

Jenkins Pipeline Tutorial

In this Jenkins pipeline tutorial, we will look at the following

1. Types of Jenkins Pipeline
2. Pipeline as code basics
3. Building a basic CI pipeline as code for java app.
4. Building a job from pipeline code present in source code repo.
5. Executing parallel stages in a pipeline
6. Generating pipeline script & directives using Jenkins inbuilt generators.

Types of Jenkins Pipeline

There are two types of Jenkins pipeline code.

1. Declarative Pipeline
2. Scripted Pipeline

In this tutorial, we will focus only on the declarative syntax as it is an advanced version of the scripted pipeline with extensible features. Also, I recommend using the declarative pipeline approach for all your Jenkins use cases. There are a lot of features and benefits you will get from the declarative pipeline approach.

You can check out my article on [Jenkins's multibranch pipeline](#) which uses declarative pipeline as code with Jenkinsfile approach.

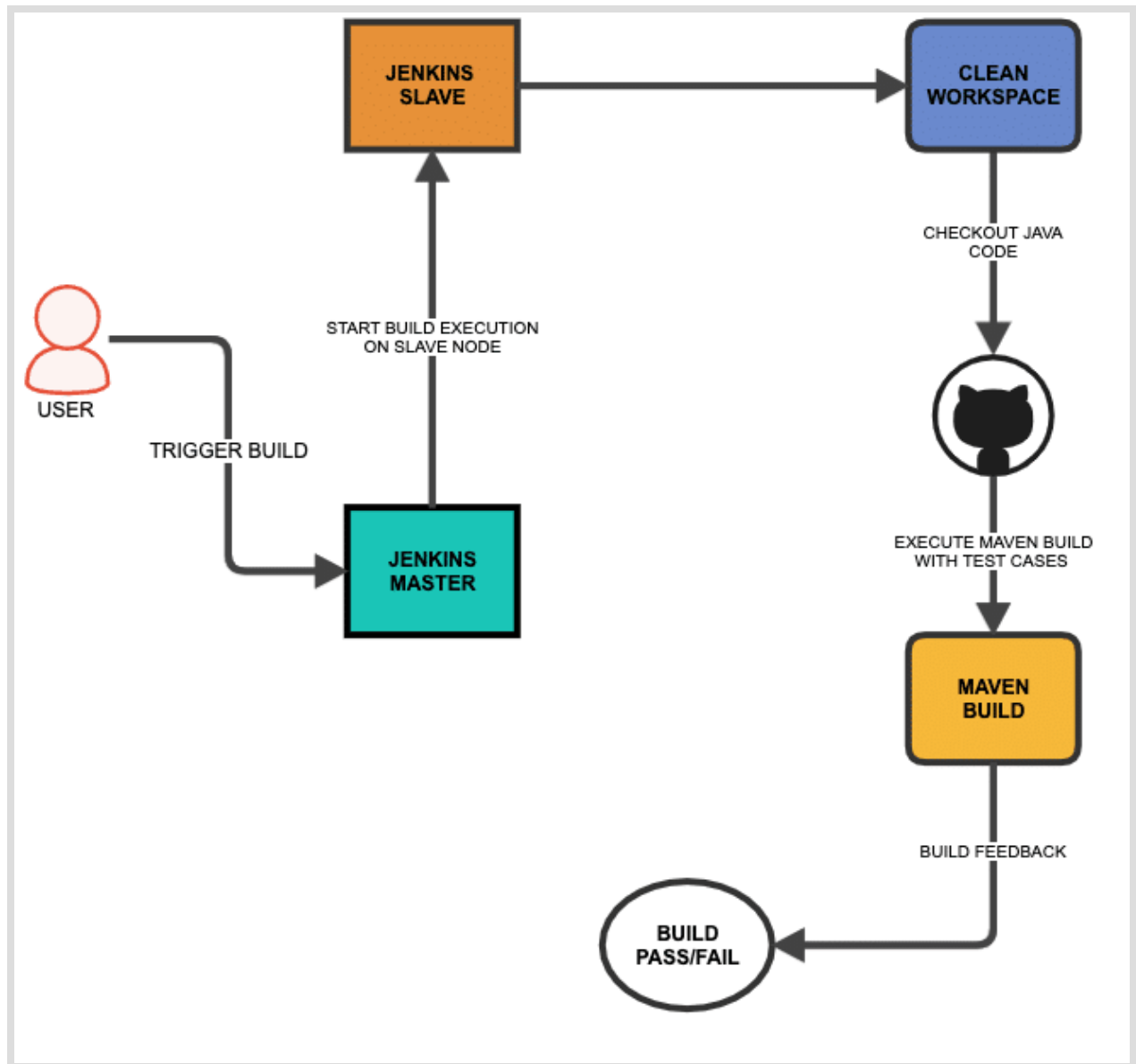
Now let's get started with the pipeline tutorial.

For better understanding, we will create a pipeline for the Java Spring Boot application build using the declarative pipeline as code.

Prerequisites

1. Jenkins master (Check [Jenkins installation steps](#))
2. Jenkins slave node connected to the master (Check [Jenkins slave setup guide](#))
3. Access to Github.com from your Jenkins server. If you are trying out from your corporate Jenkins setup, you can use your organization's private git repo.

Here is the pictorial representation of the simple build pipeline we are going to build.



Here is the pipeline code for the above workflow. Before setting up the pipeline we will understand what each block means.

Note: Do not worry about the DSL used in the pipeline code. Read the article fully to understand how to generate the DSLs in an easy way.

```

pipeline {

    agent {
        node {
            label 'SLAVE01'
        }
    }

    tools {
        maven 'maven3'
    }

    options {
        buildDiscarder logRotator(
            daysToKeepStr: '15',
            numToKeepStr: '10'
        )
    }

    environment {
        APP_NAME = "DCUBE_APP",
        APP_ENV  = "DEV"
    }

    stages {

        stage('Cleanup Workspace') {
            steps {
                cleanWs()
                sh """
                echo "Cleaned Up Workspace for ${APP_NAME}"
                """
            }
        }

        stage('Code Checkout') {
            steps {
                checkout([
                    $class: 'GitSCM',
                    branches: [[name: '*/master']],
                    userRemoteConfigs: [[url:
'https://github.com/spring-projects/spring-petclinic.git']]
                ])
            }
        }
    }
}

```

```

    }

    stage('Code Build') {
        steps {
            sh 'mvn install -Dmaven.test.skip=true'
        }
    }

    stage('Printing All Global Variables') {
        steps {
            sh """
            env
            """
        }
    }
}
}

```

Now lets understand what each block means.

1. The Pipeline Block: All your pipeline as code should be wrapped inside the pipeline block.

```

pipeline {

---<All Pipeline blocks go here>---

}

```

1. Agent Block: In the agent block you have to mention the slave details where you want to run the pipeline job. It supports both **static slaves** and **docker based dynamic slaves**. Here we have mentioned label as "SLAVE01". It is the name of a slave node.

```
agent {  
    node {  
        label 'SLAVE01'  
    }  
}
```

1. Tools Block: Here you can refer to the tools you have configured in the Jenkins Global tool configuration. We have covered the tool configuration in the next section.

```
tools {  
    maven 'maven3'  
  
}
```

1. Options Block: It contains all the options required for the job. One example, we have given is "Build Discarder" to rotate the build logs.

```
options {  
    buildDiscarder logRotator(  
        daysToKeepStr: '15',  
        numToKeepStr: '10'  
    )  
}
```

```
}
```

1. Environment Block: In this block, you can mention all the required variables for the job which has to be available in all the stages. You can define any number of variables like a key-value pair.

```
environment {  
    APP_NAME = "DCUBE_APP",  
    APP_ENV  = "DEV"  
  
}
```

1. Stages: Stages block contains multiple stages.

```
stages {  
  
    ---<All Pipeline Stages Go Here>---  
  
}
```

1. Stage Block: A stage is a subset of stages. Each stage has a `steps` block.
1. Steps Block: In each `steps` block you define a set of operations to perform. In the following example, we have shown a workplace cleanup step and echoing a variable we defined in the environment block. What you want to run inside each stage depends totally on your use case.

```
stage('Cleanup Workspace') {
```

```
        steps {
            cleanWs()
            sh """
            echo "Cleaned Up Workspace for ${APP_NAME}"
            """
        }
    }
}
```

Now that we have a basic understanding of a minimal pipeline as code, lets practically execute this pipeline on a Jenkins server with a slave node.

Configure Pipeline as Code Job In Jenkins

To execute the pipeline code we have in this article, we need to configure maven in global tool configuration.

Go to Manage Jenkins -> Global Tool Configuration -> Maven -> Maven Installation.

Add a maven configuration as shown below. We are using the tool name as `maven3` in the pipeline, so that it refers to the maven under “Global Tool Configuration”.

Maven

Maven installations

Maven
Name maven3
<input checked="" type="checkbox"/> Install automatically
Install from Apache
Version 3.6.0

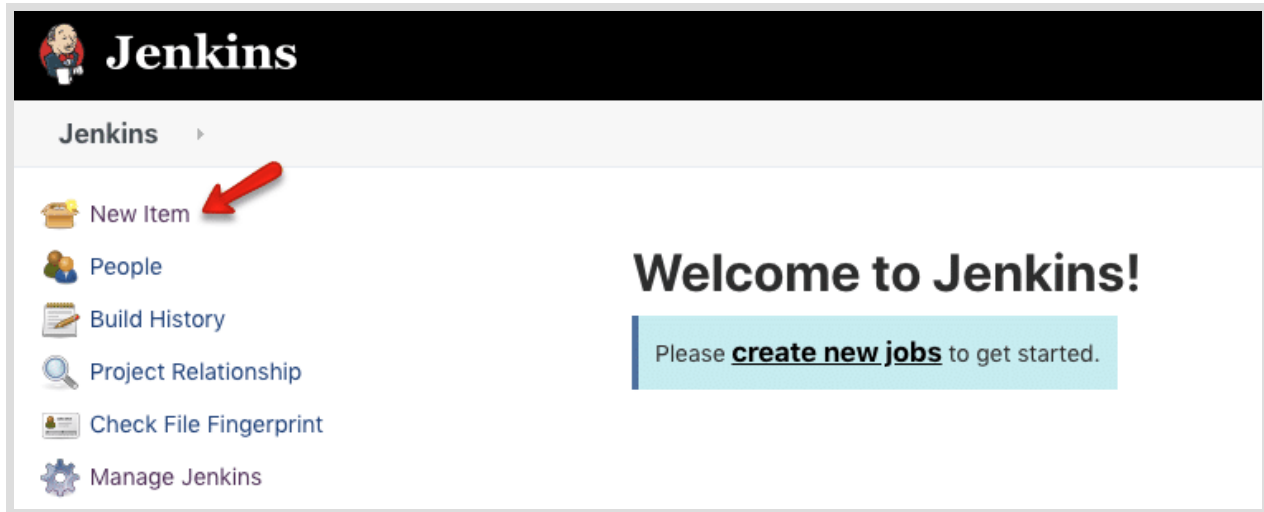
Add Installer

Note: We have selected “Install Automatically” option, which will download the selected version every time you execute the job.

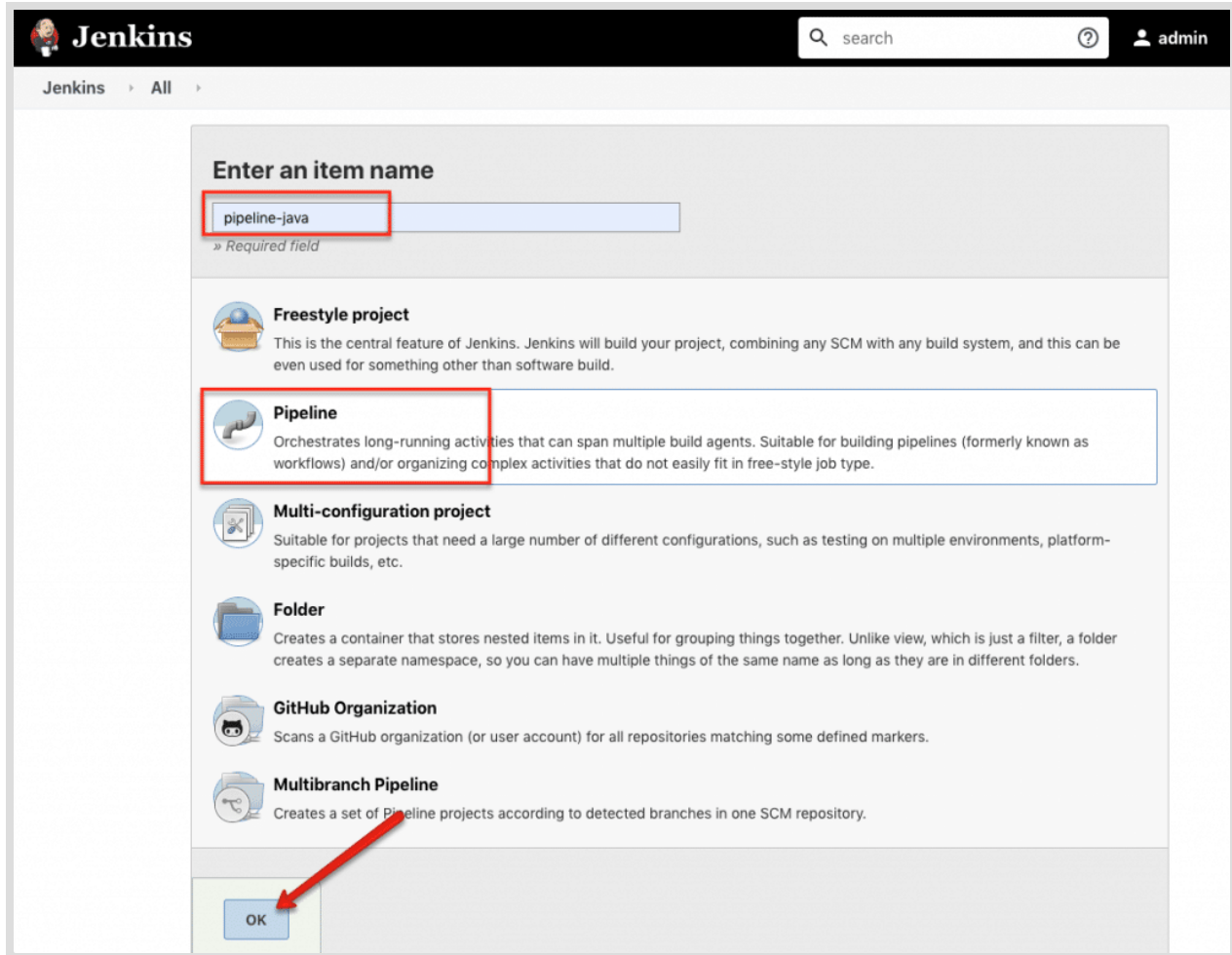
Creating & Building a Jenkins Pipeline Job

Follow the steps given below to create and build our pipeline as code.

Step 1: Go to Jenkins home and select “New Item”



Step 2: Give a name, select "Pipeline" and click ok.



Step 3: Scroll down to the Pipeline section, copy the whole pipeline code in the script section and save it.

Pipeline

Definition Pipeline script

Script

```
1 pipeline {
2
3
4   agent {
5     node {
6       label 'SLAVE01'
7     }
8   }
9
10  tools {
11    maven 'maven3'
12  }
13
14  options {
15    buildDiscarder logRotator{
```

try sample Pipeline... ?

☒ Use Groovy Sandbox ?

[Pipeline Syntax](#)

Save **Apply**

Step 4: Now, click “Build Now” and wait for the build to start.

Jenkins search

Jenkins > pipeline-java >

[Back to Dashboard](#)

[Status](#)

[Changes](#)

[Build Now](#)

[Delete Pipeline](#)

[Configure](#)

[Full Stage View](#)

[Rename](#)

[Pipeline Syntax](#)

Pipeline pipeline-java

[Recent Changes](#)

Stage View

No data available. This Pipeline has not yet run.

While the job starts you can view each stage executing in stage view. Here is the screenshot of a successfully executed job. Also, you can the job logs by clicking the blue icon.

Jenkins pipeline-java

Back to Dashboard
Status
Changes
Build Now
Delete Pipeline
Configure
Full Stage View
Rename
Pipeline Syntax

Pipeline pipeline-java

add description
Disable Project

Recent Changes

Stage View

Declarative: Tool Install	Cleanup Workspace	Code Checkout	Code Build	Priting All Global Variables
94ms	533ms	1s	28s	521ms

Average stage times: (Average full run time: ~31s)

Build History trend

#1 11 Apr 2020, 14:10

Atom feed for all Atom feed for failures

If you have the blue ocean plugin installed, you can have a very good UI to view your job status and logs as shown below. Use the “Open in Blue Ocean” from the left to open a job in the blue ocean view.

✓ pipeline-java 1

Branch: — 32s No changes
Commit: — 24 minutes ago Started by user admin

Start Cleanup Workspace Code Checkout Code Build Priting All Global Variables End

Priting All Global Variables - <1s

- ✓ > maven3 — Use a tool from a predefined Tool Installation <1s
- ✓ > Fetches the environment variables for a given tool in a list of 'FOO=bar' strings suitable for the withEnv step. <1s
- ✓ > env — Shell Script <1s

Restart Priting All Global Variables

Executing Jenkins Pipeline From Github (Jenkinsfile)

In the last section, we used the pipeline script directly on Jenkins. In this section, we will look at how to execute a pipeline script available in an SCM system like Github.

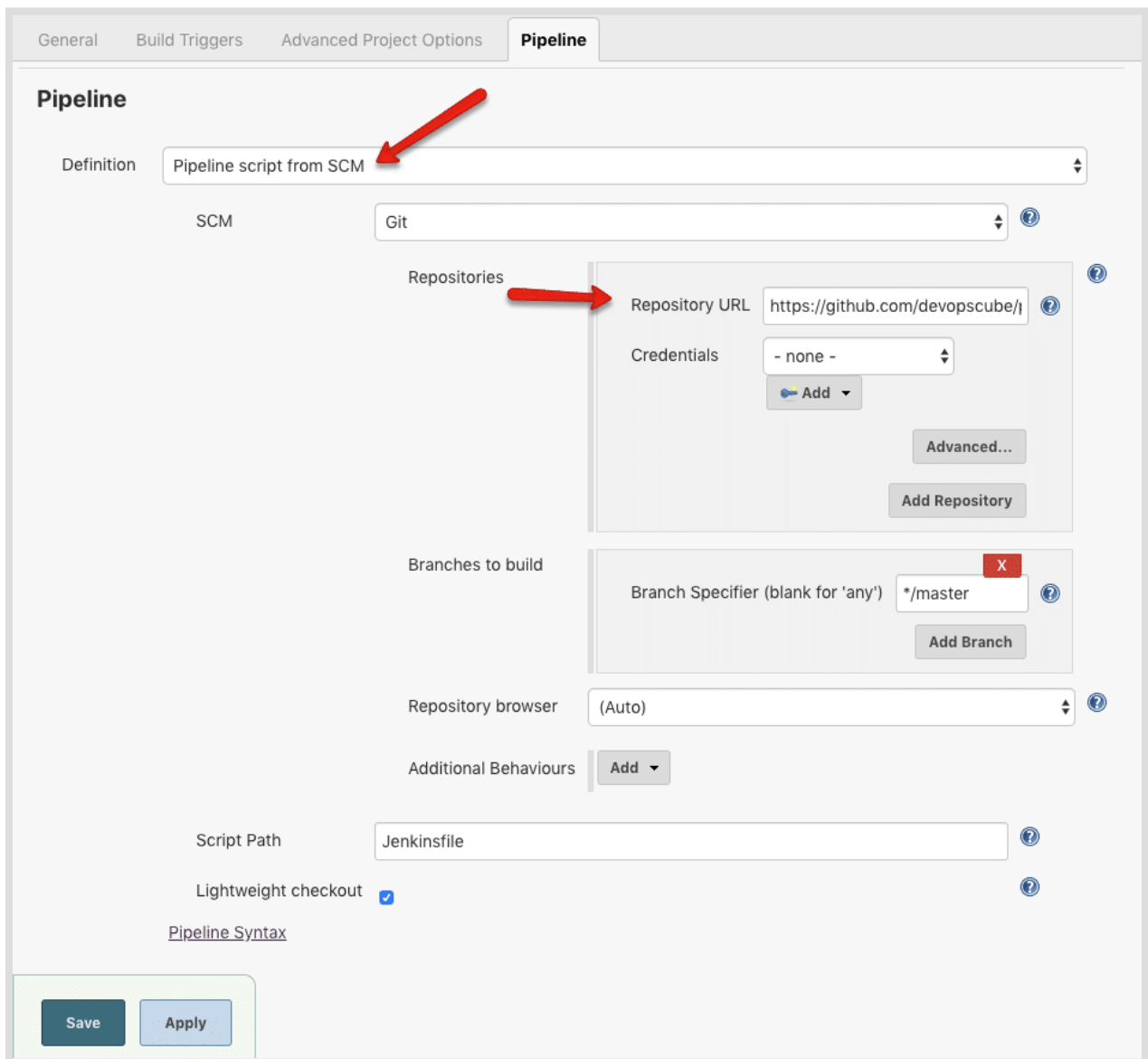
Step 1: Create a Github repo with our pipeline code in a file named `Jenkinsfile`. Or you can use this Github repo for testing.

<https://github.com/devopscube/pipeline-as-code-demo>

Step 2: Follow the same steps we used for creating a pipeline job. But instead of entering the code directly into the script block, select the “Pipeline script from SCM” option and fill in the details as shown below.

1. Definition: Pipeline script from SCM
2. Repository URL: <https://github.com/devopscube/pipeline-as-code-demo>

3. Script Path: Jenkinsfile



The screenshot shows the Jenkins 'Pipeline' configuration tab. At the top, there are tabs for 'General', 'Build Triggers', 'Advanced Project Options', and 'Pipeline'. The 'Pipeline' tab is selected. Below the tabs, the 'Definition' dropdown is set to 'Pipeline script from SCM', with a red arrow pointing to it. The 'SCM' dropdown is set to 'Git'. Below this, the 'Repositories' section is expanded, with a red arrow pointing to its header. Inside the 'Repositories' section, the 'Repository URL' is 'https://github.com/devopscube/...', 'Credentials' is '- none -', and there are buttons for 'Add', 'Advanced...', and 'Add Repository'. Below the 'Repositories' section, the 'Branches to build' section is expanded, showing a 'Branch Specifier (blank for 'any')' set to '*/master' with an 'Add Branch' button. The 'Repository browser' is set to '(Auto)'. Below that, the 'Additional Behaviours' section has an 'Add' button. The 'Script Path' is set to 'Jenkinsfile'. The 'Lightweight checkout' checkbox is checked. At the bottom left, there are 'Save' and 'Apply' buttons. A link for 'Pipeline Syntax' is also present.

General Build Triggers Advanced Project Options **Pipeline**

Pipeline

Definition Pipeline script from SCM

SCM Git

Repositories

Repository URL https://github.com/devopscube/

Credentials - none -

Add Advanced... Add Repository

Branches to build

Branch Specifier (blank for 'any') */master

Add Branch

Repository browser (Auto)

Additional Behaviours Add

Script Path Jenkinsfile

Lightweight checkout ☒

[Pipeline Syntax](#)

Save Apply

Step 3: Save the configuration and run the build. You should see a successful build.

Executing Jenkins Pipeline Stages In Parallel

There are use cases where you have to execute different stages in parallel because each stage will be independent and does not depend on other steps. Also, running separate stages in parallel will reduce the build times as well.

You can achieve parallelism in Jenkins pipelines as code using the parallel block.

Here is an example stage that contains three parallel stages. It's like you will have multiple stages inside a stage. You can test this by adding the following code to your existing pipeline.

```
stage('Environment Analysis') {  
  
    parallel {  
  
        stage('Printing All Global Variables') {  
            steps {  
                sh """  
                env  
                """  
            }  
        }  
  
        stage('Execute Shell') {  
            steps {  
                sh 'echo "Hello"'  
            }  
        }  
    }  
}
```



```

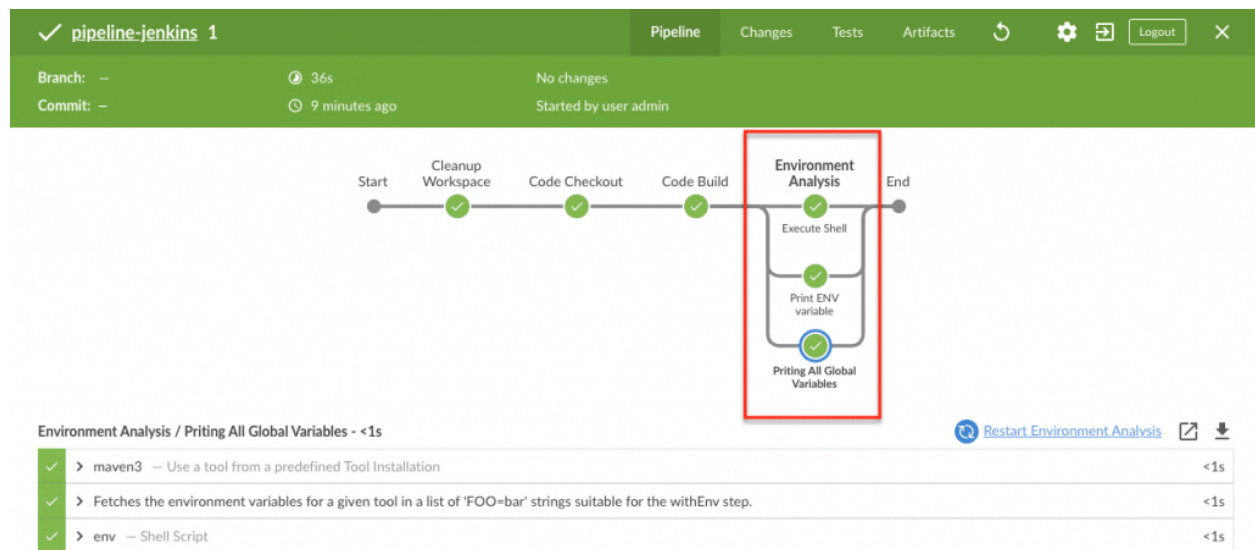
    }

    stage('Print ENV variable') {
        steps {
            sh "echo ${APP_ENV}"
        }
    }

}

```

You can clearly see the parallel execution on blue ocean view.



How to Generate Jenkins Pipeline Scripts?

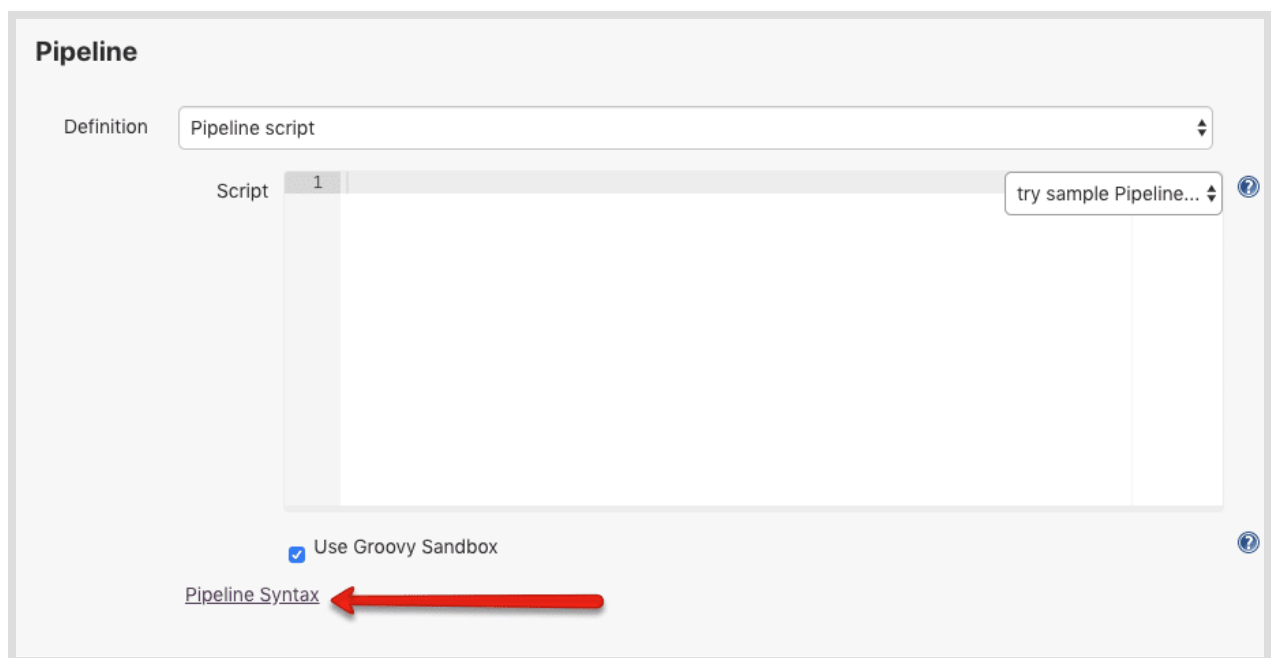
It is possible to generate Jenkins pipeline scripts?

Yes! you can generate most of the pipeline scripts from Jenkins. Here is how it works.

Jenkins has its own pipeline script generator. You can access the generator on `/pipeline-syntax` path.

`http://<your-jenkins-ip>:port/pipeline-syntax/`

You can also get the syntax generator path from your pipeline job configuration as shown below.



Snippet Generator

Snippet generator is used for generating all the scripts that are using inside the stages.

Here is how the generator looks. You can select the required option from the steps dropdown, fill in the required details and generate the script to use in your pipeline.

The screenshot shows the Jenkins web interface. The top navigation bar includes the Jenkins logo, a search bar, and user information (admin, log out). The breadcrumb trail indicates the current location: Jenkins > pipeline-java > Pipeline Syntax.

The left sidebar contains a list of links: Back, Snippet Generator (highlighted with a red arrow), Declarative Directive Generator, Declarative Online Documentation, Steps Reference, Global Variables Reference, Online Documentation, Examples Reference, and IntelliJ IDEA GDSDL.

The main content area is titled "Overview" and contains an introductory text about the Snippet Generator. Below this is a "Steps" section with a "Sample Step" dropdown menu set to "git: Git" (highlighted with a red arrow). The configuration section below the dropdown includes fields for "Repository URL" (https://github.com/devopscube/pipeline-as-code-demo.git), "Branch" (master), and "Credentials" (- none -). There are also checkboxes for "Include in polling?" and "Include in changelog?".

At the bottom, a blue button labeled "Generate Pipeline Script" is highlighted with a red arrow. Below this button, a text box displays the generated script: `git 'https://github.com/devopscube/pipeline-as-code-demo.git'`, which is also highlighted with a red box.

Declarative Directive Generator

You can use the directive generator to generate all other options in the pipeline. For example, options, parameters, triggers, etc.

Here is an example of generating the agent block.



Back

Snippet Generator

Declarative Directive Generator

Declarative Online Documentation

Steps Reference

Global Variables Reference

Online Documentation

Examples Reference

IntelliJ IDEA GDSDL

Overview

The **Directive Generator** allows you to generate the Pipeline code for a Declarative Pipeline directive, such as `agent` or `stage`. Choose the directive you're interested in from the dropdown, and then choose the contents of the directive. Once you've filled out the form with the choices and values you want for your directive, click **Generate Declarative Directive**. Pipeline code will appear in the box below. You can copy that code directly into the `pipeline` block in your `Jenkinsfile` or into a `stage` block for stage directives. See [the online syntax documentation](#) for more information.

Directives

Sample Directive

See [the online documentation](#) for more information on the `agent` directive.

Agent

Label

Generate Declarative Directive

```
agent {  
  label 'SLAVE01'  
}
```