47006- ANÁLISE E MODELAÇÃO DE SISTEMAS

Continuous Integration & Continuous Delivery

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deti

Learning objectives

Identify validation and verification activities in the SDLC

Describe the layers of the test pyramid

Describe the object of unit, integration, system and acceptance test

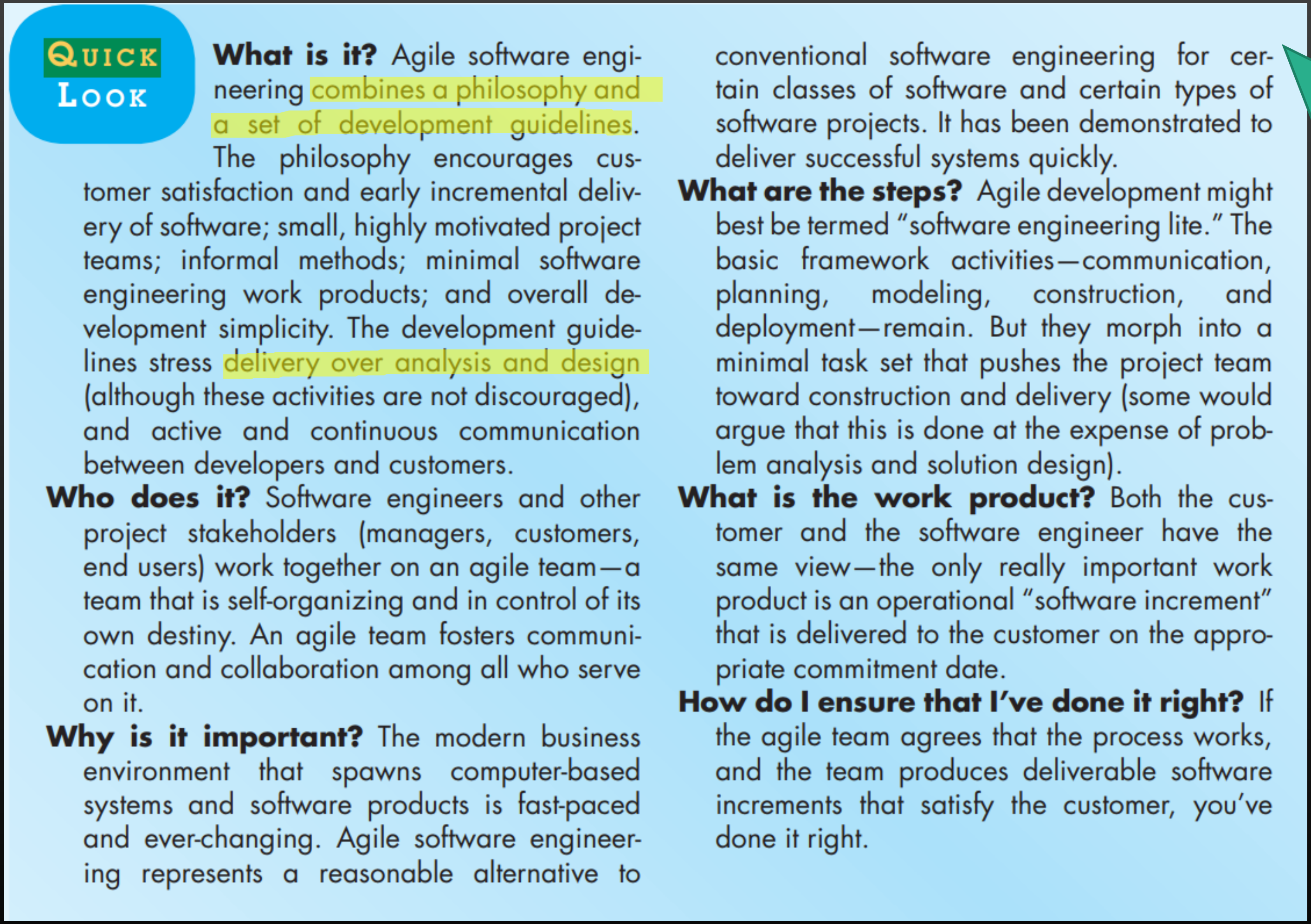
Explain the lifecycle of TDD

Explain how the QA activities are inserted in the development process in a classical approach and in agile methods

Relate the story acceptance criteria with agile testing

Explain the concept of executable specifications (and the relation with BDD).

Algumas ideias do desenvolvimento ágil



QUICK LOOK

What is it? Agile software engineering combines a philosophy and a set of development guidelines. The philosophy encourages customer satisfaction and early incremental delivery of software; small, highly motivated project teams; informal methods; minimal software engineering work products; and overall development simplicity. The development guidelines stress delivery over analysis and design (although these activities are not discouraged), and active and continuous communication between developers and customers.

Who does it? Software engineers and other project stakeholders (managers, customers, end users) work together on an agile team—a team that is self-organizing and in control of its own destiny. An agile team fosters communication and collaboration among all who serve on it.

Why is it important? The modern business environment that spawns computer-based systems and software products is fast-paced and ever-changing. Agile software engineering represents a reasonable alternative to conventional software engineering for certain classes of software and certain types of software projects. It has been demonstrated to deliver successful systems quickly.

What are the steps? Agile development might best be termed "software engineering lite." The basic framework activities—communication, planning, modeling, construction, and deployment—remain. But they morph into a minimal task set that pushes the project team toward construction and delivery (some would argue that this is done at the expense of problem analysis and solution design).

What is the work product? Both the customer and the software engineer have the same view—the only really important work product is an operational "software increment" that is delivered to the customer on the appropriate commitment date.

How do I ensure that I've done it right? If the agile team agrees that the process works, and the team produces deliverable software increments that satisfy the customer, you've done it right.

O dinamismo do mercado obriga a igual dinamismo das TIC/desenvolvimento. Especialmente quando os produtos do desenvolvimento passam a assumir um papel fundamental na criação das vantagens competitivas.

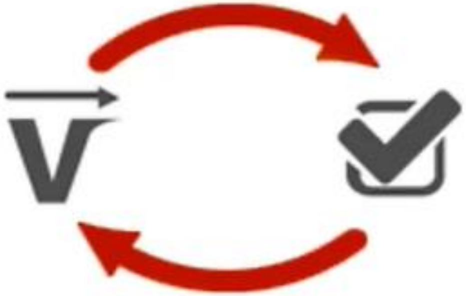
A transformação digital (competitiva) obriga a uma eng.a de software competitiva.

Credit: Pressmen'15
I Oliveira

Velocidade "furiosa"?

Greater speed may generate more risk and less quality...

... but **Velocity = Direction + Speed**



quick feedback
improves direction
which improves quality which improves speed
which improves feedback

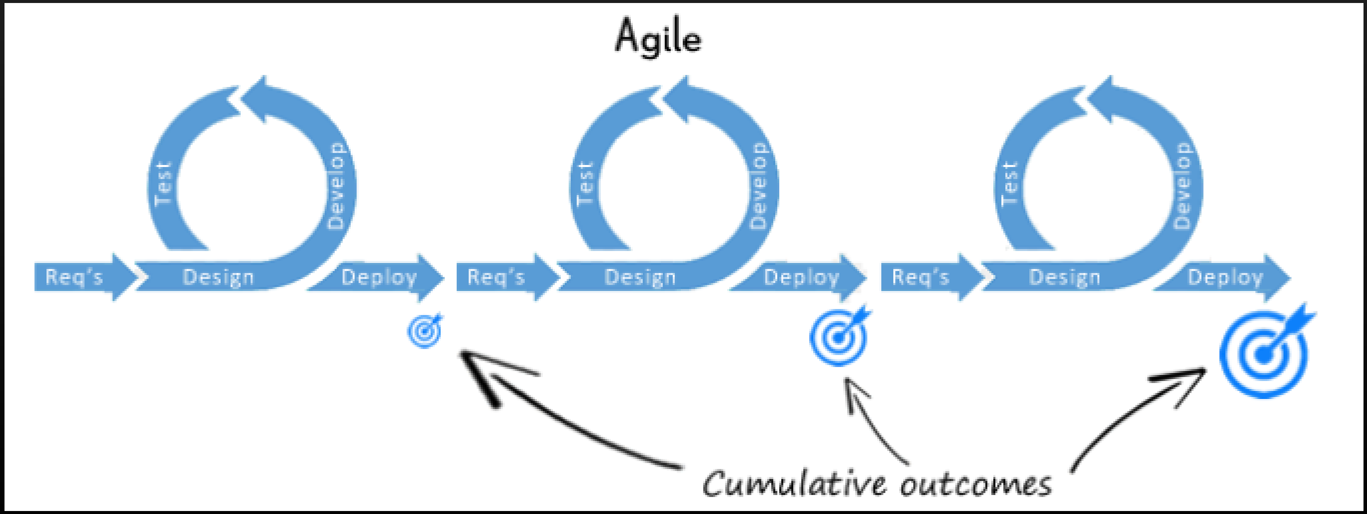
Para avançar depressa e com segurança, é preciso preparar a "máquina": mexer no próprio processo de engenharia de sw.

Crédito: Rui Gonçalves, Winning Consulting

Desenvolvimento iterativo

Cada iteração envolve escolher um pequeno subconjunto dos requisitos, para projetar/desenhar, implementar e testar.

- Desenvolvimento em ciclos curtos
- Cada ciclo dá um incremento executável (parcial)
- Cada incremento é testado e integrado
- O feedback de cada iteração leva ao requinte e adaptação da próxima.



Continuously integrating the “units”

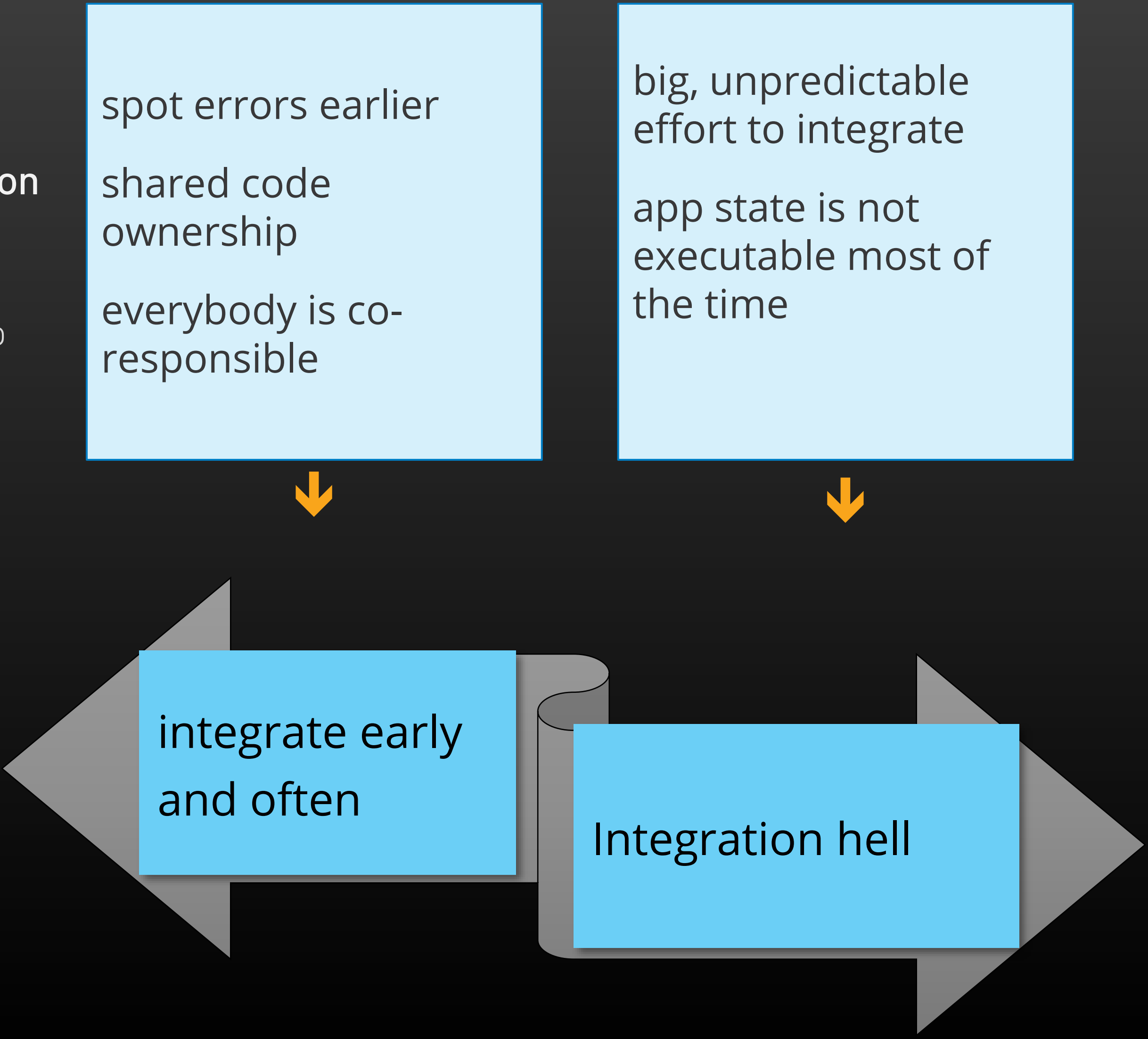
The essence of it lies in the simple practice of everyone on the team integrating frequently.

Feel comfortable and set up the tools to integrate at any time.

CI makes the development process smoother and less risky

↓ “it runs on my computer”

Early detection of failures (react quickly)



spot errors earlier

shared code ownership

everybody is co-responsible

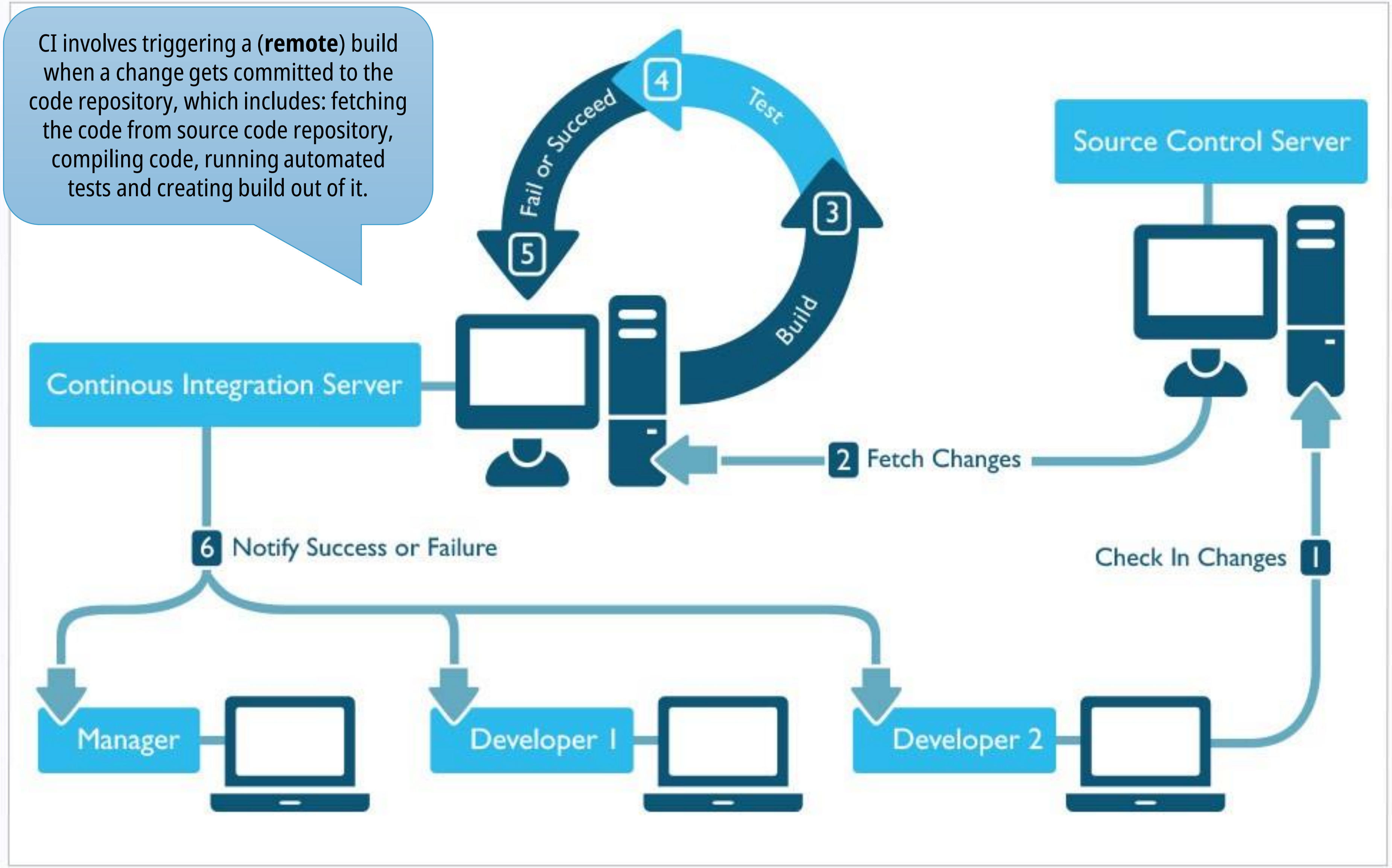
big, unpredictable effort to integrate

app state is not executable most of the time

integrate early and often

Integration hell

CI involves triggering a (**remote**) build when a change gets committed to the code repository, which includes: fetching the code from source code repository, compiling code, running automated tests and creating build out of it.



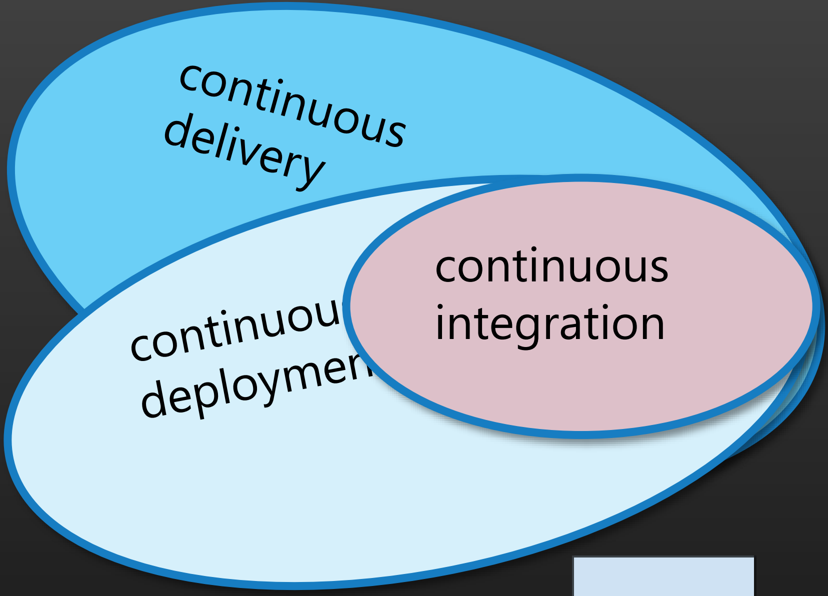
https://insights.sei.cmu.edu/devops/2015/01/continuous-integration-in-devops-1.html

Continuous integration practices

- Developers commit to a shared repository regularly
- Changes in SCM are observed and trigger automatically builds
- Immediate feedback on build failure (broken builds have high-priority)
- Optional: deploy of artifacts into a reference repository
- Optional: trigger deployment for integration/acceptance tests

The most frequent the integration process is, the less painful

Related (yet different) **terms**

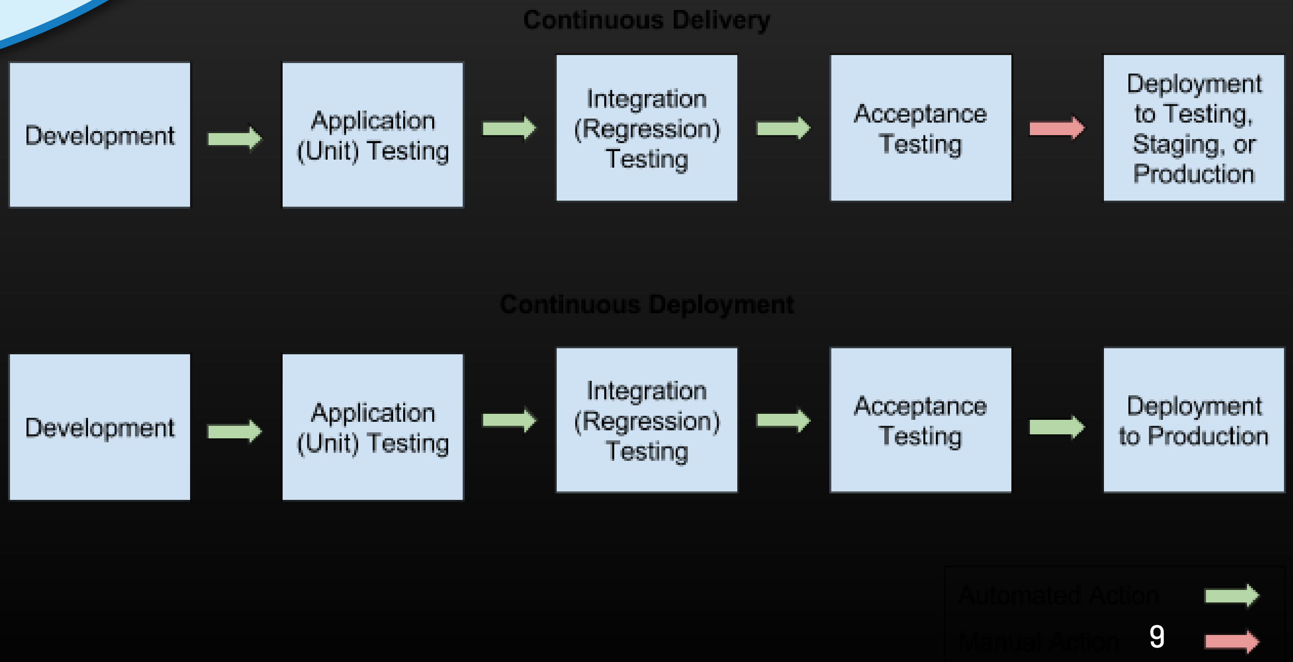


continuous delivery

continuous deployment

continuous integration

You can do frequent deployments but may choose not to do it (usually related to businesses strategy)



Continuous Delivery

Development → Application (Unit) Testing → Integration (Regression) Testing → Acceptance Testing → Deployment to Testing, Staging, or Production

Continuous Deployment

Development → Application (Unit) Testing → Integration (Regression) Testing → Acceptance Testing → Deployment to Production

Automated Action →

Manual Action →

Continuous...

Continuous Delivery

sw development practice in which you build software in such a way that it **can be released** to production at any time.

You're doing continuous delivery when:

Focus on quality of working software

Your software is deployable throughout its lifecycle

Your **team prioritizes keeping the software deployable over working on new features**

Anybody can get fast, automated feedback on the production readiness

Continuous Deployment/release

every change goes through the pipeline and **automatically gets put** into production.

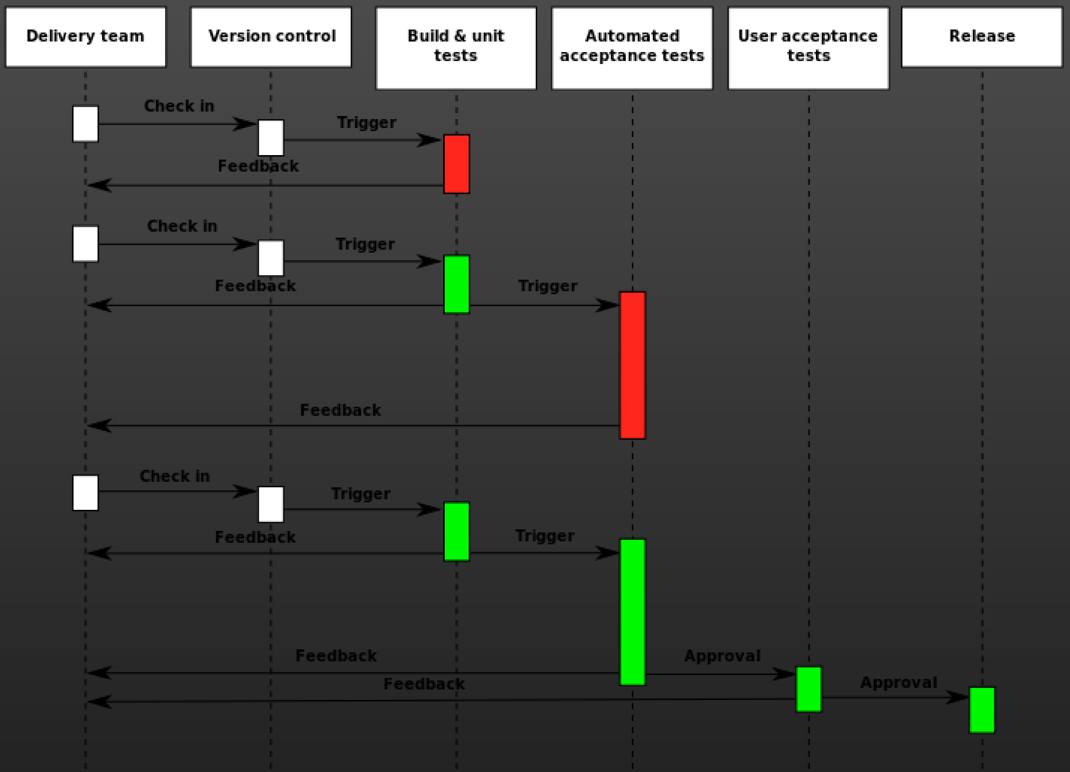
Focus on speed and agility to deploy to production

Continuous Integration

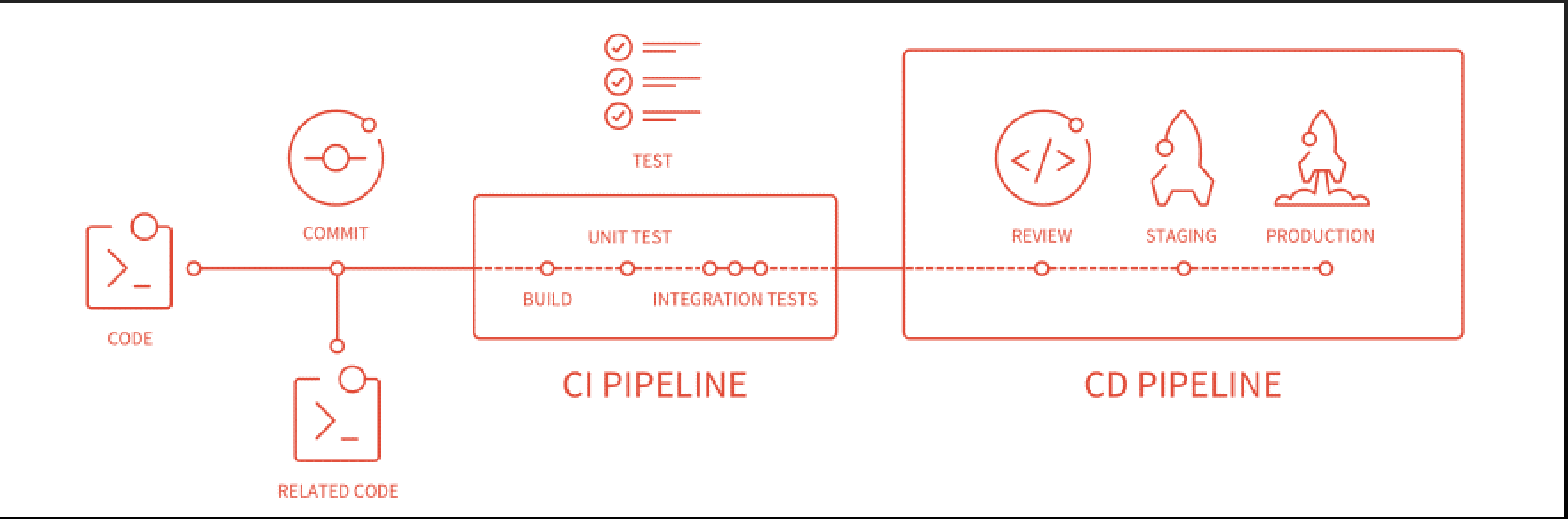
Automatically integrating, building, and testing code within the development environment.

Pre-delivery steps.

Continuous delivery



https://about.gitlab.com



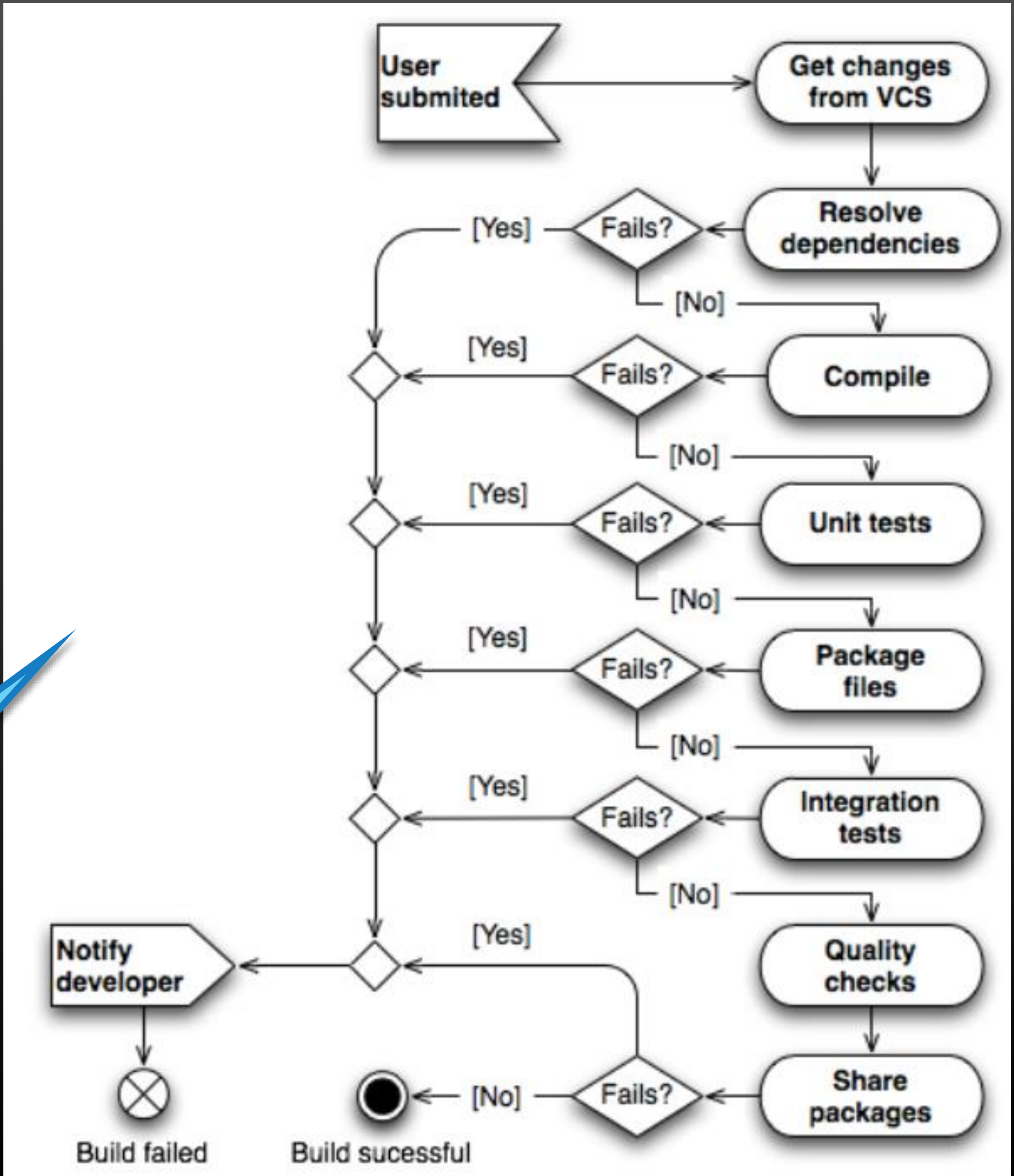
The build process

A build has several stages (goals in Maven terms).

A successful build implies success in code correctness and quality checks.

Automatic build tools run quality checks (e.g.: unit testing, code inspections)

Not just compiling…

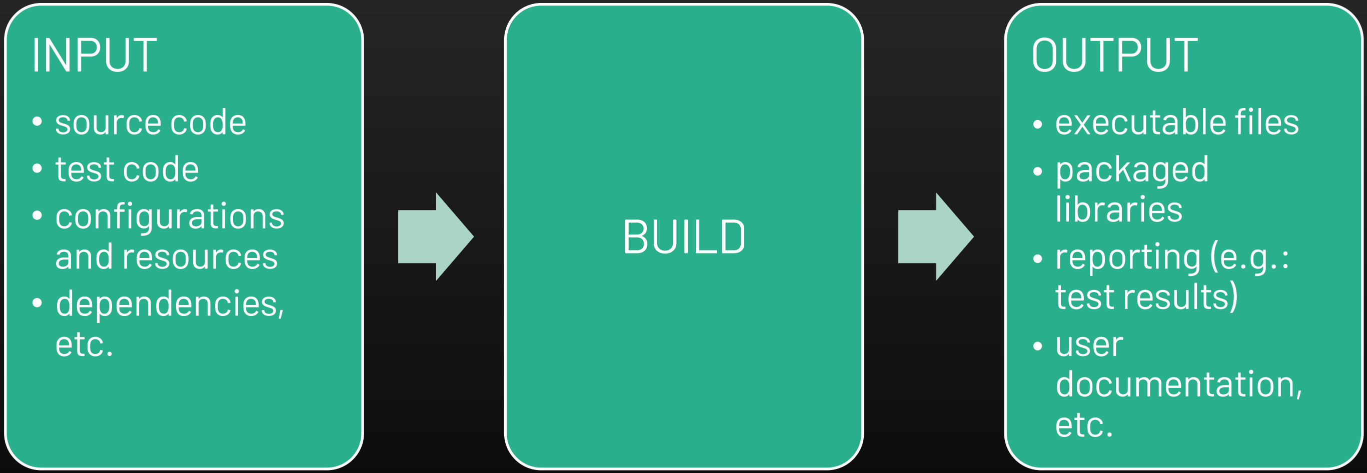


"Continuous" building: the build process

Build process is a series of steps that transforms the various project components in an application ready to be deployed

Build instructions are outlined in one or more description files

e.g.: POM.xml



INPUT

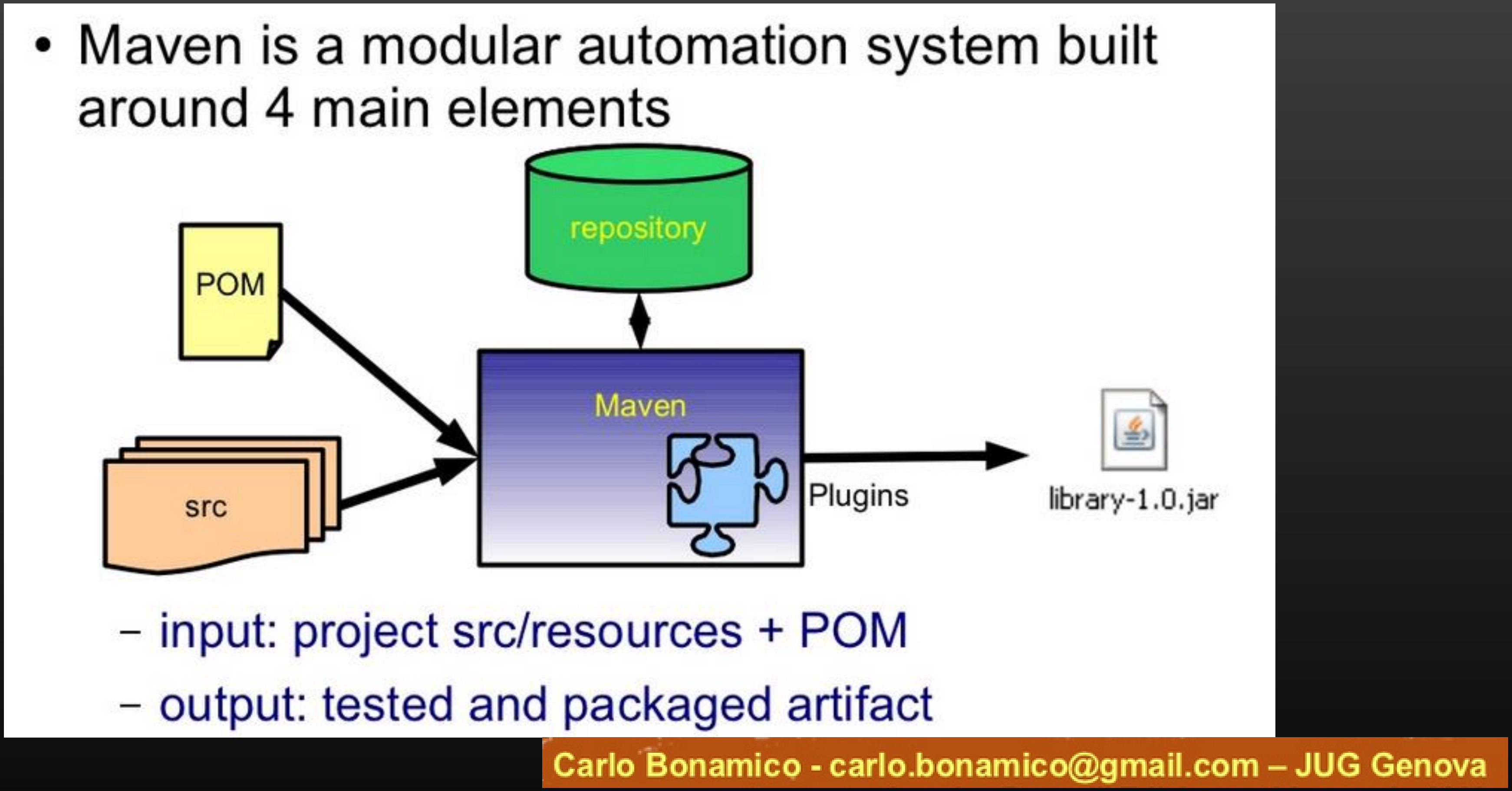
- source code
- test code
- configurations and resources
- dependencies, etc.

BUILD

OUTPUT

- executable files
- packaged libraries
- reporting (e.g.: test results)
- user documentation, etc.

Key component: build tool

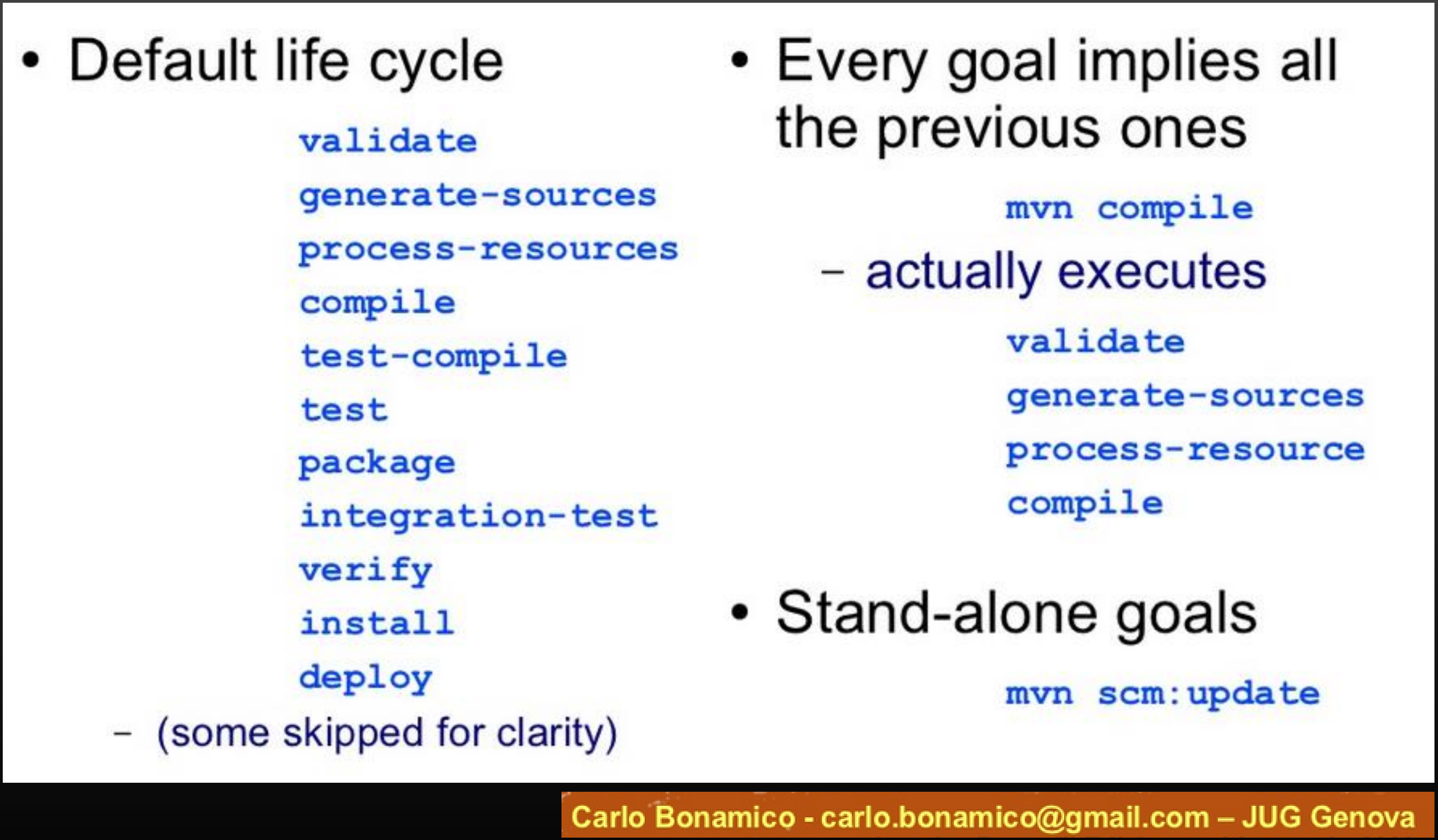


- Maven is a modular automation system built around 4 main elements

  - input: project src/resources + POM
  - output: tested and packaged artifact

Carlo Bonamico - carlo.bonamico@gmail.com – JUG Genova

Maven lifecycle



- Default life cycle

```
validate
generate-sources
process-resources
compile
test-compile
test
package
integration-test
verify
install
deploy
```

  - (some skipped for clarity)

- Every goal implies all the previous ones

```
mvn compile
```

  - actually executes

```
validate
generate-sources
process-resource
compile
```

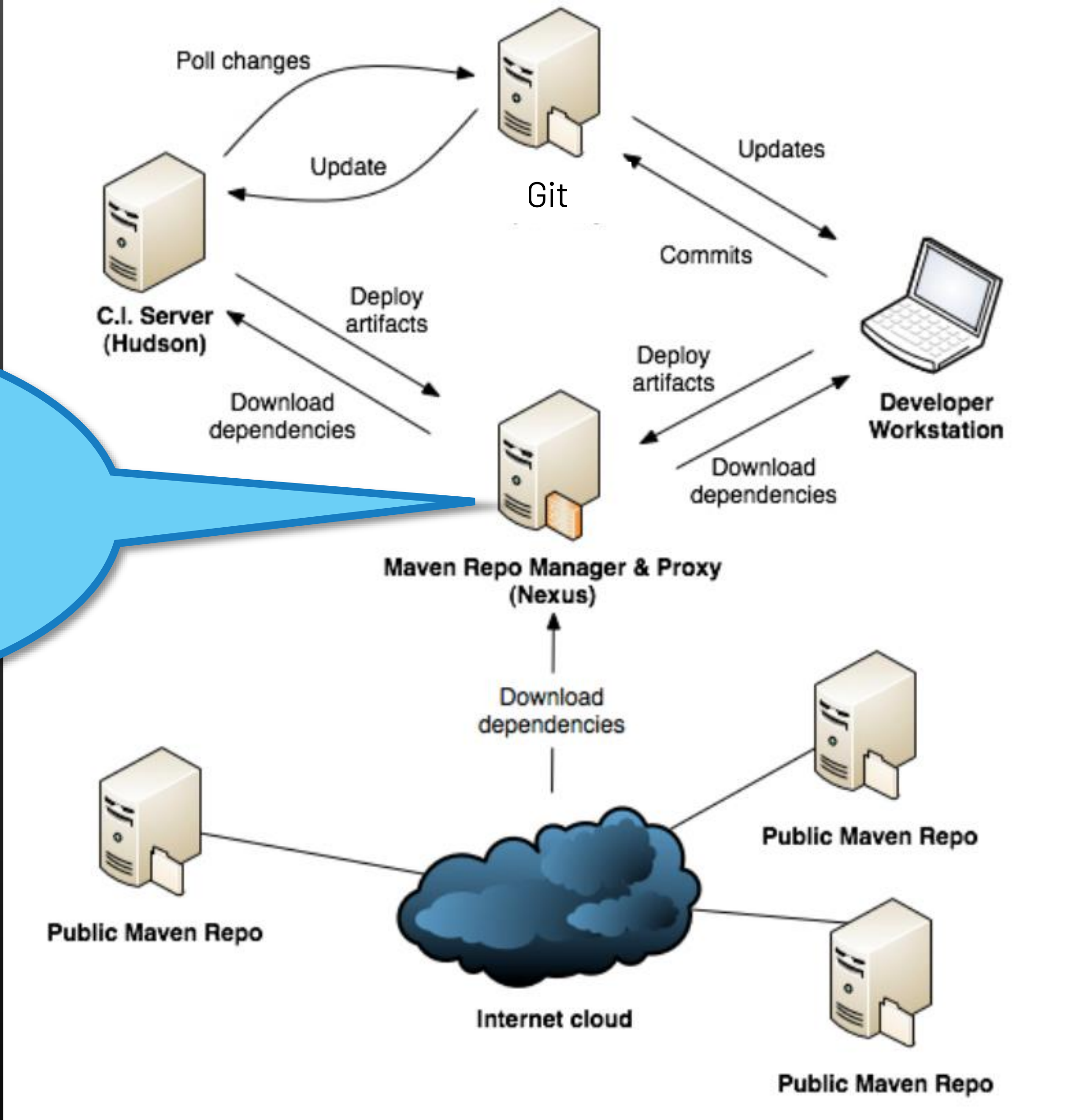
- Stand-alone goals

```
mvn scm:update
```

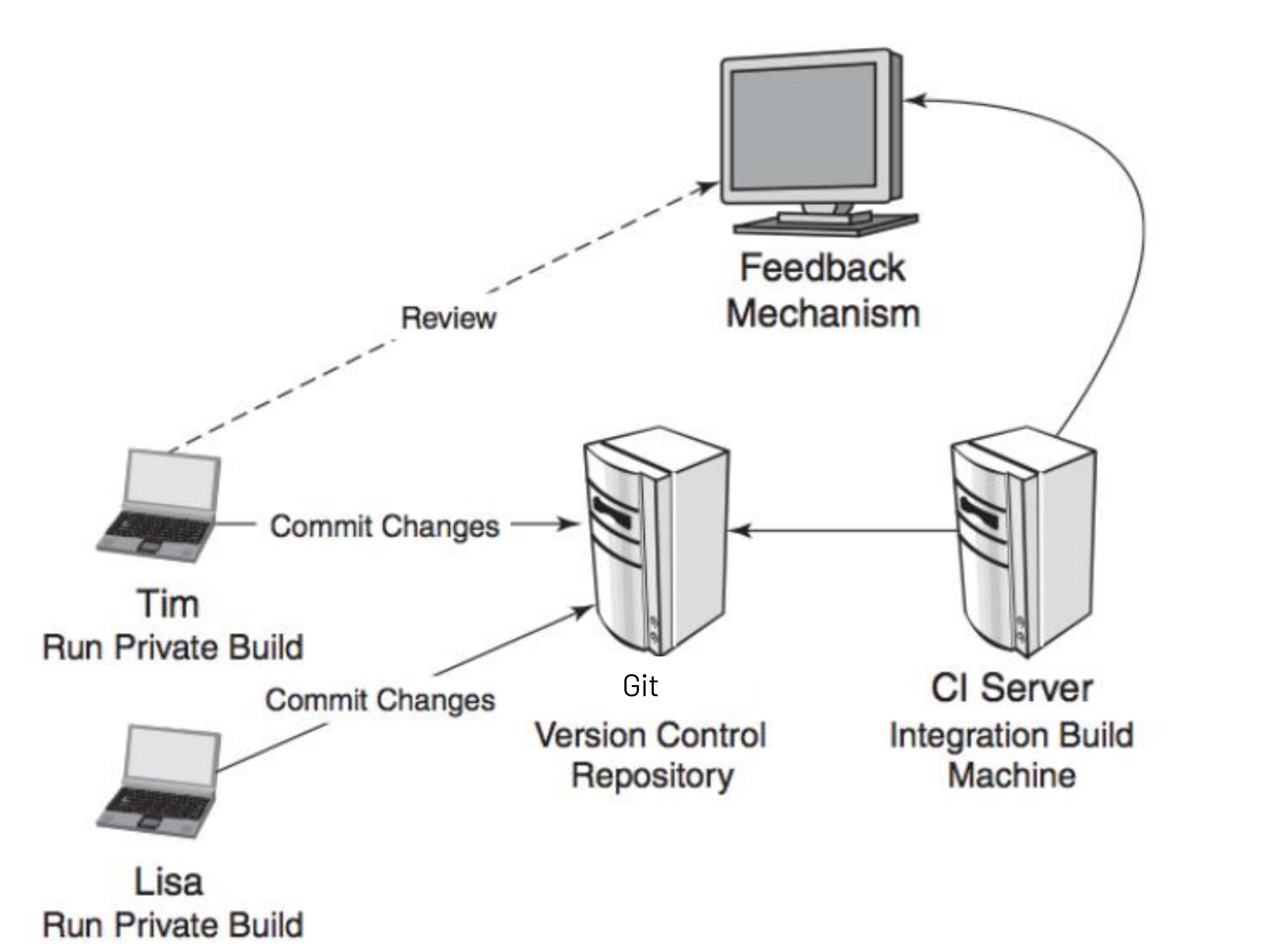
Carlo Bonamico - carlo.bonamico@gmail.com – JUG Genova

Role of (dependencies) repositories

Efficiently sharing and caching binaries
e.g.: JFrog Artifactory



Components of an integration system



Generic development workflow

1- Checkout (or update) from SCM

2- Code a new feature (tests + code)

3- Run automated build on local machine

Repeat #2 and #3 till tests pass

4- Merge local copy with latest changes from SCM

Fix and rebuild till tests pass

5- Commit (integrate with “central”)

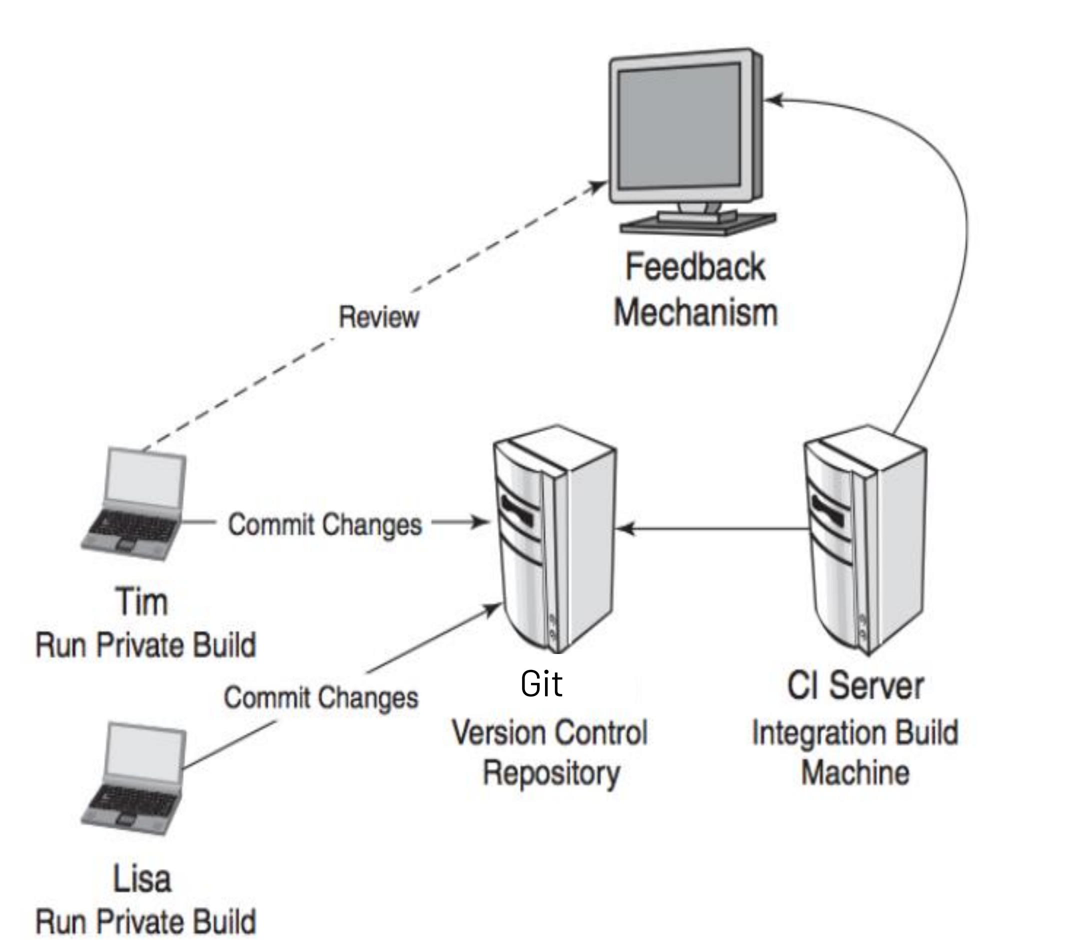
Pull requests advised.

6- Run a build on a clean machine

Update artifacts, evidence build status

Immediately fix bugs and integration issues

Not only tools: CI culture required!



Fowler's 10 CI practices

Maintain a Single Source Repository.

Automate the Build

Make Your Build Self-Testing

Everyone Commits To the Mainline Every Day

Every Commit Should Build the Mainline on an Integration Machine

Keep the Build Fast

Test in a Clone of the Production Environment

Make it Easy for Anyone to Get the Latest Executable

Everyone can see what's happening

Automate Deployment

http://martinfowler.com/articles/continuousIntegration.html

CI culture

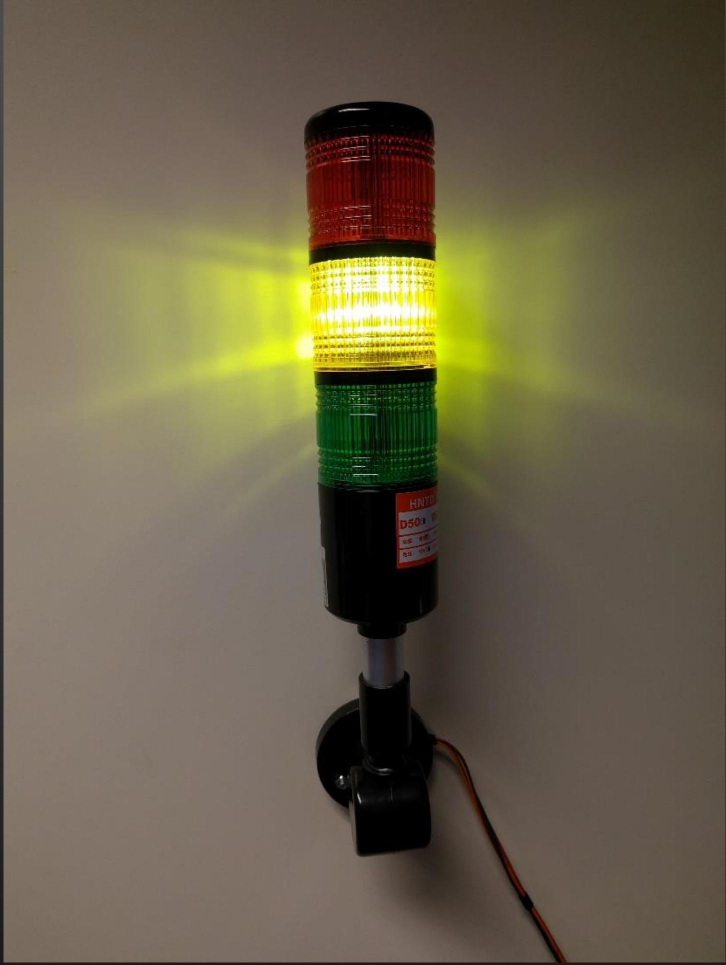
CI is a toolset and a mindset

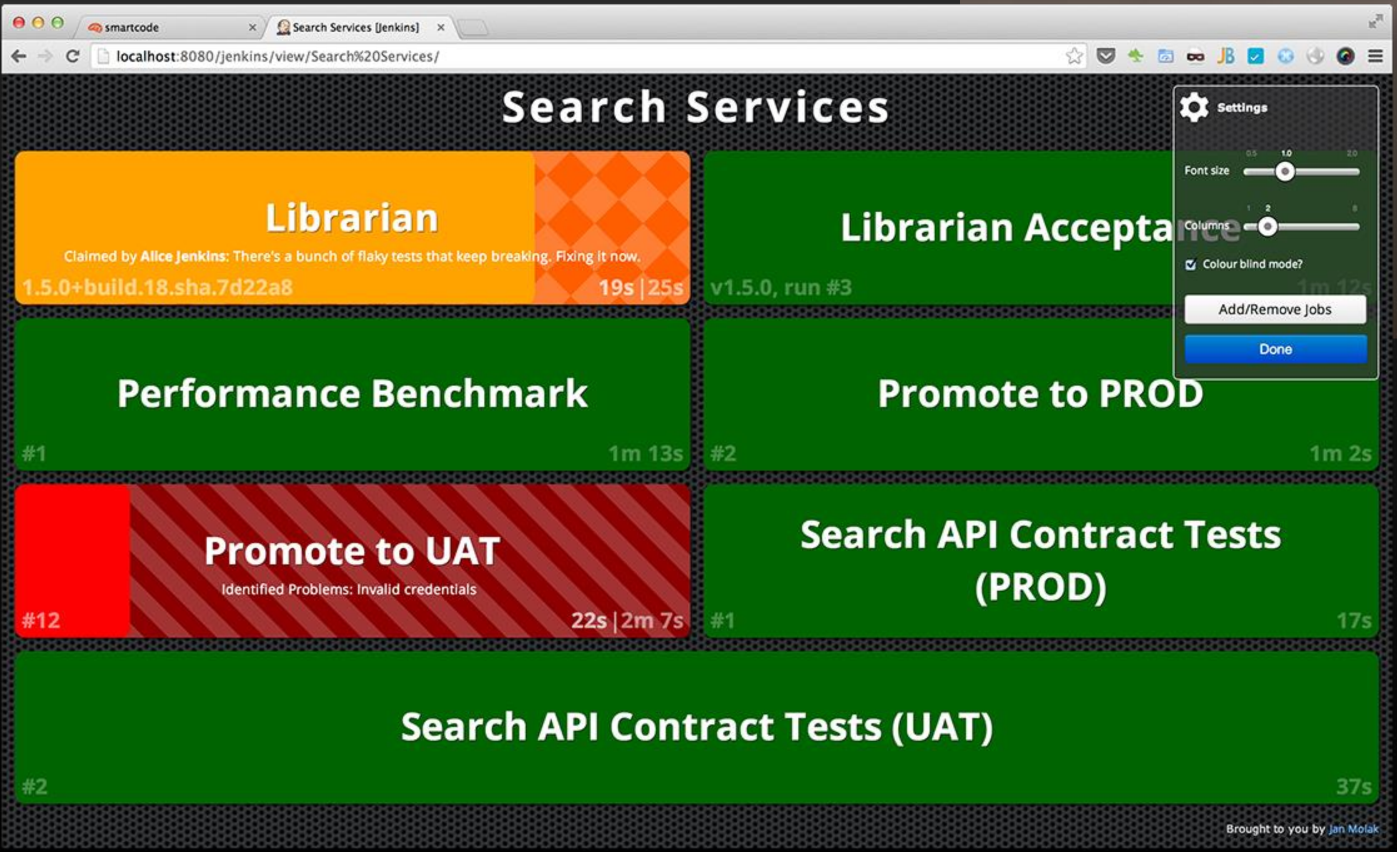
Broken builds are high-priority

No manual steps in the build process

Everybody must supply the CI with good tests

The most frequent the integration process is, the less painful




smartcode
Search Services [Jenkins]
localhost:8080/jenkins/view/Search%20Services/

Search Services

Librarian
Claimed by **Alice Jenkins:** There's a bunch of flaky tests that keep breaking. Fixing it now.
1.5.0+build.18.sha.7d22a8 — 19s | 25s

Librarian Acceptance
v1.5.0, run #3 — 1m 12s

Performance Benchmark
#1 — 1m 13s

Promote to PROD
#2 — 1m 2s

Promote to UAT
Identified Problems: Invalid credentials
#12 — 22s | 2m 7s

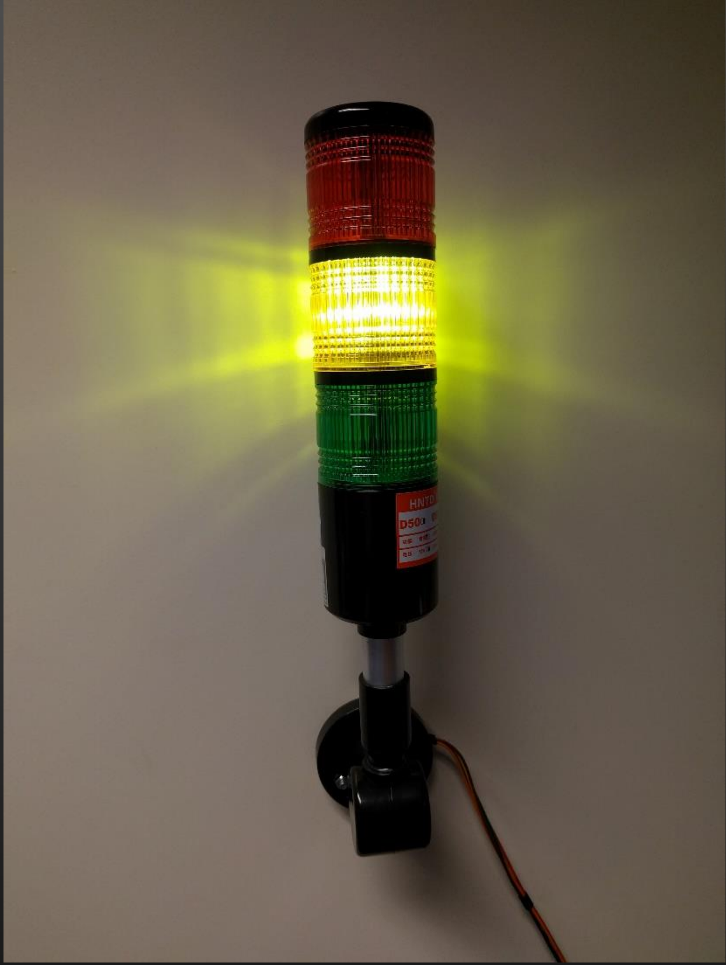
Search API Contract Tests (PROD)
#1 — 17s

Search API Contract Tests (UAT)
#2 — 37s

Settings
Font size: 1.0
Columns: 2
☑ Colour blind mode?

Brought to you by Jan Molak

Continuous feedback



Errors are easier to detect in an earlier stage, near the point where they have been introduced:

The detection mechanism of such bugs becomes simpler because the natural step in diagnosing the problem is to check what was the latest submitted change.

problems followed by atomic commits are easiest to correct than to fix several problems at once, after bulk commits

There must be an effective mechanism that automatically informs programmers, testers, database administrators and managers about the status of the build

Feedback → generate reaction in a more accurate and prompter way

Continuous testing

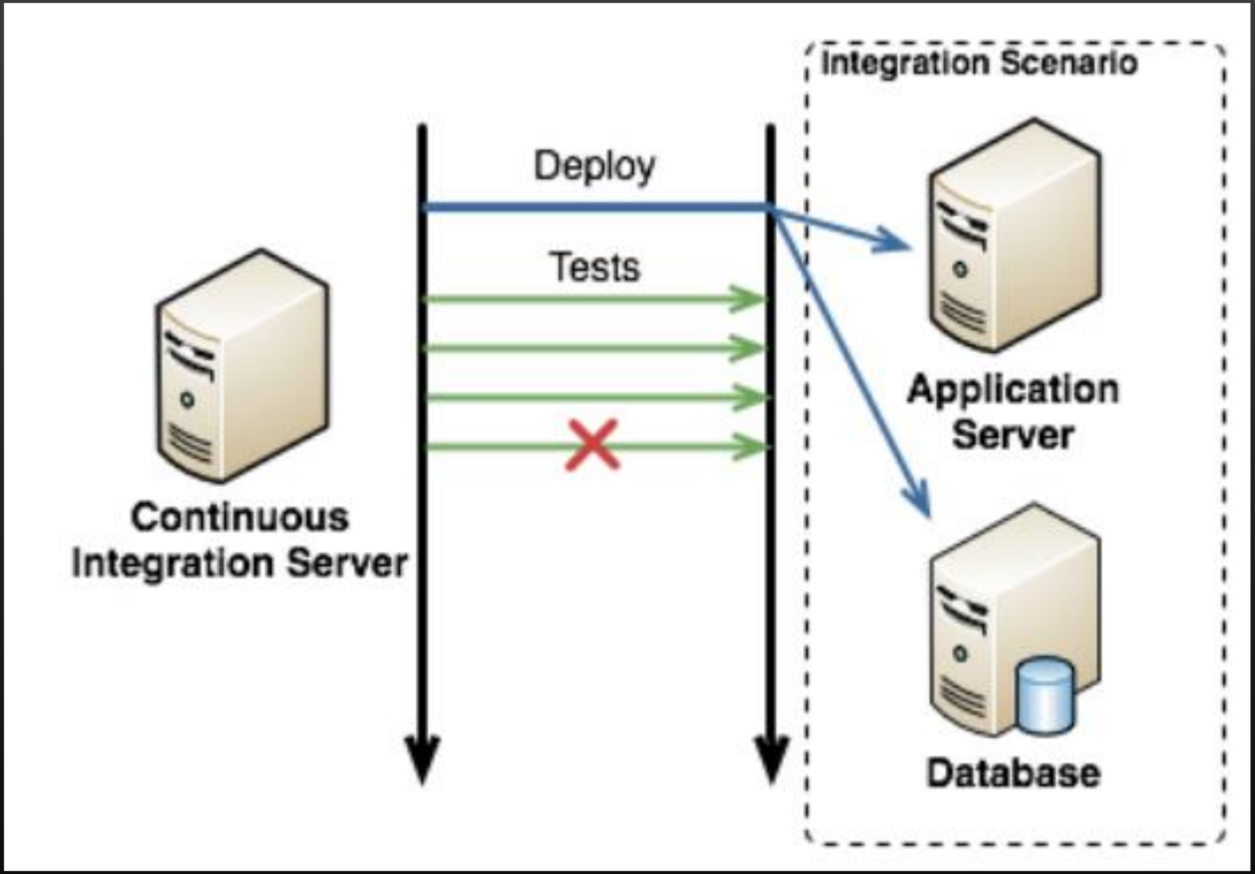
Quality checks at all system levels and involve all individuals, not just the elements of the QA team

Most of the tests can be automated and should be run in the CI pipeline to be carried out repeatedly:

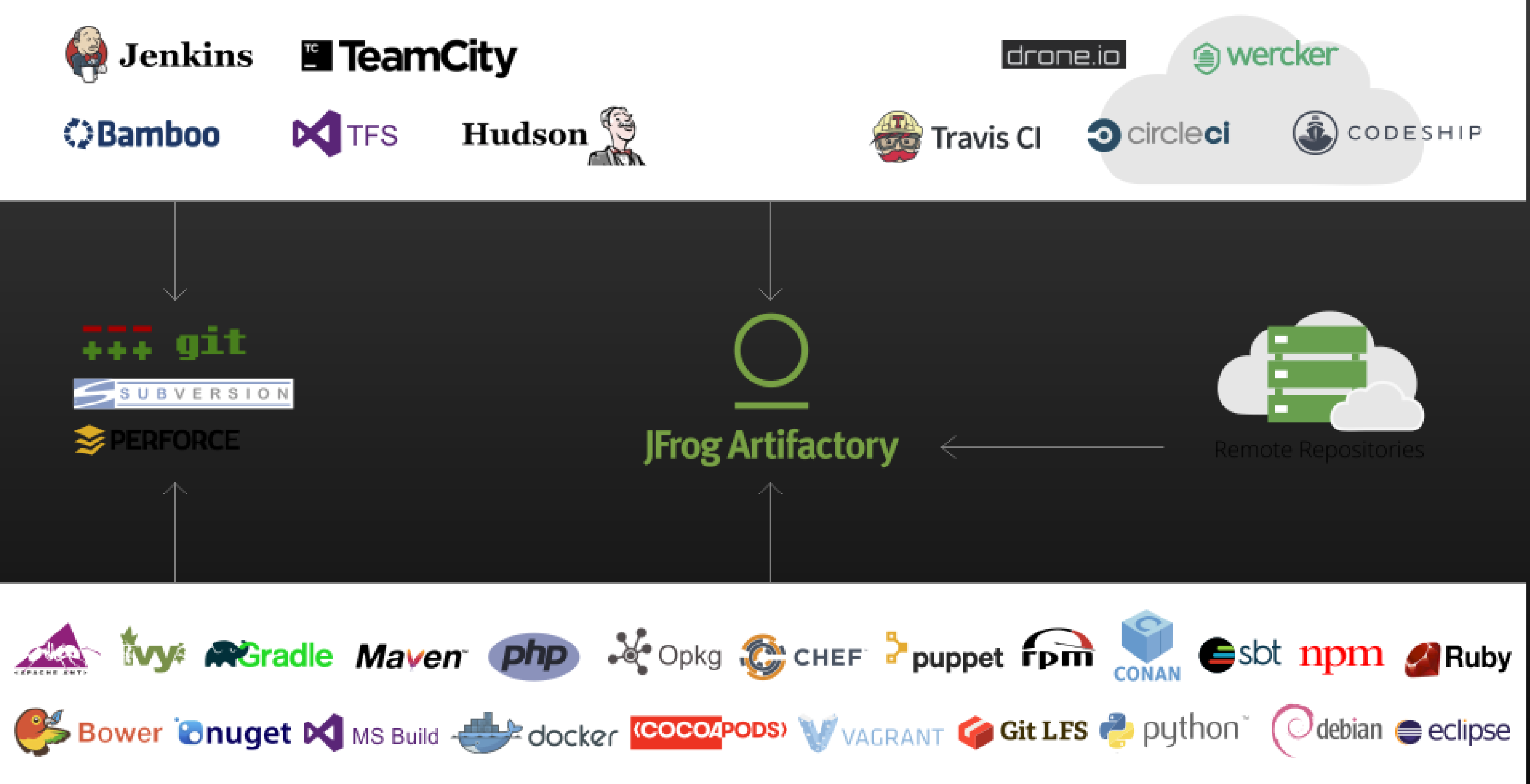
unit testing, integration testing, regression testing, system testing, load and performance testing, etc.

Build tools can take a crucial role on automating tests

Integration tests



Related technologies



https://www.jfrog.com/artifactory/

Jenkins

Easy of use and extremely extensible

Plugins-oriented

Hosted

vs cloud-centric

Distributed builds

Master/slaves architecture

Jenkins vocabulary

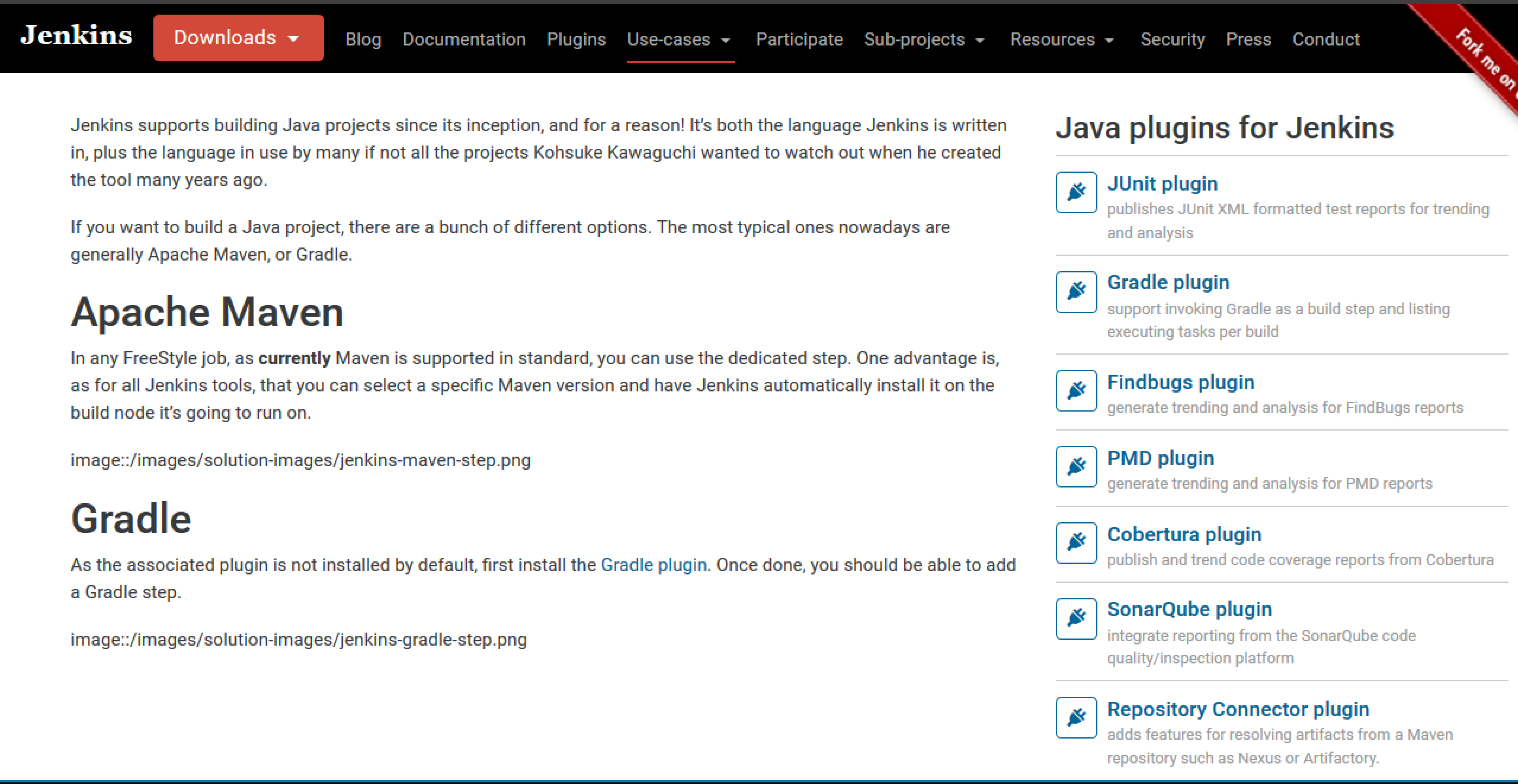
Job: a runnable task

Node: a master or slave machine

Build Executor: a stream of builds to run

Plugin: module that extends the core functionality.

Pipeline: definition of the steps to be executed



Jenkins supports building Java projects since its inception, and for a reason! It's both the language Jenkins is written in, plus the language in use by many if not all the projects Kohsuke Kawaguchi wanted to watch out when he created the tool many years ago.

If you want to build a Java project, there are a bunch of different options. The most typical ones nowadays are generally Apache Maven, or Gradle.

Apache Maven

In any FreeStyle job, as **currently** Maven is supported in standard, you can use the dedicated step. One advantage is, as for all Jenkins tools, that you can select a specific Maven version and have Jenkins automatically install it on the build node it's going to run on.

image::/images/solution-images/jenkins-maven-step.png

Gradle

As the associated plugin is not installed by default, first install the Gradle plugin. Once done, you should be able to add a Gradle step.

image::/images/solution-images/jenkins-gradle-step.png

Java plugins for Jenkins

JUnit plugin
publishes JUnit XML formatted test reports for trending and analysis

Gradle plugin
support invoking Gradle as a build step and listing executing tasks per build

Findbugs plugin
generate trending and analysis for FindBugs reports

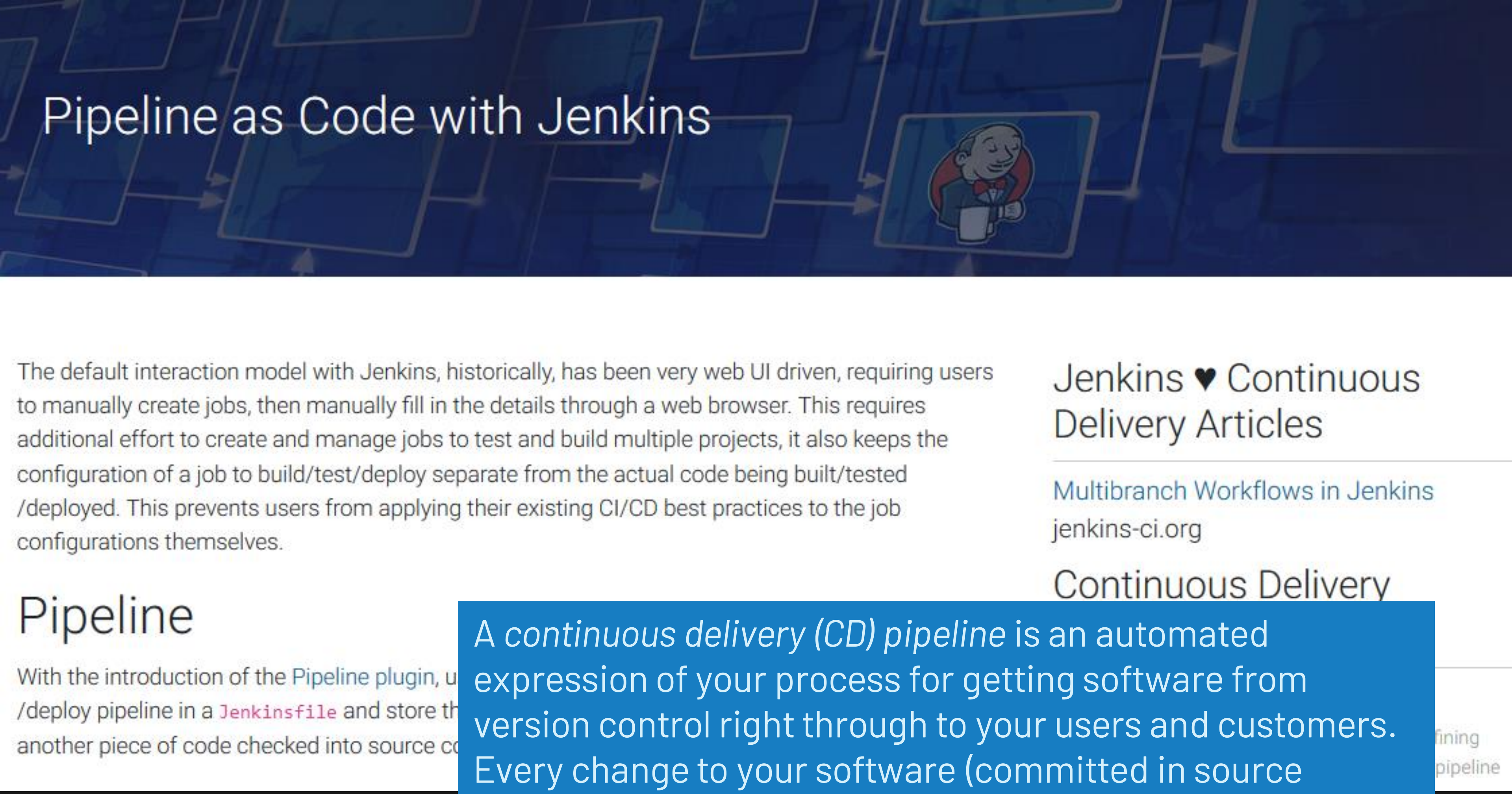
PMD plugin
generate trending and analysis for PMD reports

Cobertura plugin
publish and trend code coverage reports from Cobertura

SonarQube plugin
integrate reporting from the SonarQube code quality/inspection platform

Repository Connector plugin
adds features for resolving artifacts from a Maven repository such as Nexus or Artifactory.

→ https://jenkins.io/solutions/java/



Pipeline as Code with Jenkins

The default interaction model with Jenkins, historically, has been very web UI driven, requiring users to manually create jobs, then manually fill in the details through a web browser. This requires additional effort to create and manage jobs to test and build multiple projects, it also keeps the configuration of a job to build/test/deploy separate from the actual code being built/tested /deployed. This prevents users from applying their existing CI/CD best practices to the job configurations themselves.

Pipeline

With the introduction of the Pipeline plugin, u
/deploy pipeline in a `Jenkinsfile` and store th
another piece of code checked into source co

Jenkins ♥ Continuous Delivery Articles

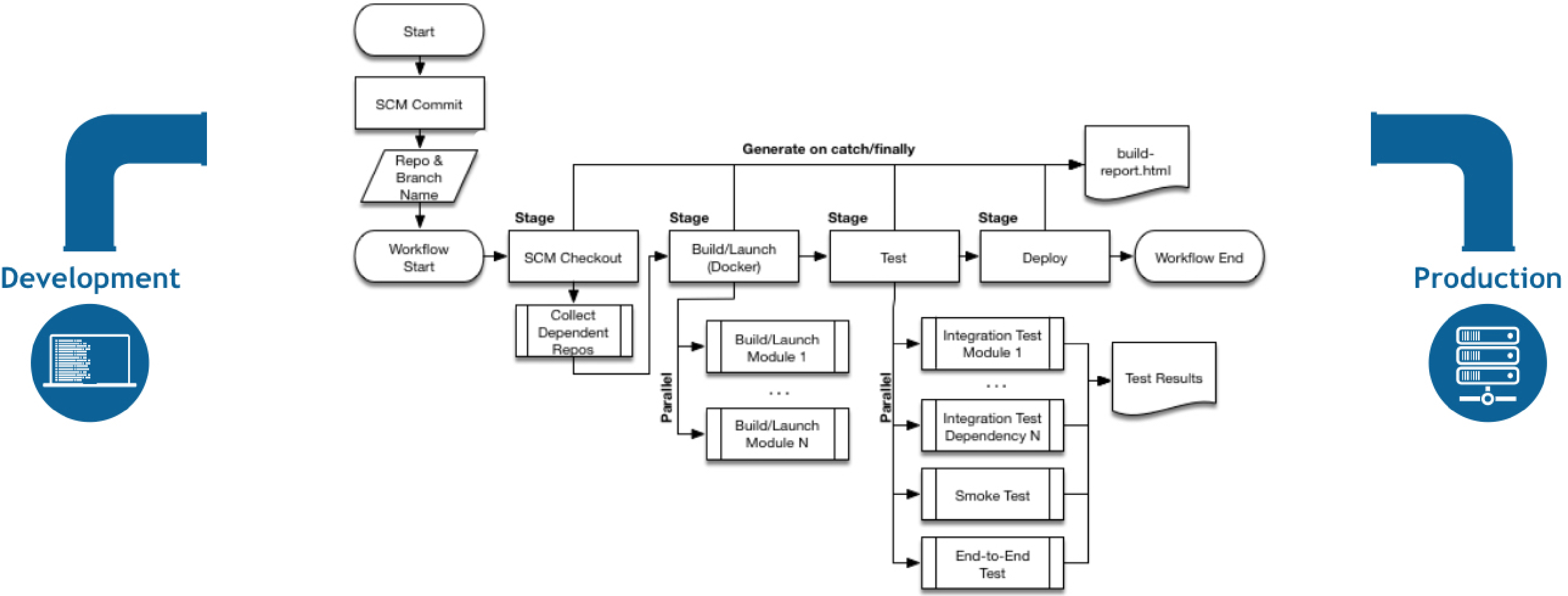
Multibranch Workflows in Jenkins
jenkins-ci.org

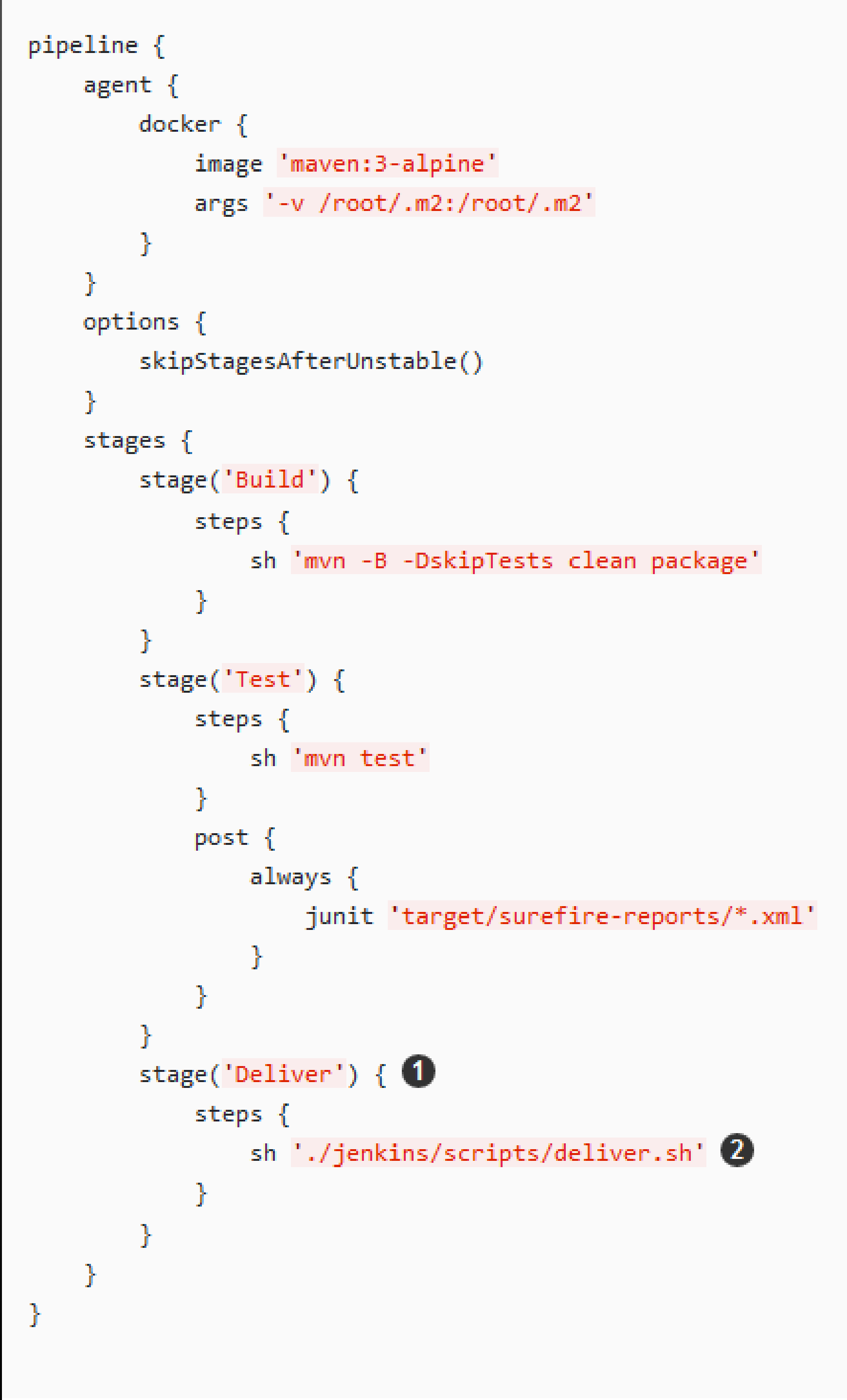
Continuous Delivery

fining
pipeline

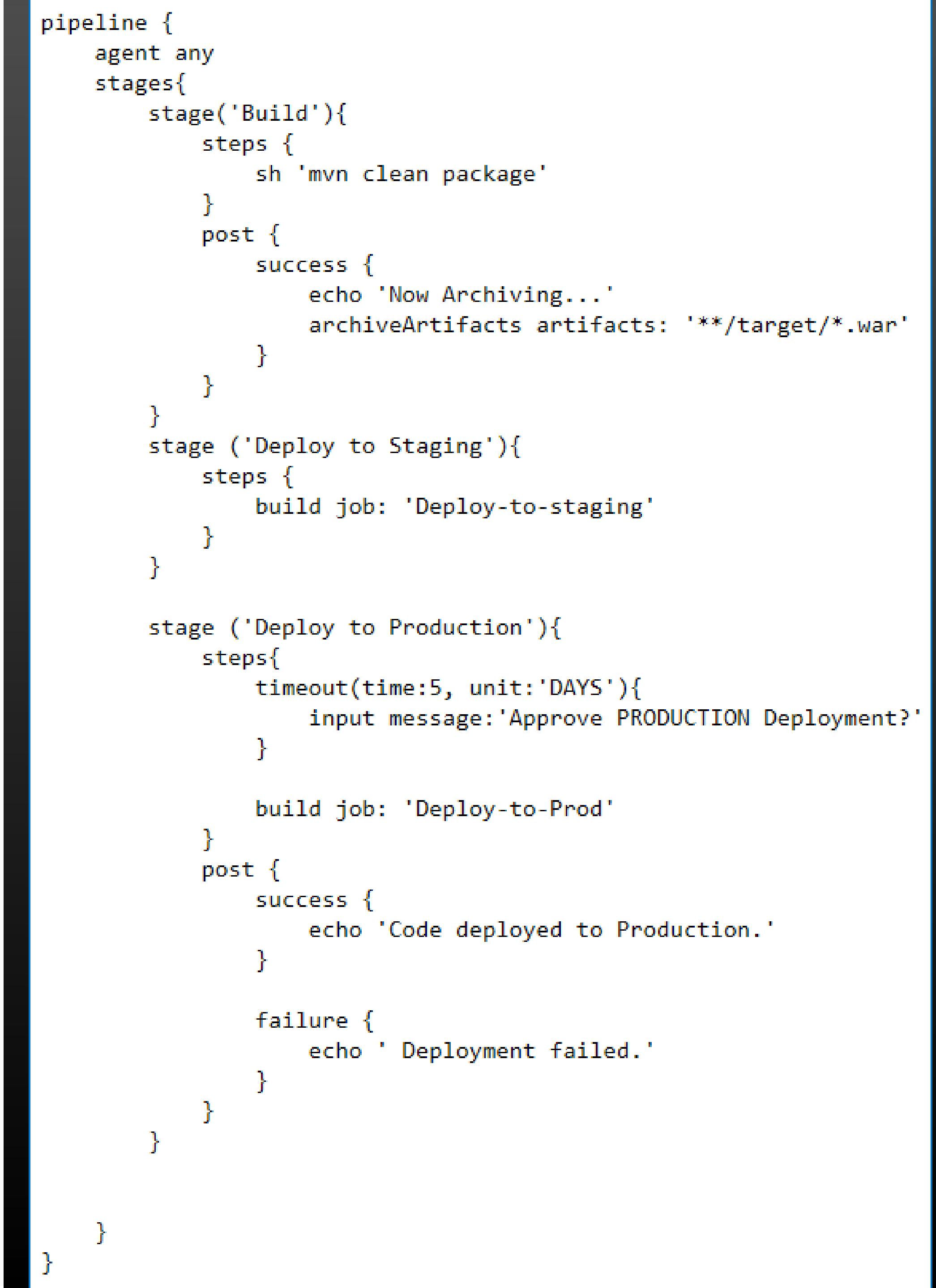
A *continuous delivery (CD) pipeline* is an automated expression of your process for getting software from version control right through to your users and customers. Every change to your software (committed in source control) goes through a complex process on its way to being released.
Pipeline provides an extensible set of tools for modeling simple-to-complex delivery pipelines "as code" via the Pipeline domain-specific language (DSL) syntax.

Jenkins pipelines





```
pipeline {
    agent {
        docker {
            image 'maven:3-alpine'
            args '-v /root/.m2:/root/.m2'
        }
    }
    options {
        skipStagesAfterUnstable()
    }
    stages {
        stage('Build') {
            steps {
                sh 'mvn -B -DskipTests clean package'
            }
        }
        stage('Test') {
            steps {
                sh 'mvn test'
            }
            post {
                always {
                    junit 'target/surefire-reports/*.xml'
                }
            }
        }
        stage('Deliver') { ❶
            steps {
                sh './jenkins/scripts/deliver.sh' ❷
            }
        }
    }
}
```

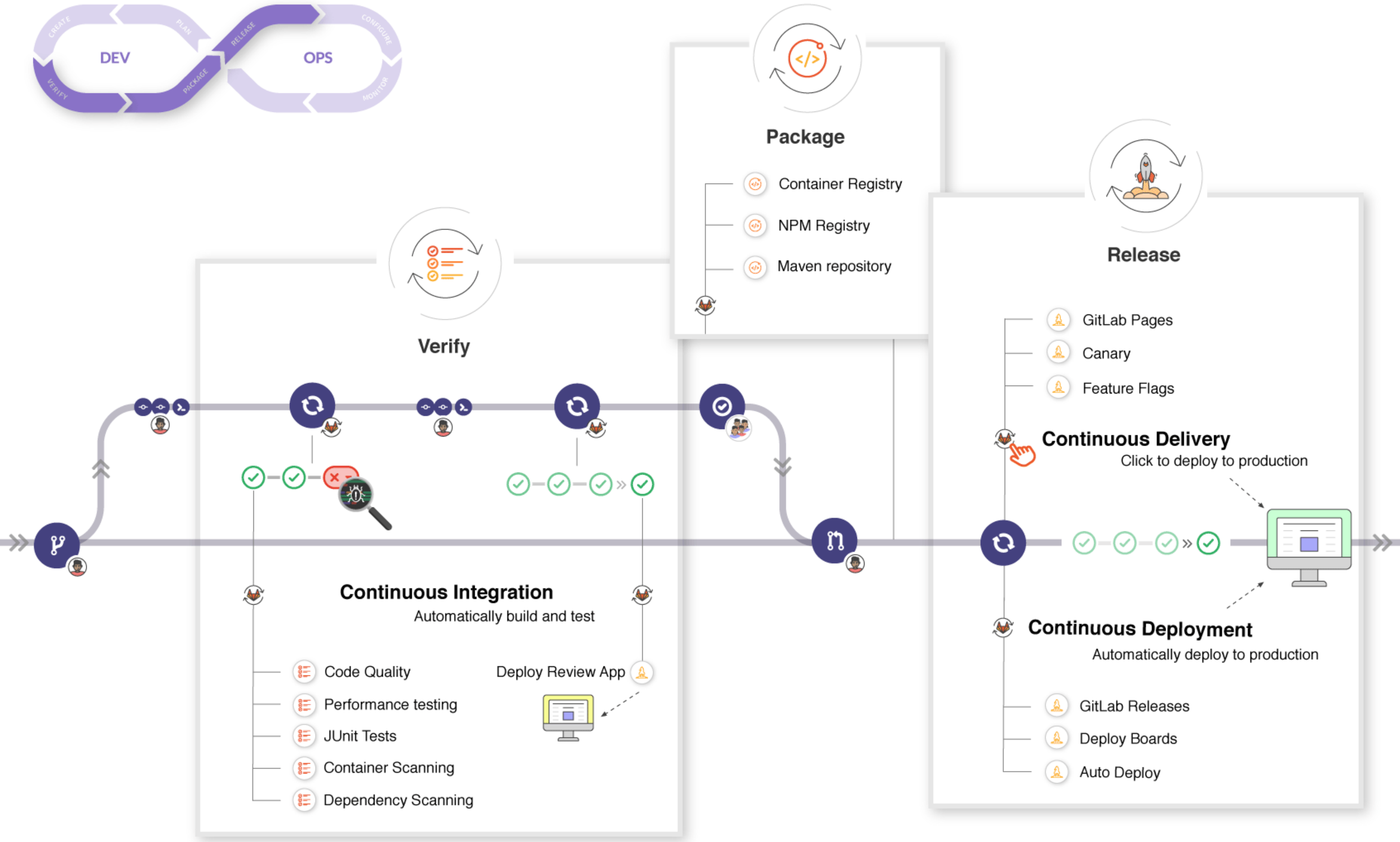


```
pipeline {
    agent any
    stages{
        stage('Build'){
            steps {
                sh 'mvn clean package'
            }
            post {
                success {
                    echo 'Now Archiving...'
                    archiveArtifacts artifacts: '**/target/*.war'
                }
            }
        }
        stage ('Deploy to Staging'){
            steps {
                build job: 'Deploy-to-staging'
            }
        }

        stage ('Deploy to Production'){
            steps{
                timeout(time:5, unit:'DAYS'){
                    input message:'Approve PRODUCTION Deployment?'
                }

                build job: 'Deploy-to-Prod'
            }
            post {
                success {
                    echo 'Code deployed to Production.'
                }

                failure {
                    echo ' Deployment failed.'
                }
            }
        }


    }
}
```

GitLab CI/CD

https://docs.gitlab.com/ee/ci/introduction/

→ Includes video demos



Package

- Container Registry
- NPM Registry
- Maven repository

Verify

Continuous Integration

Automatically build and test

- Code Quality
- Performance testing
- JUnit Tests
- Container Scanning
- Dependency Scanning

Deploy Review App

Release

- GitLab Pages
- Canary
- Feature Flags

Continuous Delivery

Click to deploy to production

Continuous Deployment

Automatically deploy to production

- GitLab Releases
- Deploy Boards
- Auto Deploy

More to explore

Books on Continuous integration:

Duvall's Continuous Integration: http://www.amazon.com/Continuous-Integration-Improving-Software-Reducing/dp/0321336380

Humble's "Continuous Delivery": http://www.amazon.com/Continuous-Delivery-Deployment-Automation-Addison-Wesley/dp/0321601912

Hudson/Jenkins

Extensive information: http://www.youtube.com/watch?v=6k0S4O2PnTc#!

Maven:

Free ebook: http://www.sonatype.com/books/mvnref-book/reference/public-book.html