Why Pipeline?

Jenkins pipeline is a single platform that runs the entire pipeline as code.

Instead of building several jobs for each phase, you can now code the workflow and put it in a Jenkinsfiles.

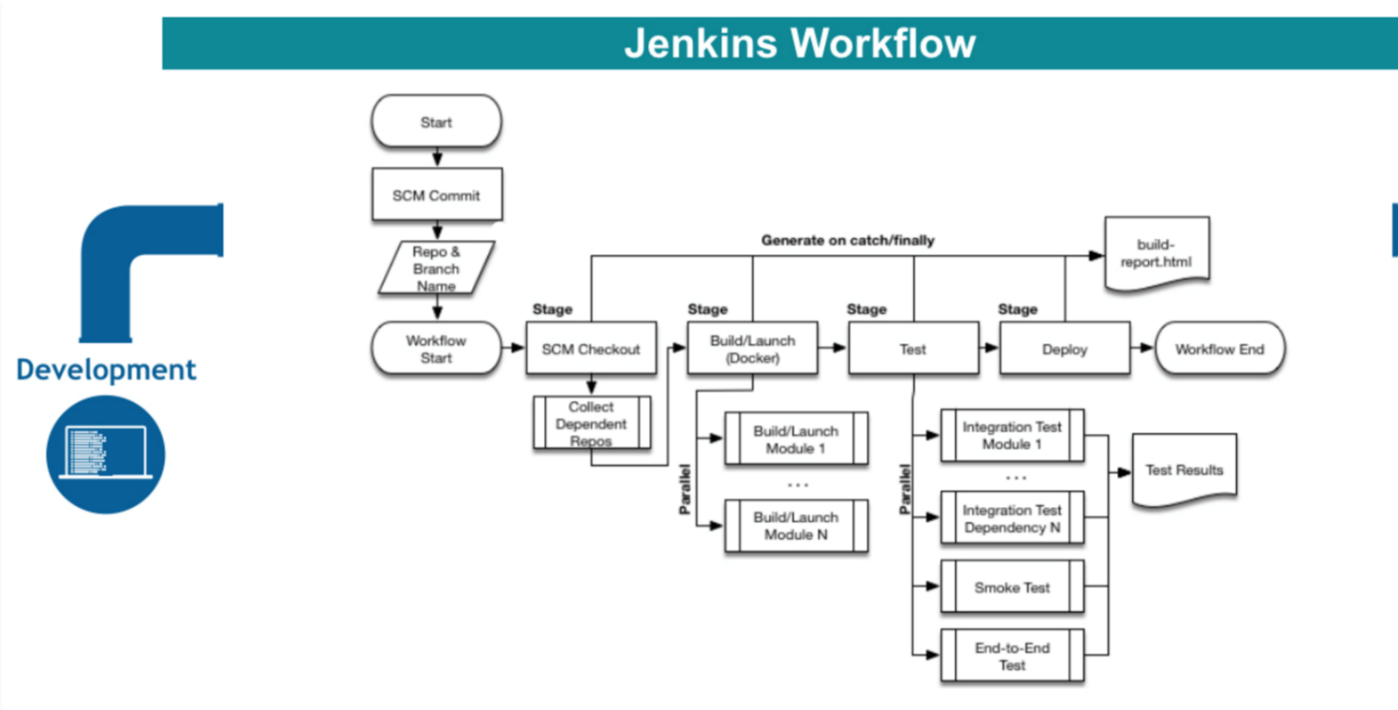
While standard Jenkins “freestyle” jobs support simple continuous integration by allowing you to define sequential tasks in an application lifecycle, they do not create a persistent record of execution, enable one script to address all the steps in a complex workflow, or confer the other advantages of pipelines.

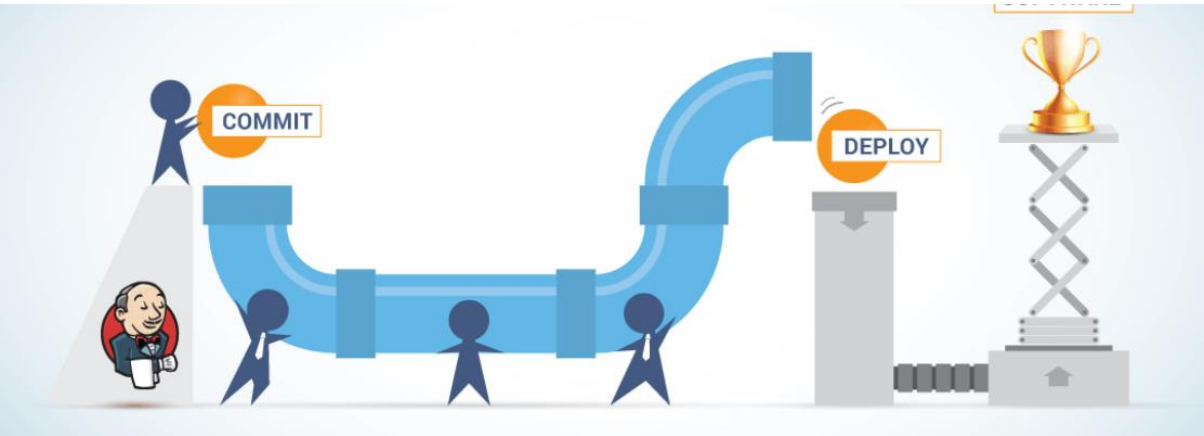
In contrast to freestyle jobs, pipelines enable you to define the whole application lifecycle. Pipeline functionality helps Jenkins to support continuous delivery (CD). The Pipeline plugin was built with requirements for a flexible, extensible, and script-based CD workflow capability in mind.

Accordingly, pipeline functionality is:

- Pausable: Pipelines can optionally stop and wait for human input or approval before completing the jobs for which they were built.
- Versatile: Pipelines support complex real-world CD requirements, including the ability to fork or join, loop, and work in parallel with each other.
- Efficient: Pipelines can restart from any of several saved checkpoints.
- Extensible: The Pipeline plugin supports custom extensions to its DSL (domain scripting language) and multiple options for integration with other plugins.

The flowchart below is an example of one continuous delivery scenario enabled by the Pipeline plugin:





Declarative Pipeline Vocabulary: -

Pipeline terms such as “step,” “node,” and “stage” are a subset of the vocabulary used for Jenkins in general.

any — Which mean the whole pipeline will run on any available agent.

Step

A “step” (often called a “build step”) is a single task that is part of sequence. Steps tell Jenkins what to do.

Steps: steps are carried out in sequence to execute a stage

```
pipeline {
        agent any
        stages {
                stage ('Build') {
                        steps {
                                echo 'Running build phase...'
                        }
                }
        }
}
```

Node

In pipeline coding contexts, as opposed to Jenkins generally, a “node” is a step that does two things, typically by enlisting help from available executors on agents:

- Schedules the steps contained within it to run by adding them to the Jenkins build queue (so that as soon as an executor slot is free on a node, the appropriate steps run).
- Creates a workspace, meaning a file directory specific to a particular job, where resource-intensive processing can occur without negatively impacting your pipeline performance. Workspaces last for the duration of the tasks assigned to them.

(In Jenkins generally, a “node” means any computer that is part of your Jenkins installation, whether that computer is used as a master or as an agent).

Stage

A “stage” is a step that calls supported APIs. Pipeline syntax is comprised of stages. Each stage can have one or more build steps within it.

none — Which mean all the stages under the block will have to declared with agent separately.
label — this is just a label for the Jenkins environment
docker — this is to run the pipeline in Docker environment.

Familiarity with Jenkins terms such as “master,” “agent,” and “executor” also helps with understanding how pipelines work. These terms are not specific to pipelines:

- master - A “master” is the basic installation of Jenkins on a computer; it handles tasks for your build system. Pipeline scripts are parsed on masters, and steps wrapped in node blocks are performed on available executors.

- agent - An “agent” (formerly "slave") is a computer set up to offload particular projects from the master. Your configuration determines the number and scope of operations that an agent can perform. Operations are performed by executors.

- executor - An “executor” is a computational resource for compiling code. It can run on master or agent machines, either by itself or in parallel with other executors. Jenkins assigns a *java.lang.Thread* to each executor.

Stages: It contains all the work, each stage performs a specific task.

```
pipeline {
        agent any
        stages {
                stage ('Build') {
                        ...
                }
                stage ('Test') {
                        ...
                }
                stage ('QA') {
                        ...
                }
                stage ('Deploy') {
                        ...
                }
                stage ('Monitor') {
                        ...
                }
        }
}
```

Agent: instructs Jenkins to allocate an executor for the builds. It is defined for an entire pipeline or a specific stage.
It has the following parameters:

- *Any*: Runs pipeline/ stage on any available agent
- *None*: applied at the root of the pipeline, it indicates that there is no global agent for the entire pipeline & each stage must specify its own agent
- *Label*: Executes the pipeline/stage on the labelled agent.
- *Docker*: Uses docker container as an execution environment for the pipeline or a specific stage.

Scripted Pipeline:

- The scripted pipeline is a traditional way of writing the Jenkins pipeline as code. Ideally, Scripted pipeline is written in Jenkins file on web UI of Jenkins.
- Unlike Declarative pipeline, the scripted pipeline strictly uses groovy based syntax. Since this, The scripted pipeline provides huge control over the script and can manipulate the flow of script extensively.
- This helps developers to develop advance and complex pipeline as code.

Structure and syntax of the scripted pipeline:

Node Block:

Node is the part of the Jenkins architecture where Node or agent node will run the part of the workload of the jobs and master node will handle the configuration of the job. So this will be defined in the first place as

```
node {
}
```

Stage Block:

Stage block can be a single stage or multiple as the task goes. And it may have common stages like

- Cloning the code from SCM
- Building the project
- Running the Unit Test cases
- Deploying the code
- Other functional and performance tests.

So the stages can be written as mentioned below:

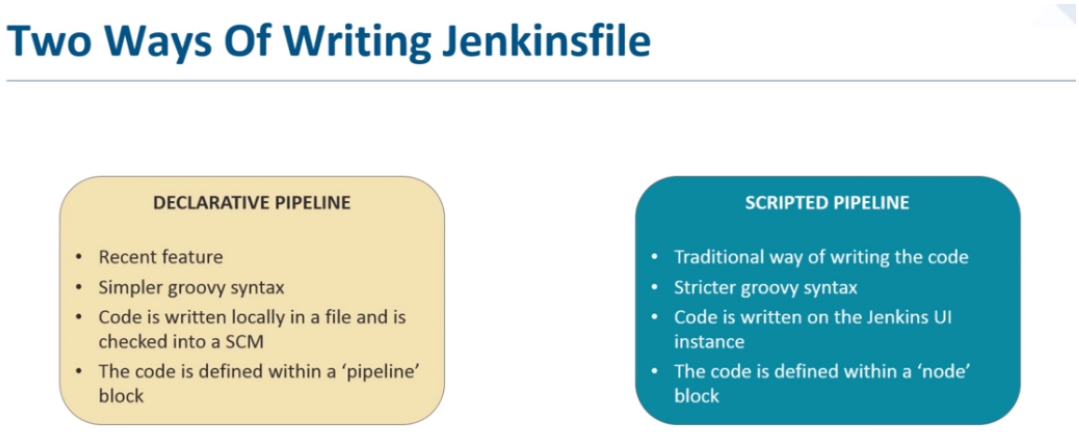
```
stage {
}
```

So, Together, the scripted pipeline can be written as mentioned below.

```
node ('node-1') {
  stage('Source') {
    git 'https://github.com/prakashk0301/gradle-calculator'
  }
  stage('Compile') {
    def gradle_home = tool 'gradle4'
    sh "'${gradle_home}/bin/gradle' clean compileJava test"
  }
}
```

Difference between Scripted and Declarative Pipeline:

- The **key difference** between Declarative pipeline and Scripted pipeline would be with respect to their **syntaxes** and their **flexibility**.
- Declarative pipeline is a relatively new feature that supports the pipeline as code concept. It makes the pipeline code easier to read and write. This code is written in a Jenkinsfile which can be checked into a source control management system such as Git.
- Whereas, the scripted pipeline is a traditional way of writing the code. In this pipeline, the Jenkinsfile is written on the Jenkins UI instance.
- Though both these pipelines are based on the groovy DSL, the scripted pipeline uses stricter groovy based syntaxes because it was the first pipeline to be built on the groovy foundation. Since this Groovy script was not typically desirable to all the users, the declarative pipeline was introduced to offer a simpler and more optioned Groovy syntax.
- The declarative pipeline is defined within a block labelled 'pipeline' whereas the scripted pipeline is defined within a 'node'.

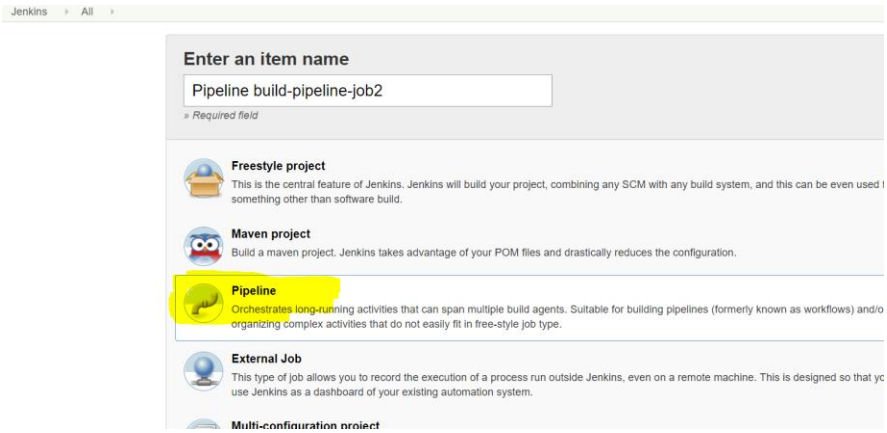


Lab 1:

To create a simple pipeline from the Jenkins interface, perform the following steps:

1. Click **New Item** on your Jenkins home page, enter a name for your (pipeline) job, select **Pipeline**, and click **OK**.
2. In the Script text area of the configuration screen, enter your pipeline syntax. If you are new to pipeline creation, you might want to start by opening Snippet Generator and selecting the "Hello Word" snippet. **Note:** Pipelines are written as Groovy scripts that tell Jenkins what to do when they are run, but because relevant bits of syntax are introduced as needed, you do not need deep expertise in Groovy to create them, although basic understanding of Groovy is helpful.
3. Check the Use Groovy Sandbox option below the Script text area. **Note:** If you are a Jenkins administrator (in other words, authorized to approve your own scripts), sandboxing is optional but efficient, because it lets scripts run without approval as long as they limit themselves to operations that Jenkins considers inherently safe.
4. Click **Save**.
5. Click **Build Now** to create the pipeline.
6. Click ▾ and select **Console Output** to see the output.

Lab 2:

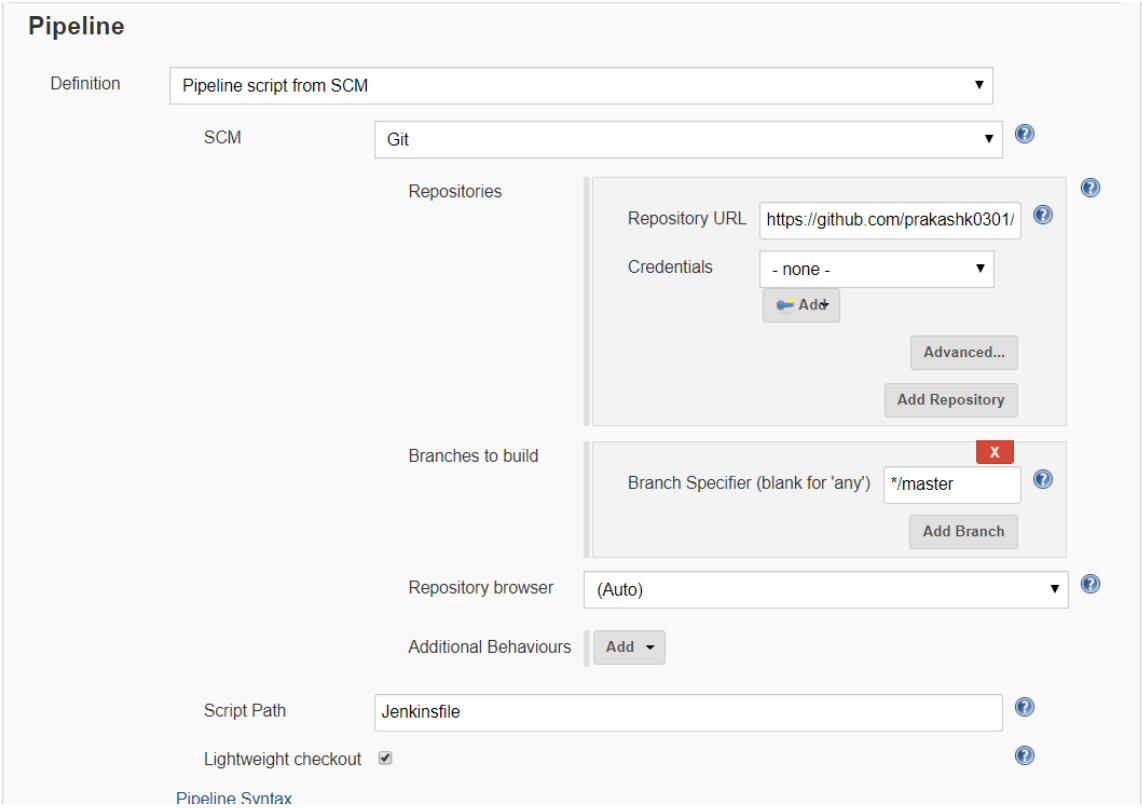


Pipeline section

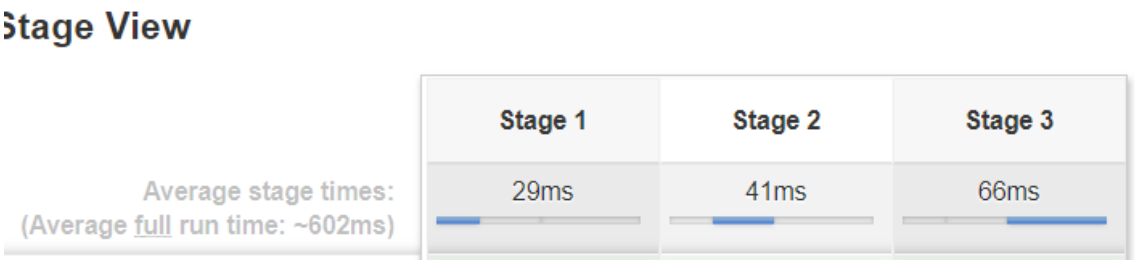
(https://github.com/prakashk0301/jenkins_pipeline_hello.git)

and

https://github.com/prakashk0301/jenkins_pipeline



Console output:



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https://github.com/prakashk0301/jenkins_pipeline

(install pipeline maven integration plugin)

Declarative Pipeline:

https://github.com/prakashk0301/git-test