# Topics

Following are the topics covered in this module:

- Branching and merging in Git
- Merge Conflicts
- Stashing, Rebasing, Reverting and Resetting
- Git Workflows
- Continuous Integration
- Introduction to Jenkins
- Introduction to Maven
- Maven installation
- Pom.xml in Maven
- Maven Project execution using Jenkins

# Objective

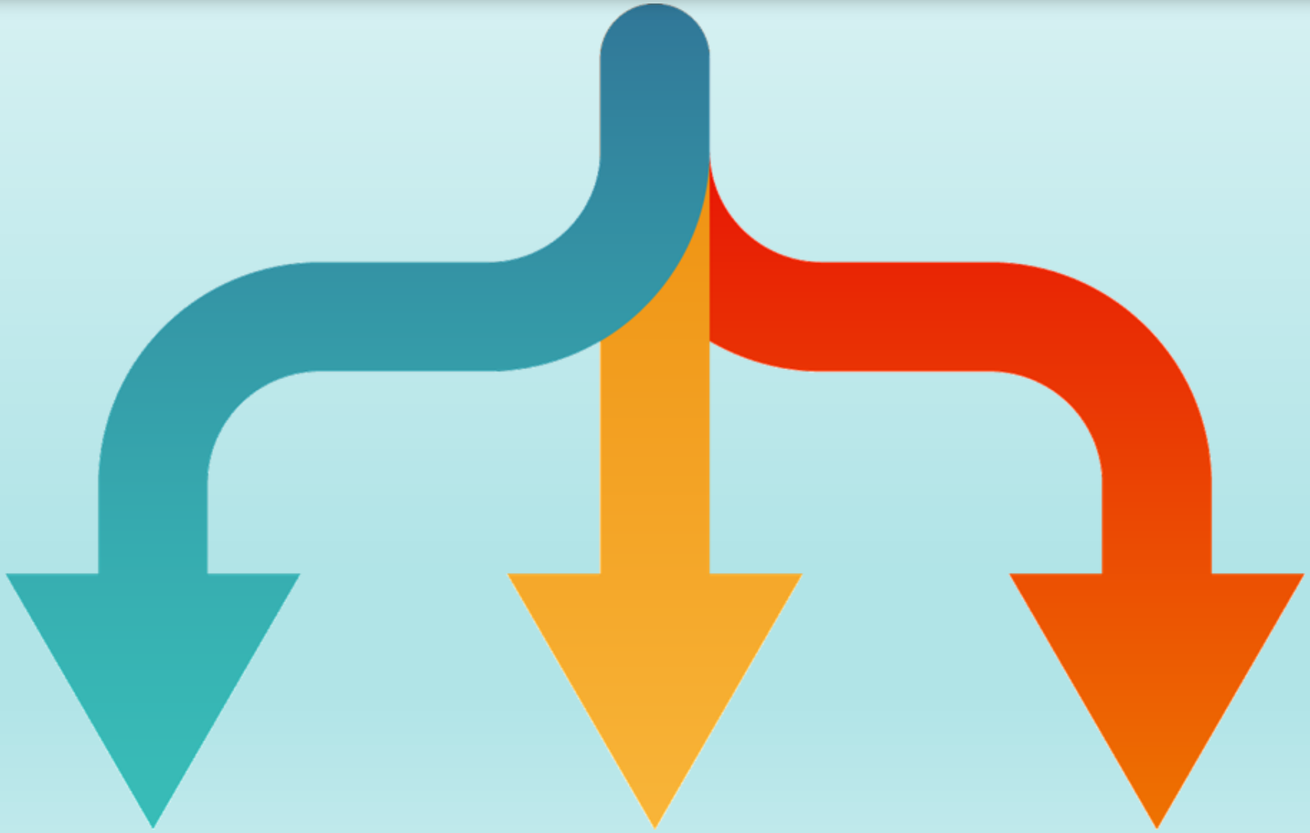
At the end of this module, you will be able to:

- Execute branching and merging operations
- Perform various Git commands
- Learn about Continuous Integration & its importance
- Introduction to Jenkins
- Introduction to Maven
- Understand Maven Architecture and dependencies
- Install Maven through terminal and building of Maven Project using Jenkins

# Branching And Merging

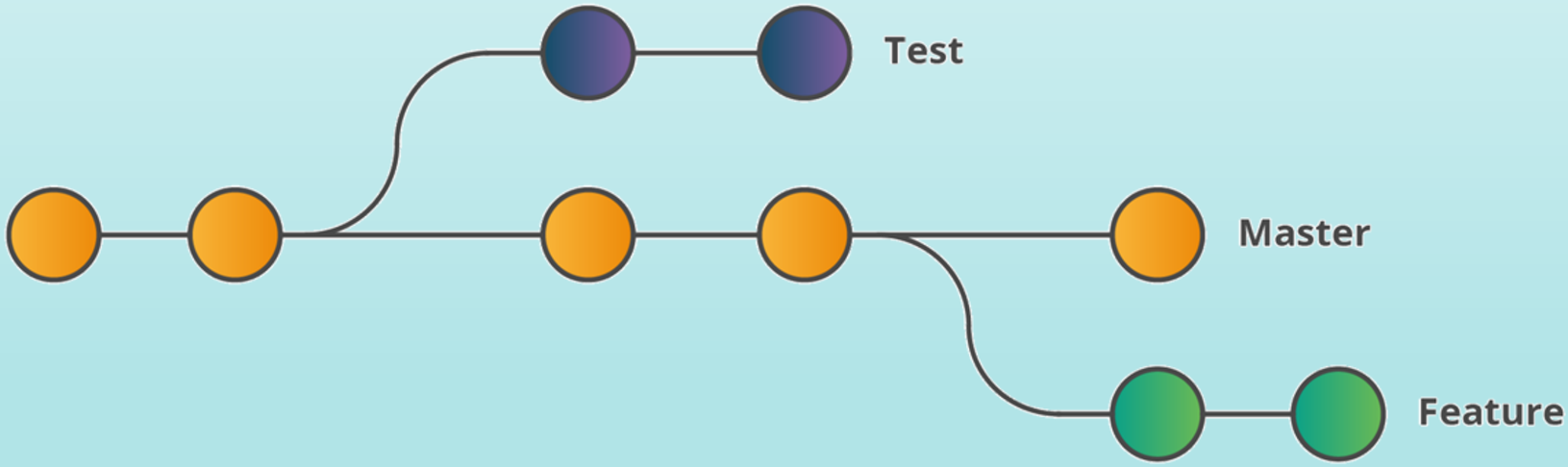
# Branching

A project in its development could take multiple different paths to achieve its goal. Branching helps us take these different directions, test them out and in the end achieve the required goal.



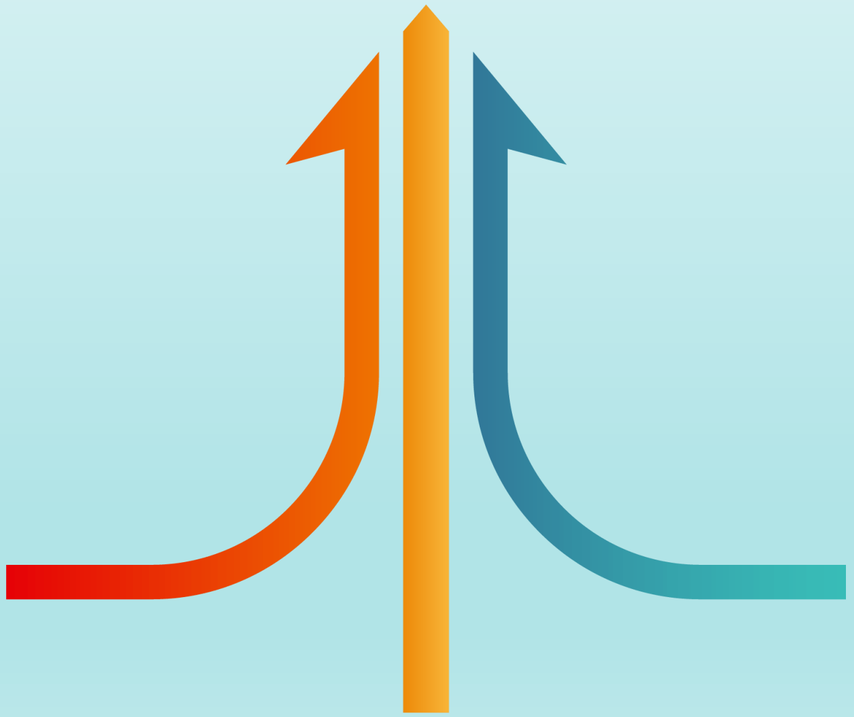
# Branching In Git

- Branching is an integral part of any Version Control(VC) System
- Unlike other VC's Git **does not** create a copy of existing files for new branch
- It **points** to snapshot of the changes you have made in the system

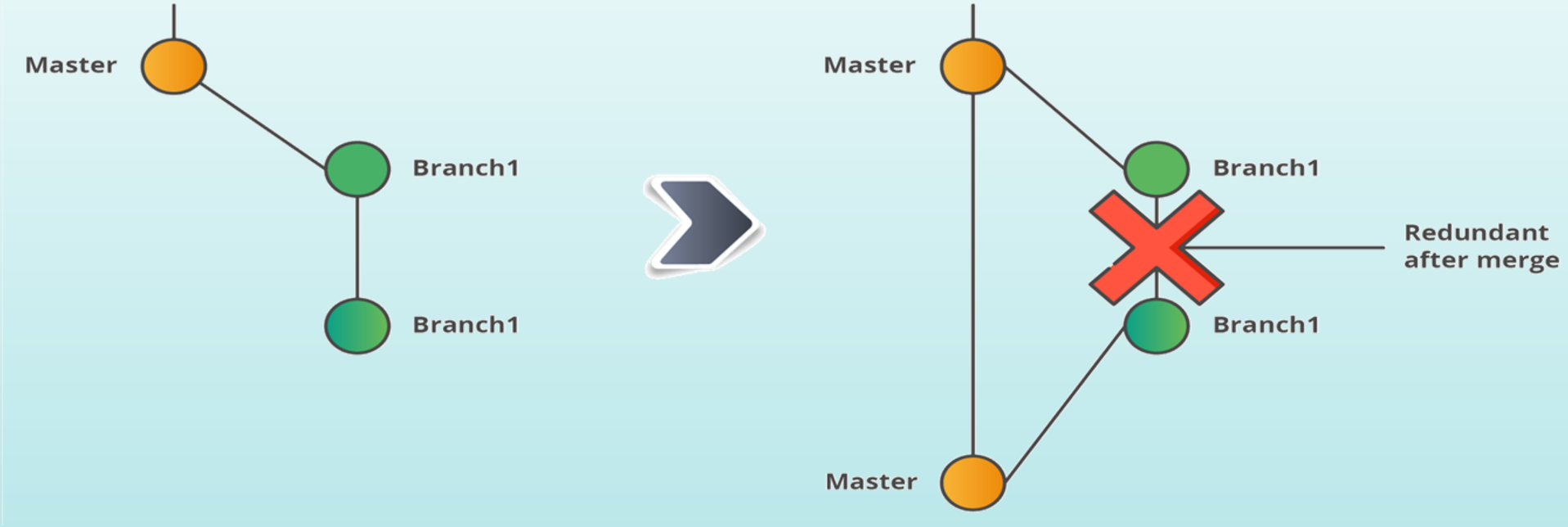


# Merging In Git

Merging integrates the changes made in different branches into one single branch



# Merging



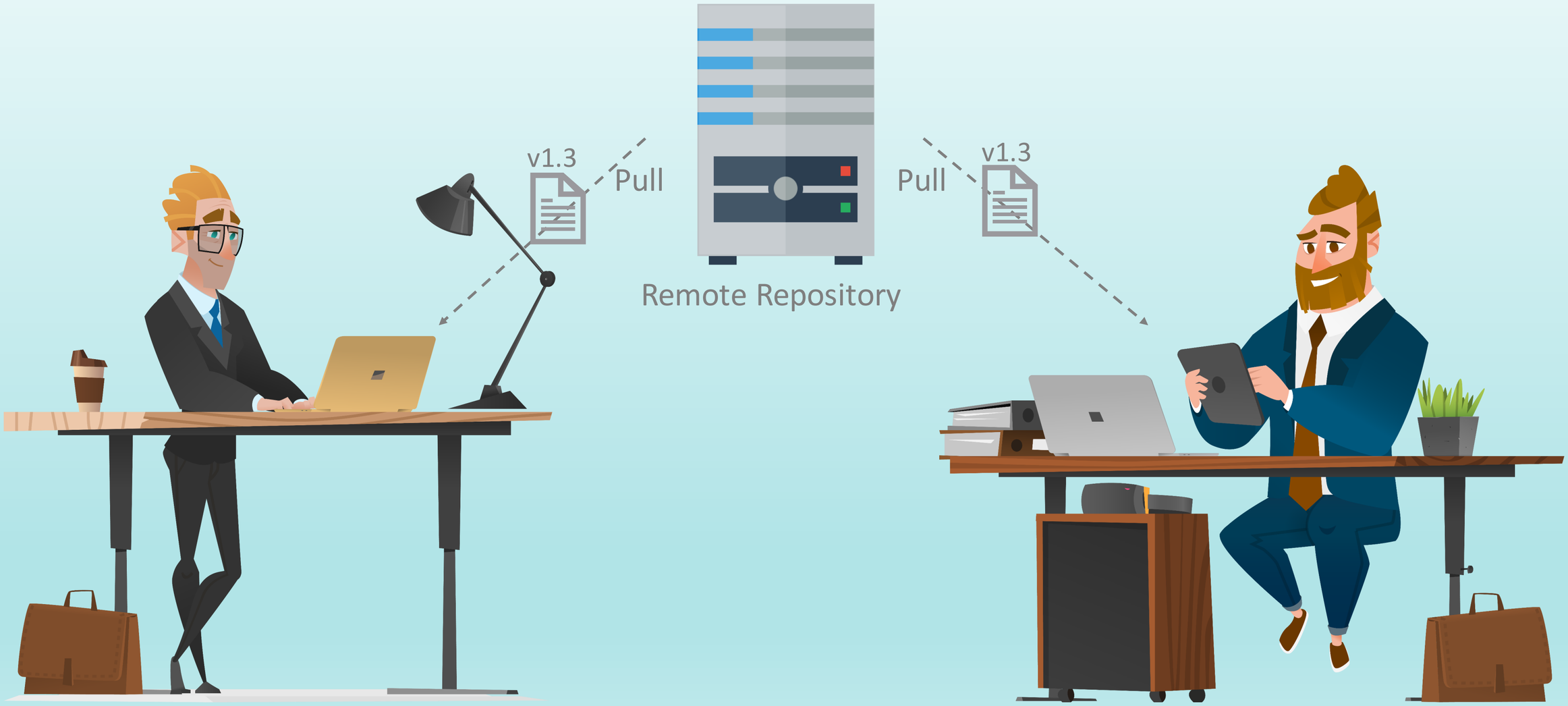

Before Merging

After Merging

- All the changes made in **Branch1** after merging are available in the Merged branch(Master)
- Branch1 becomes redundant after merging, hence it can be deleted

# Demo: Branching & Merging

# Merge Conflicts



# Merge Conflict

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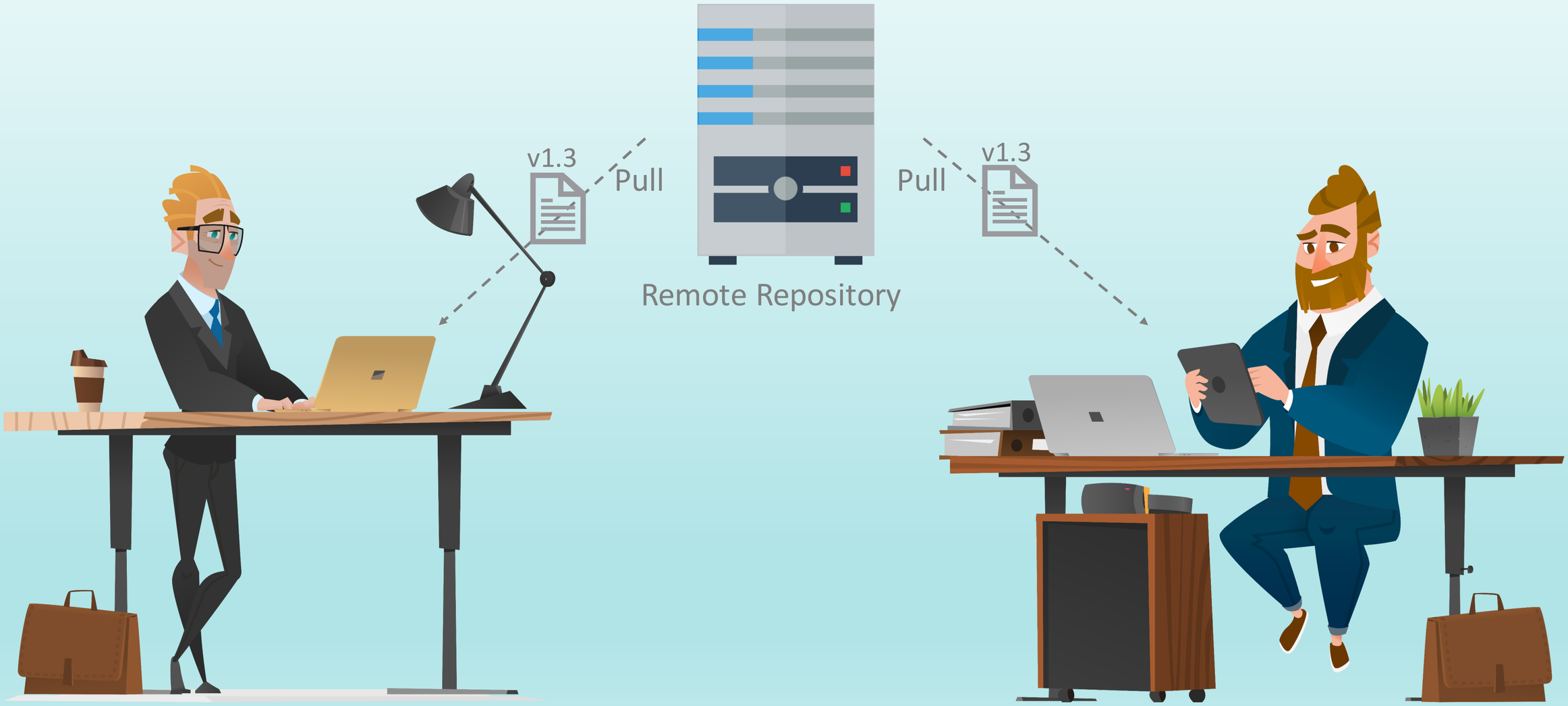
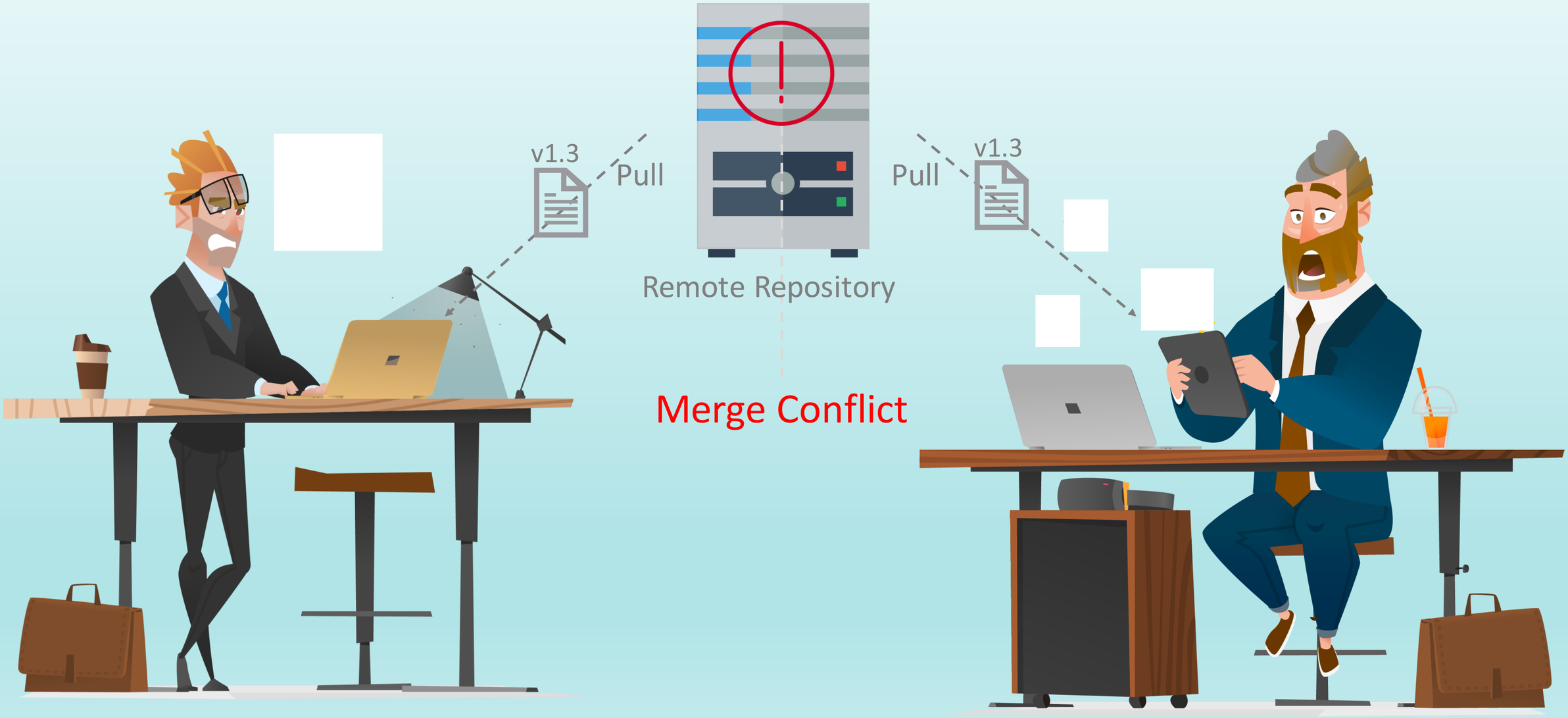
# Merge Conflicts

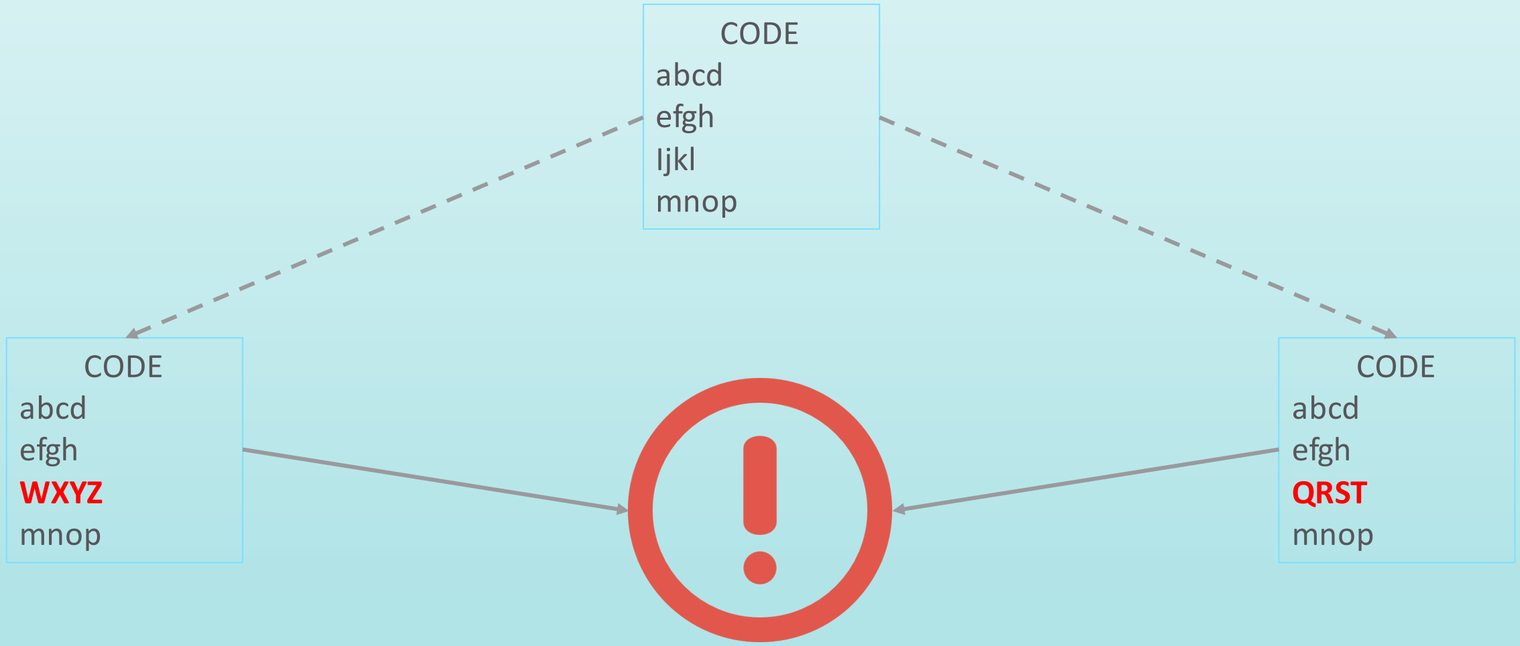


# Merge Conflicts



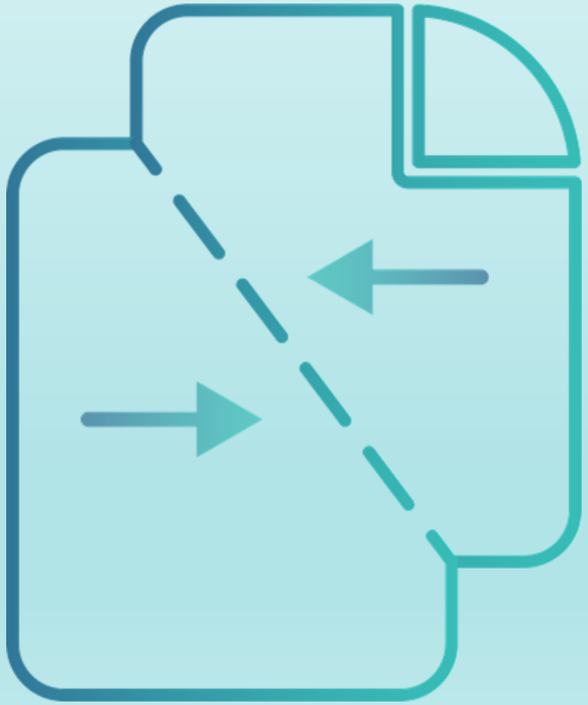
# Merge Conflict

- Merge conflicts arise when two files having same content modified are merged
- Merge conflicts can occur on merging branches or when merging forked history together

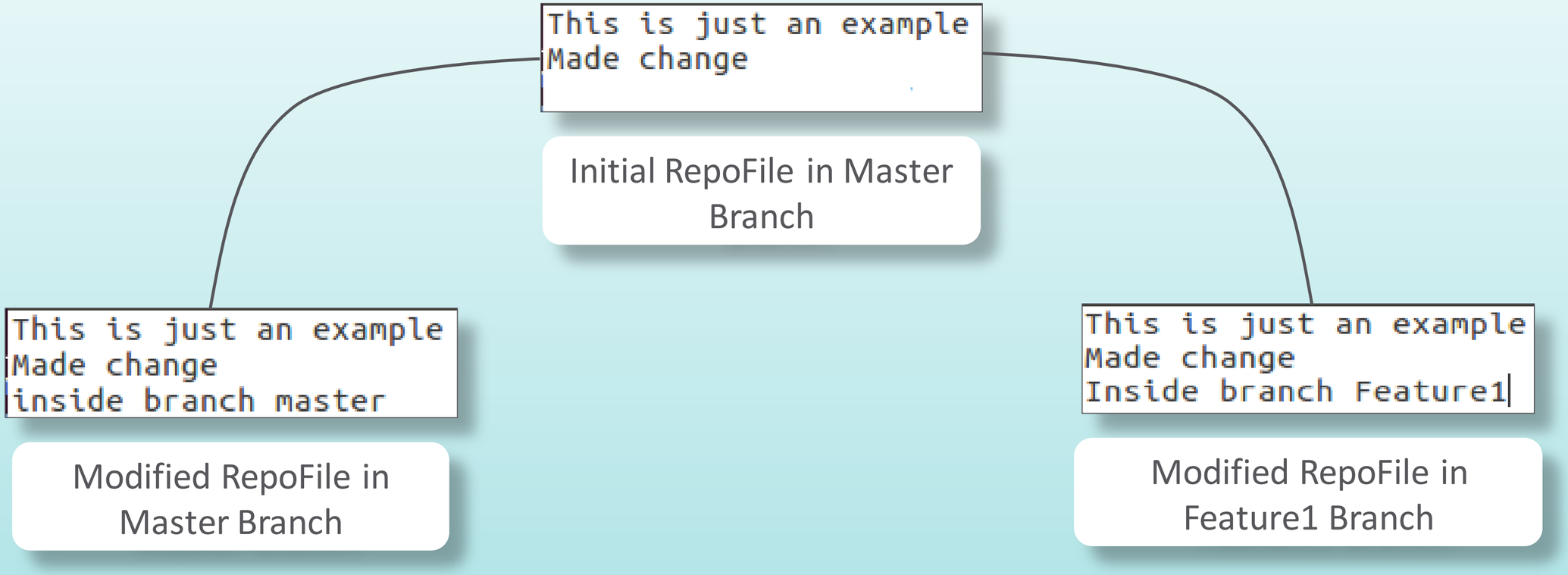


# Resolving Merge Conflict

- Merge Conflicts are resolved manually by users
- Git provides different Merge-Tools to compare and choose the required changes
- User can also use third party Merge-Tools with Git



# Merge Conflict

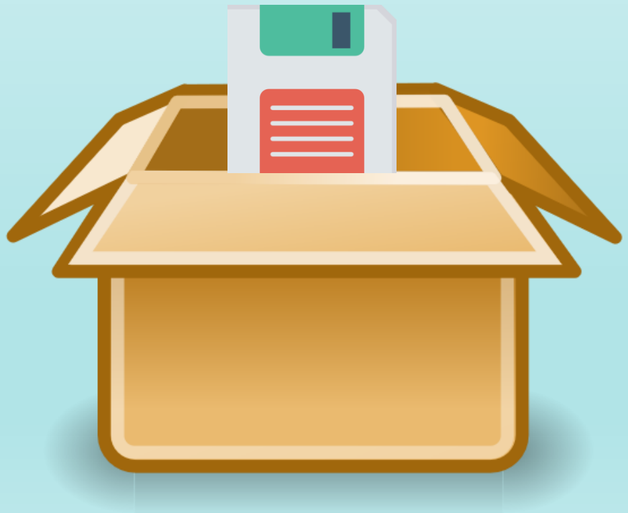


# Demo : Merge Conflicts

# Stashing, Rebasing, Reverting and Resetting

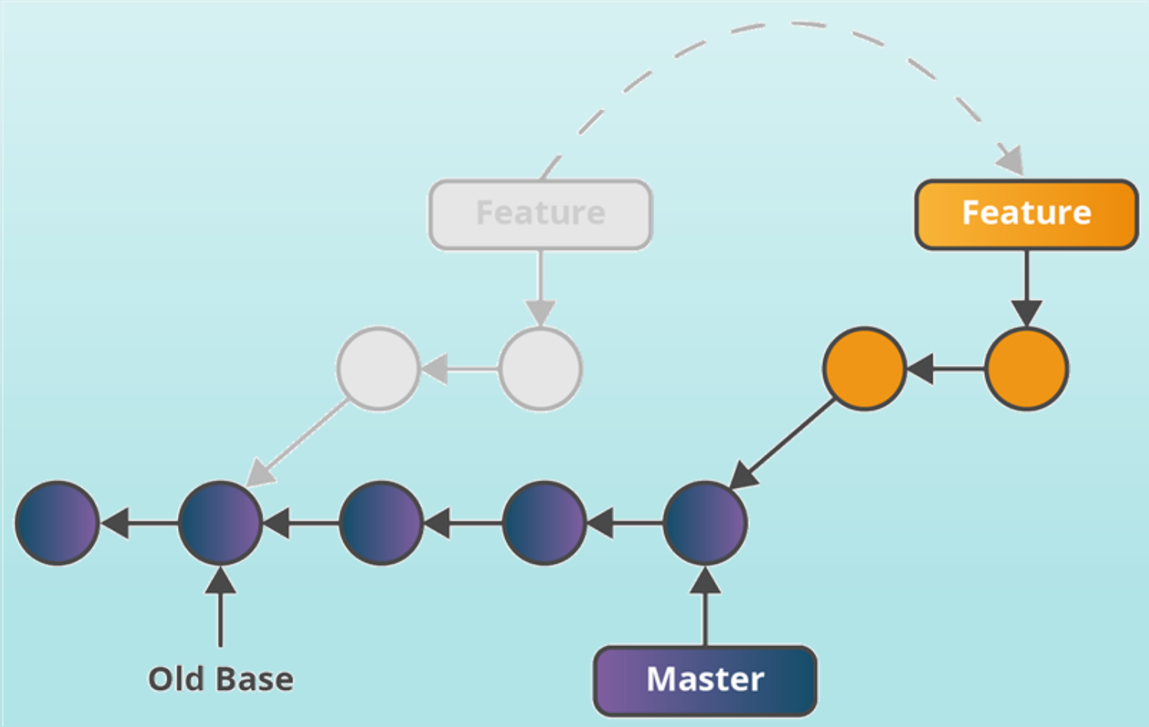
# Git Stashing

Git Stashing is a way of creating a checkpoint for non-committed changes. It saves all the changes to a temporary location so the user can perform other tasks such as switching branches, reverting etc. These changes can then be reapplied anywhere.



# Branch Rebasing

Git rebasing is used, when changes made in one branch needs to be reflected in another branch



# Rebasing

To Rebase a branch

```
Syntax: git rebase <rebase branch>
```

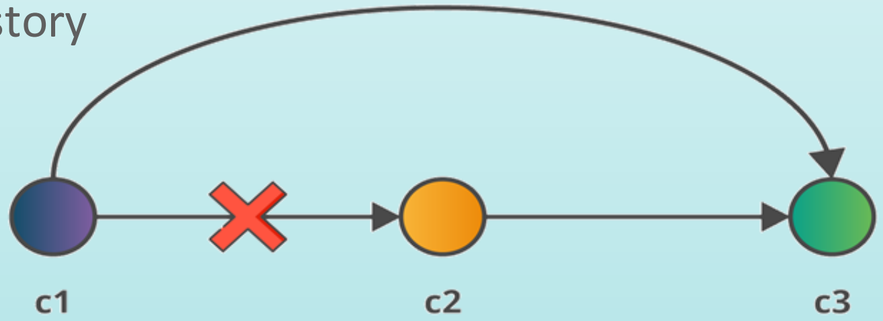
```
amr@amr-VirtualBox:~/Documents/demo$ git rebase master
First, rewinding head to replay your work on top of it...
Fast-forwarded feat2 to master.
amr@amr-VirtualBox:~/Documents/demo$
```

# Revert

- Revert or **undo** the changes made in the previous commit
- New commit is created without the changes made in the other commit

```
Syntax: git revert <commit id>
```

- Old commit still resides in the history



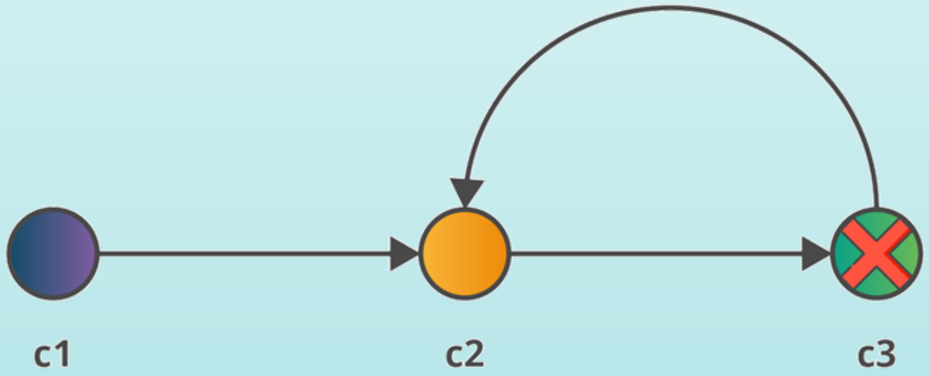

HEAD refers to the latest commit

```
amr@amr-VirtualBox:~/Documents/demo$ git revert HEAD
[feat2 a50d898] Revert "revert edit"
 1 file changed, 1 deletion(-)
amr@amr-VirtualBox:~/Documents/demo$
```

# Reset

- Reset command can be used to undo changes at different levels
- Modifiers like --hard, --soft and --mixed can be used to decide the degree to which to reset

```
Syntax: git reset <modifier> <commit id>
```



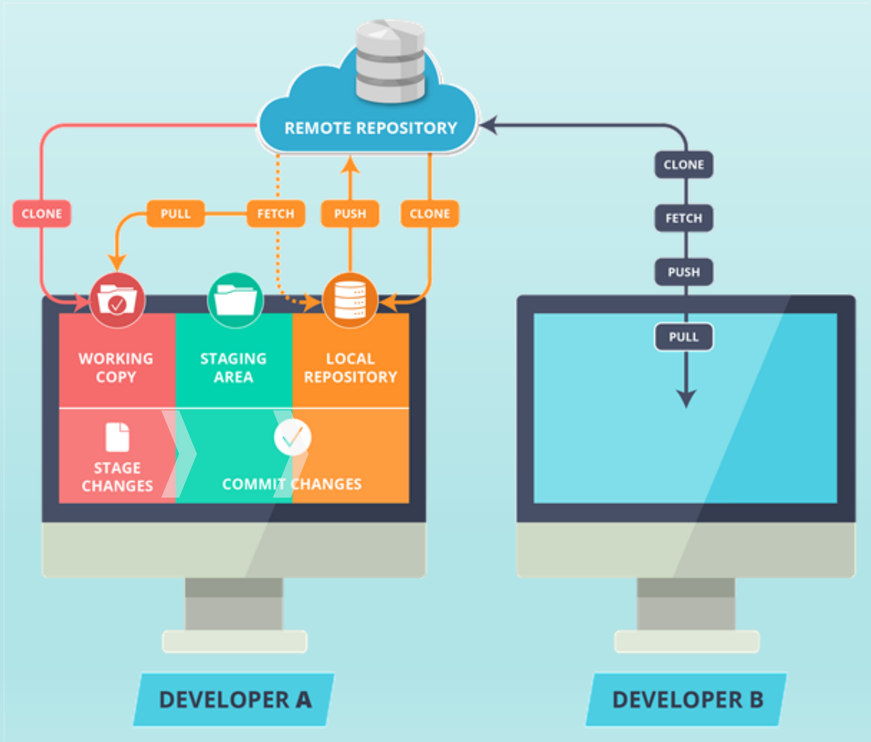

```
amr@amr-VirtualBox:~/Documents/demo$ git reset V1.5
Unstaged changes after reset:
M       RepoFile
amr@amr-VirtualBox:~/Documents/demo$
```

# Demo : Stashing, Rebasing, Reverting & Resetting

# Git Workflows

# Git Workflows

Depending upon the collaborators or the organization using git different workflows could be adopted to maximize productivity and consistency.



Git Workflows

# Centralized Workflow

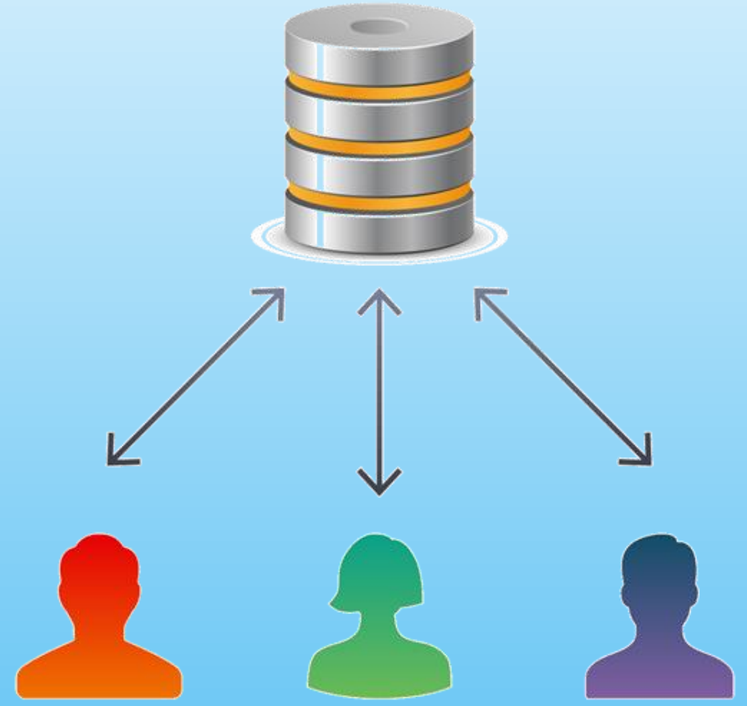
Centralized Workflow

Feature Branching

Gitflow Workflow

Forking Workflow

- A central repository is created on a remote server
- All the Developers clone this central repository



# Git Workflows

## Centralized Workflow

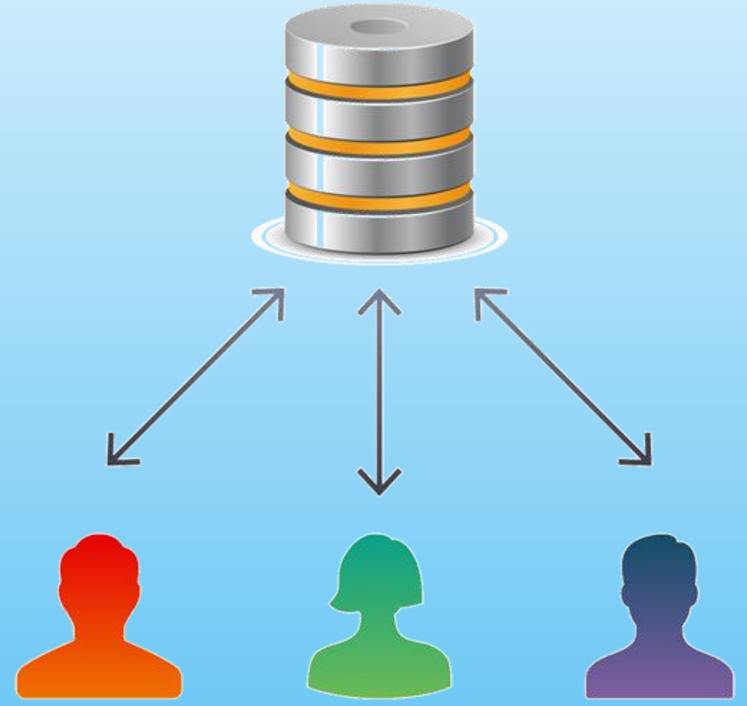
Centralized Workflow

Feature Branching

Gitflow Workflow

Forking Workflow

- All the changes are made locally on every users computers
- Isolated environment enables devs to work on their own and then push changes to remote repository
- Suitable for smaller enterprises where teams are small



Git Workflows

Centralized Workflow

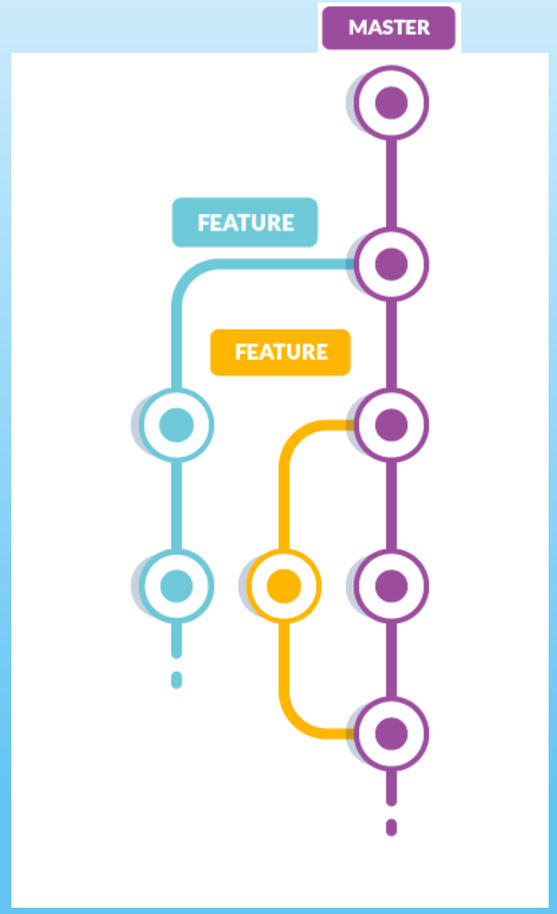
Feature Branching

Gitflow Workflow

Forking Workflow

## Feature Branching

- All the development is done as features on separate branches
- The master branch remains untouched unless all developers agree
- Back and forth of pull requests enable developers to collaborate easy



Git Workflows

Centralized Workflow

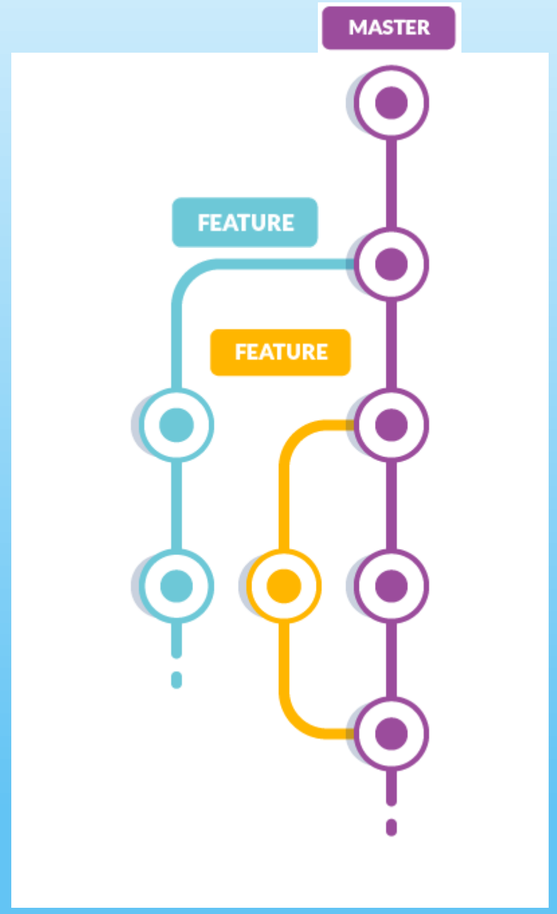
Feature Branching

Gitflow Workflow

Forking Workflow

## Feature Branching

- Pull requests enable feedback as well as acknowledgement from other devs
- Master branch never gets incomplete or broken code



Git Workflows

Centralized Workflow

Feature Branching

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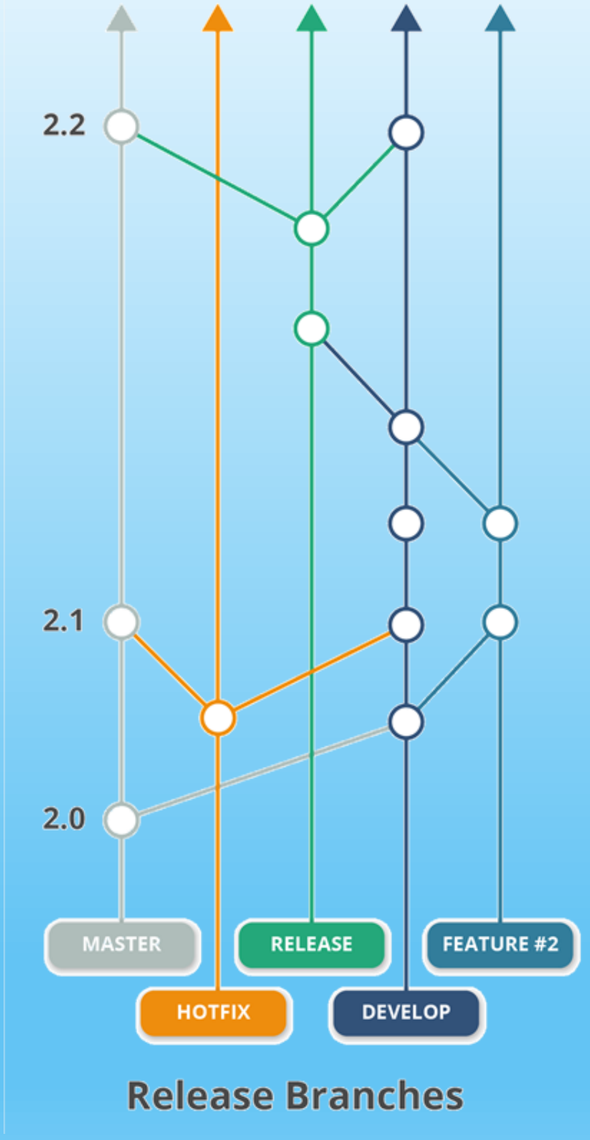
Forking Workflow

# Gitflow Workflow

- The Gitflow Workflow works as an extension to the feature branching model
- In addition to feature branches, separate branches for bugfixes, maintenance, development etc are maintained
- All other features of feature branching workflow are also present



Git Workflows

Centralized Workflow

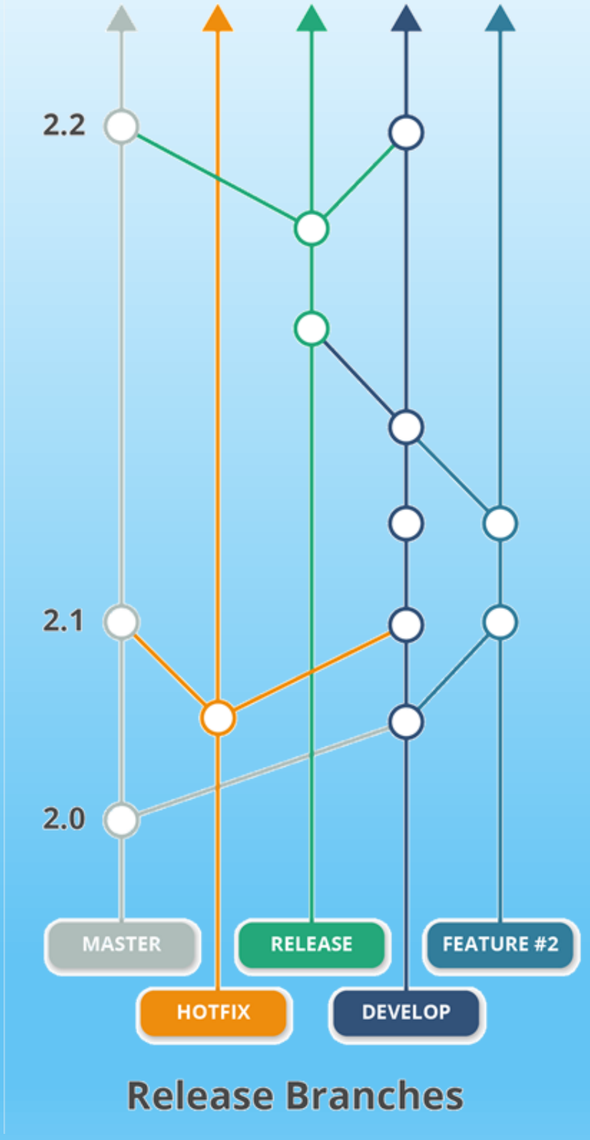
Feature Branching

Gitflow Workflow

Forking Workflow

# Gitflow Workflow

This workflow is suitable for large organizations with emphasis on rapid software releases



Git Workflows

Centralized Workflow

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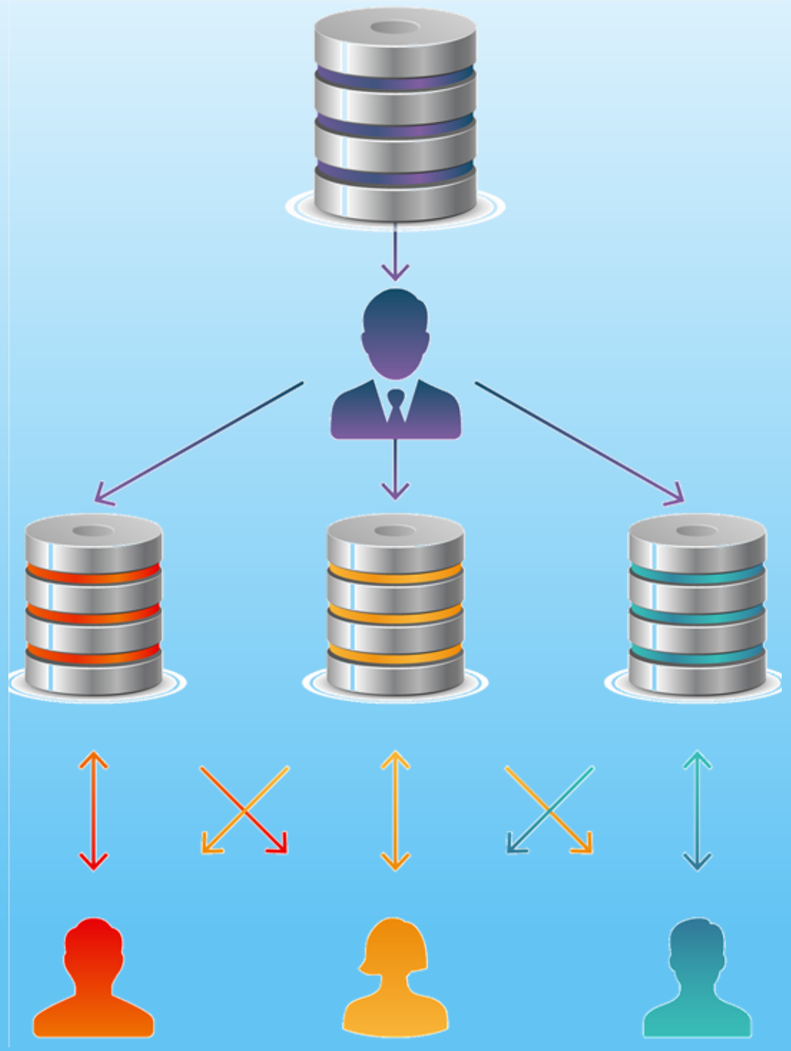
Forking Workflow

# Forking Workflow

- A server side public repository is maintained by a project lead
- Every collaborator gets his own private repository(clone of public)
- Developers work on their own private repositories



Git Workflows

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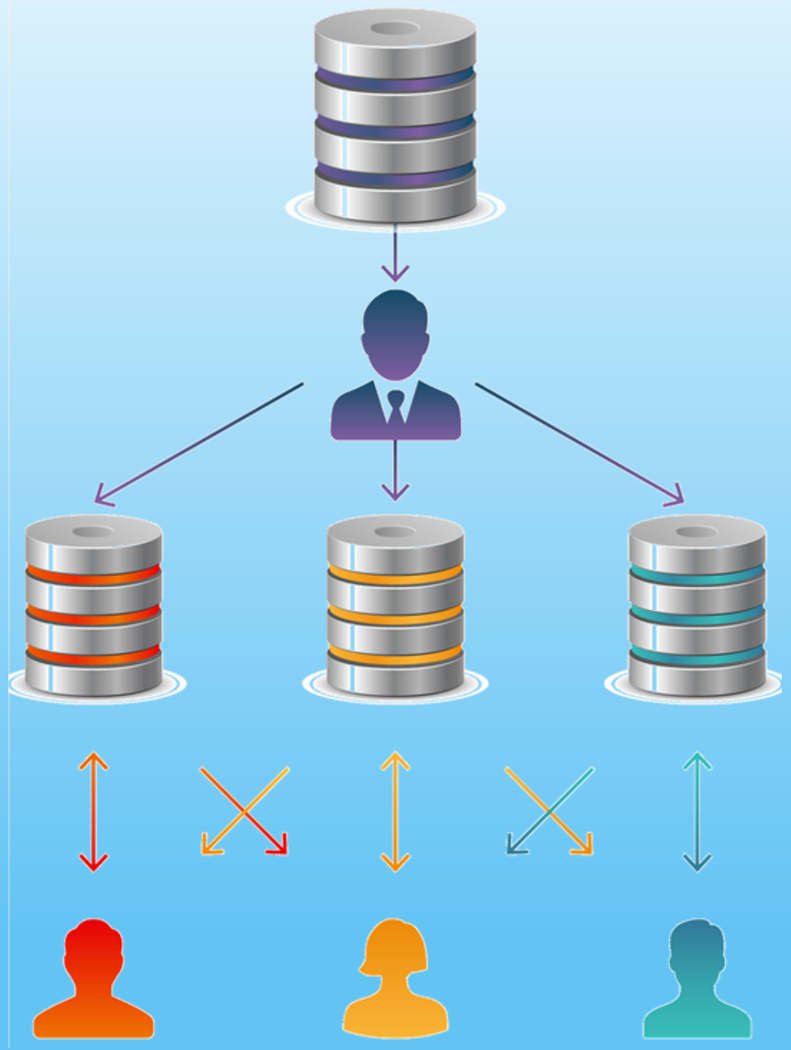
Forking Workflow

# Forking Workflow

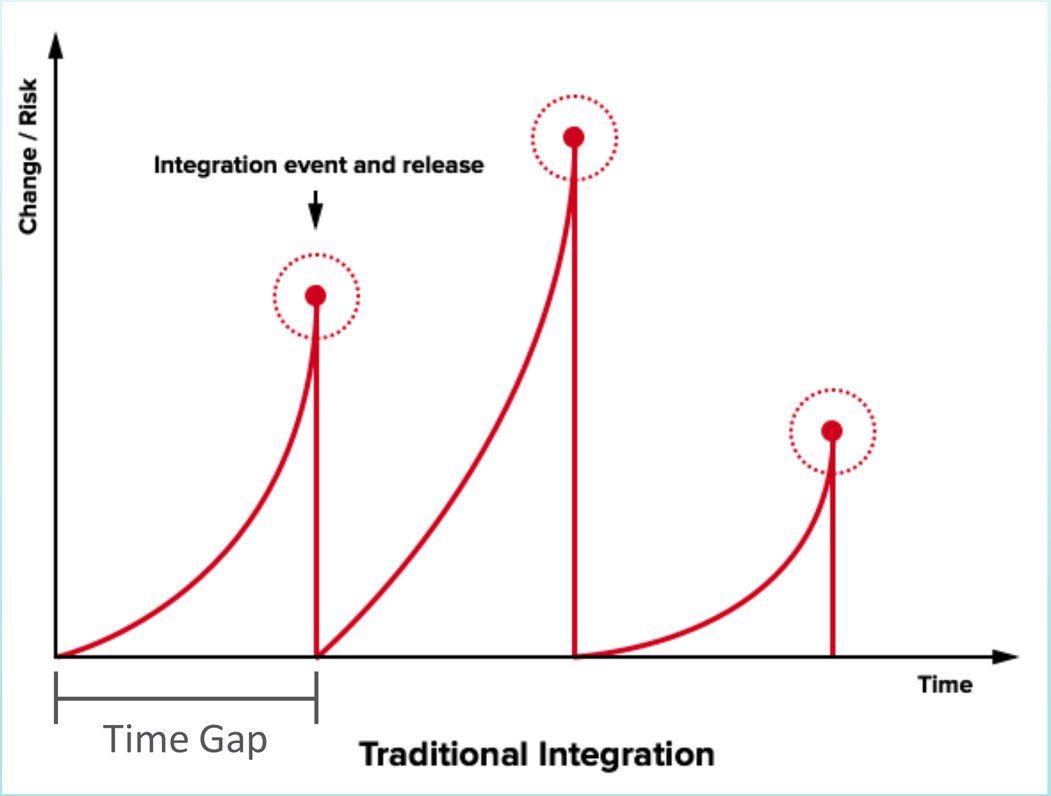
- The project maintainer chooses and accepts code from other collaborators
- Only the maintainer can upload changes to the public repository



# Continuous Integration & Its Importance

# Traditional Integration

- Greater time gap in case of Traditional Integration
- Relatively greater risk or change in conflicts



# Problems With Traditional Integration

# How To Help Dave?

Hey Dave, why don't you use continuous integration method for your project development. It will help you to keep track of changes in your code frequently, and will solve your problems.

# Dave’s Query?

How should I start following Continuous Integration Process during development of my code ??

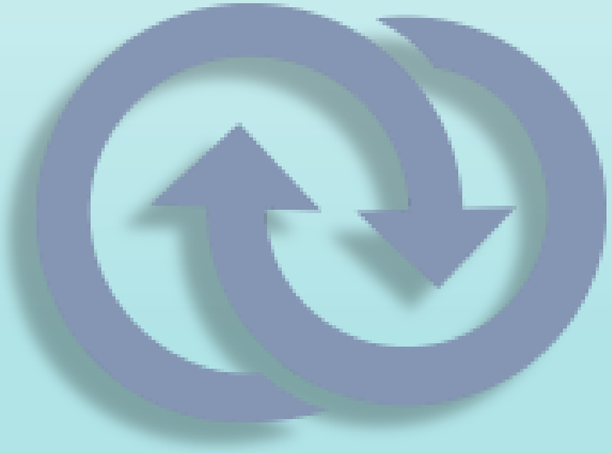
Don’t worry I have an experience on working with CI process, if you want I can help you to resolve your queries.

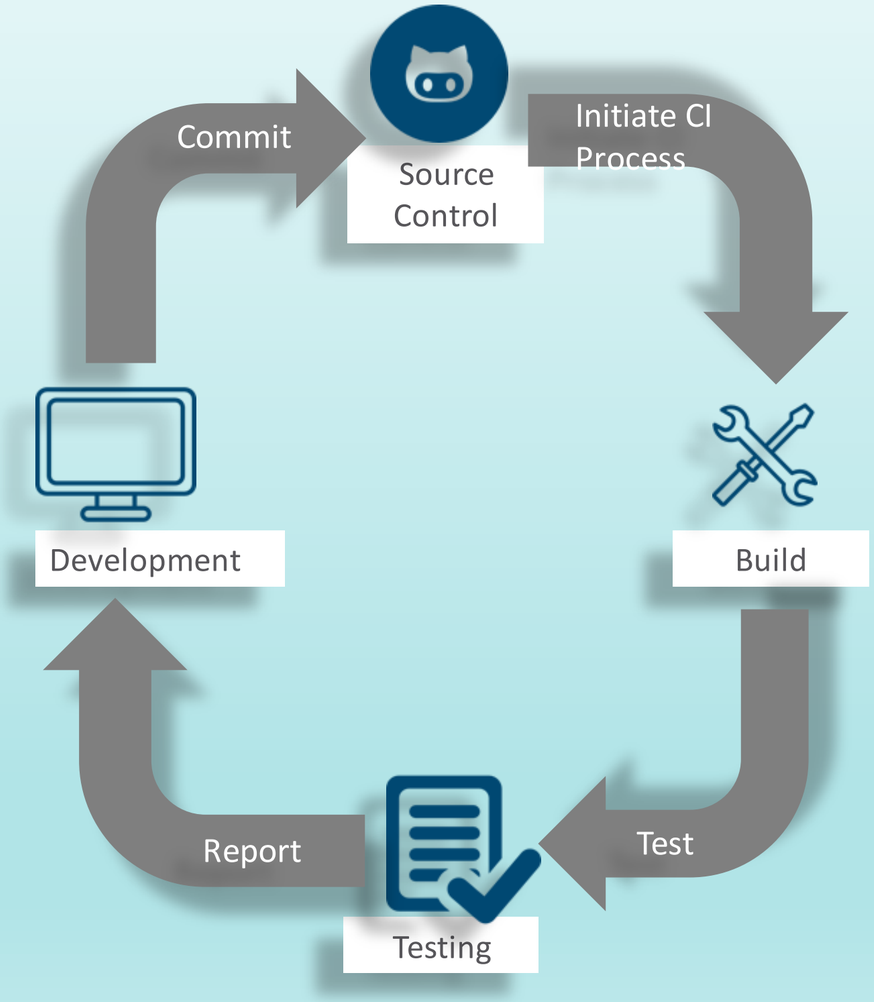
# How To Solve Dave’s Problem?

# Solution: Continuous Integration

# What Is Continuous Integration?

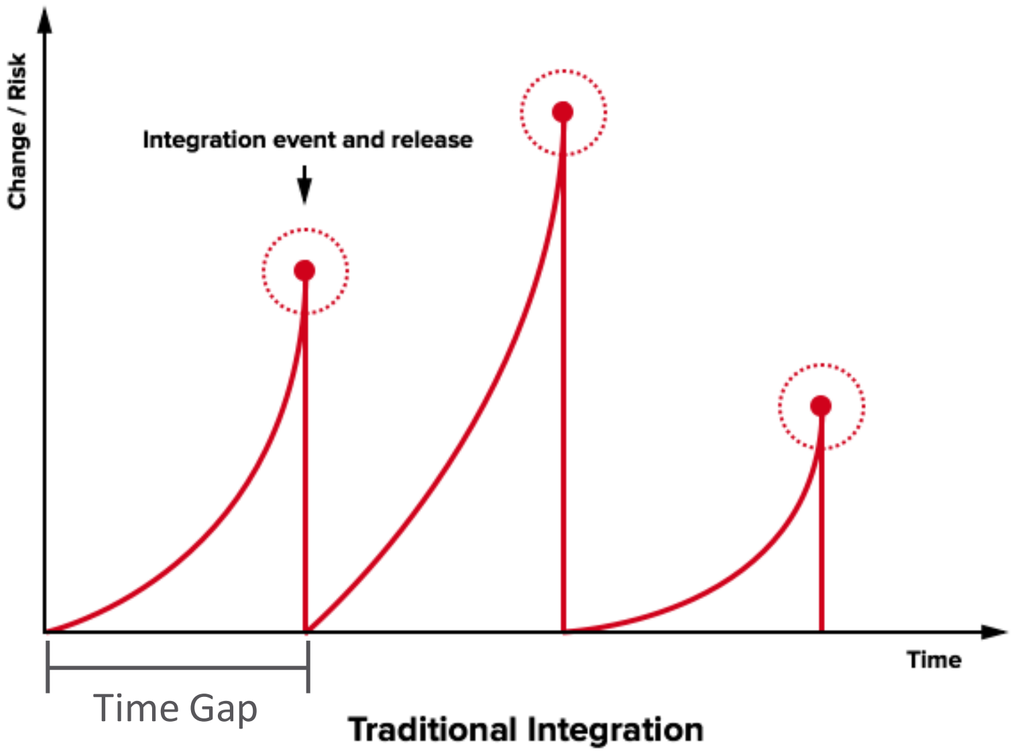
"It is the process of automating the building and testing of code, each time one of the team member commits changes to version control."





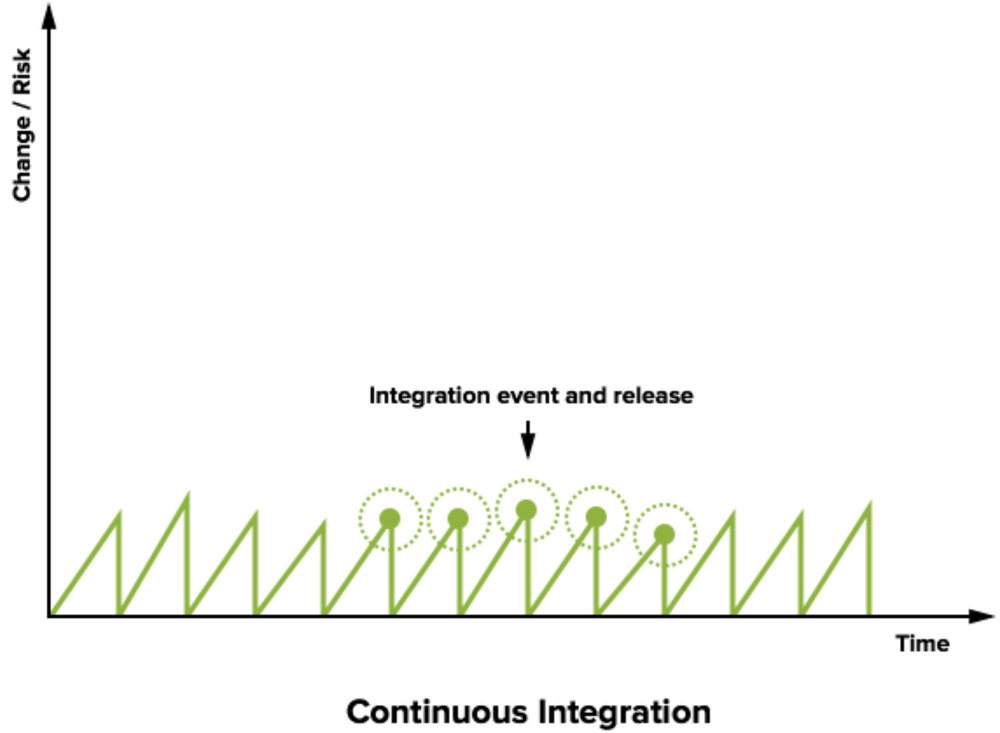
# Traditional Integration Vs Continuous Integration

## Traditional Integration




- Greater time gap in case of Traditional Integration
- Relatively greater risk or change in conflicts

## Continuous Integration




- Integration time gap is relatively much lesser
- Relatively lesser risk or change in conflicts

# Importance Of Continuous Integration

01

## Improves Quality

Improves the quality by running multiple unit tests and analysing various static code

02

## Increases Productivity

Automating build of code saves a lot of time, thereby increasing productivity

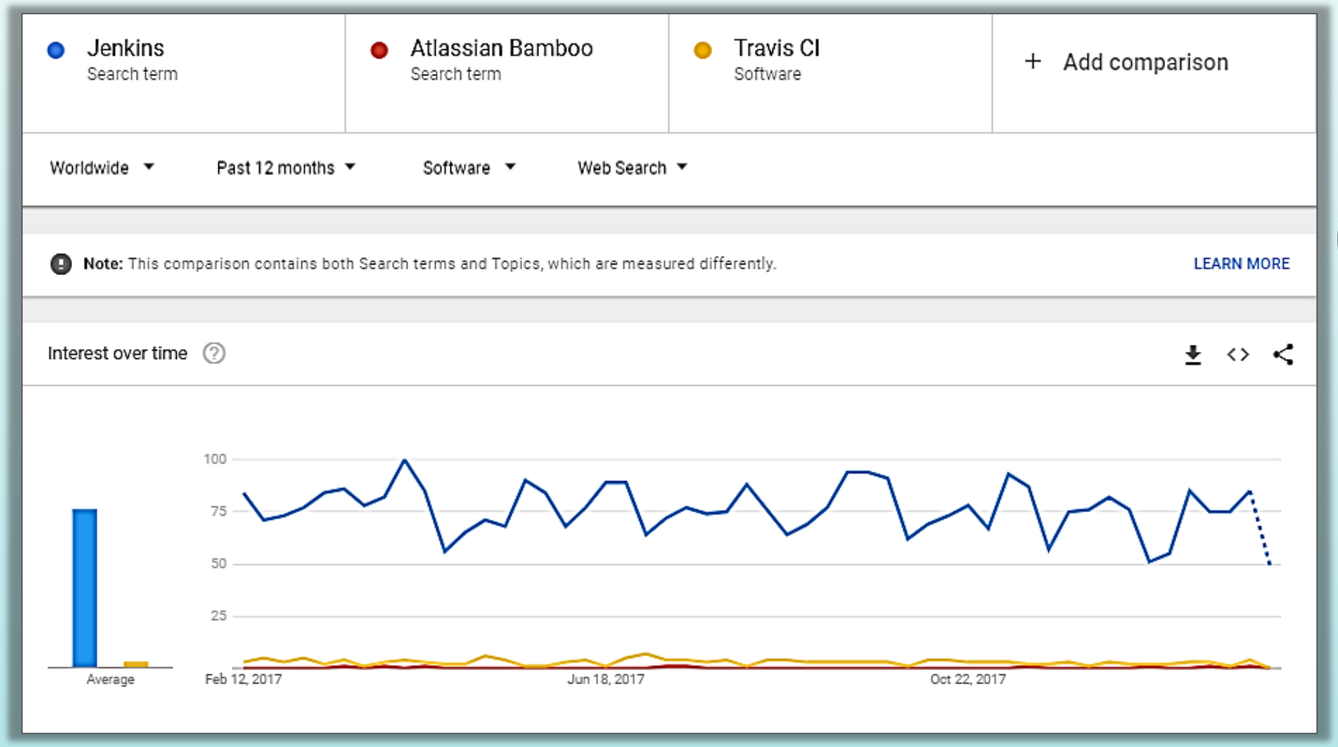
03

## Reduces Risk

Eliminate the risk of potential human errors by automating test

# Popular Continuous Integration Tools

# Jenkins Popularity: Google Trend



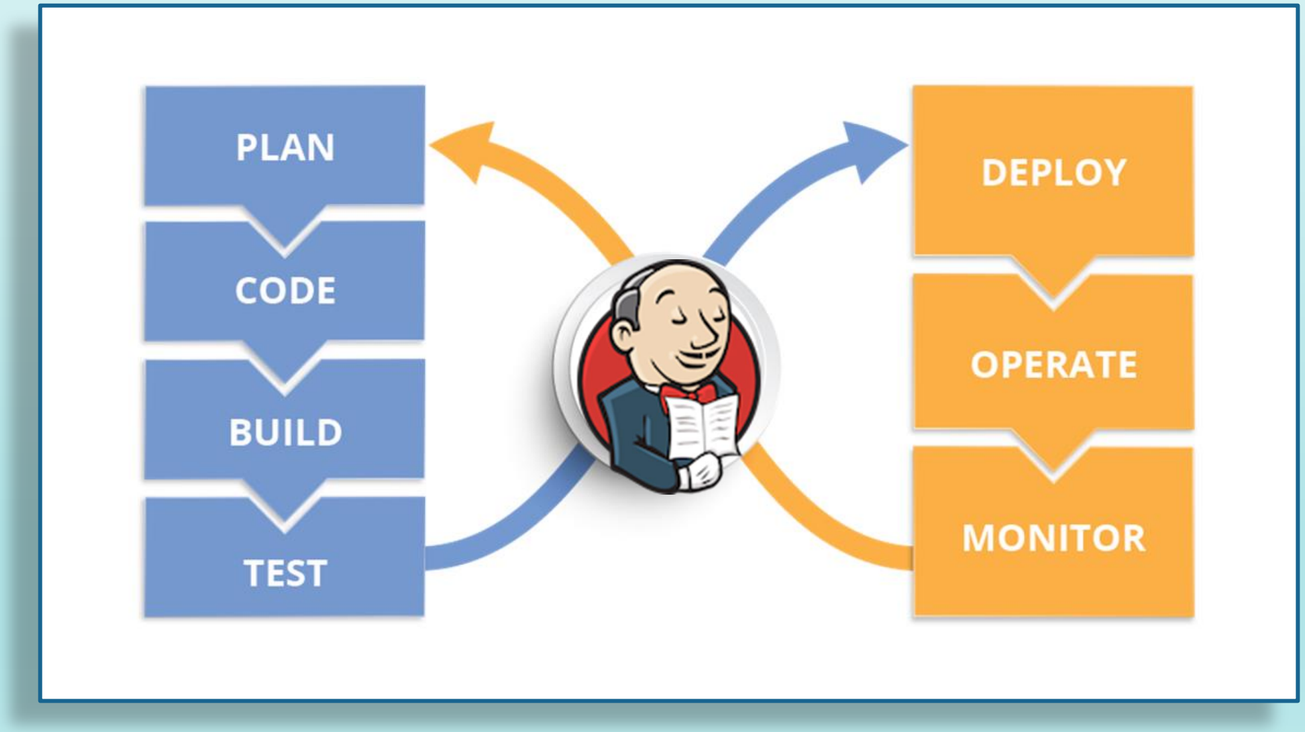

Google Trends: Jenkins VS Travis VS Atlassian Bamboo

# Companies Using Jenkins

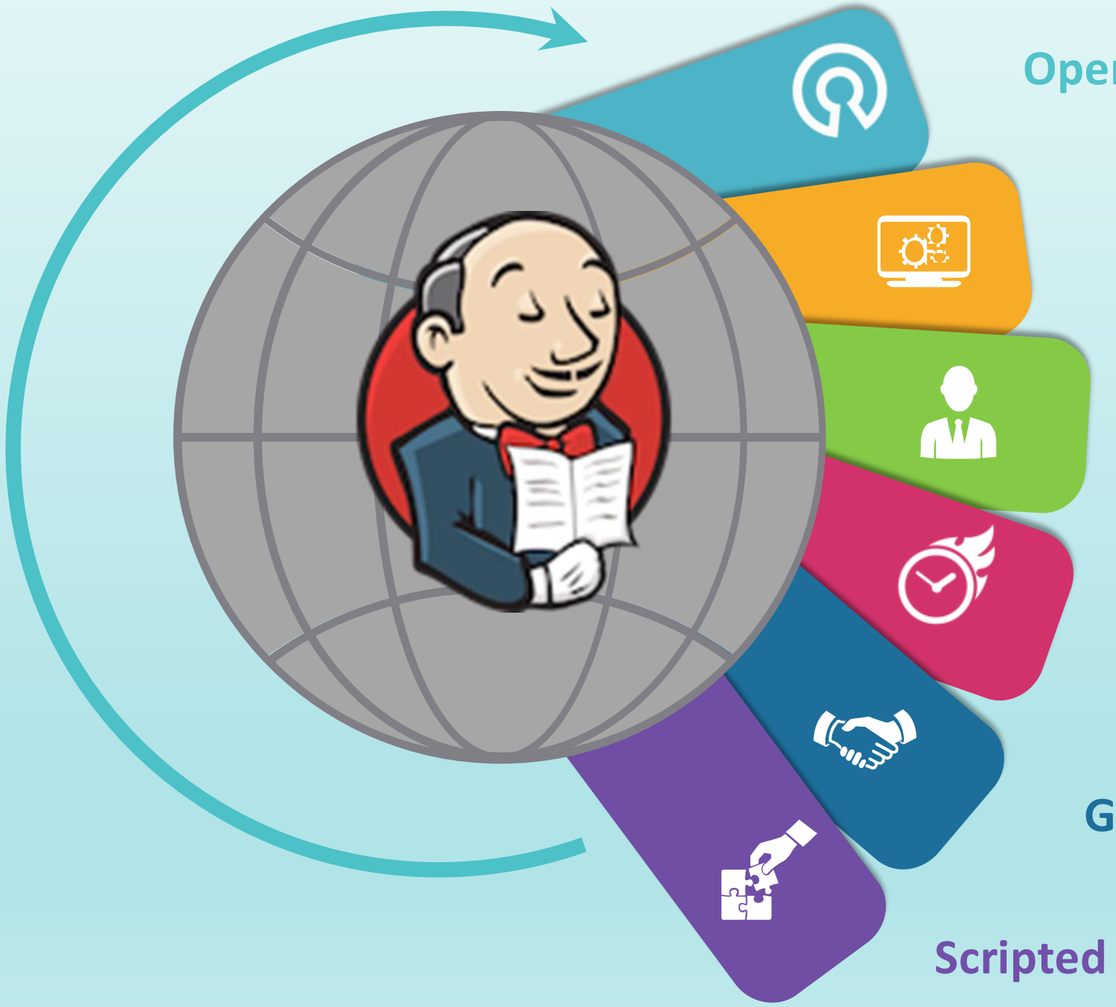
# Introduction To Jenkins

# What Is Jenkins?

“A Continuous Integration server which manages and control processes such as plan, code, build, test, deploy, operate and monitor in DevOps Environment.”



# Why Jenkins Is So Popular?



Open Source

Good Plugin Support

Good Community Support

Fast And Reliable

Good OS Support

Scripted Builds

# Features Of Jenkins

Easy Installation Process

Provides advance security

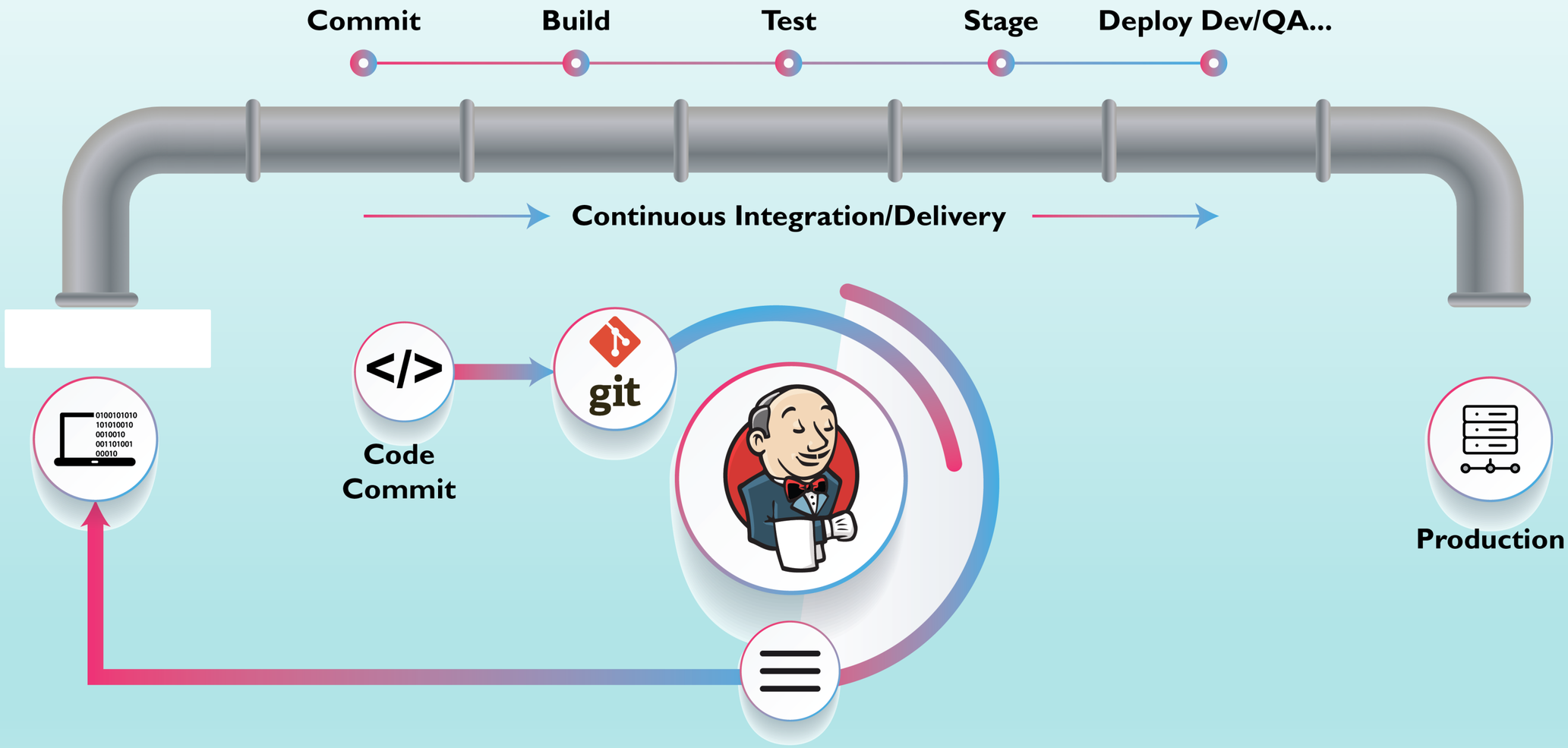
Optimized Performance

Upgrades are easily available

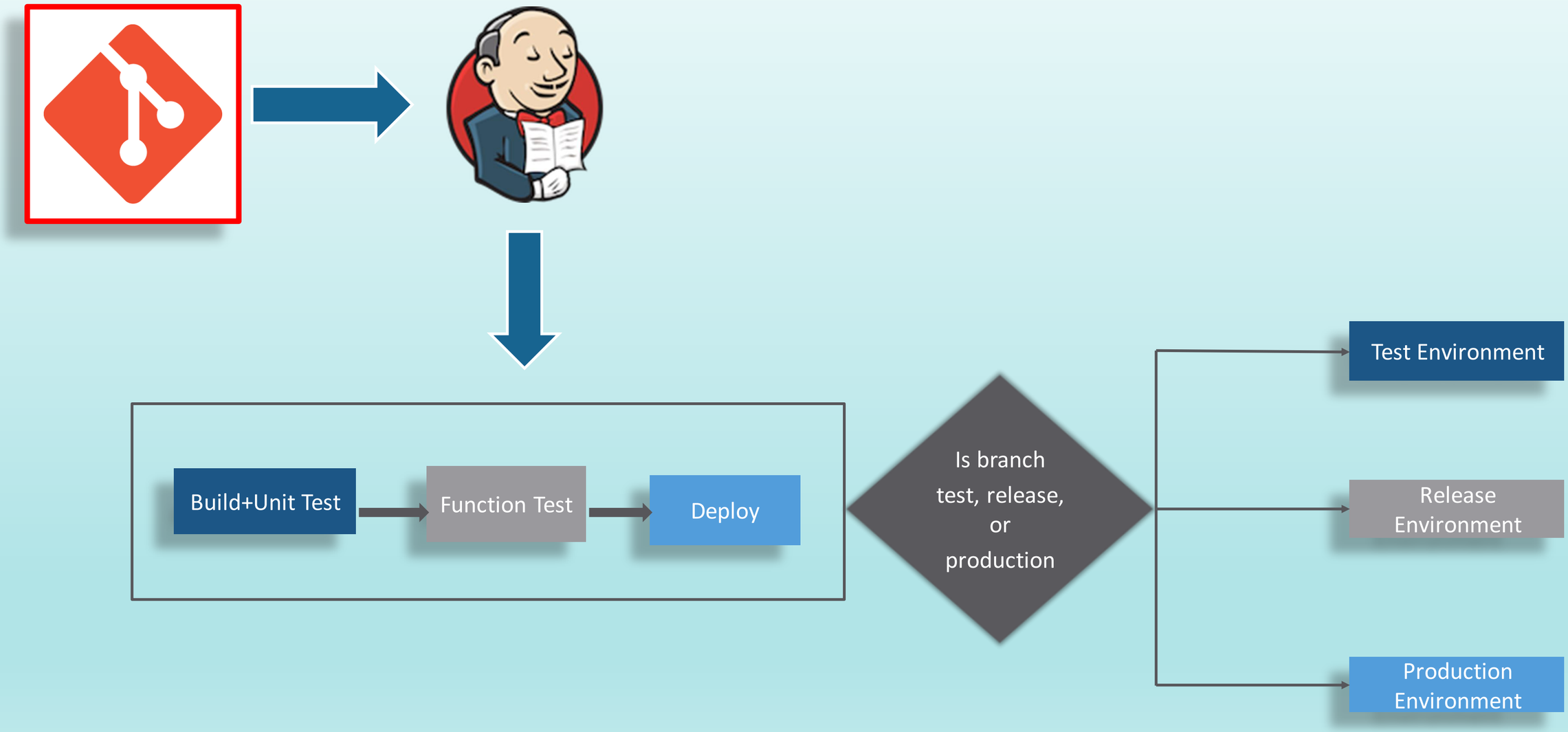

Lightweight container support

Distributed Team Management

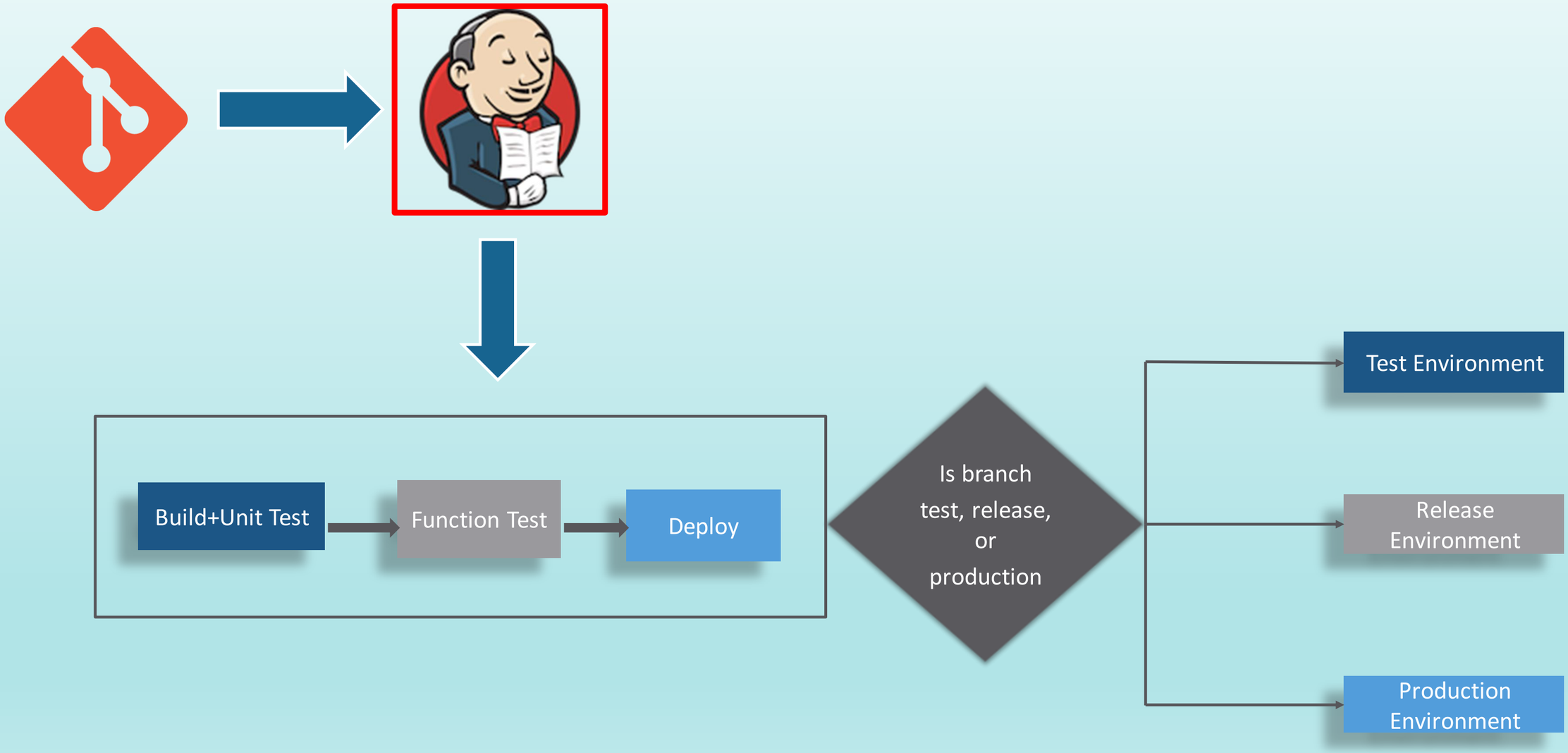
# Bigger Picture: Role of Jenkins in DevOps



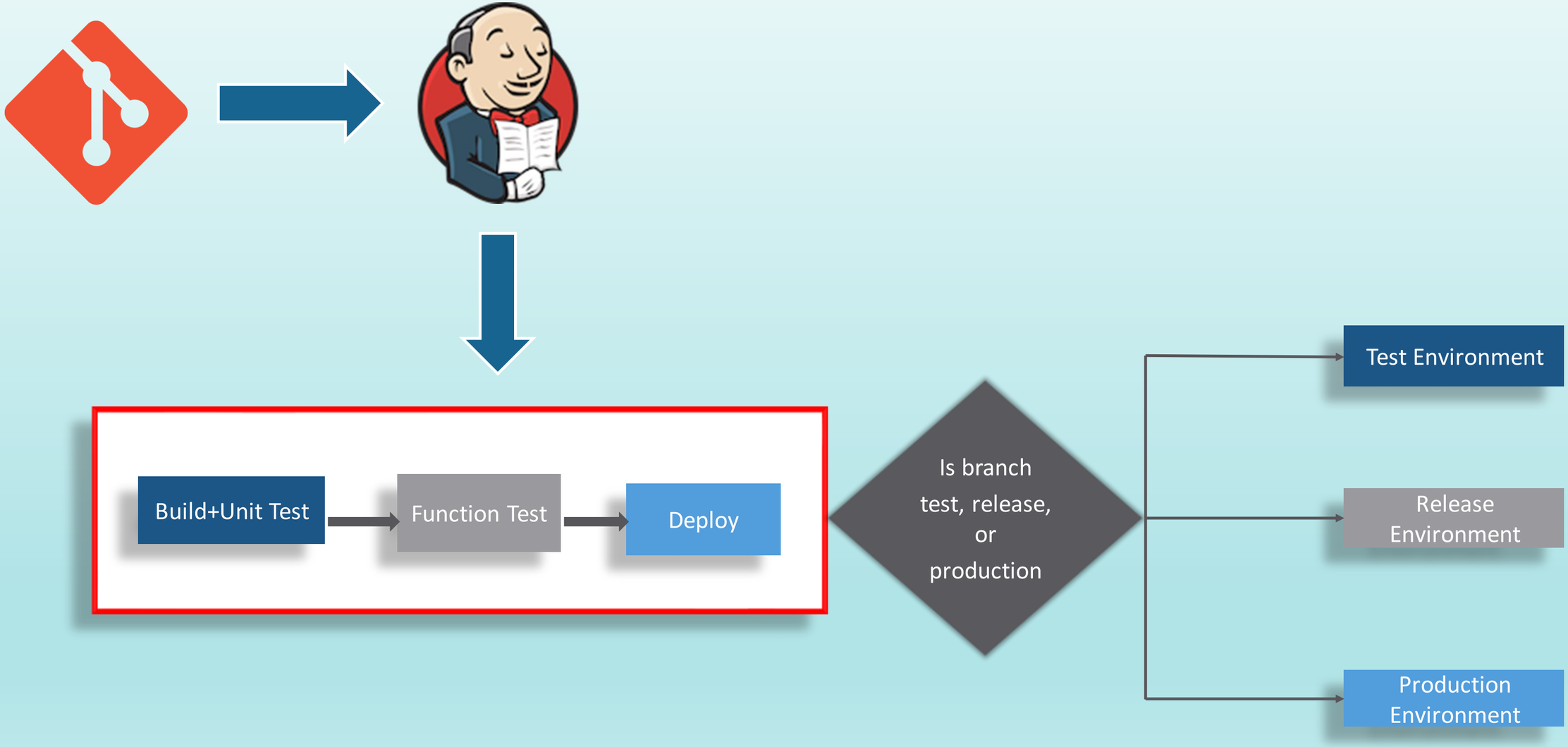
# Jenkins Architecture: Source Control Management



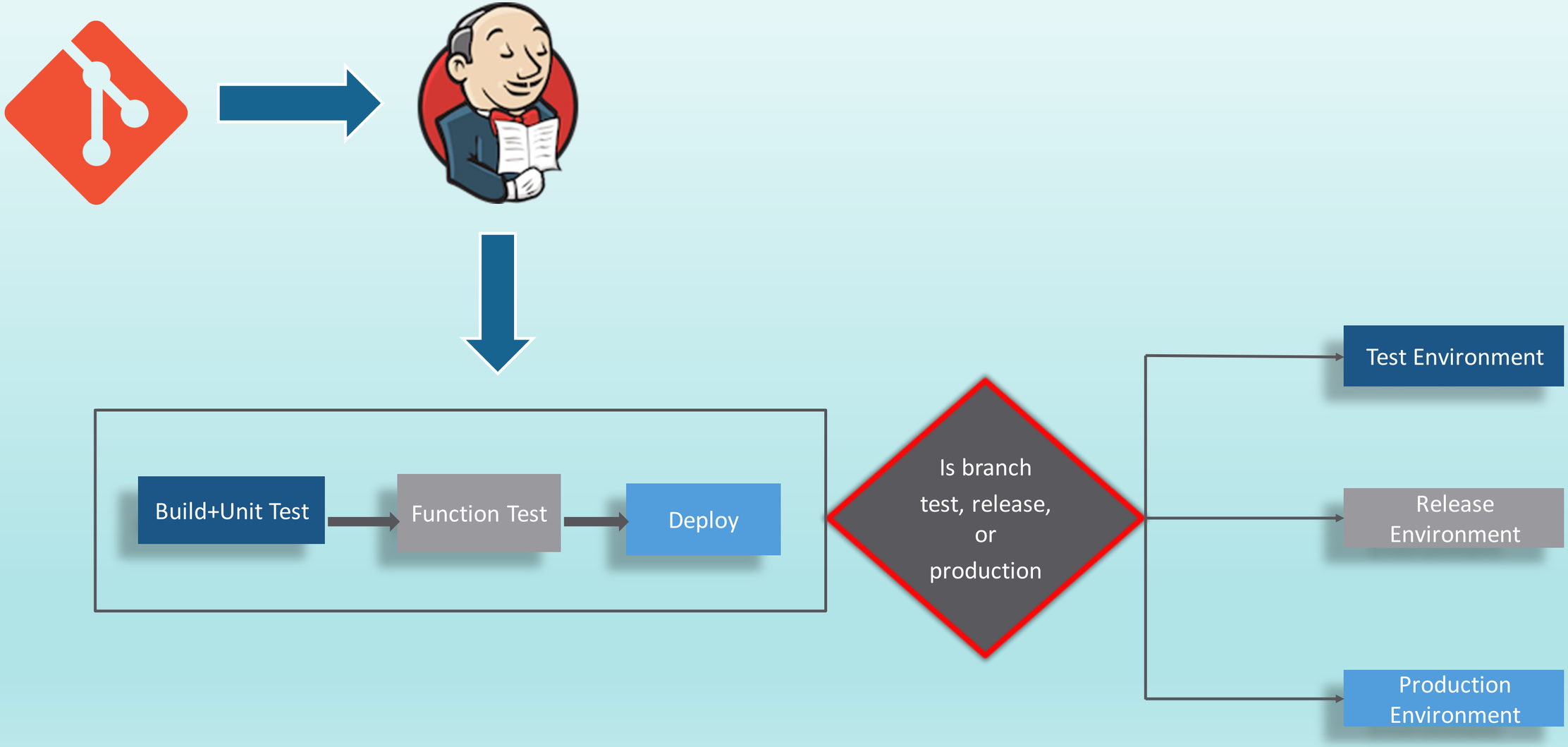
# Jenkins Architecture:  Jenkins Operation



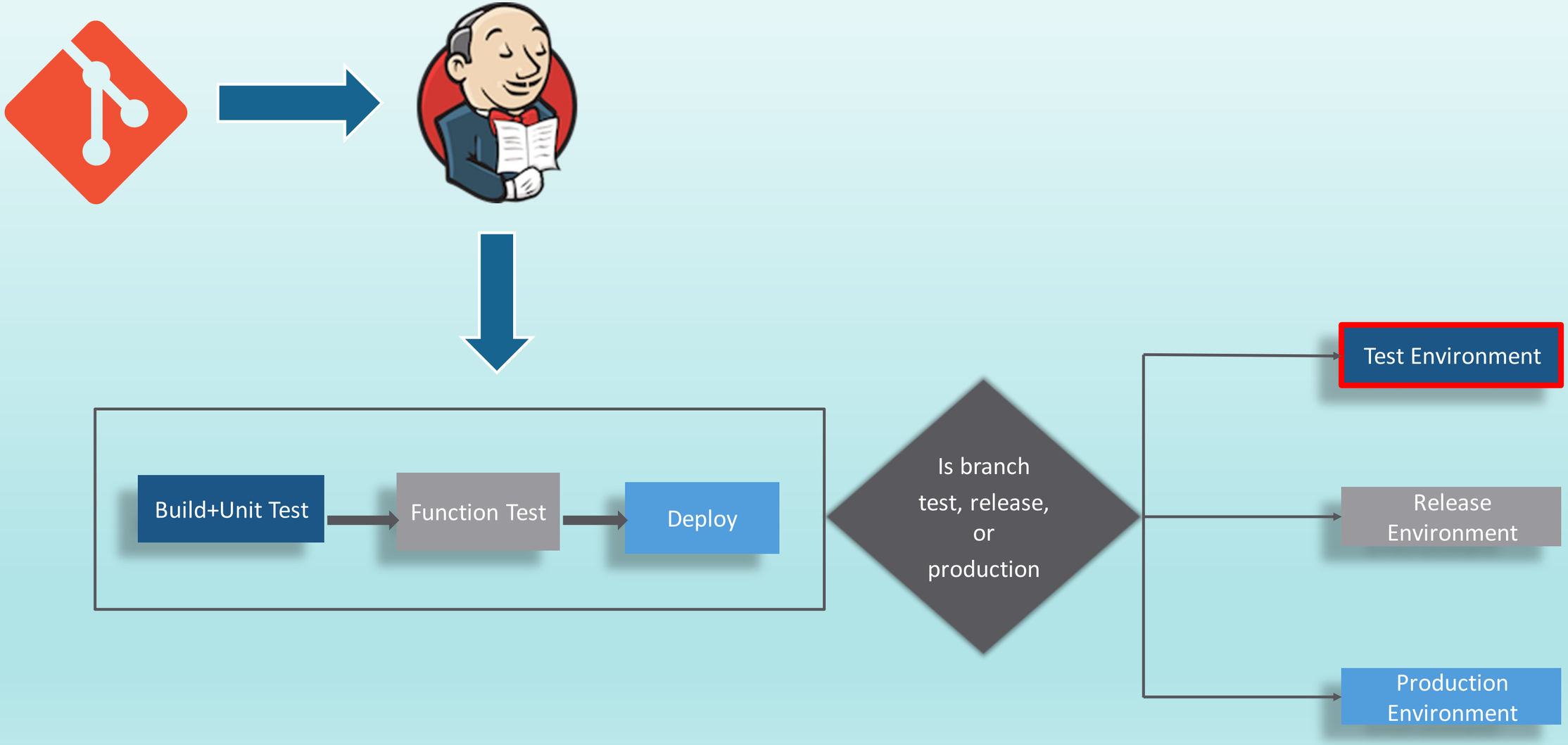
# Jenkins Architecture: Build, Function Test & Deploy



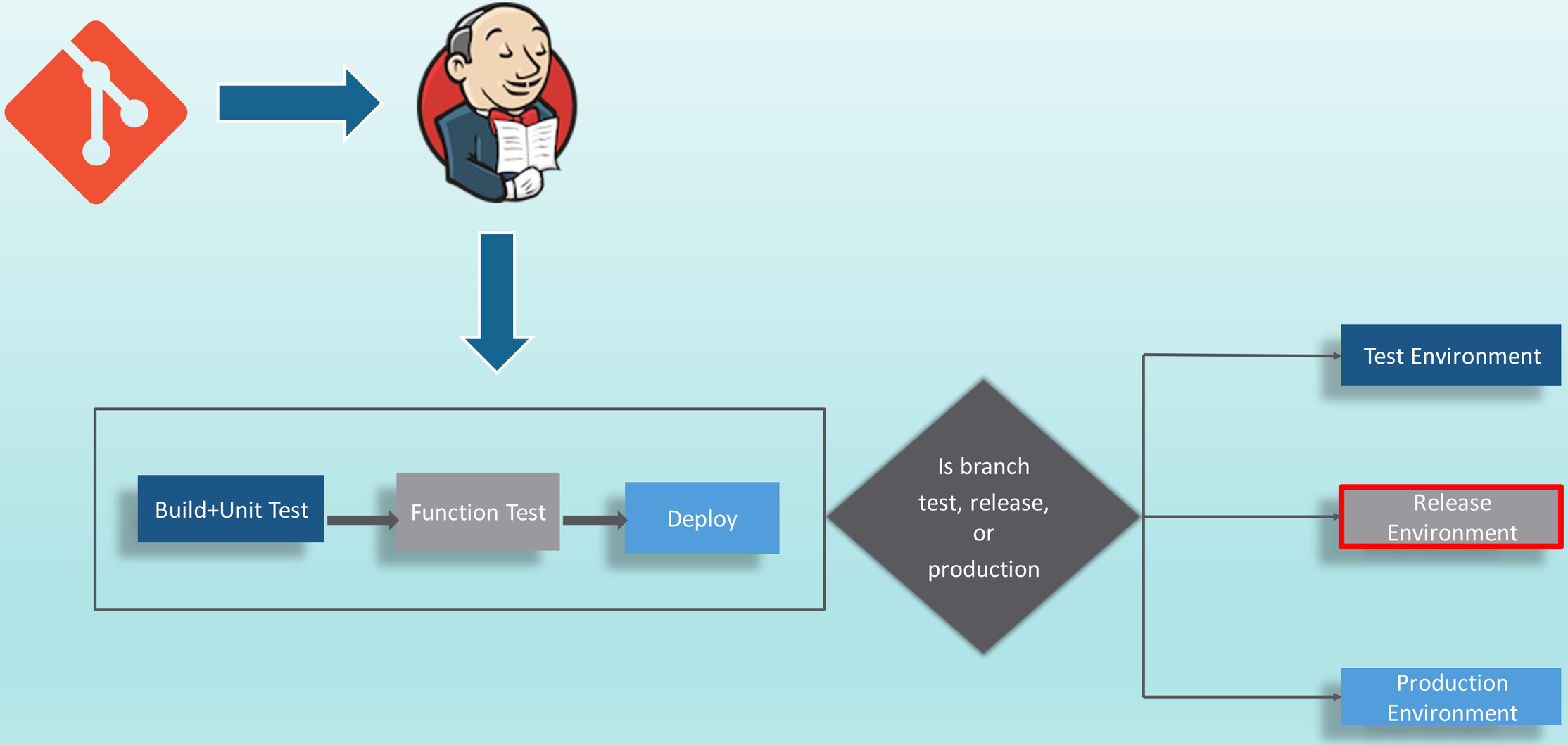
# Jenkins Architecture: Condition Check



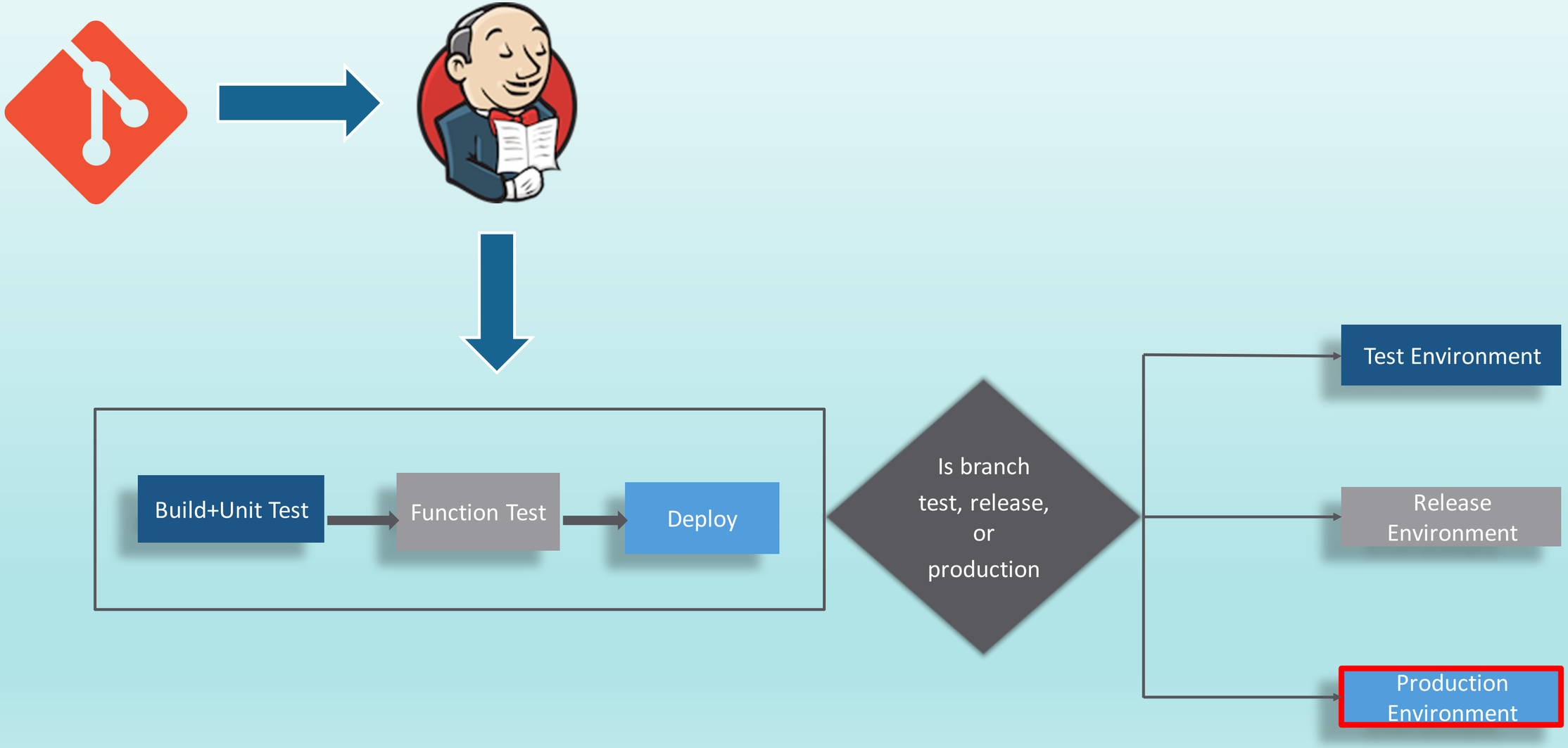
# Jenkins Architecture: Deployed for Testing



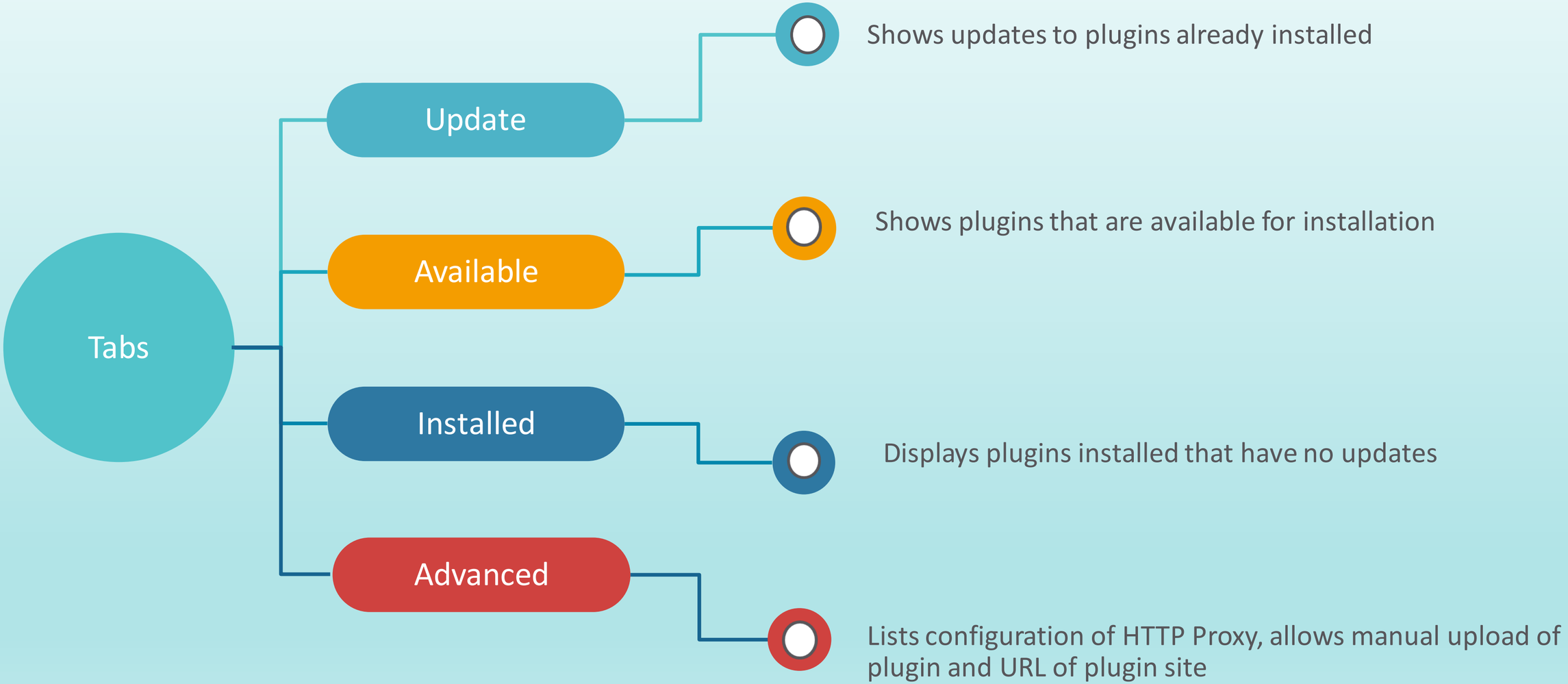
# Jenkins Architecture: Deployed For Release



# Jenkins Architecture: Deployed For Production



# Plugin Management in Jenkins



# Jenkins Projects

**Free Style Project**

This is the central feature of Jenkins. Jenkin will build your project combining any SCM with any build system.

**Pipeline**

Suitable for building pipelines or organizing complex activities that do not easily fit in free style

**Multi-configuration Project**

Suitable for projects that needs large number of different configurations, such as testing on multiple environment, platform specific builds etc..

**Folder**

Creates a container and stores nested items in it. Useful for grouping things together.

**Github Organization**

Scans a Github Organization for all matching repositories..

**Multibranch Pipeline**

Creates a set of pipeline projects according to detected branches in one SCM repositories.

# Introduction To Maven

# What is Maven?

“Maven is a tool that is used to compile, validate codes, and analyse the test-cases in the code.”

- Manages the building, reporting and documentation from Source Control Management (SCM)
- Maven projects are configured through Project Object Model (POM)
- pom.xml file contains documentation for all of the objects, properties, methods, and events

# What Maven Is Capable of ?

- Information of project is centralized through Maven
- Our software project is modelled by it
- Build process is managed
- Data about the software project is gathered and then build itself
- Document the software, and our project
- Deployable artifacts can be generated from source code
- Your source code is compiled, packed, test and distributed
- Reports is created, website is generated for the project

Apache Maven VS Apache Ant

## Google Analytics

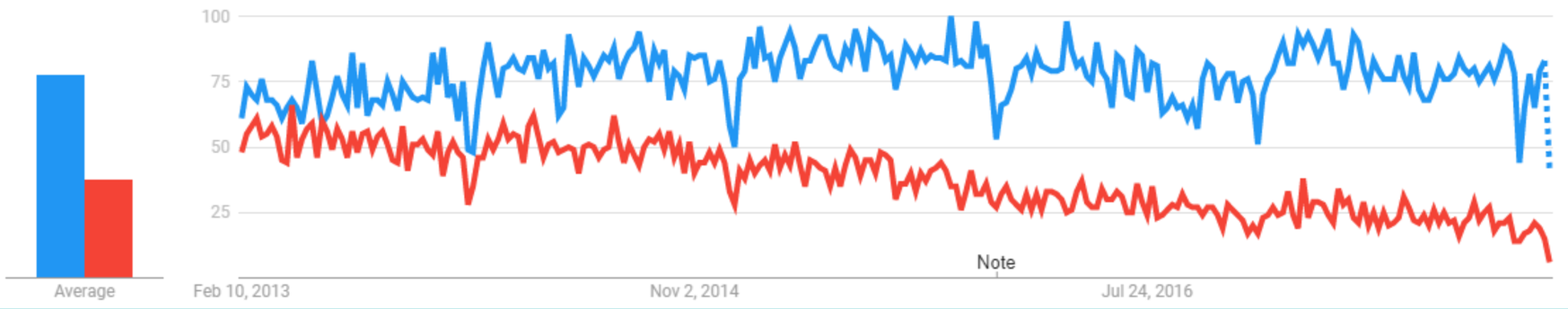
Apache Maven
Search term

Apache Ant
Search term

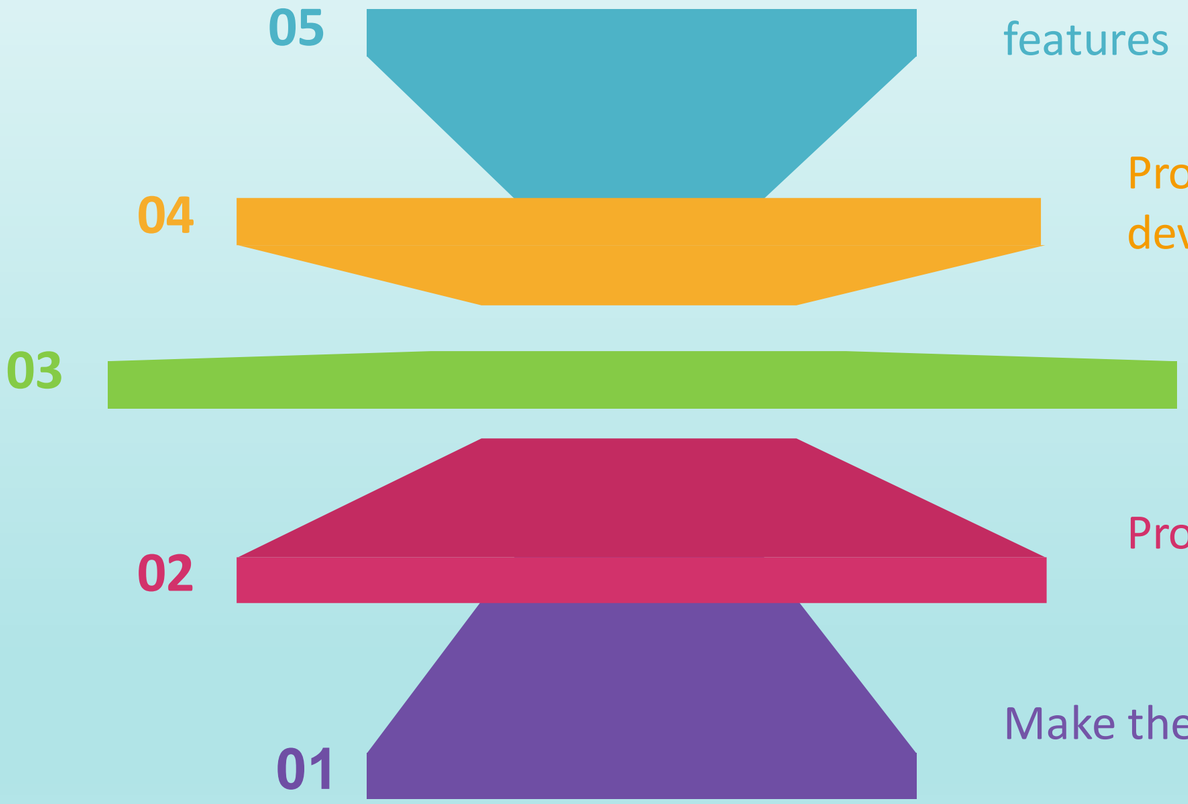
+ Add compa

Worldwide | Past 5 years | All categories | Web Search

Interest over time




# Objectives Of Maven




Allow transparent migration to new features

Provide guidelines for best practices development

Gives quality project information

Provide uniform build system

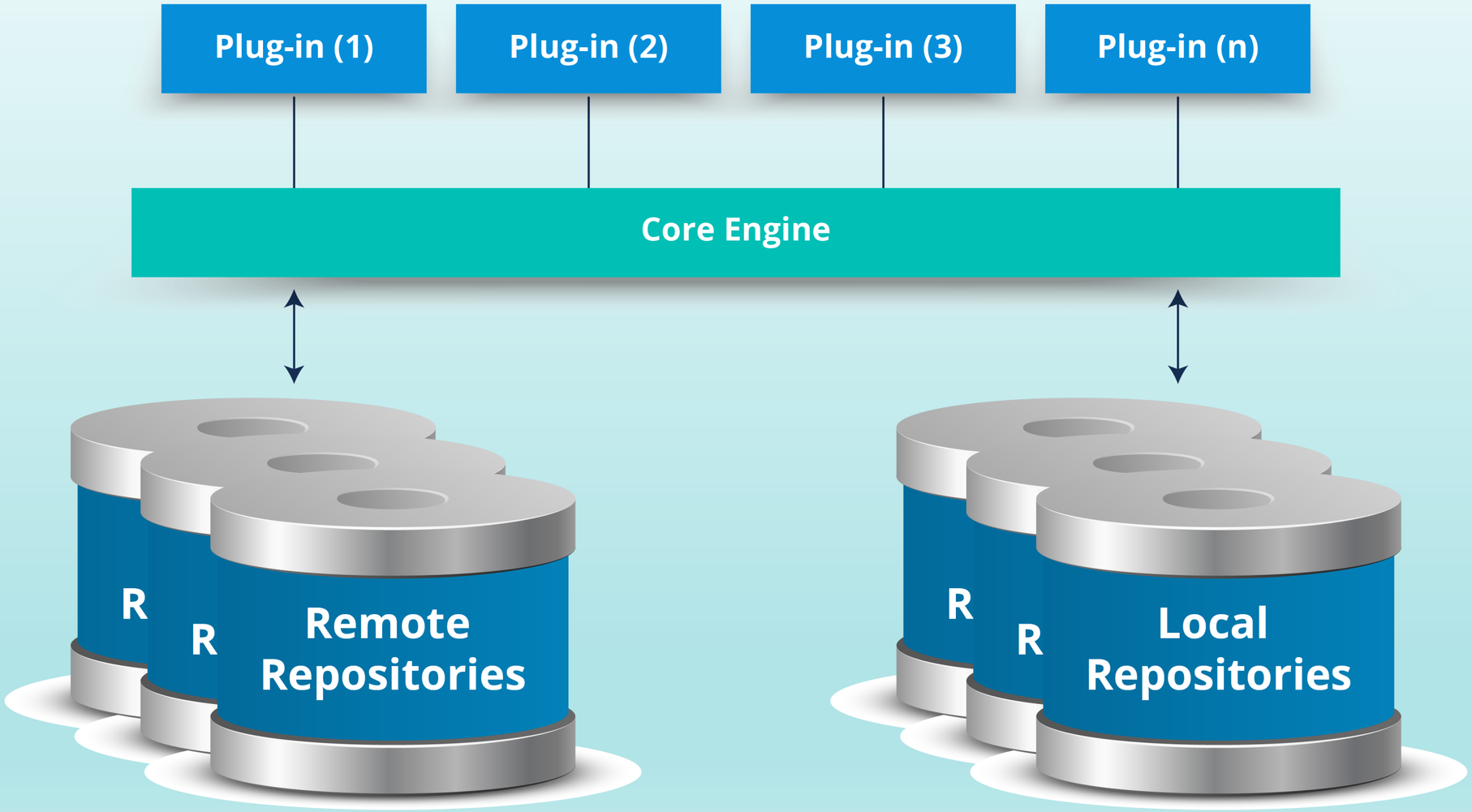
Make the build process easy

# Maven Build Lifecycle

- In Maven, the build is run using a predefined and ordered set of steps to call the build life-cycle
- The build tasks that will be performed during each phase are determined by the configuration in the project file, and in particular the selected packaging
- Maven relies on build lifecycles to define the process of building and distributing artifacts (eg. Jar files, war files)
- There are three built-in build lifecycles
  - Default – handles project building and deployment
  - Clean – handles project cleaning
  - Site – handles project's site generation

# Maven Architecture

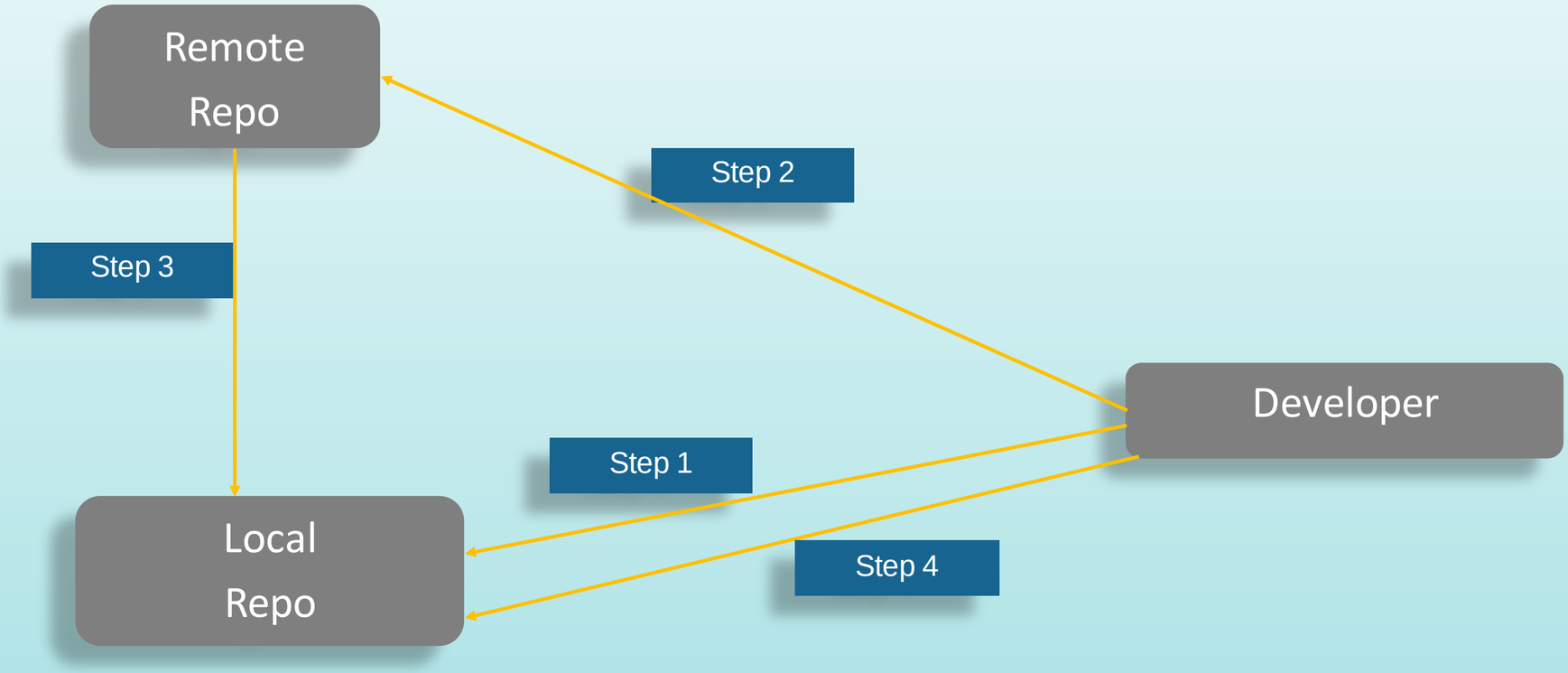
# Maven Architecture



# Maven Artefacts

- An artifact is a file resulting from packaging a project
- Can be a jar, war, ear, .xml file, for example
- Artifacts are deployed in repositories, so they can be used, as dependencies, by other projects
- Artifacts are identified by three components:
- – Group Id → An unique identifier for a group of related artifacts. Usually named like Java packages (Ex: pt.jpereira.mobile)
- – Artifact Id → An unique identifier, within the context of GroupId, that identifies the artifact (project). (Ex: puzzle)
- – Version
- Also called artifact coordinates

# Maven Repository Flow



# Maven Repository

- Maven repository stores all the versions of all the dependencies
- There are three types of maven repository:
  - Local : It is located in developers machine. By default, it is created in home directory and whenever dependencies are downloaded from remote server, it is saved into the developers machine
  - Central Repository : The location of this repository is http://repo.maven.apache.org/maven2/ . Whenever build job is run, maven try to find it from local repository but when it's not there, they download the dependencies from central repository
  - Remote : Sometimes, there are objects and modules which are specific to organization, for which remote repositories are created which are accessible within the organization.

# Project Object Module

- POM for short
- XML file located at the root of the project (pom.xml)
- It includes configuration for your project, including
  - Information about the project
  - Configuration details to build the project
  - Contains default values for most of the projects. Ex: Source dir, target dir
  - Dependencies of the project
  - Configuration about plugins and goals
  - Used repositories

# Dependencies

- Maven comes into the picture for dependencies
- Manages hundreds of plug-ins
- Dependencies get cached into the local repository
- Manages the transitive dependencies
- Provides multiple scope for including dependencies

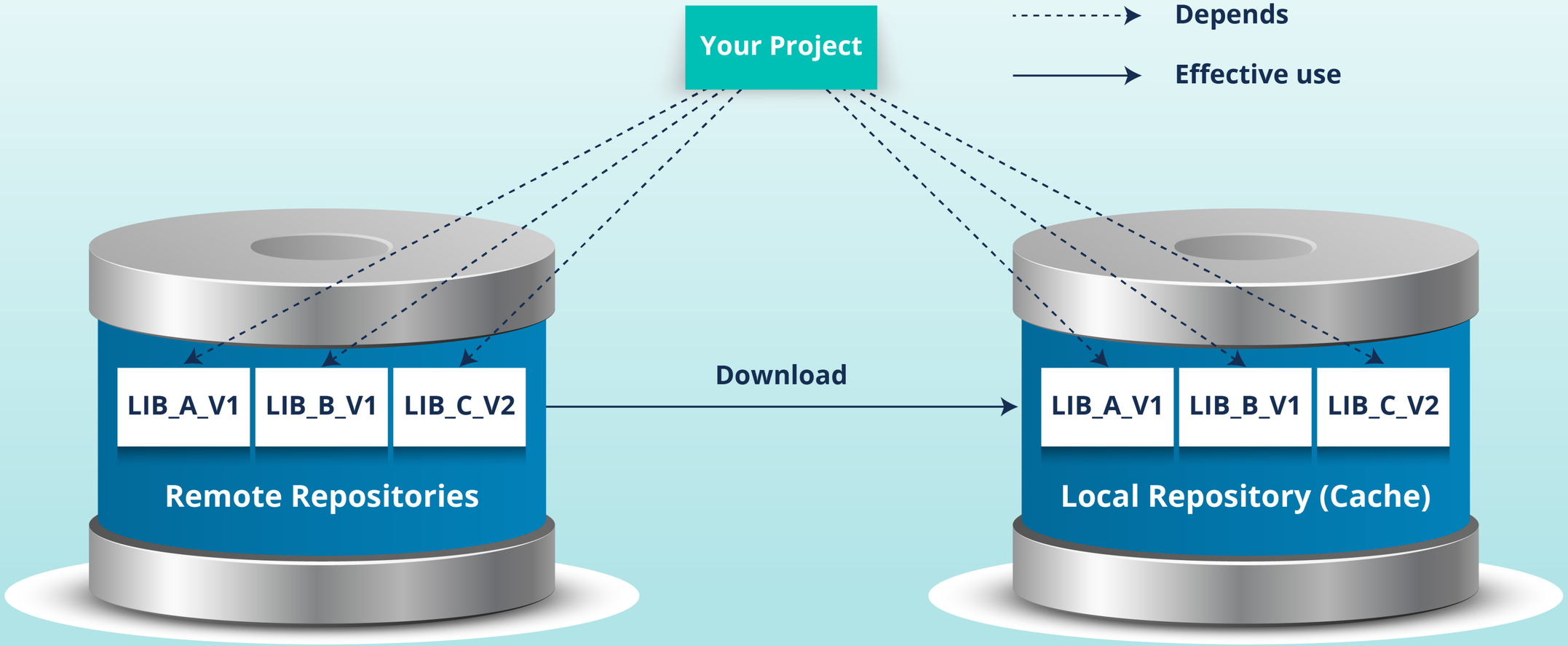
# Declaring Dependencies

- While declaring the dependencies, coordinates of the artefacts must be provided:
  - GroupID : A unique identifier for the group of related artifact
  - ArtifactID : An artefact is a file which is made after packaging a project and ArtefactID is a unique identifier within the context of GroupID and it identifies the artefact
  - Version : It is an identifier for the release or build number of project

# Dependency Management

- It has mechanism to centralize dependency information
- Maven has all information about dependencies in the parent POM (version, exclusions, scope, type)
- Child POMs only have to have a simple reference to the dependencies, excluding version, exclusions, scope type

# Cache Dependencies



# Maven Through Terminal

- Latest version of Maven available for now is 3.5.3
- Install the Maven tar file after verifying the signature
- After installing the Maven, check its version from ubuntu terminal by using the below command
  - `$mvn -version`
- Below command will create a project using Maven

```
$mvn archetype:generate -DgroupId=com.mycompany.app -DartifactId=my-app -
DarchetypeArtifactId=maven-archetype-quickstart -DinteractiveMode=false
```

- The generate goal will create a directory having the same name given as the artifactId

# Build The Package In Maven Through Terminal

- Below command will build the Maven project
  - $ mvn package
- The newly compile and build project can be tested by using the below command
  - `$java -cp target/my-app-1.0 proj_name.jar com.mycompany.app.App`
- The above command will print the output of the project

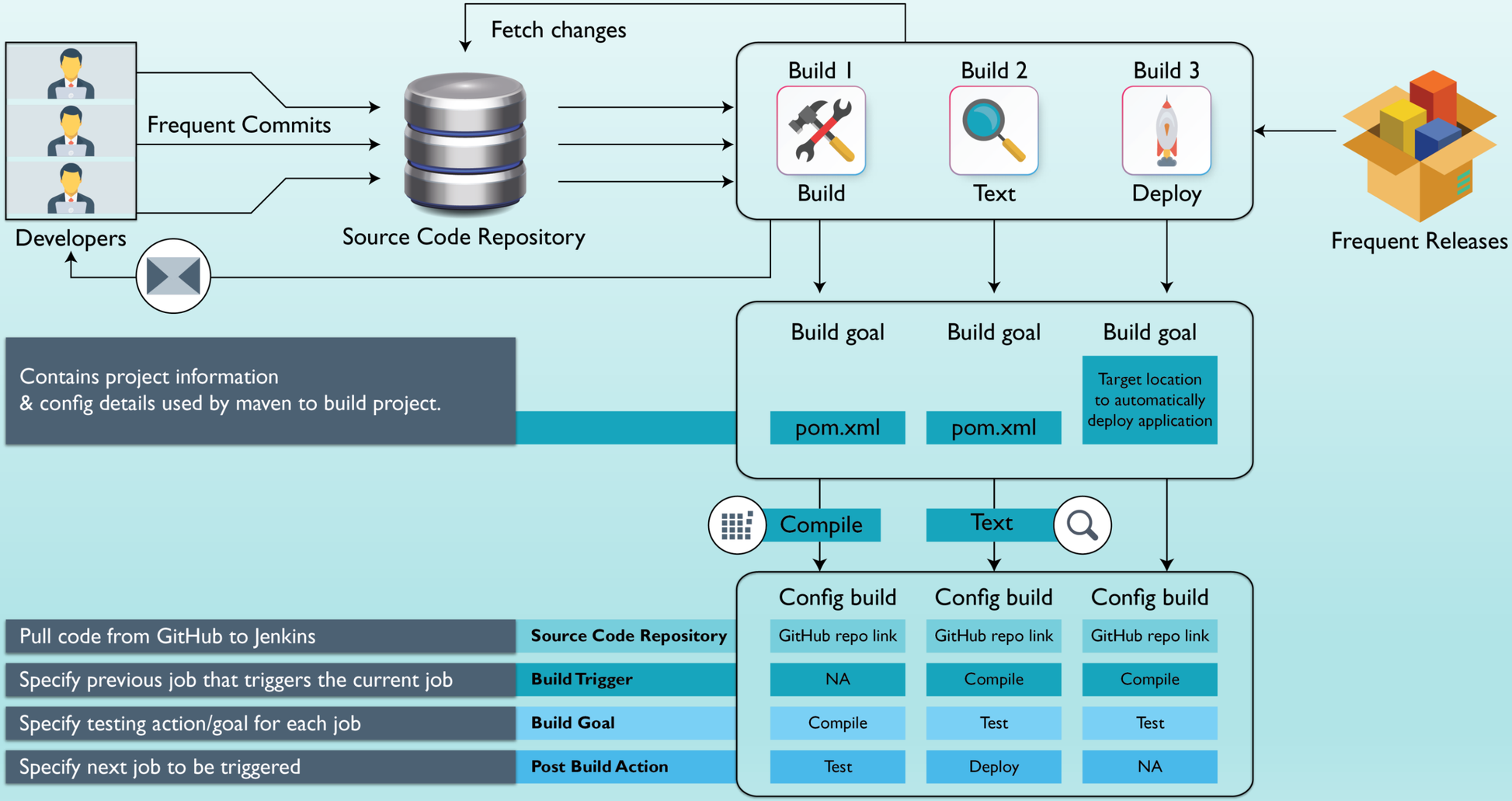
# Maven Lifecycle Phases

- **validate**: check if the project is correct, having all the necessary information
- **compile**: compile the source code of the project
- **test**: test the compiled source code using a suitable unit testing framework. These tests should not require the code be packaged or deployed
- **package**: take the compiled code and package it in its distributable format, such as a JAR

# Maven Lifecycle Phases

- **integration-test**: process and deploy the package into an environment where integration tests can be run
- **verify**: run any checks to verify the package is valid and meets quality criteria
- **install**: install the package into the local repository, for use as a dependency in other projects locally
- **deploy**: done in an integration or release environment, copies the final package to the remote repository for sharing with other developers and projects.

# Jenkins Workflow to build a Maven Project

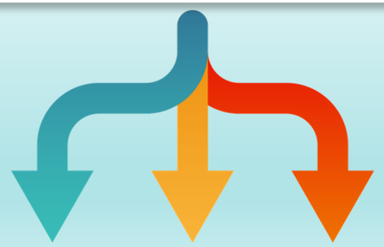


# Demo: Create A Maven Project And Compile The Pulled Code From Repository

# Summary

## Branching

A project in its development could take multiple different paths to achieve its goal. Branching helps us take these different directions, test them out and in the end achieve the required goal.

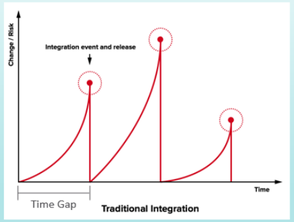


## Git Stashing

Git Stashing is a way of creating a checkpoint for non-committed changes. It saves all the changes to a temporary location so the user can perform other tasks such as switching branches, reverting etc. These changes can then be reapplied anywhere.

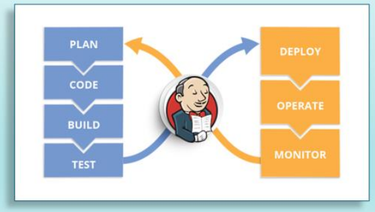
## Traditional Integration

- Greater time gap in case of Traditional Integration
- Relatively greater risk or change in conflicts

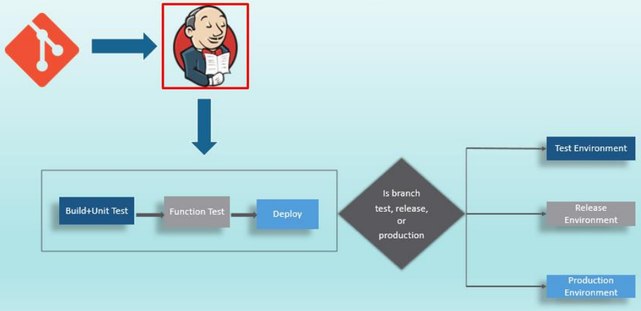



## What Is Jenkins?

"A Continuous Integration server which manages and control processes such as plan, code, build, test, deploy, operate and monitor in DevOps Environment."




## Jenkins Architecture: Jenkins Operation

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