you can directly access the Jenkins URL using the environment variable JENKINS\_URL which can be accessed as \${JENKINS\_URL}.

#### **Email Notification**

In the email Notification area, you can configure the SMTP settings for sending out emails. This is required for Jenkins to connect to the SMTP mail server and send out emails to the recipient list.

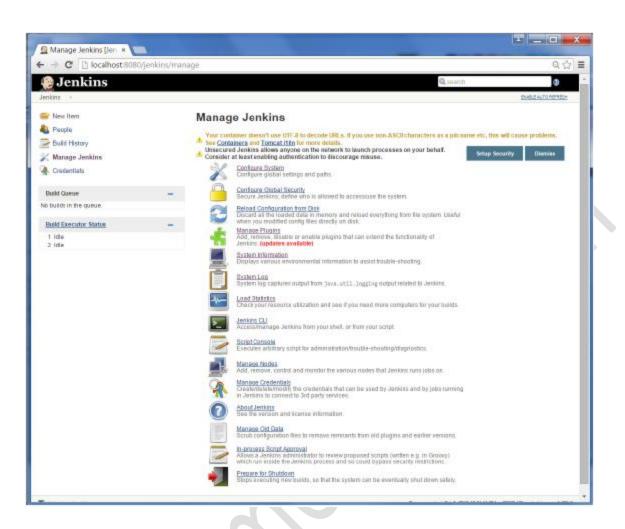
## Jenkins - Management

To manage Jenkins, click on the 'Manage Jenkins' option from the left hand menu side.

So one can get the various configuration options for Jenkins by clicking the 'Manage Jenkins' option from the left hand menu side.

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You will then be presented with the following screen -



Some of the management options are as follows -

## **Configure System**

This is where one can manage paths to the various tools to use in builds, such as the JDKs, the versions of Ant and Maven, as well as security options, email servers, and other system-wide configuration details. When plugins are installed. Jenkins will add the required configuration fields dynamically after the plugins are installed.

### **Reload Configuration from Disk**

Jenkins stores all its system and build job configuration details as XML files which is stored in the Jenkins home directory. Here also all of the build history is stored. If you are migrating build jobs from one Jenkins instance to another, or archiving old build jobs, you will need to add or remove the corresponding build job directories to Jenkins's builds directory. You don't need to take Jenkins offline to do this—you can simply use the "Reload Configuration from Disk" option to reload the Jenkins system and build job configurations directly.

#### **Manage Plugin**

Here one can install a wide variety of third-party plugins right from different Source code management tools such as Git, Mercurial or ClearCase, to code quality and code coverage metrics reporting. Plugins can be installed, updated and removed through the Manage Plugins screen.

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	Jourding Plugin     This plugin adds Javaddic support to Javidina.	1.3	1.1
	Ani Fluam     Alows JUmi-Ibortal test results to be published.	1,9	1.2-beta-4
	Mathy Authorization Strategy Plugin Otens mathy-based security authorization strategies (global and per-project).	1.2	1.1
	Mattix Project Elugin     Multi-configuration (matrix) project type	1.6	1.4,1
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	EAM Authentication plugiti Adds Univ Pluggable Authentication Module (PAM) support to Janions.	1.2	1.1
	Sotpt Security Plugin Allows Jenkins administrators to control what in-process scripts can be run by less-privilege	d users. 1.15	1.13
	SSH Stores plugh This plugh allows you to manage stores running on Phot machines over SSH.	1.10	1.9
	Sutversion Plug-In This plugin adds the Sutversion support (via SVM60) to Jensina.	2.5.3	3.54
	Transiston Assistance pluoin This plugin adds as additional ifising bas in every page, which enables people is contribute localizations for the massages they are seeing in the current page.	1.12	1.10
	Windows Staves Plagn Alows you to connect to Windows machines and start Gave apents on them.	1.1	1.0
	Deventioned now and install after realiset Update information obtained -1 hr 36 min app Select. All, None This page lists updates to the plugins you currently use.		

#### **System Information**

This screen displays a list of all the current Java system properties and system environment variables. Here one can check exactly what version of Java Jenkins is running in, what user it is running under, and so forth. The following screenshot shows some of the name-value information available in this section.

C localhost 808	Drienkins/systemInfo	9.
	oyjerikins/systeminio	2
Jenkins		Q, search 👔
ns >		D08.8.470.484
na y		
New Item	System Properties	i
People		
Build History	Name 1	Value
·	awt to olkit	sun awt windows.WToolkit
Manage Jenkins	catalina.base	E'Appsitomcaf7
redentials	catalina.home	E'Appsitomcaf7
	catalina.useNaming	bie
d Cuana	common Joader	S(catalina.base)/lib.S(catalina.base)/lib.º jar.S(catalina.home)/lib.S(catalina.home )/lib.º jar
ld Queue	- file.encoding	Qp1252
ilds in the queue.	file encoding pkg	sunio
	file separator	1
Id Executor Status	<ul> <li>java.awl.graphicsenv</li> </ul>	sun awt Win32GraphicsEnvironment
de	java.awt.printerjob	sun awt.windows.WPrinterJob
l de	java.class.path	E:Appsitomcat7/bin/bootstrap.jar.E:\Appsitomcat7/bin/tomcat-juli.jar
	java.class.version	51.0
	java.endorsed.dirs	E:Appsitomcat7iendorsed
	java.ext.dirs	C:Program Files (x86)/Java/(dk1.7.0_79)(re/lib/ext;C:Windows/Sun/Java/lib/ext;
	java home	C:Program Files (x86)/Java/(dk1.7.0_79)(re
	java Jo.tmpdir	E:Appsitomcat7itemp
	Java Jibrary, path	C:Ptogram Files (d8/Nava)(el: 7.2, 7%bit) C:Windows/Sun/JavaNin Files J88/Nindows/Sun/JavaNin C:Windows/Sun/JavaNin C:Windows/Sun/JavaNin Files J88/Nindows/Sun/JavaNin C:Windows/Sun/JavaNin Files J88/Nindows/Sun/JavaNin Files J88/Nindows/Sun/JavaNin C:Windows/Sun/JavaNin Files J88/Nindows/Sun/JavaNin Files J88/Nindows/Sun/J
	java.naming.factory.initial	org.apache.naming.java.javaURLContexFactory
	java.naming.factory.url.pkgs	org apache naming
	Java runtime name	Java (TM) SE Runtime Environment
	Java.runtime.version	17.0_79-b15
	java.specification.name	Java Platform API Specification
	java specification vendor	Oracle Corporation
	java specification version	17
	java.util.logging.config.file	E:Appsitomcat7iconfilogging.praperties
	java util logging manager	org apache juli ClassLoaderLogVlanager
	java.vendor	Oracle Corporation
	java.vendor.url	http://java.oracie.com/
	java.vendor.url.bug	http://bugreport.sun.com/bugreport/
	java.version	17.0_79

#### System Log

The System Log screen is a convenient way to view the Jenkins log files in real time. Again, the main use of this screen is for troubleshooting.

#### **Load Statistics**

This pages displays graphical data on how busy the Jenkins instance is in terms of the number of concurrent builds and the length of the build queue which gives an idea of how long your builds need to wait before being executed. These statistics can give a good idea of whether extra capacity or extra build nodes is required from an infrastructure perspective.

#### **Script Console**

This screen lets you run Groovy scripts on the server. It is useful for advanced troubleshooting since it requires a strong knowledge of the internal Jenkins architecture.

#### Manage nodes

Jenkins is capable of handling parallel and distributed builds. In this screen, you can configure how many builds you want. Jenkins runs simultaneously, and, if you are using distributed builds, set up build nodes. A build node is another machine that Jenkins can use to execute its builds.

#### **Prepare for Shutdown**

If there is a need to shut down Jenkins, or the server Jenkins is running on, it is best not to do so when a build is being executed. To shut down Jenkins cleanly, you can use the Prepare for Shutdown link, which prevents any new builds from being started. Eventually, when all of the current builds have finished, one will be able to shut down Jenkins cleanly.

## Jenkins - Setup Build Jobs

For this exercise, we will create a job in Jenkins which picks up a simple HelloWorld application, builds and runs the java program.

**Step 1** – Go to the Jenkins dashboard and Click on New Item

🙎 Dashboard [Jenkins] × 📃				
← → C Di localhost:8080/je	nkins/			್ ಭ ≡
🇐 Jenkins			Q search	٩
Jenkins >				ENABLE AUTO REPRESH
🚔 New Item				add description
<b>&amp; People</b> ☞ Build History		Welcome to Jenkins!		
X Manage Jenkins		Please create new jobs to get started.		
Credentials				
Build Queue	-			
No builds in the queue.				
Build Executor Status	-			
1 idle 2 idle				

**Step 2** – In the next screen, enter the Item name, in this case we have named it Helloworld. Choose the 'Freestyle project option'

· → C 🗋 localhost8080/jenkin	s/view/All/newJob Q	นิ
👩 Jenkins	Q, search	3
ankins 🔸 Ali 🕞		
P New Item	Item name Helloworld	
People	Freestyle project This is the central feature of Jenkins. Jenkins will build your project, combining any S	av
Build History	with any build system, and this can be even used for something other than software b Mayon protect	uild
🐇 Manage Jankins	Build a maven project. Jenkins takes advantage of your POM files and drastically red the conflouration.	uce
Credentials	External Job This type of job allows you to record the execution of a process run outside Jenkins, e on a remote machine. This is designed so that you can use Jenkins as a dashboard	wer
Build Queue	<ul> <li>your existing automation system. See the documentation for more details.</li> <li>Multi-configuration project</li> </ul>	
io builds in the queue.	<ul> <li>Instance configuration projects Statute for projects that need a large number of different configurations, such as test on multiple environments, platform-specific builds, etc.     </li> </ul>	ing
Build Executor Status	-	
1 Idle 2 Idle	ок	
5 TOTO		

**Step 3** – The following screen will come up in which you can specify the details of the job.

> C 🗋 localhost:8080/jenkins/job/	And a second		0.☆ ≣
🔮 Jenkins		QL sear(3)	0
Jenkins + Helloworld + configuration			
Back to Dashboard	Project name	Helloworld	
Status	Description		
Changes			
Workspace			
Build New		(Escaped HTML) Preview	
O Delete Project	Discard Old GitHub project		0
Configure	and the second	parameterized	0
-	🗉 Disable Bul	Id (No new builds will be executed unbit the project is re-enabled.)	0
Build History Irend		ncurrent builds if recessary	0
BISS for all D FSB for failures	Advanced Prop		- I
		Advinced.	
	Source Code M	lanagument	- 1
	© CVS		
	O CVS Project O Cit	sut	
	Subversion		
	Build Triggers		
	<ul> <li>Build after o</li> <li>Build period</li> </ul>	ither projects are built ticelly	0
	Build when	a change is pushed to GIB-lub	
	Poll SCM		0
	eung Antikanal a		

**Step 4** – We need to specify the location of files which need to be built. In this example, we will assume that a local git repository(E:\Program) has been setup which contains a 'HelloWorld.java' file. Hence scroll down and click on the Git option and enter the URL of the local git repository.

**Note** – If you repository if hosted on Github, you can also enter the url of that repository here. In addition to this, you would need to click on the Add button for the credentials to add a user name and password to the github repository so that the code can be picked up from the remote repository.

	Helloworld/configure	e			Q 🕸	≡
ankins > Helloworld > configuration						-
Changes Workspace Build Now Delete Project Configure	<ul> <li>Discard Old Builds</li> <li>GliHub project</li> <li>This build is paran</li> <li>Disable Build (Note)</li> </ul>	neterized new builds will be	executed until the pro	iject is re-enabled.)	0 0 0	l
Build History trend =	Execute concurrent Advanced Project Op		ary		0	
🔀 RSS for all 🔀 RSS for failures	Source Code Manage None CVS CVS Projectset G dt	ment		Advance	ю	
	Repositories	Repository URL	E:/Program		Ð	
		Credentials	-none - 🔻	← Add	0	1
			Add Repositor	y Delete Repository		ł
	Branches to build	Branch Specifie	Add Repositor er (blank for 'any') *in	y Delete Repository	0	ĺ

**Step 5** – Now go to the Build section and click on Add build step  $\rightarrow$  Execute Windows batch command

← → C 🗋 localhost 8080/jenkins/jo	b/Helloworld/configure	2				Q. 23	Ξ
Jenkins + Helloworld + configuration							
	Repositories	Repository URL E:Program			0		
		Credentals	- none -	•	hth -		
					Advanced	•	
			Add Report	sitory	Delete Repository		
	Branches to build	Branch Specifie	r (blank for "any")	*/mast	or	0	
					Add Branch	000	
					Delete Branch		
	Repository browser	(Auto)					
		(4010)					1
	Additional Behaviours	Add 👻					
	Subversion						
	Build Triggers					-	
	<ul> <li>Build after other pro</li> <li>Build periodically</li> </ul>	ojects are built				0	
	Build when a change	ge is pushed to Gr	Hub				
	Build					Ð	
	Add build step •	1					
	Execute Windows ba	ich command					
	Execute shell	in contraine					
	Invoke Ant						
	Invoke top-level Mave	en targets					
	Set build status to "pe	ending" on GilHub co	trant				

**Step 6** – In the command window, enter the following commands and then click on the Save button.

Javac HelloWorld.java Java HelloWorld

😫 Helloworld Config [J: ×	e <u>-</u>		x
← → C 🗋 localhost:8080/jenkins/job/He	lloworld/configure	Q☆	=
Jenkins > Helloworld > configuration			
	Delete Branch Repository browser     (Auto)  Additional Behaviours	• ®	
	Subversion Build Triggers		
	Build after other projects are built     Build periodically     Build when a change is pushed to GitHub     Poll SCM Build Buil	9 9 9	
	Execute Windows batch command Command javas HelloWorld.java java HelloWorld	0	
	See the list of available environment variables Delt Add build step	ste	
	Post-build Actions		
	Add post-build action -		
🝓 Help va Iscolica Uni suco	Page generated: Oct 10, 2015 12-42:11 AM REST AR Janking	t ver. 1.609.3	*

**Step 7** – Once saved, you can click on the Build Now option to see if you have successfully defined the job.



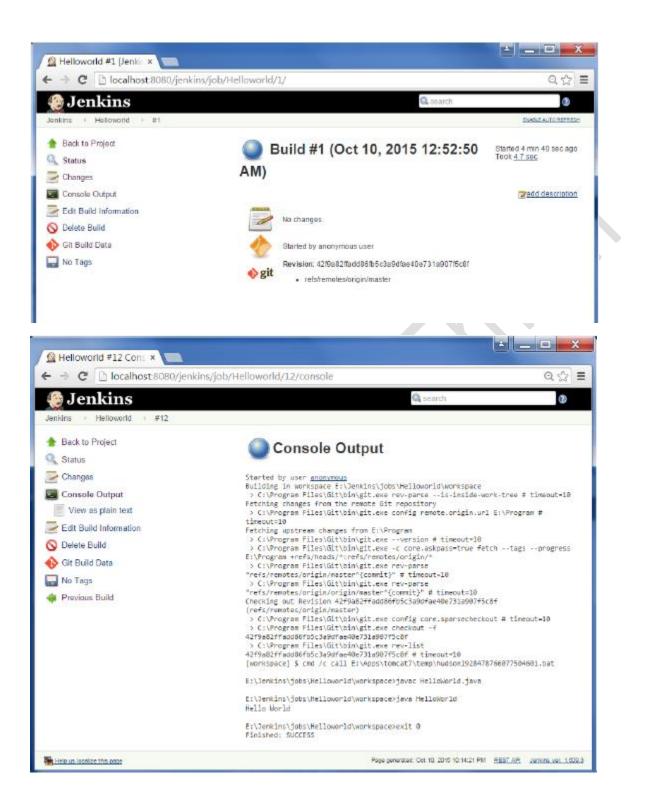
**Step 8** – Once the build is scheduled, it will run. The following Build history section shows that a build is in progress.

Lonling			Q search	
Jenkins			W6 30/81(21)	0
itins + Helloworld +				ENABLE AUTO REPARCH
Back to Dashboard		Project Helloworld		
Status		19 9-92 • CANCEL CONSIGNATION CONTRACTOR - 2011		gadd description
Changes				Disable Project
Workspace				
Build New		Workspace		
Delete Project				
Configura		Recent Changes		
Build History	trend	Permalinks		
#1 Det 10 2015 12:52 AM				
RSS for all 🚮 R	SS for failures			

**Step 9** – Once the build is completed, a status of the build will show if the build was successful or not. In our case, the following build has been executed successfully. Click on the #1 in the Build history to bring up the details of the build.



Step 10 – Click on the Console Output link to see the details of the build



Apart from the steps shown above there are just so many ways to create a build job, the options available are many, which what makes Jenkins such a fantastic continuous deployment tool.

## Jenkins - Unit Testing

Jenkins provides an out of box functionality for Junit, and provides a host of plugins for unit testing for other technologies, an example being MSTest for .Net Unit tests. If you go to the link <u>https://wiki.jenkins-ci.org/display/JENKINS/xUnit+Plugin</u> it will give the list of Unit Testing plugins available.

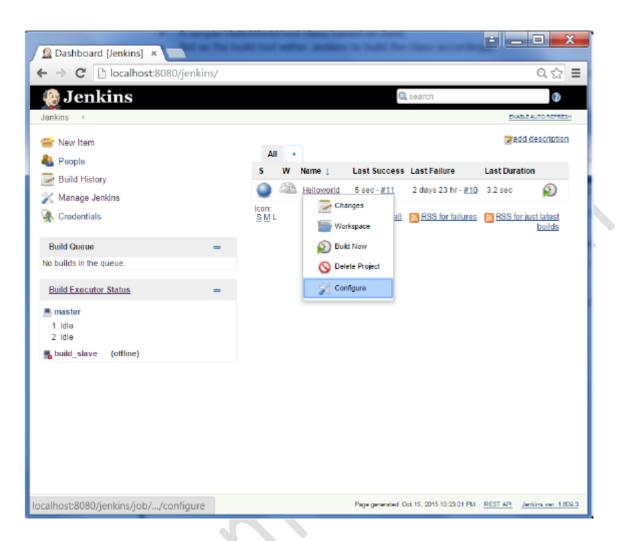
🔡 xUı	enkins + Plugins + xUnit		Browse ▼ Q Search ▲		
r Added by <u>G</u> Jenkins Home	Plugin Informatio	ed by <u>Gregory Boissing</u> t on Oct 08, 2015 ( <u>view change</u> )			
Mailing lists Pl Source code La Bugtracker La Security Re	Plugin ID	xunit	Changes	In Latest Release Since Latest Release	
	Latest Release Latest Release Date Required Core Dependencies	1.98 (archives) Oct 09, 2015 1.580.1 junit (version:1.6)	Source Code Issue Tracking Pull Requests Maintainer(s)	GitHub Open Issues Pull Requests Gregory Boissingt (id: gboissingt)	
Events Donation Commercial Support Wiki Site Map		xunit - installations	Installations	2014-Oct 11692 2014-Nov 11557 2014-Dec 11631 2015-Jan 12106 2015-Feb 12262 2015-Mar 12891 2015-Apr 12694 2015-Jay 12716	
Vleet Jankins Jae Jankins		4000 2000 0 10 11 12 01 02 03 04 05 06 07 08 09 Month		2015-Jun 13143 2015-Jul 13470 2015-Aug 13192 2015-Sep 13563	
Extend Jenkins Plugins Servlet Container Notes	This plugin makes it po	ssible to publish the test results of an execution of a t	lesting tool in Jenk	ins.	

#### **Example of a Junit Test in Jenkins**

The following example will consider

- A simple HelloWorldTest class based on Junit.
- Ant as the build tool within Jenkins to build the class accordingly.

**Step 1** – Go to the Jenkins dashboard and Click on the existing HelloWorld project and choose the Configure option



**Step 2** – Browse to the section to Add a Build step and choose the option to Invoke Ant.

	nkins/job/Helloworld/configure	Q ☆ 〓
nkins 🕨 Helloworld 🕨 configura	tion	Branch
		branch
	Repository browser (Auto)	• 📵
	Additional Behaviours Add 👻	
	Subversion	
	Build Triggers	
	Build after other projects are built	0
	<ul> <li>Build periodically</li> <li>Build when a change is pushed to GitHub</li> </ul>	0
	<ul> <li>Poll SCM</li> </ul>	0
	Build	_
	Execute Windows batch command Command java: HelloWorld.java java HelloWorld	•
	See the list of available environment variables	Delete
	Add build step ·	
	Execute Windows batch command	
	Execute shell	
	Invoke Ant	
	Invoke top-level Maven targets Set build status to "pending" on GitHub commit	

**Step 3** – Click on the Advanced button.

enkins + Helloworld + configuration		
	Additional Behaviours Add + Subversion Build Triggers	
	Build after other projects are built     Build periodically     Build when a change is pushed to GitHub     Poll SCM	0 0
	Build Execute Windows batch command Command javac Hellokorld, java java Hellokorld	
	See the list of available environment variables	<i>d</i> Delete
	Invoke Ant Ant Version	
	Targets	Advanced
		Delete
	Save Apply	

**Step 4** – In the build file section, enter the location of the build.xml file.

C localhost:8080/jenkins/j	bb/Helloworid/configure	ର ଚ୍ଚ
kins + Helloworld + configuration		
	Build Environment	0
	Create Selenium RC instance Build	
	DOBN <sup>2</sup>	
	Execute Windows batch command	0
	Command java HelloWorld.java java HelloWorld	
	See the list of available environment variables	Delete
	Invoke Ant	.0
	Ant Version NewHome	•
	Targets	<b>•</b>
	Build File E:Java\HelloWorldTest/build.xml	
	Properties	× 0
	Java Options	10
		Delete
	Add build step -	
	Post-build Actions	
	Publish JUnit test result report Test report XMLs ReportsV*xml Tissue Valuates* certice that use	Ð

**Step 5** – Next click the option to Add post-build option and choose the option of "Publish Junit test result report"

	s/job/Helloworld/configure	ର୍ 🏠 🔳
nkins + Helloworld + configuration		*
	Build Environment	
	Create Selenium RC instance	0
	Build	
	Execute Windows batch command	8
	Command javac HelloWorld.java java HelloWorld	
		de la constanción de
	See the list of available environment variables	Delete
	Publish FindBugs analysis results	
	Publish combined analysis results	
	Aggregate downstream test results	•
	Archive the artifacts	•
	Build other projects Fublish JUnit test result report d.xml	
	Publish Javadoc	•
	Publish Selenium Report	
	Record fingerprints of files to track usage	
	Git Publisher	Delete
	Deploy war/ear to a container	
	E-mail Notification	
	Set build status on Gillfub commit	
	Add post-build action -	

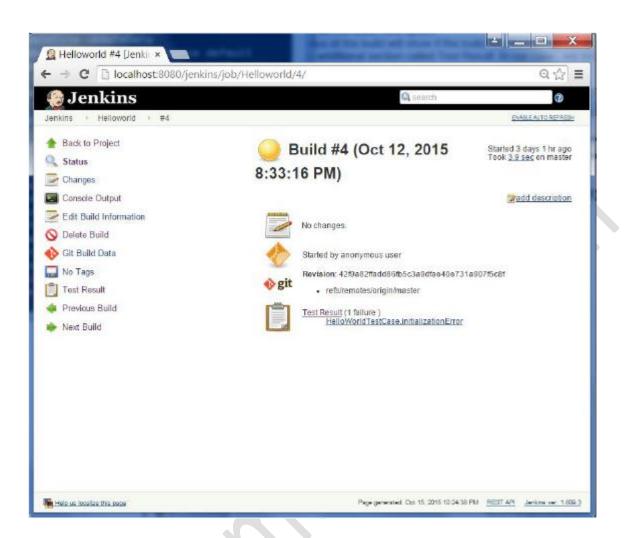
**Step 6** – In the Test reports XML's, enter the location as shown below. Ensure that Reports is a folder which is created in the HelloWorld project workspace. The "\*.xml" basically tells Jenkins to pick up the result xml files which are produced by the running of the Junit test cases. These xml files which then be converted into reports which can be viewed later.

Once done, click the Save option at the end.

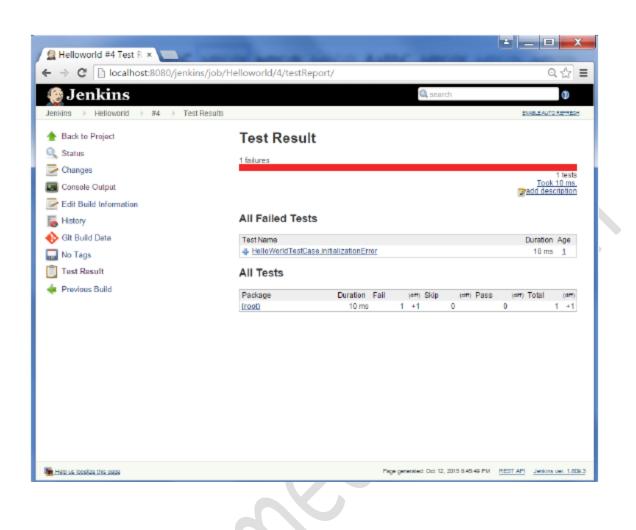
nkins > Helloworld > configuration	→ C   localhost:8080/jenkins/j	b/Helloworld/configure	의 뜻 ≡
Post-build Actions  Publish JUnit test result report Test report XMLs Reports**.xml Floor insurance; carting that specifies the generated row XML report fless Reports are insurance and action as important and the specifies the generated row XML report fless Reports are insurance and action as important and action as important and action for a transmission and action for the float in long standard output/error Retain long standard standard output/error Retain long standard stand	nkins > Helloworld > configuration	Ant Version Targets Build File E:\Java\Hello\WorldTestbuild.xml Properties Java Options	▼.0 ▼.0 ▼.0
Health report amplification factor     1.0     1% failing tests scores as 99% health. 5% failing tests     scores as 95% health     Detete		Publish JUnit test result report Test report XMLs     Reports**.xml     Elicer instance, sering that specifies the     such as impropertizinger/sect-reports*.xm	
Add post-build action -		Retain long standard output/ Health report amplification factor     1.0     1% failing tests scores as 99% he	ealth. 5% failing tests
		Add post-build action -	

**Step 7** – Once saved, you can click on the Build Now option.

Once the build is completed, a status of the build will show if the build was successful or not. In the Build output information, you will now notice an additional section called Test Result. In our case, we entered a negative Test case so that the result would fail just as an example.



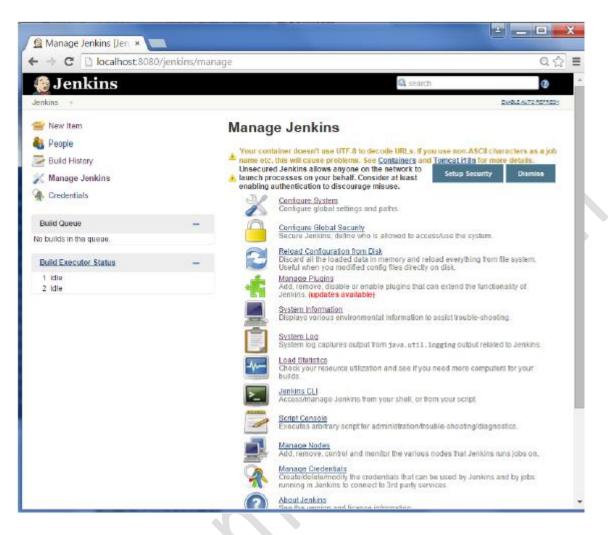
One can go to the Console output to see further information. But what's more interesting is that if you click on Test Result, you will now see a drill down of the Test results.



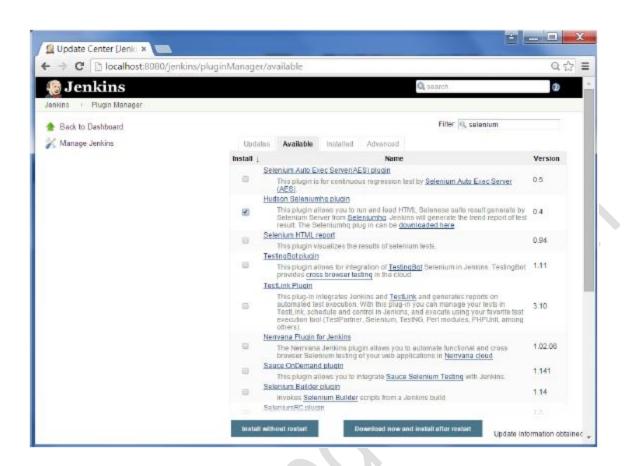
## Jenkins - Automated Testing

One of the basic principles of Continuous Integration is that a build should be verifiable. You have to be able to objectively determine whether a particular build is ready to proceed to the next stage of the build process, and the most convenient way to do this is to use automated tests. Without proper automated testing, you find yourself having to retain many build artifacts and test them by hand, which is hardly in the spirit of Continuous Integration. The following example shows how to use Selenium to run automated web tests.

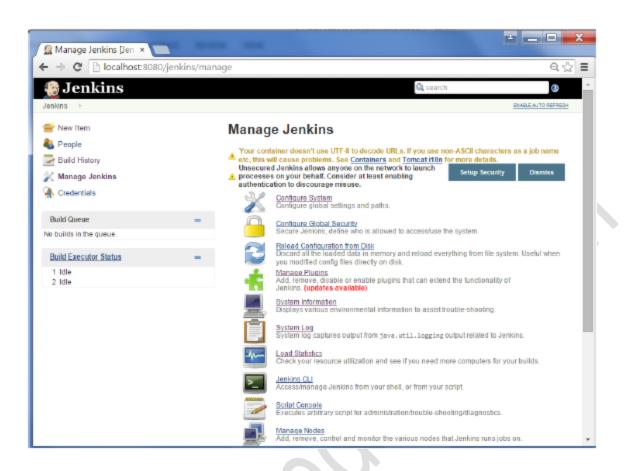
**Step 1** – Go to Manage Plugins.



**Step 2** – Find the Hudson Selenium Plugin and choose to install. Restart the Jenkins instance.



Step 3 – Go to Configure system.

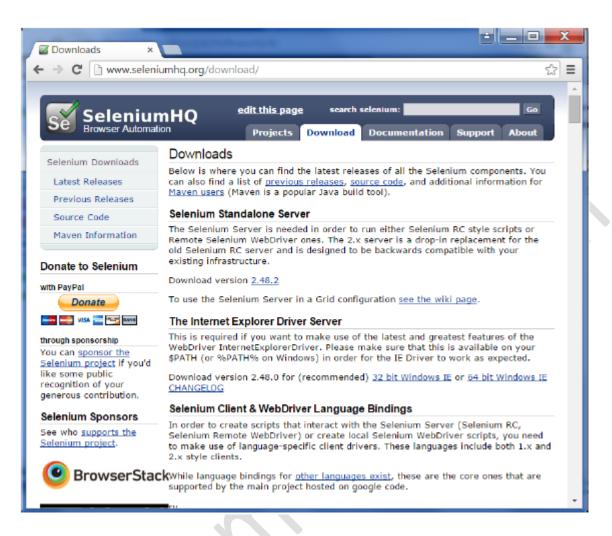


**Step 4** – Configure the selenium server jar and click on the Save button.

→ C D localhost:8080/jen/	cins/configure		Q 🏠	=
kins in configuration	Create tretraccounts take or automotivitititiers and	1001	w	-
	Default Compression Level Private Key Location	3 (Recommended) * C/Users/Babul/Usshild_rsa		
	Private Key Password	C. CSETSIBUUT.SSING_S8		
	Known Hosts Location	C:/Users/Babuli/.ssh/knovn_hosts		
	Authentication	Add		
	Subversion Subversion Workspace Version	1.4 •	•	
	Exclusion revprop name		0	
	Validate repository URLs up to the first variable r	1970.0		
	<ul> <li>Update default Subversion credentials cache aft</li> </ul>		0	
	Selenium Remote Control			
	htmlSuite Runner	E:\Apps\selenium-server-standalone-2.48.2 jar	Ø	
	Shell			
	Shell executable		10	
	E-mail Notification			
	SMTP server		1	10
	Default user e-mail suffix			
		-		
		Advanced		
	Test configuration by sending test e-mail			

**Note** – The selenium jar file can be downloaded from the location <u>SeleniumHQ</u>

Click on the download for the Selenium standalone server.



**Step 5** – Go back to your dashboard and click on the Configure option for the HelloWorld project.

	nkins/							요 문 ☆ Ξ	<u>.</u>
Jenkins						🔍 sear	ch	0	
nkins 🔸								DARK AUTO REFRECH	
New Item		All	+					Redd description	
Build History		8	w	Name ↓	Last Success	Last Failure	Last Duration		
Manage Jenkins				Helloworld	23 hr - <u>#12</u>	23 hr - <u>#10</u>	3.7 sec		
Credentials		lcon: <u>5</u> !	ΜL	Changes	Legand 🔝 I	RSS for all 🔝 RSS for	failures 🔉 RSS fo	rjust latest builds	
Build Queue	-			Duild Now					
builds in the queue.				S Delete Proje	d				
Build Executor Status	-			🔀 Contigure					
1 klie 2 klie									

**Step 6** – Click on Add build step and choose the optin of "SeleniumHQ htmlSuite Run"

Build	Henium RC instance Windows batch command javat HelloWorld.java java HelloWorld	0
Execute Command	javac HelloWorld,java	0
Command	javac HelloWorld,java	0
	java⊂ HelloWorld.java java HelloWorld	
	tee the list of available environment variables	Delete
	nHQ htmlSuite Run	
browser	Trefox	0
startURI	https://www.google.ae	0
suiteFile	E. Mpps we we ampre. In mi	0
resultFil	E:Jenkins\jobs\Helloworldworkspace\Reports\Results.html	0
other		
		Delete
Add build		
Post-build Ac		
Add post-	build action ·	

**Step 7** – Add the necessary details for the selenium test. Here the suiteFile is the TestSuite generated by using the Selenium IDE. Click on Save and execute a build. Now the post build will launch the selenium driver, and execute the html test.

Helloworld Config [] ×		- <u> </u>
← → C 🗋 localhost:8080/jenkins/job/Hell	oworld/configure	@☆ ≡
Jenkins > Helloworld > configuration		-
	Repository browser (Auto)	- 10
	Additional Behaviours Add - © Sutiversion Julid Triggers	
	Build after other projects are built Build periodically Build when a change is pushed to GitHub Poll SCM	0 0 0
	tuid  Execute Windows batch command Command Java: HelloWorld.java Java HelloWorld  Execute Int of available environment variables	0
	Add build step	Delete
	Execute Windows batch command Execute shell Imode Att Imode Att Imode Isp-Isvel Marken targets	
	SelaniumHO htmlSale Run Set build status to "pending" on GitHub commit	
localhost:8080/jenkins/job/Helloworld/configure#	Page generated Oct 11, 2015 & 17:15 PM	LATI Jenkina ver. 1.628.3 🚽

## Jenkins - Notification

Jenkins comes with an out of box facility to add an email notification for a build project.

**Step 1** – Configuring an SMTP server. Goto Manage Jenkins  $\rightarrow$  Configure System. Go to the E-mail notification section and enter the required SMTP server and user email-suffix details.

	kins/configure	Q. 😭 :
nkins E configuration		
	Default Compression Level	3 (Recommended)
	Private Key Location	C:/Users/Babuli/.ssh/id_rsa
	Private Key Password	
	Known Hosts Location	C/Users/Babull/.ssh/known_hosts
	Authentication	Add
	Subversion	
	Subversion Workspace Version	1.4
	Exclusion revprop name	
	Validate repository URLs up to the first variant	able name
	Update default Subversion credentials cach	
	Selenium Remote Control	
	htmlSuite Runner	E:\Apps\selenium-server-standalone-2
		selenium-serven jar path
	Shell	
	Shell executable	
	E-mail Notification	
	SMTP server	192.168.0.100
	Default user e-mail suffix	@emirates.com
		Advanced
	Test configuration by sending test e-mail	
	,,,	

**Step 2** – Configure the recipients in the Jenkins project - When you configure any Jenkins build project, right at the end is the ability to add recipients who would get email notifications for unstable or broken builds. Then click on the Save button.

<ul> <li>         → C         <ul> <li>localhost:8080/jenkins/job/t</li> </ul> </li> </ul>	telloworld/configure	୍⇔ ≡	
enkins → Helloworid > configuration	SeleniumHQ htmlSuite Run browser iexplore startURL https://www.google.ae suiteFile E14pps:Selenium/Sample.html resultFile Result.html other	Device	
	Post-build Actions  E-mail Notification  Recipients St12233@domain.com  Whitespace-repended list of recipient addresses. May reference build parameters like prace. E-mail will be service a build for becomes unstande or where is to stable.  Send e-mail for every unstable build  Send separate e-mails to individuals who broke the build  Add post-build action	e a. Deskor	

Apart from the default, there are also notification plugin's available in the market. An example is the notification plugin from Tikal Knowledge which allows sending Job Status notifications in JSON and XML formats. This plugin enables end-points to be configured as shown below.

⇒ C ☐ localhost:8080/jenkins/job/	Helloworld/configure					Q. 🏠	≡
nkins i Helloworld i configuration							-
Changes							
Workspace							
Build Now		Escaped H	TML) Preview			-	
Delete Project	Discard Old Builds GifHub project						
Configure						8	
	Job Notifications Notification Endpoints						
Build History trend -	Noncentra Endpoints	Delete					
21 Oct 10, 2015 12:52 AM		Format	JSON	•			
RSS for all RSS for failures		Protocol	HTTP	•			
		Event	All Events				
			Job Mecycle event triggering notification			_	
		URL	http://dx.bmem30/1xe4567h	0		•	
		Timeout	Where to send messages 30000				
			Subbu Timeout (in ma)	0			
		Log	0				
			Number lines of log messages to send. Use -1 for all (use with	caution).			
		Add End	lpoint				
	This build is parameter					•	
	<ul> <li>Disable Build (No net</li> <li>Execute concurrent b</li> </ul>		e executed until the project is re-enabled.)			0	
	Advanced Project Optio		satry			÷	
	· · · · · · · · · · · · · · · · · · ·				Advanced		
					The Call Call		

Here are the details of each option -

- **"Format"** This is the notification payload format which can either be JSON or XML.
- "Protocol" protocol to use for sending notification messages, HTTP, TCP or UDP.
- **"Event"** The job events that trigger notifications: Job Started, Job Completed, Job Finalized or All Events (the default option).
- **"URL"** URL to send notifications to. It takes the form of "<u>http://host</u>" for HTTP protocol, and "host:port" for TCP and UDP protocols.
- **"Timeout"** Timeout in milliseconds for sending notification request, 30 seconds by default.

## Jenkins - Reporting

As demonstrated in the earlier section, there are many reporting plugins available with the simplest one being the reports available for jUnit tests.

In the Post-build action for any job, you can define the reports to be created. After the builds are complete, the Test Results option will be available for further drill-down.

→ C lacalhost:8080/jenkins/j	의 ☆ 🔳		
nkins > Helloworld > configuration			
	Choose operating system windows		0
	Build		
	Execute Windows batch command Command javas Hellolorld.java java Hellolorld	xinhee	
	SeleniumHQ html Suite Run browser semione Aggregate devolutionen test results Archive the artifacts Built other projects	tesi	Date:
	Publish JUrit test result report Publish Javanico Publish Selenium Report Record Ingerprints of thes to track usage Git Publisher E-mail Notification Set build status on Github corrent		eeste
	Add post-build action -		

# Jenkins - Code Analysis

Jenkins has a host of Code Analysis plugin. The various plugins can be found at <u>https://wiki.jenkins-ci.org/display/JENKINS/Static+Code+Analysis+Plugins</u>

-> X 🙆 ht	tps://wiki.jenkins-ci.o	rg/display/JENKINS/Static+Code+Analysis+	Plug-ins		☆ ≡
shboard   Jenkins	Plugins + Static Code	Analysis Plug-ins		Browse + Q Search	-
	Code Analys	<b>is Plug-ins</b> har on Sop 24, 2014 ( <u>Visw.change</u> )	i.	🖉 Edit 🛛 🖶 Add 🔹	🕼 Tools 🔹
Jenkins					
Home	Plugin Information	on			
Mailling lists Source code	Plugin ID	analysis-core	Changes	In Latest Release Since Latest Release	
Bughracker Security Advisories Events Donation Commercial Support	Latest Release Latest Release Date Required Core Dependencies	1.74 (archives) Sep 07, 2015 1.596.1 and (version: 1.1, optional) taken-macre (version: 1.10, optional) maxie-plagin (version: 2.9, optional) matrix-project (version: 1.4) deshboard-view (version: 2.9.4, optional)	Source Code Issue Tracking Pull Requests Maintainer(s)	<u>GilHuti</u> Open Issues PvII:Requests <u>Ulli Hafner</u> (kt. drull)	
Wiki Site Map Documents	Usage	analysis-core - installations	Installations	2014-Oct 26415 2014-Nov 26297 2014-Dec 26166	
Meet Jankins Use Jankins Extend Jankins Plugins Sarvlet Container Notes		25000 20000 19000 10000 5000 0 10 11 12 01 02 03 04 05 06 07 08 09 Month		2015-Jun 27193 2015-Jun 27193 2015-Fab 27184 2015-Apr 28399 2015-Apr 28399 2015-Apr 28399 2015-Jun 28906 2015-Jul 29519 2015-Apg 29170 2015-Sep 29858	

This plugin provides utilities for the static code analysis plugins. Jenkins can parse the results file from various Code Analysis tools such as CheckStyle, FindBugs, PMD etc. For each corresponding code analysis tool, a plugin in Jenkins needs to be installed.

Additionally the add-on plugin <u>Static Analysis Collector</u> is available that combines the individual results of these plugins into a single trend graph and view.

The plugins can provide information such as

- The total number of warnings in a job
- A showing of the new and fixed warnings of a build
- Trend Reports showing the number of warnings per build
- Overview of the found warnings per module, package, category, or type
- Detailed reports of the found warnings optionally filtered by severity (or new and fixed)

### Jenkins - Distributed Builds

Sometimes many build machines are required if there are instances wherein there are a larger and heavier projects which get built on a regular basis. And running all of these builds on a central machine may not be the best option. In such a scenario, one can configure other Jenkins machines to be slave machines to take the load off the master Jenkins server.

Sometimes you might also need several different environments to test your builds. In this case using a slave to represent each of your required environments is almost a must.

A slave is a computer that is set up to offload build projects from the master and once setup this distribution of tasks is fairly automatic. The exact delegation behavior depends on the configuration of each project; some projects may choose to "stick" to a particular machine for a build, while others may choose to roam freely between slaves.

Since each slave runs a separate program called a "slave agent" there is no need to install the full Jenkins (package or compiled binaries) on a slave. There are various ways to start slave agents, but in the end the slave agent and Jenkins master needs to establish a bi-directional communication link (for example a TCP/IP socket.) in order to operate.

To set up slaves/nodes in Jenkins follow the steps given below.

**Step 1** – Go to the Manage Jenkins section and scroll down to the section of Manage Nodes.

Jenkins +		EVALEAUTOREMEEN
Build Queue No builds in the queue	-	Configure Clobal Security Secure Jenkins; define who is allowed to accessitise the system.
Build Executor Status	-	Relead Configuration frem Disk Discard all the loaded data in memory and relead everything them file system. Useful when you modified config files directly on disk.
1 Idle 2 Idle		Manage Plugins Add, remove, disable or enable plugins that can extend the functionality of Jenkins, (updates available)
		Bystem information Displays various environmental information to assist trouble-shoeting.
		System log captures output from java.util.logging output reisted to Jenkins.
		Check your resource utilization and see If you need more computers for your builds.
		Jenkins CLI Accessemenage Jonkins from your shell, or from your script
		Scilal Console Executes arbitrary script for administration/trouble-shooting/tilagnostics.
		Manage Nodes Add, ramove, control and monitor the various nodes that Jenkins runs jobs on
		Marcana Cradantiate

#### Step 2 – Click on New Node

- → C 🗋 localhost:8080	)/jenkins/comp	outer/					Q 🕁	=
🏀 Jenkins					🔍 se	arch	3	
lenkins → nodes →							ENALE AUTO NETTE	21
🚖 Back to Dashboard		5	Name (	Architecture	Clock Difference	Free Disk Space	Free Swap Space	Fre
🔀 Manage Jenkins			master	Windows 7 (x86)	in sync	229.89 GB	12.13 GB	
📕 New Node			Data obtained		3 min 12 sec	3 min 12 sec	3 min 12 sec	
🔀 Configure							Refresh status	
Build Queue	-							
No builds in the queue.								
Build Executor Status	-							
1 Idle 2 Idle								

**Step 3** – Give a name for the node, choose the Dumb slave option and click on Ok.

Q Jenkins ×	
← → C 🗋 localhost:8080/jenkins/con	nputer/new Q 😭 🗮
😥 Jenkins	🔍 search 🛛 🕐
Jenkins ⊨ nodes ⊨	
<ul> <li>▲ Back to Dashboard</li> <li>☆ Manage Jenkins</li> <li>■ New Node</li> <li>☆ Configure</li> </ul>	Node name build_slave      Dumb Slave     Adds a plain, dumb slave to Jankins. This is called "dumb" because Jankins doesn't     provide higher level of integration with these slaves, such as dynamic provisioning.     Select this type if no other slave types apply — for example such as when you are     adding a physical computer, virtual machines managed outside Jenkins, etc.
Build Queue 📼	OK
Build Executor Status =	

**Step 4** – Enter the details of the node slave machine. In the below example, we are considering the slave machine to be a windows machine, hence the option of "Let Jenkins control this Windows slave as a Windows service" was chosen as the launch method. We also need to add the necessary details of the slave node such as the node name and the login credentials for the node machine. Click the Save button. The Labels for which the name is entered as "New\_Slave" is what can be used to configure jobs to use this slave machine.

→ C Diocalhost:8080/jenkins/co	omputer/build_slave/co	nfigure	(	à 🗘
Jenkins			Q search	9
ankins 🕨 nodes 🕨 build_slave				
Back to List	Name	build_slave		0
🐛 Status	Description			0
Delete Slave	# of executors	1		0
Configure	Remote root directory	D: Uankins		0
Build History	Labels	New_Slave		0
Load Statistics	Usage	Utilize this node as muc	h as possible 🔹	0
Log	Launch method	Let Jenkins control this	Windows slave as a Windows service •	0
Build Executor Status 🚥			This launch method relies on DCOM and is often associated with <u>subte problems</u> . Consider using Launch stave agents using Java Web Start Instaad, which also permits installation as a Windows service but is generally considered more reliable.	
		Administrator user name	admin	0
		Password		
		Host	dibmem30	0
		Run service as	Use Local System User 🔹	
			Advanced	
	Availability	Keep this slave on-line	as much as possible 🔹	0
	Node Properties			
	<ul> <li>Environment varia</li> <li>Tool Locations</li> </ul>	bles		

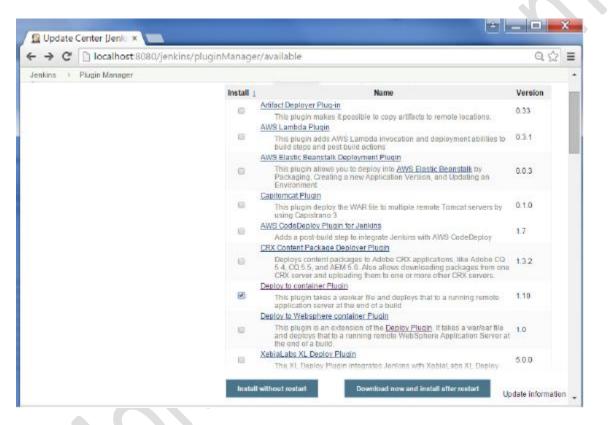
Once the above steps are completed, the new node machine will initially be in an offline state, but will come online if all the settings in the previous screen were entered correctly. One can at any time make the node slave machine as offline if required.

🙎 Nodes [Jenkins] 🛛 🗙								
← → C 🗋 localhost:80	80/jenkins/compu	uter/					Q	¶☆ ≡
👲 Jenkins						🔍 search		3
Jenkins → nodes →							EVALUA	UTO REFRECH
🚖 Back to Dashboard		\$	Name 1	Architecture	Clock Difference	Free Disk Space	Free Swap Space	Free Temp S
🎉 Manage Jenkins		-	build slave		N/A	NIA	N/A	
🛒 New Node			master	Windows 7 (x96)	in sync	229.89 GB	12.13 GB	229.8
💥 Configure			Data obtained	3 ma	2 ms	1 ma	11 min	
Build Queue	-						Refresh	status
No builds in the queue.								
Build Executor Status	-							
I master 1 idie 2 idie ∎ build_slave (offline)								

### Jenkins - Automated Deployment

There are many plugins available which can be used to transfer the build files after a successful build to the respective application/web server. On example is the "Deploy to container Plugin". To use this follow the steps given below.

**Step 1** – Go to Manage Jenkins  $\rightarrow$  Manage Plugins. Go to the Available section and find the plugin "Deploy to container Plugin" and install the plugin. Restart the Jenkins server.



This plugin takes a war/ear file and deploys that to a running remote application server at the end of a build.

Tomcat 4.x/5.x/6.x/7.x

JBoss 3.x/4.x

Glassfish 2.x/3.x

**Step 2** – Go to your Build project and click the Configure option. Choose the option "Deploy war/ear to a container"

← → C 🗋 localhost 8080/jenkins/job/Hel	iowonu/co	nigure		Q 🟠	=
Jenkins + Helloworld + configuration		ee the list of available oneitanment y	orizăs Det	eto	
	Invoke Ar Ant Version			•	
		NewHome		•	
	Targets		L	× 0	
	Aggregate o Archive the Build other Publish Jun Publish Java Publish Sele	projecta it lest result report	f xml sec serve the selected the service tax XVL second files, such as petitiestreports "well. Based of the fileset is <u>the workscare too</u> in long standard outputierror	0	
	Git Publishe	r lear to a container	) tests scores as 99% health. 5% failing tests scores as 9		
	E-mail Note	Contraction of the second s	Des	fic	
	Add post-b	Apply			

**Step 3** – In the Deploy war/ear to a container section, enter the required details of the server on which the files need to be deployed and click on the Save button. These steps will now ensure that the necessary files get deployed to the necessary container after a successful build.

> C	🗅 localhost 8080/jenkins/job/Demo/configu	ire		이 않	=
enkins -	Demo + configuration				
		ee the list of available environment of		ekte	
	invoke A			0	
	Ant Version	NewHome		•	
	Targets				
			Advanced.	**	
	WAREAR	tangerapare-1.0.war		Ð	
	Context pat	h spare		Ð	
	Containers	Tomcat 7.x Manager user name	S112233		
		Torncat URL	http://dxbmern10:8080		
			Delets		
		Add Container +			
		Manager password Terricat URL	http://dxbmern10:8080 Delete		

# Jenkins - Metrics & 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

Step 1 – Go to the Jenkins dashboard and click on Manage Jenkins

📓 Dashboard [Jenkins] ×				
← → C 🗋 localhost:808	0/jenkins/			್ ಭ ⊒
Ø Jenkins			🧟 search	٩
Jenkins >				EVABLE AUTO REPRESE
쯜 New Item				Padd description
🌯 People		Welcome to Jenkins!		
🔄 Build History				
💥 Manage Jenkins		Please create new jobs to get started.		
强 Credentials				
Build Queue	-			
No builds in the queue.				
Build Executor Status	-			
1 Idle 2 Idle				
2 1018				

**Step 2** – Go to the Manage Plugins option.

► → C 🗋 localhost.808	0/jenkins/ma	age	Q¢
Ø Jenkins		C search	Ø
Jenkins +			DWBLEAKTO ASTARON
😑 New Item		Manage Jenkins	
🍇 People		. Your container doesn't ase UTF.8 to decode URLs. If you use m	on ASCH characters on a lob
Build History		name etc, this will cause problems. See Containers and Tomcat	titen for more details.
🎉 Manage Jenkins		Unsecured Jenkins allows anyone on the network to aunch processes on your behalf. Consider at least enabling authentication to discourage misuse.	p Security Dismiss
Credentials		Configure System Configure global settings and paths	
Build Queue	-	Configure Global Security	
No builds in the queue.		Secure Jenkins, define who is allowed to access/use to	he cystem.
Build Executor Status	-	Reload Configuration from Disk Discard all the loaded data in memory and reload eve Useful when you modified config files directly on disk.	rything from file system.
1 idie 2 idie		Manade Plugins Add, remove, disable of enable plugins that can exten Jenkins, (updates available)	
		System Information Displays various environmental information to assist to	ouble-shooting.
		System Log System log captures output Yom java.util.logging	output related to Jenkins.
		Check your resource utilization and see if you need m builds	ore computers for your
		Jenkins CLI Access/manage Jenkins from your shell, or from your	script
		Script Console Executes arbitrary script for administration/trouble-sho	ofingidiagnostics.
		Manage Nodes Add, remove, control and monitor the various nodes th	at Jenkins runs jobs on.
		Manage Credentials Create/delete/modify the credentials that can be used running in Jenkins to connect to 3rd party services	by Jenkins and by jobs
		About Jenkins	

**Step 3** – Go to the Available tab and search for the plugin 'Build History Metrics plugin' and choose to 'install without restart'.

😫 Update Center [Jenki ×			
← → C 🗋 localhost:8080/jenkins/plu	uginManager/available		९.☆ ≡
🎡 Jenkins		🔍 search	0
Jenkins 🔸 Plugin Manager			
🛧 Back to Dashboard		Filter	9, build-history-metrics-plugin
💥 Manage Jenkins	Updates Available	Installed Advanced	
	Install 🛓	Namo	Version
	Build History M     Provides b	<u>etrics plugin</u> uiid metrics that encompass the history of all the runs	1.2
	Install without restart	Download now and install after restart	Update information obtained: 2 mi

**Step 4** – The following screen shows up to confirm successful installation of the plugin. Restart the Jenkins instance.

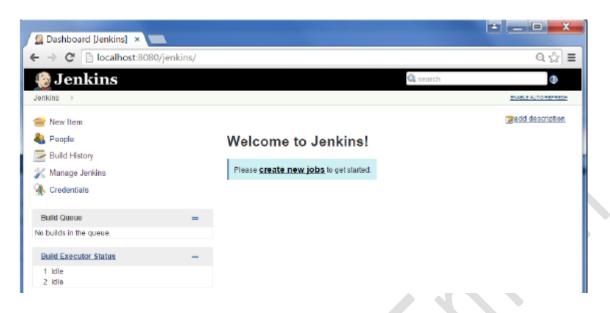
→ C Diocalhost:8080/jenkins/con	iparent pano_parent/co			Q☆
Jenkins			Q, search	٩
nkins > nodes > build_slave				
Back to List	Name	build_slave		0
Status	Description			0
Delete Slave	# of executors	1		0
Configure	Remote root directory	D: Uenkins		۲
Build History	Labels	New_Slave		0
Load Statistics	Usage	Utilize this node as muc	h as possible	• 😣
Log	Launch method	Let Jenkins control this	Windows slave as a Windows service	• 0
Build Executor Status 😐			This launch method relias on DCOM and is often associated with <u>subtle problems</u> . Consider using Launch stave agents using Java Web Start instead which also permits installation as a Windows service is generally considered more reliable.	
		Administrator user name	admin	0
		Password		
		Host	dxbmem30	0
		Run service as	Use Local System User	•
			Advanced	
	Availability	Keep this slave on-line a	as much as possible	• 0
	Node Properties			
	Environment varia	bles		

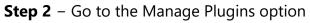
When you go to your Job page, you will see a table with the calculated metrics. Metric's are shown for the last 7 days, last 30 days and all time.

	C 🗋 localhost:8080	/jenkins/job/Hell	oworld/	Q. 🏠 🗄		
🔁 J	enkins				🔍 search	Ð
00	Helloworld +					ENABLE AUTO REFIREDH
Back	to Dashboard		Project Hell	loworld		
Statu	16		rojectnen	oworru		
						Padd description
Chan	-					Disable Project
Work	space					
Build	Now		Workspace			
S Delet	e Project		-00000000			
Confi	aure		Recent Char	iges		
	2					
🚊 Bui	ld History	trend =		Last 7 Days	0 ms	]
<u>#12</u>	Oct 24, 2015 3:57 PM		MTTR	Last 30 Days	23 hr	
<u>≢11</u>	Oct 15, 2015 10:22 PM			All Time	23 hr	
<b>≠1</b> 0	Oct 12, 2015 10:50 PM			Last 7 Days	0 ms	
) <u>#9</u>	Oct 12, 2015 10:48 PM		MTTE	Last 30 Days	2 days 4 hr	
2 #8	Oct 12, 2015 10:40 PM			All Time	2 days 4 hr	
) <u>#1</u>	Oct 12, 2015 10:39 PM			Last 7 Days	0 ms	
2 #8	Oct 12, 2015 10:31 PM		Standard Deviation	Last 30 Days	52 sec	
#5	Oct 12, 2015 10:29 PM			All Time	52 sec	
2 #	Oct 12, 2015 8:33 PM					-
	Oct 11, 2015 11:04 PM		Permalinks			
i) #3	Oct 11, 2015 10:51 PM		<ul> <li>Last build (#12).</li> </ul>		-	
	Oct 11, 2015 10:48 PM		<ul> <li>Last stable build</li> <li>Last successful t</li> </ul>	ouild (#11), 8 days	s 17 hr ago	
_				(#12), 5,5 sec aq		

To see overall trends in Jenkins, there are plugins available to gather information from within the builds and Jenkins and display them in a graphical format. One example of such a plugin is the 'Hudson global-build-stats plugin'. So let's go through the steps for this.

Step 1 – Go to the Jenkins dashboard and click on Manage Jenkins





> C 🗋 localhost 808	0/jenkins/ma	nage Q s	13
Jenkins		Q, search 🕖	
lenkins 🕨		Diebularto renes	8
🔐 New Item		Manage Jenkins	
👌 People			
Build History		Your container doesn't use UTF-8 to decode URLs. If you use non-ASCII characters as a job aname etc, this will cause problems. See <u>Containers</u> and <u>Tomcat H8n</u> for more details.	
Manage Jenkins		Unsecured Jenkins allows anyone on the network to a launch processes on your behalf. Consider at least enabling authentication to discourace misuse.	
Credentials		Configure System Configure global settings and paths	
Build Queue	-	Configure Global Security	
to builds in the queue.		Secure Jenkins; define who is allowed to access/use the system.	
Build Executor Status	-	Reload Configuration from Disk Discard all the loaded data in memory and reload everything from file system. Useful when you modified config files directly on disk.	
1 Idie 2 Idie		Manage Plugins Add, remove, disable or enable plugins that can extend the functionality of Jenkins. (updates available)	
		System Information Displays various environmental information to assist trouble-shooting.	
		System Log System log captures output from java.util.logging output related to Jenkins.	
		Load Statistics Check your resource utilization and see if you need more computers for your builds	
		Jenkins CLI Access/manage Jenkins from your shall, or from your script.	
		Script Console Executes arbitrary script for administration/trouble-shooting/diagnostics.	
		Manage Nodes Add, remove, control and monitor the various nodes that Jenkins runs jobs on.	
		Manage Credentials Create/delete/modely the credentials that can be used by Jenkins and by jobs running in Jenkins to connect to 3rd party services	
		About Jenkins Saa bina sametrice and licenses information	

**Step 3** – Go to the Available tab and search for the plugin 'Hudson global-build-stats plugin' and choose to 'install without restart'.

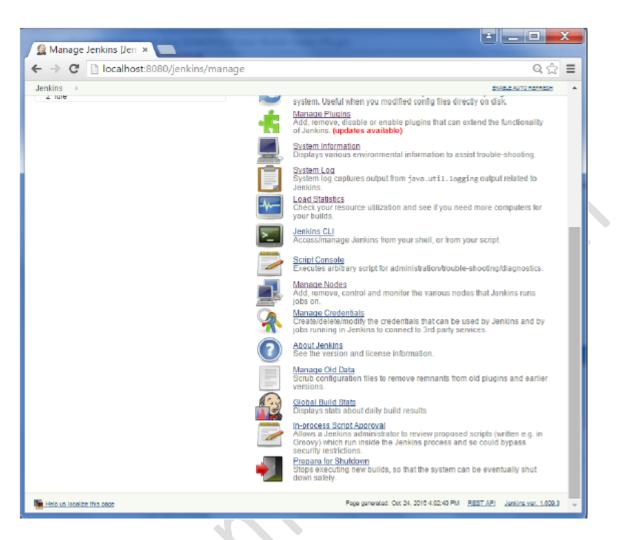
← → C 🗋 localhost:8080/jer	kins/pluginManager/	available			Q ☆ Ξ
🧶 Jenkins			🔍 searc	h	0
Jenkins 🔸 Plugin Manager					
🛧 Back to Dashboard			Fi	iter: 🔍 global-build-stats	
💥 Manage Jenkins	Update	s Available	Installed Advanced		
	Install 🕴		Name		Version
	Ŀ	ludson global-bu	ild-stats plugin		
	8	build result s	stats plugin will allow to ga atistics. It is a useful tool a trend over time.	ther and display global llowing to display global	1.3
	Install v	thout restart	Download now	and install after restart	Update info

**Step 4** – The following screen shows up to confirm successful installation of the plugin. Restart the Jenkins instance.

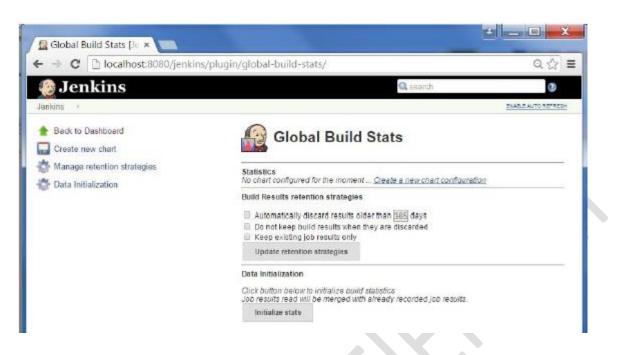


To see the Global statistics, please follow the Step 5 through 8.

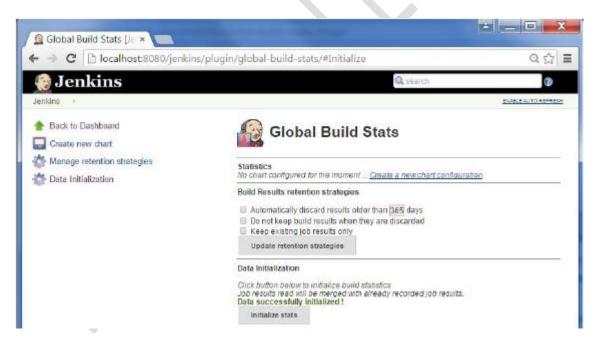
**Step 5** – Go to the Jenkins dashboard and click on Manage Jenkins. In the Manage Jenkins screen, scroll down and now you will now see an option called 'Global Build Stats'. Click on this link.



**Step 6** – Click on the button 'Initialize stats'. What this does is that it gather's all the existing records for builds which have already been carried out and charts can be created based on these results.



**Step 7** – Once the data has been initialized, it's time to create a new chart. Click on the 'Create new chart' link.



**Step 8** – A pop-up will come to enter relevant information for the new chart details. Enter the following mandatory information

- Title Any title information, for this example is given as 'Demo'
- 🔸 Chart Width 800
- 4 Chart Height 600
- Chart time scale Daily

4 Chart time length – 30 days

The rest of the information can remain as it is. Once the information is entered, click on Create New chart.

<ul> <li>Global Build Stats [/e ×</li> <li>← → C i localhost:8080/jenkins/plugin/global-build-stats/#</li> <li>Q ☆ =</li> </ul>	
Search Casearch Casearch	
Jenkins >	
Back to Dashboard     Global Build Stats	•
Image retention strategies         Statistics           Image retention strategies         Statistics           Image retention strategies         No chart configured for the moment <u>Create a new chart configuration</u>	
Adding new chart	
Chart Width * Height: <u>B00 * B00</u> Chart time length: <u>30</u> days Filters: Job filtering: ® ALL Jobs © Job name regex: Node filtering: ® ALL Jobs © Master only © Node name regex: Launcher filtering: ® ALL Users © System only © Usemame regex: Statuses taken into account: Ø Success Ø Failures Ø Unstables Ø Aborted © Not Build Elements displayed on chart: Ø Build statuses with Y Axis type : Count ▼ Ø Total build time Ø Average build time	
Overview Create new chart Cancel	
Poge generated. Oct 24, 2016 4.03:17 PM BEST API Junking vor. 1.009.3	

You will now see the chart which displays the trends of the builds over time.

C D localhost 8080/www.in	w/www.gkobility.ukid-stats)*	요☆ 물
Jenkins	Q. insert	0
Jerkina -		Delinguarday (
<ul> <li>Brack to Distribution</li> <li>Create new shart</li> </ul>	Global Build Stats	
🐉 Menage reteritor strategies 👘 Data Initialization	Bolistics Demo	
	41 III III III III	
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	2 <sup>10</sup> m <sup>10</sup>	
	2 AL (1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1	
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	21 Keep e citang jap eeu lit ann.	
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If you click on any section within the chart, it will give you a drill down of the details of the job and their builds.

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### Jenkins - Server Maintenance

The following are some of the basic activities you will carry out, some of which are best practices for Jenkins server maintenance

#### **URL Options**

The following commands when appended to the Jenkins instance URL will carry out the relevant actions on the Jenkins instance.

http://localhost:8080/jenkins/exit - shutdown jenkins

http://localhost:8080/jenkins/restart - restart jenkins

http://localhost:8080/jenkins/reload - to reload the configuration

#### **Backup Jenkins Home**

The Jenkins Home directory is nothing but the location on your drive where Jenkins stores all information for the jobs, builds etc. The location of your home directory can be seen when you click on Manage Jenkins  $\rightarrow$  Configure system.

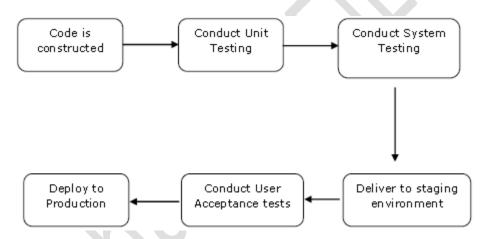
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Set up Jenkins on the partition that has the most free disk-space – Since Jenkins would be taking source code for the various jobs defined and doing continuous builds, always ensure that Jenkins is setup on a drive that has enough hard disk space. If you hard disk runs out of space, then all builds on the Jenkins instance will start failing.

Another best practice is to write cron jobs or maintenance tasks that can carry out clean-up operations to avoid the disk where Jenkins is setup from becoming full.

#### Jenkins - Continuous Deployment

Jenkins provides good support for providing continuous deployment and delivery. If you look at the flow of any software development through deployment, it will be as shown below.



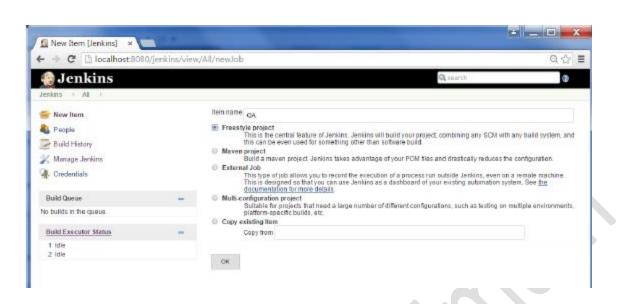
The main part of Continuous deployment is to ensure that the entire process which is shown above is automated. Jenkins achieves all of this via various plugins, one of them being the "Deploy to container Plugin" which was seen in the earlier lessons.

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There are plugins available which can actually give you a graphical representation of the Continuous deployment process. But first lets create another project in Jenkins, so that we can see best how this works.

Let's create a simple project which emulates the QA stage, and does a test of the Helloworld application.

**Step 1** – Go to the Jenkins dashboard and click on New Item. Choose a 'Freestyle project' and enter the project name as 'QA'. Click on the Ok button to create the project.



**Step 2** – In this example, we are keeping it simple and just using this project to execute a test program for the Helloworld application.

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So our project QA is now setup. You can do a build to see if it builds properly.

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**Step 3** – Now go to you Helloworld project and click on the Configure option

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**Step 4** – In the project configuration, choose the 'Add post-build action' and choose 'Build other projects'

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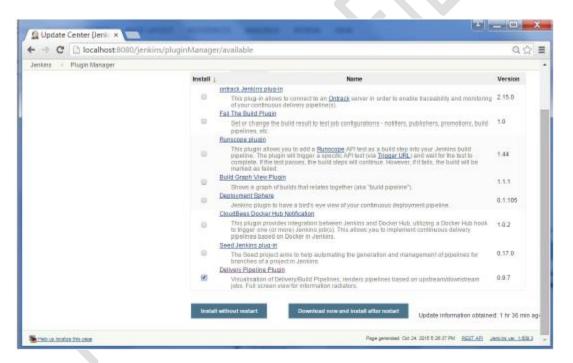
**Step 5** – In the 'Project to build' section, enter QA as the project name to build. You can leave the option as default of 'Trigger only if build is stable'. Click on the Save button.

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**Step 6** – Build the Helloworld project. Now if you see the Console output, you will also see that after the Helloworld project is successfully built, the build of the QA project will also happen.



**Step 7** – Let now install the Delivery pipeline plugin. Go to Manage Jenkins  $\rightarrow$  Manage Plugin's. In the available tab, search for 'Delivery Pipeline Plugin'. Click On Install without Restart. Once done, restart the Jenkins instance.



**Step 8** – To see the Delivery pipeline in action, in the Jenkins Dashboard, click on the + symbol in the Tab next to the 'All' Tab.

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**Step 9** – Enter any name for the View name and choose the option 'Delivery Pipeline View'.

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lo builds in the queue.				
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**Step 10** – In the next screen, you can leave the default options. One can change the following settings –

- **4** Ensure the option 'Show static analysis results' is checked.
- **4** Ensure the option 'Show total build time' is checked.
- For the Initial job Enter the Helloworld project as the first job which should build.
- Enter any name for the Pipeline
- Click the OK button.

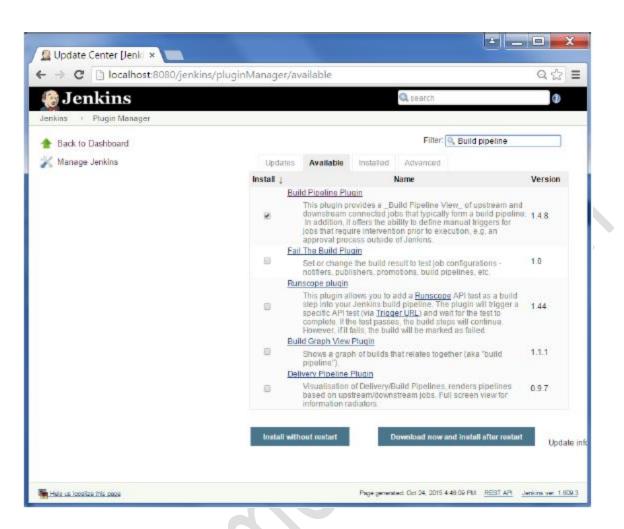
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You will now see a great view of the entire delivery pipeline and you will be able to see the status of each project in the entire pipeline.

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#12 triggered by user anonymous started 2 hours ago Total build time: 1 sec Helloworld QA Helloworld QA	No builds in the queue.  Build Executor Status -  1 Idle	Total build time: 3 sec Helloworld Helloworld #12 triggered by user anonymous started 2 hours ago Total build time: 1 sec Helloworld QA	

Another famous plugin is the **build pipeline plugin**. Let's take a look at this.

**Step 1** – Go to Manage Jenkins  $\rightarrow$  Manage Plugin's. In the available tab, search for 'Build Pipeline Plugin'. Click On Install without Restart. Once done, restart the Jenkins instance.



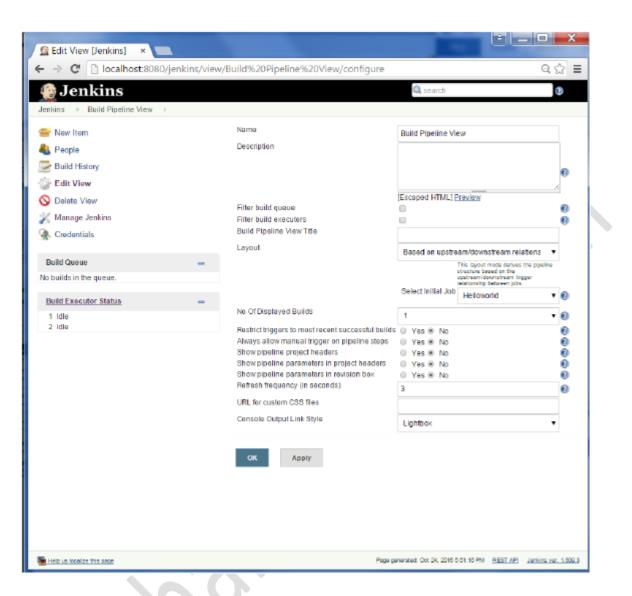
**Step 2** – To see the Build pipeline in action, in the Jenkins Dashboard, click on the + symbol in the Tab next to the 'All' Tab.

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**Step 3** – Enter any name for the View name and choose the option 'Build Pipeline View'.

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**Step 4** – Accept the default settings, just in the Selected Initial job, ensure to enter the name of the Helloworld project. Click on the Ok button.

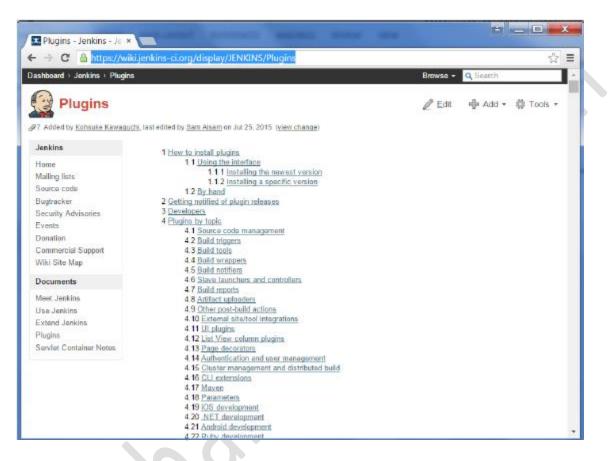


You will now see a great view of the entire delivery pipeline and you will be able to see the status of each project in the entire pipeline.

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# Jenkins - Managing Plugins

To get the list of all plugins available within Jenkins, one can visit the link – <u>https://wiki.jenkins-ci.org/display/JENKINS/Plugins</u>



We've already seen many instances for installing plugins, let's look at some other maintenance tasks with regards to plugins

### **Uninstalling Plugins**

To uninstall a plugin, Go to Manage Jenkins  $\rightarrow$  Manage plugins. Click on the Installed tab. Some of the plugins will have the Uninstall option. You can click these buttons to uninstall the plugins. Ensure to restart your Jenkins instance after the uninstallation.

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### Installing another Version of a Plugin

Sometimes it may be required to install an older version of a plugin, in such a case, you can download the plugin from the relevant plugin page on the Jenkins web site. You can then use the **Upload** option to upload the plugin manually.

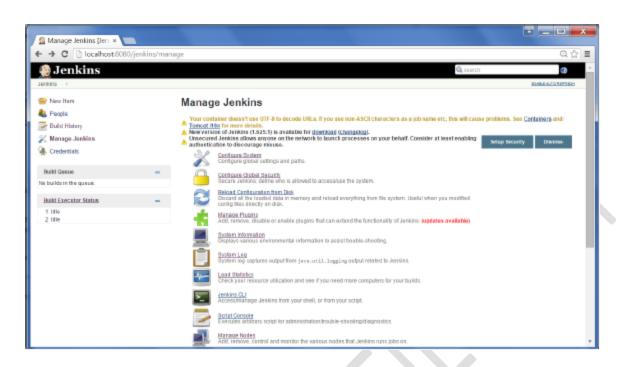
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# Jenkins - Security

In Jenkins you have the ability to setup users and their relevant permissions on the Jenkins instance. By default you will not want everyone to be able to define jobs or other administrative tasks in Jenkins. So Jenkins has the ability to have a security configuration in place.

To configure Security in Jenkins, follow the steps given below.

**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 it's own database of users, so in the Security Realm, choose the option of 'Jenkins' own user database'.

By default you would want a central administrator to define users in the system, hence ensure the 'Allow users to sign up' option is unselected. You can leave the rest as it is for now and click the Save button.

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**Step 3** – You will be prompted to add your first user. As an example, we are setting up an admin users for the system.

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💥 Manage Jenkins	
Note and the User Note and Not	Username: admin Password: Confirm password:
	Full name: Administrator E-mail address: al@gmail.com

**Step 4** – It's now time to setup your users in the system. Now when you go to Manage Jenkins, and scroll down, you will see a 'Manage Users' option. Click this option.

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	Load Statistics Check your resource utilization and see if you need more computers for your build	ts.
	Accessimating Jenkins from your shell, or from your script.	
	Strict Consule Executes arbitrary script for administration/trouble-shooting/diagnostics.	
	Manage Nodes Add, remove, control and monitor the various nodes that Jankins runs jobs on	
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	About Janisms See the version and license information	
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**Step 5** – Just like you defined your admin user, start creating other users for the system. As an example, we are just creating another user called 'user'.

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**Step 6** – Now it's time to setup your authorizations, basically who has access to what. Go to Manage Jenkins  $\rightarrow$  Configure Global Security.

Now in the Authorization section, click on 'Matrix based security'

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**Step 7** – If you don't see the user in the user group list, enter the user name and add it to the list. Then give the appropriate permissions to the user.

Click on the Save button once you have defined the relevant authorizations.

Your Jenkins security is now setup.

**Note** – For Windows AD authentication, one has to add the Active Directory plugin to Jenkins.

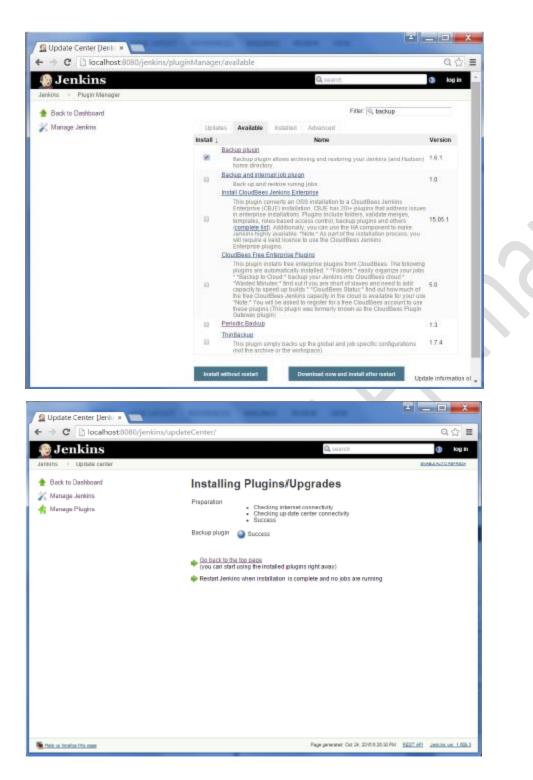
# Jenkins - Backup Plugin

Jenkins has a backup plugin which can used to backup critical configuration settings related to Jenkins. Follow the steps given below to have a backup in place.

**Step 1** – Click on Manage Jenkins and choose the 'Manage Plugins' option.

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**Step 2** – In the available tab, search for 'Backup Plugin'. Click On Install without Restart. Once done, restart the Jenkins instance



**Step 3** – Now when you go to Manage Jenkins, and scroll down you will see 'Backup Manager' as an option. Click on this option.

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	È,	<u>System Log</u> System log captures output from java.util.logging output related to Jenkins.	
		Load Statistics Check your resource utilization and see if you need more computers for your builds.	
	2	Jenkins CL1 Access/manage Jenkins from your shell, or from your script.	
	2	<u>Script Console</u> Executes arbitrary script for administration/trouble-shooting/diagnostics.	
	₫.	Manage Nodes Add, remove, control and monitor the various nodes that Jenklins runs jobs on.	į,
	R	Manage Credentials Create/delete/modify the credentials that can be used by Jenkins and by jobs running in Jenkins to connect to 3rd party services.	I
	0	About Jenkins See the version and license information.	I
		Manace Old Data Scrub configuration files to remove remnants from oid plugins and earlier versions.	I
		<u>Global Build State</u> Displays stats about daily build results	I
	4	Manage Users Create/delete/modify users that can log in to this Jenkins	I
	1	In-process Script Approval Allows a Jenkins administrator to review proposed scripts (written e.g. in Groovy) which run inside the Jenkins process and so could bypass security restrictions.	I
	ŋ	<u>Backup manager</u> Backup or Restore Jenkins configuration files	
	-	Propare for Shutdown Stops executing new builds, so that the system can be eventually shut down safely.	

#### Step 4 – Click on Setup.

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lenkins 🕐 Backup manager				
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**Step 5** – Here, the main field to define is the directory for your backup. Ensure it's on another drive which is different from the drive where your Jenkins instance is setup. Click on the Save button.

g Jenkins ×				± ×
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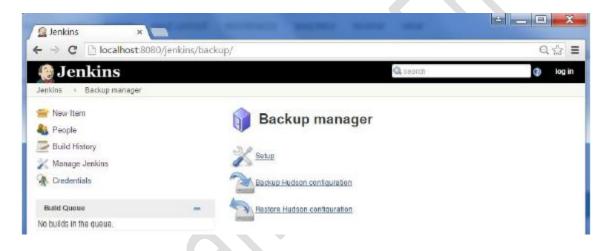
**Step 6** – Click on the 'Backup Hudson configuration' from the Backup manager screen to initiate the backup.

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Jenkins + Backup manager			
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The next screen will show the status of the backup

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To recover from a backup, go to the Backup Manager screen, click on Restore Hudson configuration.



The list of backup's will be shown, click on the appropriate one to click on Launch Restore to begin the restoration of the backup.

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lenitins 🕕 Backup manager			
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Build Queue	-		
No builds in the queue.			
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1 Idio 2 Idie			

#### Resources

https://www.jenkins.io/

https://www.jenkins.io/doc/

https://www.jenkins.io/doc/book/system-administration/

https://www.tutorialandexample.com/jenkins-tutorial/