DevOps 2TIN

Chapter 5

Pipelines in jenkins

DE HOGESCHOOL
MET HET NETWERK

Elfde-Liniestraat 24, 3500 Hasselt, www.pxl.be

Pipelines

Recap
Jenkins workspace
Pipeline scripts
Groovy
Stages & steps
Commands
Plugins

HOGESCHOOL PXL

Wat is een Pipeline?

Definitie “deployment pipeline”:

(first defined by Jez Humble and David Farley in their book *Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation*)

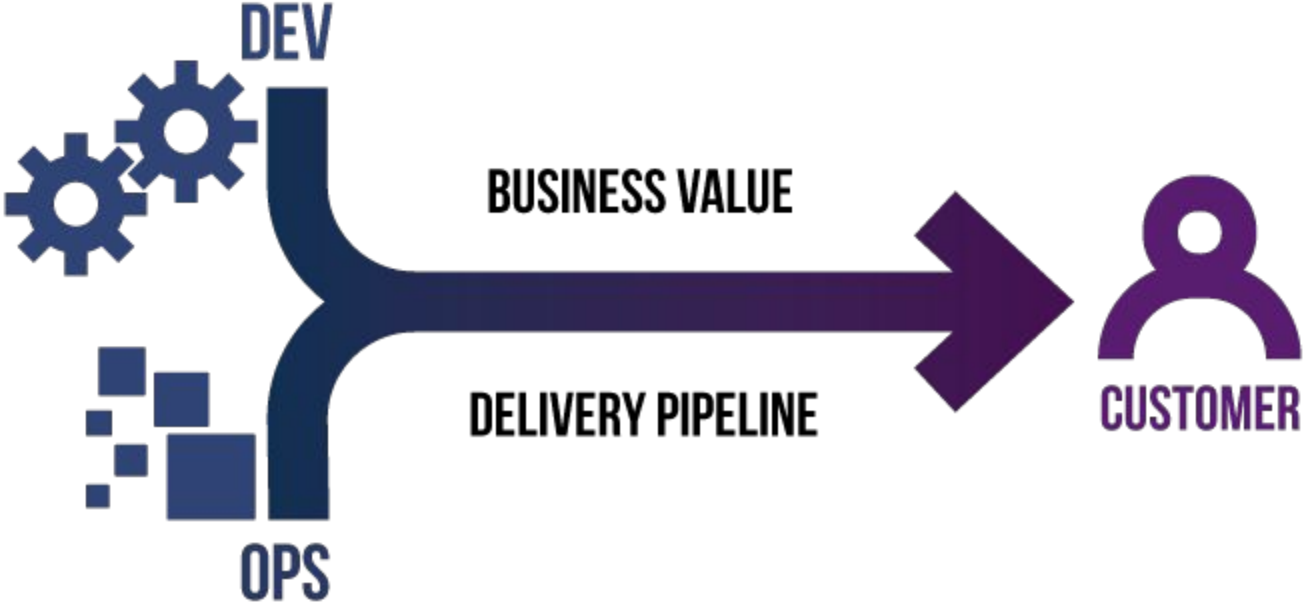
It ensures that all code checked in to version control is automatically built and tested in a production-like environment.

Sleutelwoorden:

- Alle Code
- Versiebeheer
- **Automatisch gebouwd**
- Automatisch getest
- Productie-waardige omgeving

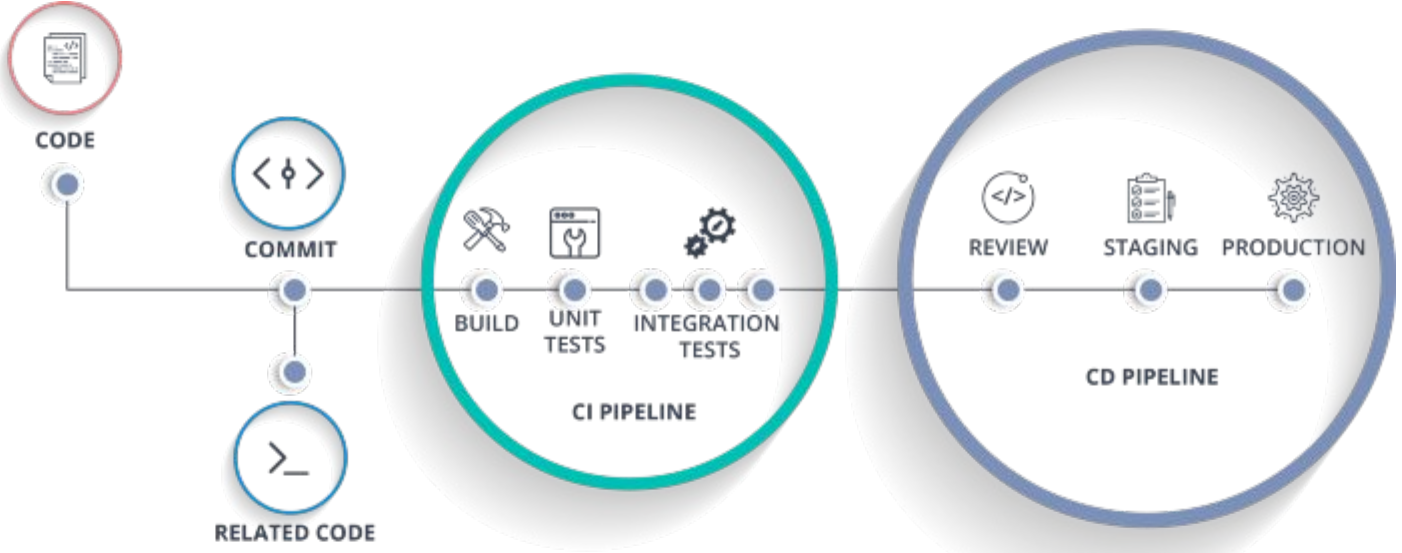
THE FIRST WAY

CREATE A DELIVERY SYSTEM



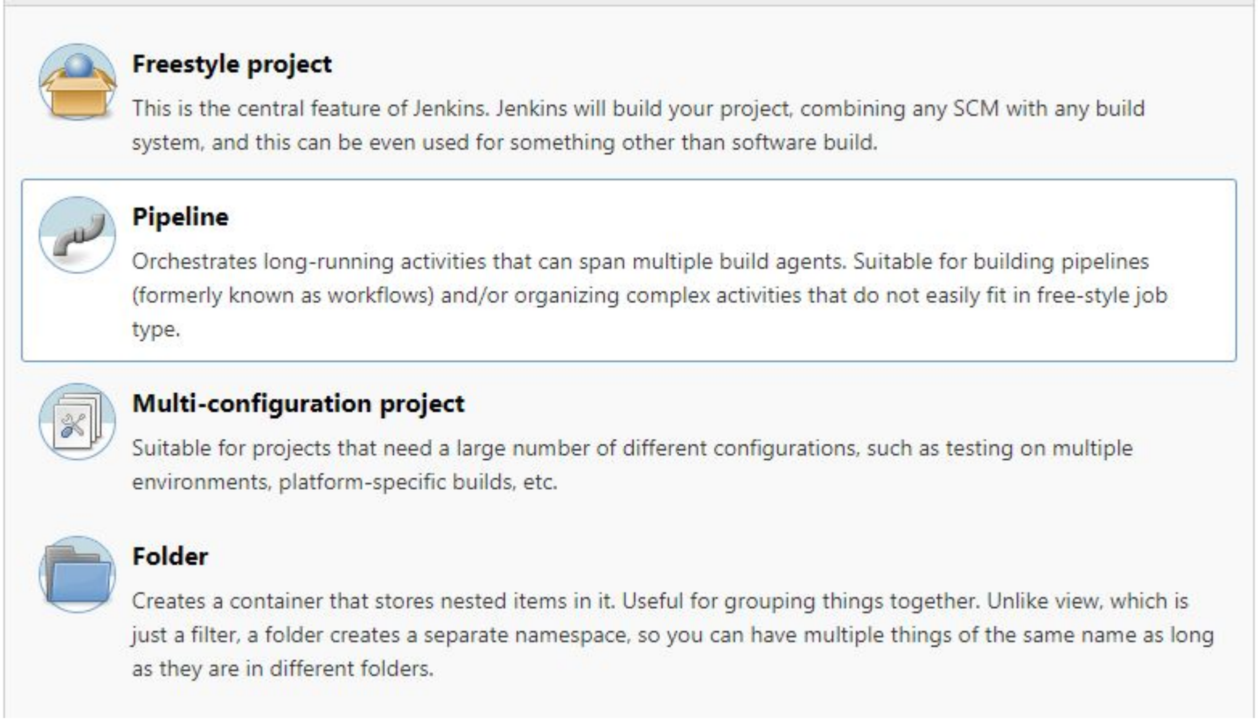
Recap: CI/CD pipeline

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. This process involves building the software in a reliable and repeatable manner, as well as progressing the built software (called a "build") through multiple stages of testing and deployment.

Jenkins items



Freestyle project

This is the central feature of Jenkins. Jenkins will build your project, combining any SCM with any build system, and this can be even used for something other than software build.

Pipeline

Orchestrates long-running activities that can span multiple build agents. Suitable for building pipelines (formerly known as workflows) and/or organizing complex activities that do not easily fit in free-style job type.

Multi-configuration project

Suitable for projects that need a large number of different configurations, such as testing on multiple environments, platform-specific builds, etc.

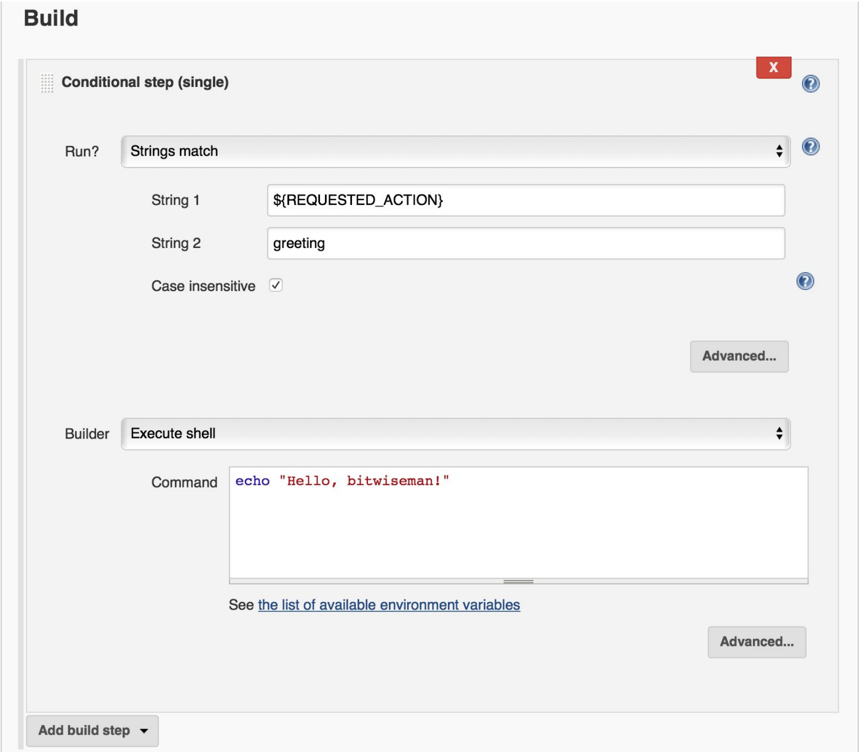
Folder

Creates a container that stores nested items in it. Useful for grouping things together. Unlike view, which is just a filter, a folder creates a separate namespace, so you can have multiple things of the same name as long as they are in different folders.

https://app.pluralsight.com/course-player?clipId=c5537166-12a3-48fa-9cfd-67f2024cf366

Jenkins - Pipeline

Freestyle project vs pipeline



Build

Conditional step (single)

Run? Strings match

String 1 ${REQUESTED_ACTION}

String 2 greeting

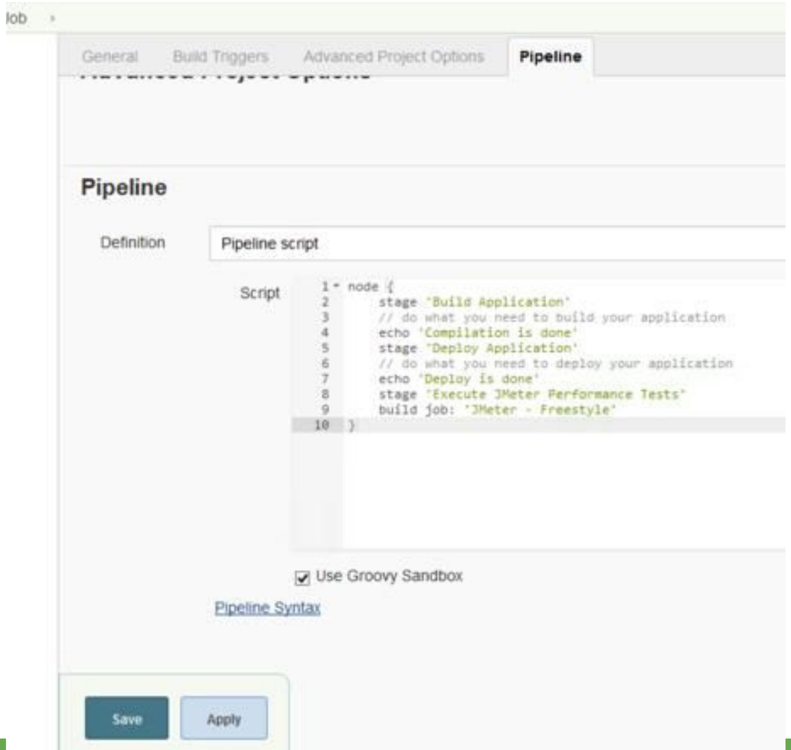
Case insensitive ☑

Builder Execute shell

Command

```
echo "Hello, bitwiseman!"
```

See the list of available environment variables



Pipeline

Definition Pipeline script

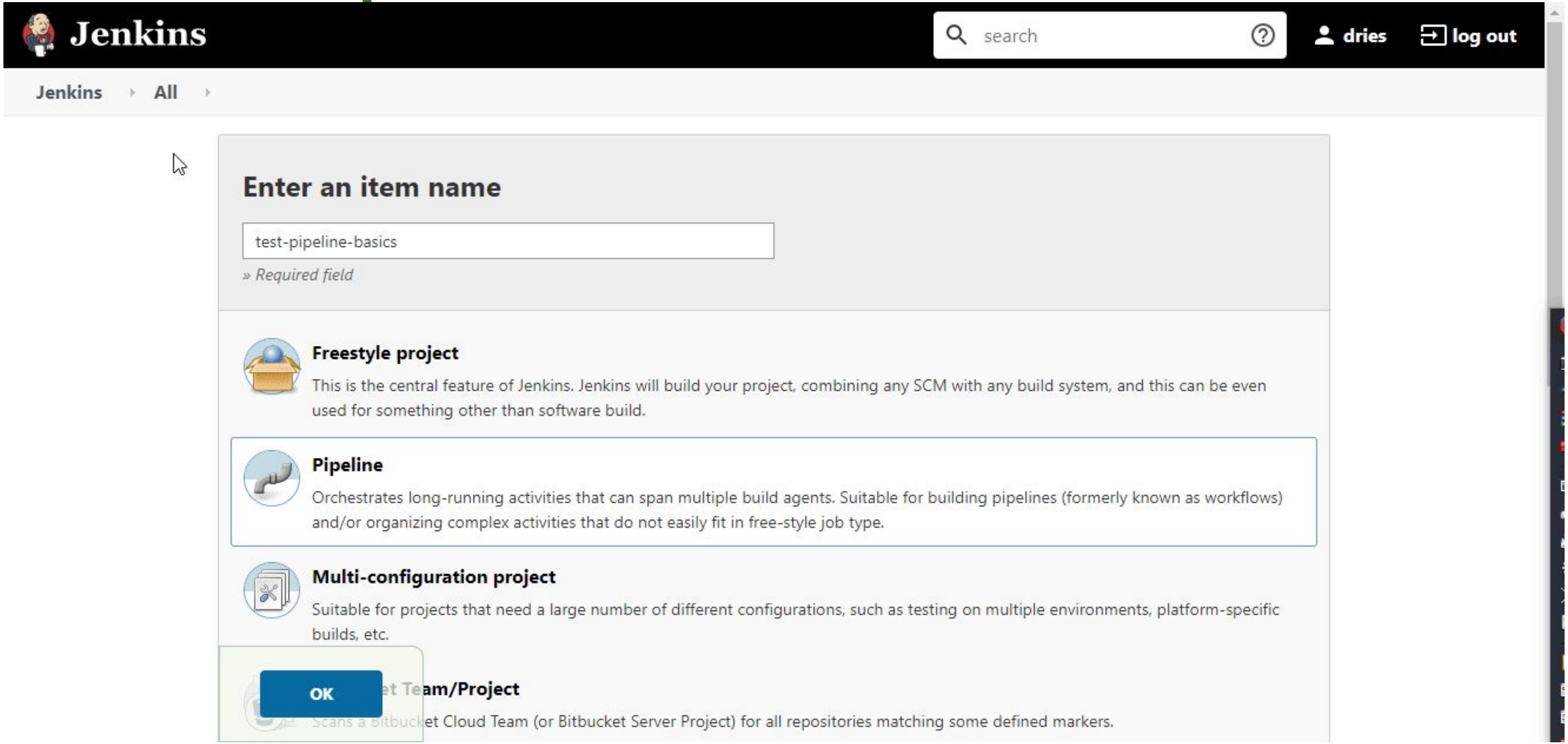
Script

```
node {
    stage 'Build Application'
    // do what you need to build your application
    echo 'Compilation is done'
    stage 'Deploy Application'
    // do what you need to deploy your application
    echo 'Deploy is done'
    stage 'Execute JMeter Performance Tests'
    build job: 'JMeter - Freestyle'
}
```

☑ Use Groovy Sandbox

Pipeline Syntax

Jenkins - Pipeline as code



Enter an item name

test-pipeline-basics

» *Required field*

Freestyle project

This is the central feature of Jenkins. Jenkins will build your project, combining any SCM with any build system, and this can be even used for something other than software build.

Pipeline

Orchestrates long-running activities that can span multiple build agents. Suitable for building pipelines (formerly known as workflows) and/or organizing complex activities that do not easily fit in free-style job type.

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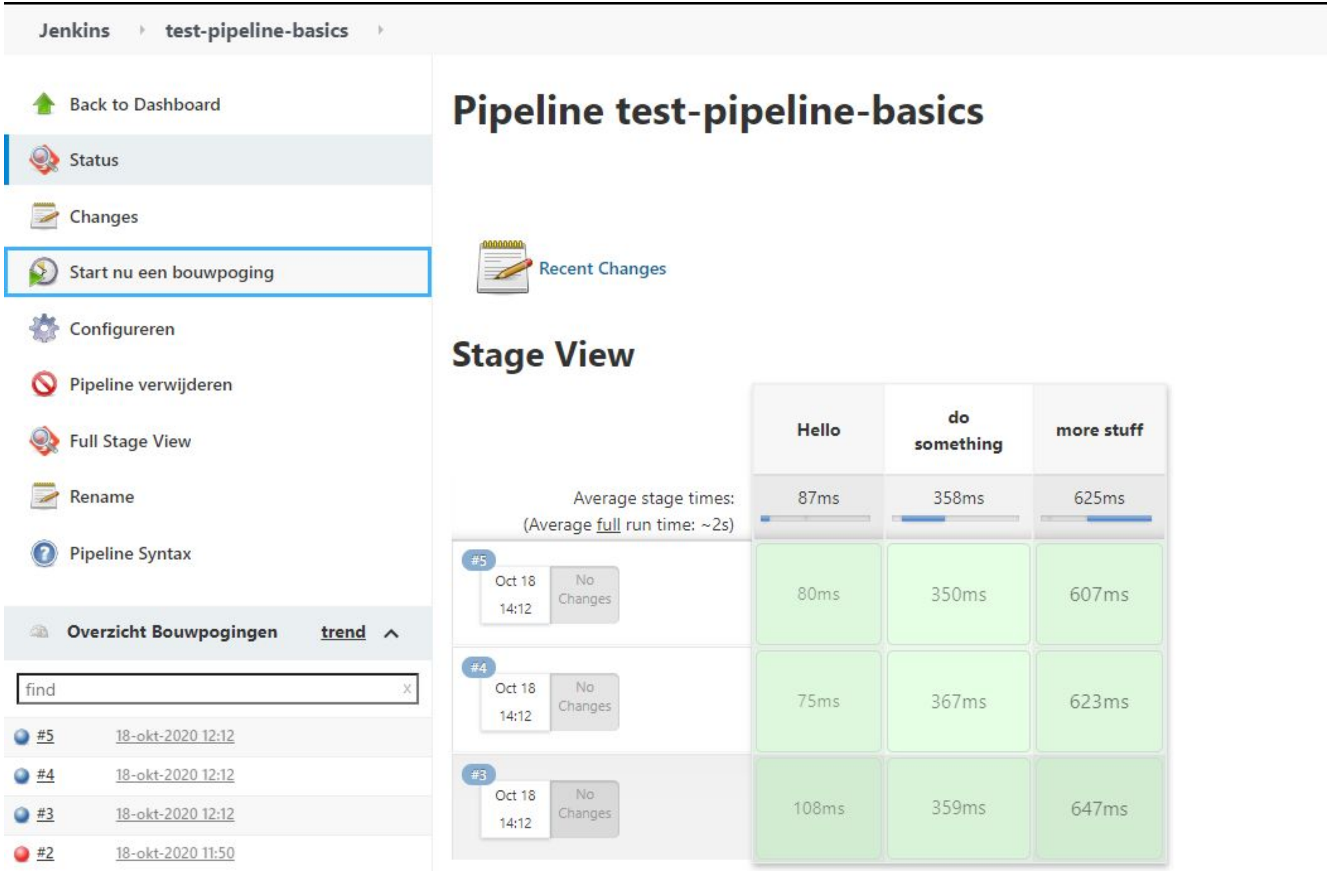
Suitable for projects that need a large number of different configurations, such as testing on multiple environments, platform-specific builds, etc.

Bitbucket Team/Project

Scans a Bitbucket Cloud Team (or Bitbucket Server Project) for all repositories matching some defined markers.

Jenkins - Pipeline - stage view



Jenkins › test-pipeline-basics ›

- Back to Dashboard
- Status
- Changes
- Start nu een bouwpoging
- Configureren
- Pipeline verwijderen
- Full Stage View
- Rename
- Pipeline Syntax

Overzicht Bouwpogingen trend

find

#5	18-okt-2020 12:12
#4	18-okt-2020 12:12
#3	18-okt-2020 12:12
#2	18-okt-2020 11:50

Pipeline test-pipeline-basics

Recent Changes

Stage View

	Hello	do something	more stuff
Average stage times: (Average full run time: ~2s)	87ms	358ms	625ms
#5 Oct 18 14:12 No Changes	80ms	350ms	607ms
#4 Oct 18 14:12 No Changes	75ms	367ms	623ms
#3 Oct 18 14:12 No Changes	108ms	359ms	647ms

Jenkins - Pipeline - stage view

Handmatig starten van het pipeline script

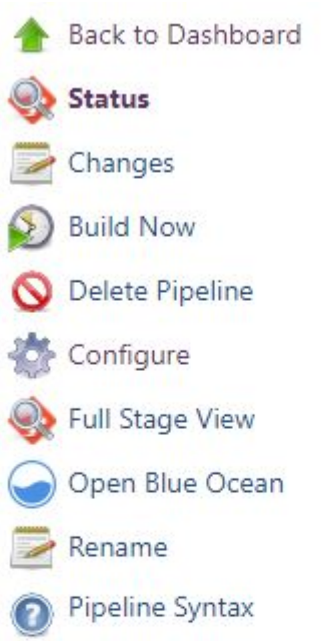
- Maakt een nieuwe build poging (#)

Configureren van het pipeline script

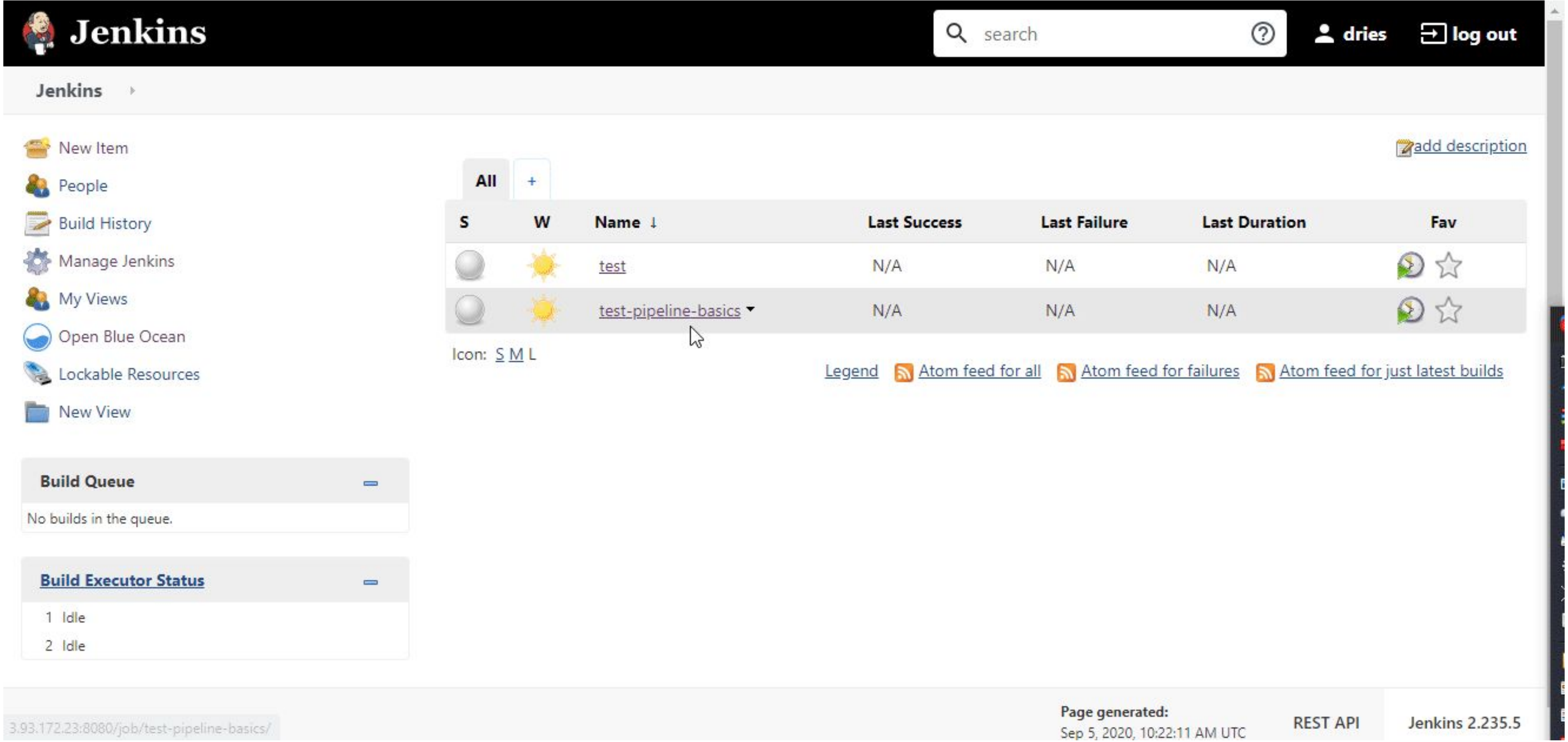
- Jenkins as code!

GUI schil over een pipeline script

- Pas beschikbaar na installatie plugin “blue ocean”



Jenkins - Pipeline - Hello world



Jenkins

search

dries log out

Jenkins

- New Item
- People
- Build History
- Manage Jenkins
- My Views
- Open Blue Ocean
- Lockable Resources
- New View

add description

All +

S	W	Name ↓	Last Success	Last Failure	Last Duration	Fav
○	☀	test	N/A	N/A	N/A	☆
○	☀	test-pipeline-basics	N/A	N/A	N/A	☆

Icon: S M L

Legend Atom feed for all Atom feed for failures Atom feed for just latest builds

Build Queue

No builds in the queue.

Build Executor Status

1 Idle

2 Idle

3.93.172.23:8080/job/test-pipeline-basics/

Page generated: Sep 5, 2020, 10:22:11 AM UTC

REST API

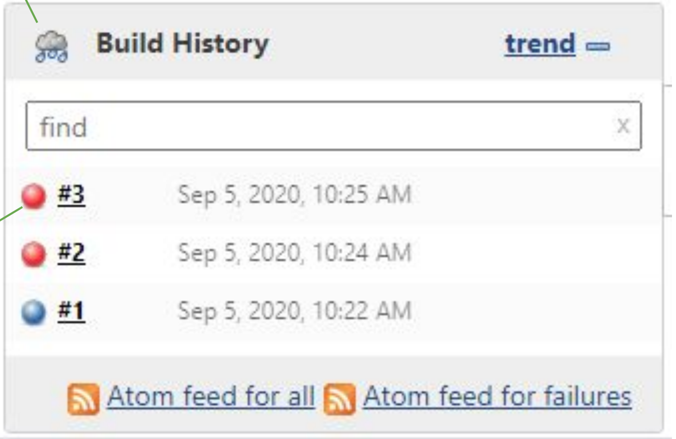
Jenkins 2.235.5

Jenkins - Build history & details

Algemene status van pipeline
- op basis van laatste 4 pogingen

Build history van alle pogingen

Status specifieke build poging
- Link naar detail-view build poging

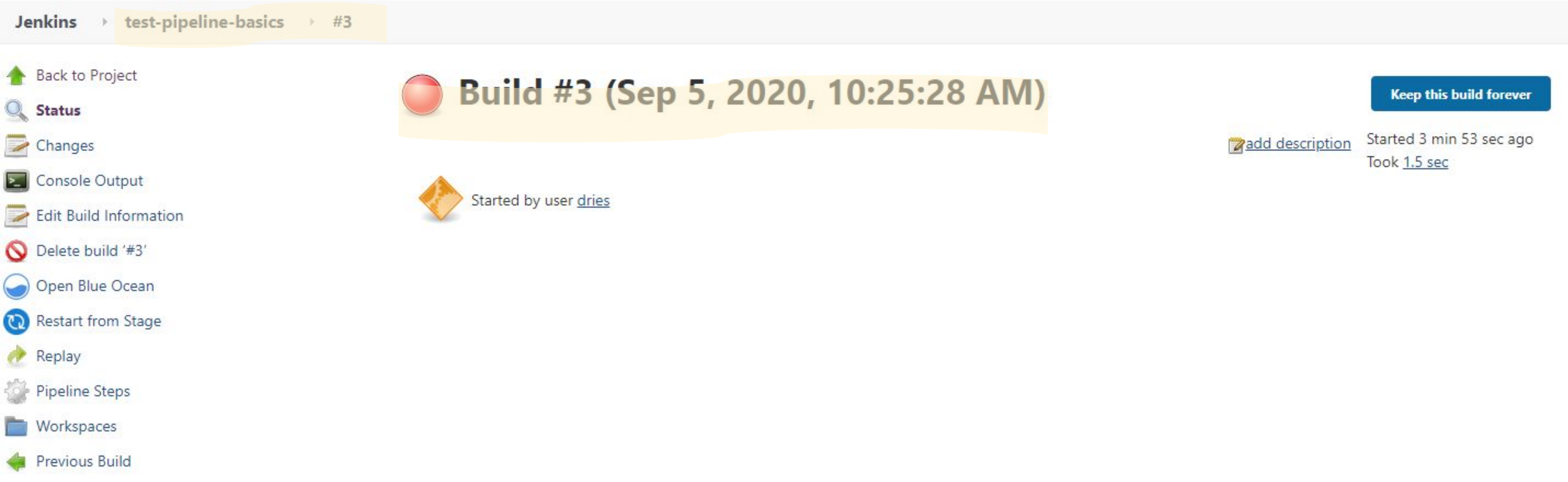


Build History trend

find

🔴	#3	Sep 5, 2020, 10:25 AM
🔴	#2	Sep 5, 2020, 10:24 AM
🔵	#1	Sep 5, 2020, 10:22 AM

Jenkins - Build history & details



Jenkins › test-pipeline-basics › #3

- Back to Project
- Status
- Changes
- Console Output
- Edit Build Information
- Delete build '#3'
- Open Blue Ocean
- Restart from Stage
- Replay
- Pipeline Steps
- Workspaces
- Previous Build

Build #3 (Sep 5, 2020, 10:25:28 AM)

Keep this build forever

add description

Started 3 min 53 sec ago
Took 1.5 sec

Started by user dries

Jenkins - Build history & details

Console output

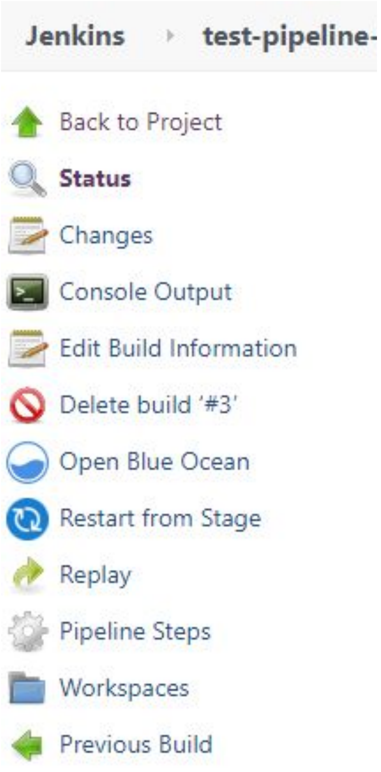
- Debugging pipeline
- Geeft output van elke stap

Aanvullende informatie voorzien voor specifieke build

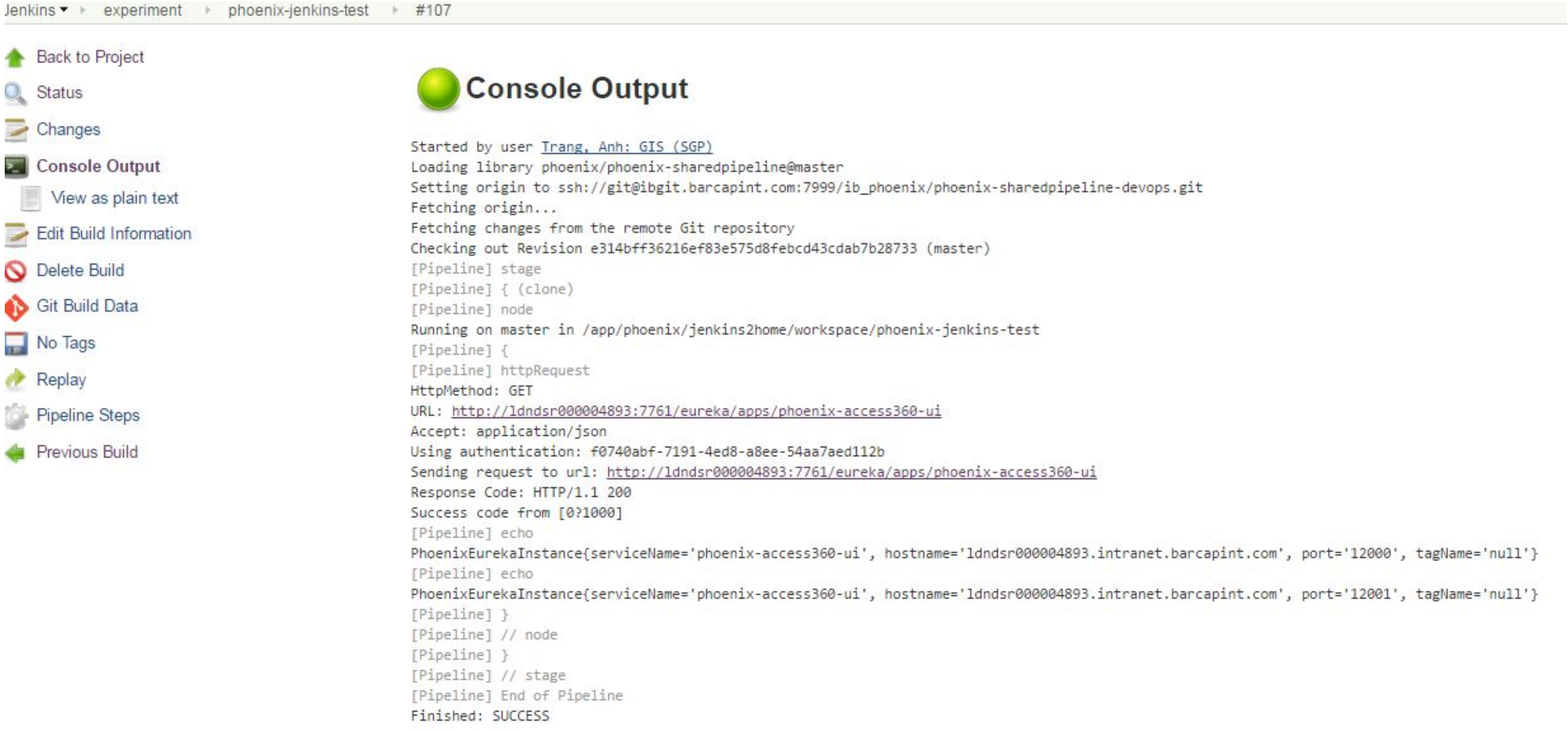
Detailweergave build per pipeline step

- Console output per step

Handmatig bekijken bestanden workspace specifieke pipeline



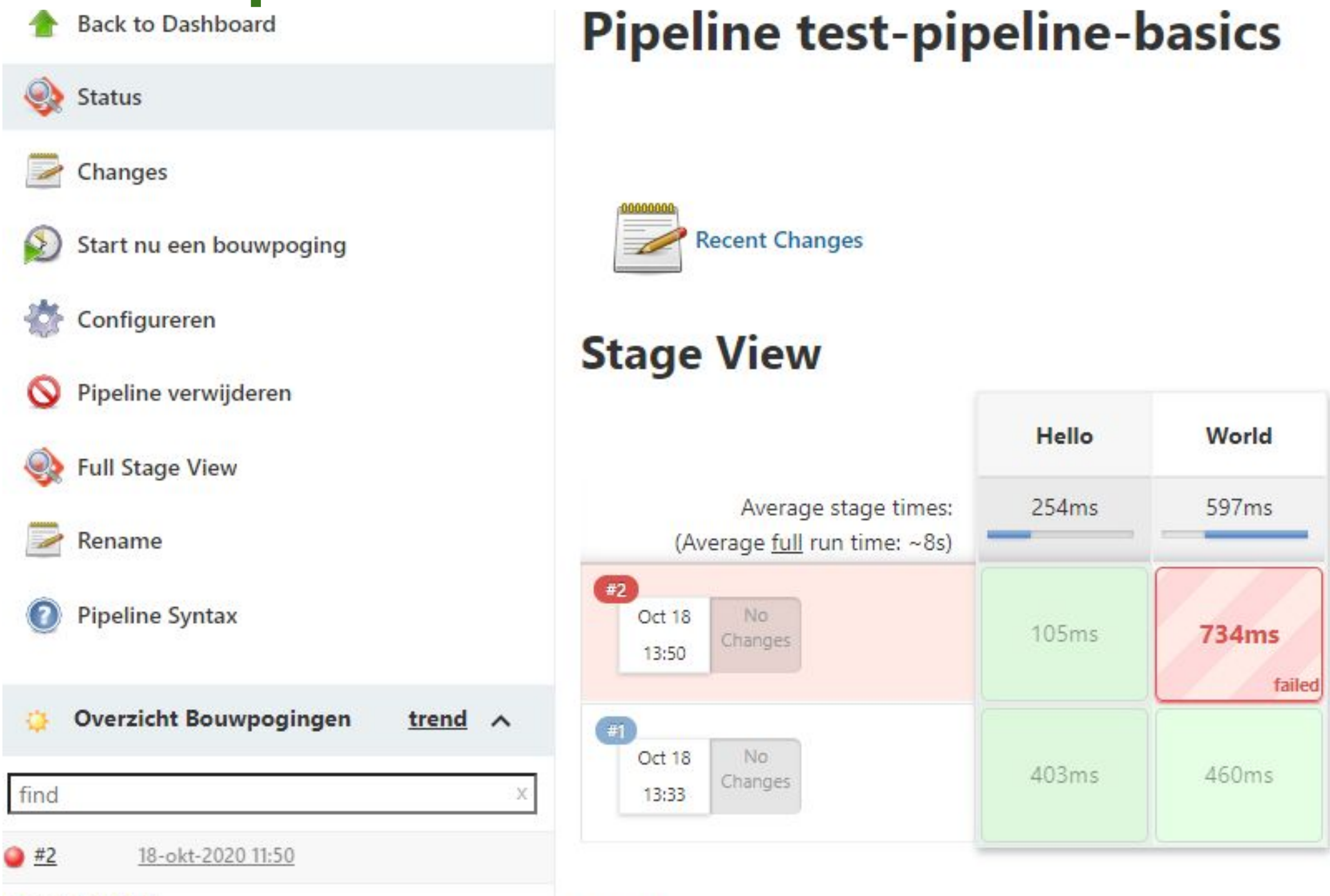
Jenkins - pipeline - debugging a pipeline



Console Output

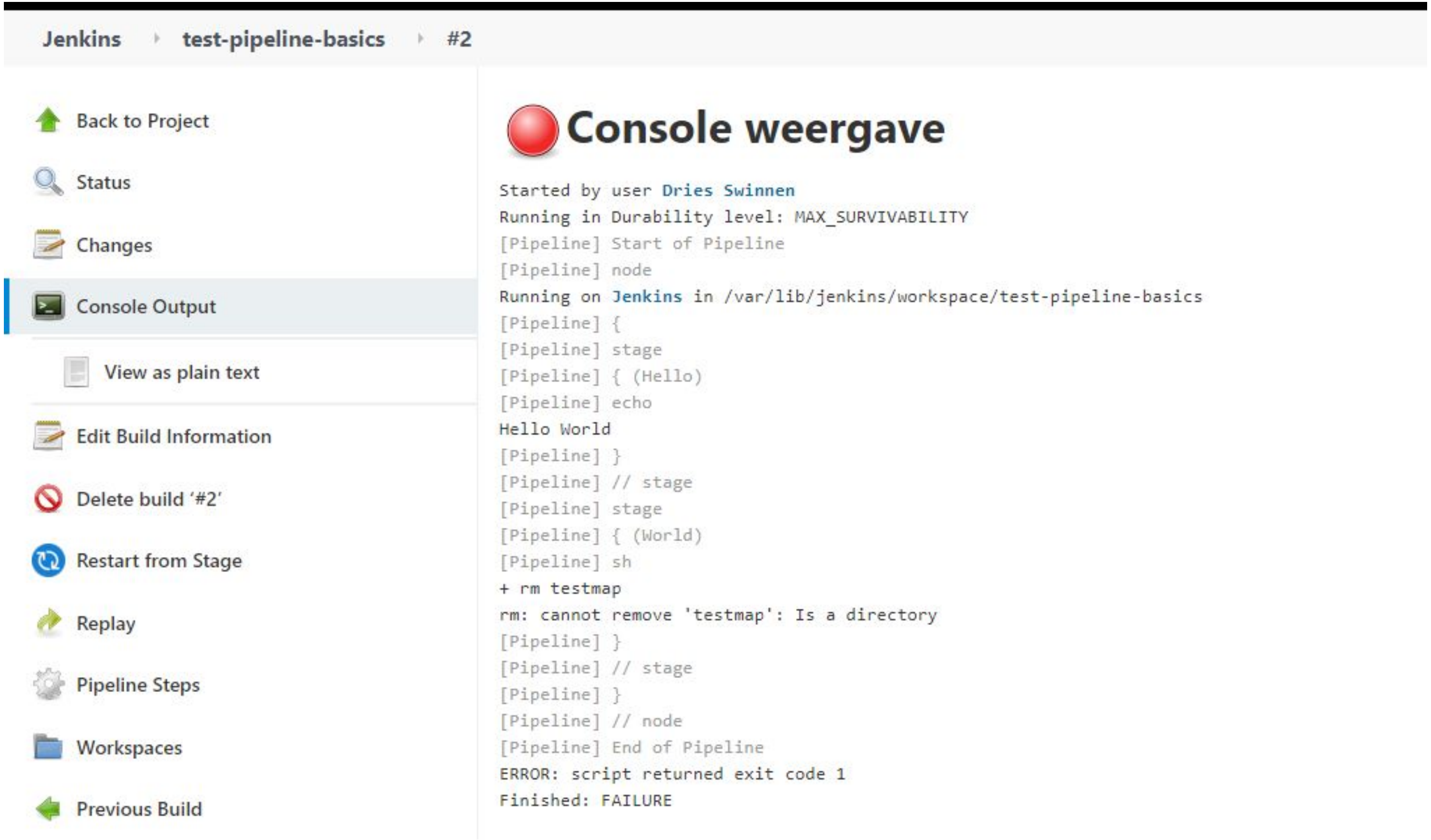
```
Started by user Trang, Anh: GIS (SGP)
Loading library phoenix/phoenix-sharedpipeline@master
Setting origin to ssh://git@ibgit.barcapint.com:7999/ib_phoenix/phoenix-sharedpipeline-devops.git
Fetching origin...
Fetching changes from the remote Git repository
Checking out Revision e314bff36216ef83e575d8febcd43cdab7b28733 (master)
[Pipeline] stage
[Pipeline] { (clone)
[Pipeline] node
Running on master in /app/phoenix/jenkins2home/workspace/phoenix-jenkins-test
[Pipeline] {
[Pipeline] httpRequest
HttpMethod: GET
URL: http://ldndsr000004893:7761/eureka/apps/phoenix-access360-ui
Accept: application/json
Using authentication: f0740abf-7191-4ed8-a8ee-54aa7aed112b
Sending request to url: http://ldndsr000004893:7761/eureka/apps/phoenix-access360-ui
Response Code: HTTP/1.1 200
Success code from [0?1000]
[Pipeline] echo
PhoenixEurekaInstance{serviceName='phoenix-access360-ui', hostname='ldndsr000004893.intranet.barcapint.com', port='12000', tagName='null'}
[Pipeline] echo
PhoenixEurekaInstance{serviceName='phoenix-access360-ui', hostname='ldndsr000004893.intranet.barcapint.com', port='12001', tagName='null'}
[Pipeline] }
[Pipeline] // node
[Pipeline] }
[Pipeline] // stage
[Pipeline] End of Pipeline
Finished: SUCCESS
```

Jenkins - Pipeline errors



	Hello	World
Average stage times: (Average full run time: ~8s)	254ms	597ms
#2 Oct 18 13:50 No Changes	105ms	734ms failed
#1 Oct 18 13:33 No Changes	403ms	460ms

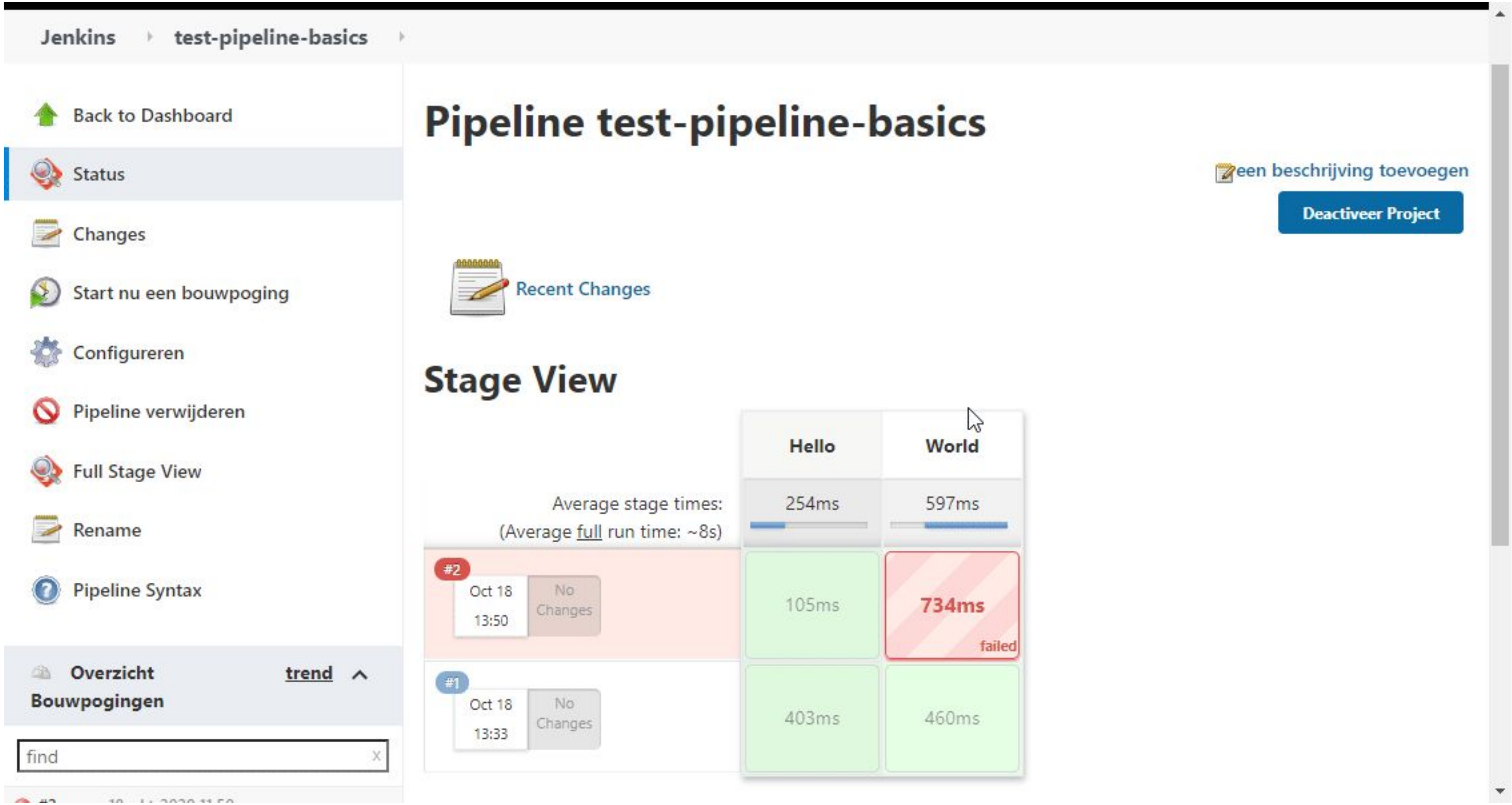
Jenkins - Pipeline errors



Console weergave

```
Started by user Dries Swinnen
Running in Durability level: MAX_SURVIVABILITY
[Pipeline] Start of Pipeline
[Pipeline] node
Running on Jenkins in /var/lib/jenkins/workspace/test-pipeline-basics
[Pipeline] {
[Pipeline] stage
[Pipeline] { (Hello)
[Pipeline] echo
Hello World
[Pipeline] }
[Pipeline] // stage
[Pipeline] stage
[Pipeline] { (World)
[Pipeline] sh
+ rm testmap
rm: cannot remove 'testmap': Is a directory
[Pipeline] }
[Pipeline] // stage
[Pipeline] }
[Pipeline] // node
[Pipeline] End of Pipeline
ERROR: script returned exit code 1
Finished: FAILURE
```

Jenkins - Pipeline errors



Jenkins › test-pipeline-basics ›

- Back to Dashboard
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- Full Stage View
- Rename
- Pipeline Syntax

Overzicht Bouwpogingen trend

find

Pipeline test-pipeline-basics

een beschrijving toevoegen

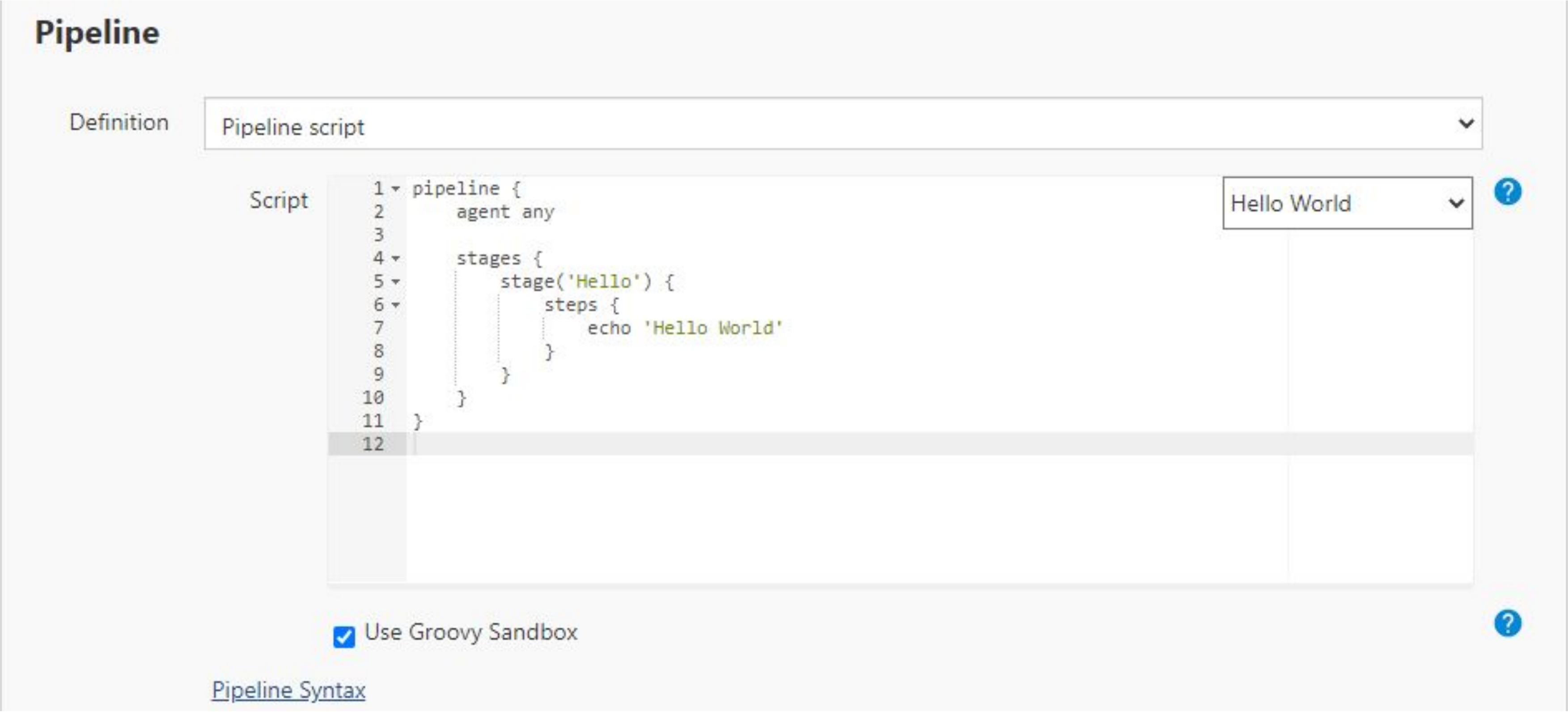
Deactiveer Project

Recent Changes

Stage View

	Hello	World
Average stage times: (Average full run time: ~8s)	254ms	597ms
#2 Oct 18 13:50 No Changes	105ms	734ms failed
#1 Oct 18 13:33 No Changes	403ms	460ms

Jenkins - Minimaal pipeline script



Pipeline

Definition: Pipeline script

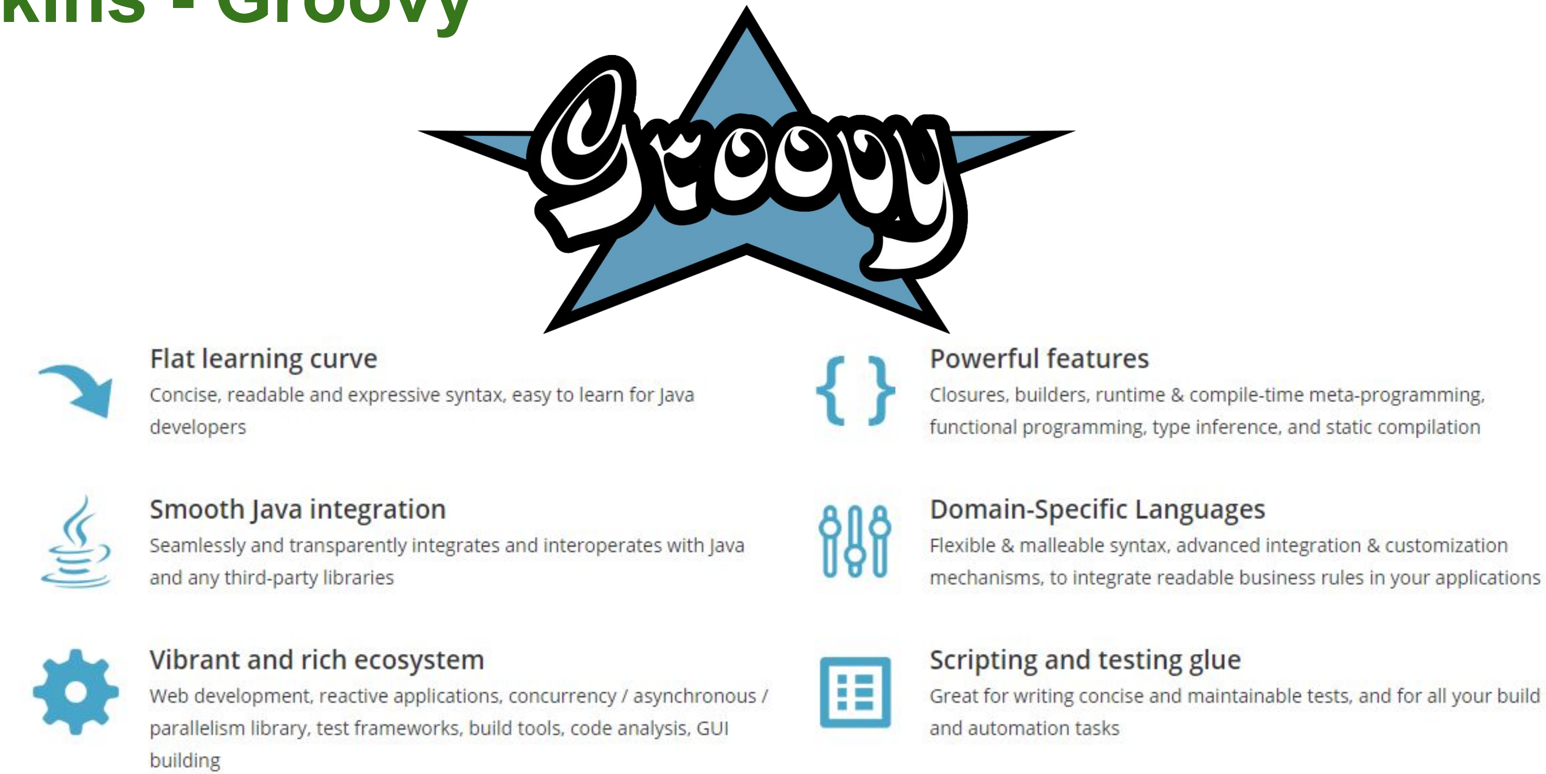
Script:

```
pipeline {
    agent any

    stages {
        stage('Hello') {
            steps {
                echo 'Hello World'
            }
        }
    }
}

```

☑ Use Groovy Sandbox

Pipeline Syntax

Jenkins - Groovy



Flat learning curve

Concise, readable and expressive syntax, easy to learn for Java developers

Smooth Java integration

Seamlessly and transparently integrates and interoperates with Java and any third-party libraries

Vibrant and rich ecosystem

Web development, reactive applications, concurrency / asynchronous / parallelism library, test frameworks, build tools, code analysis, GUI building

Powerful features

Closures, builders, runtime & compile-time meta-programming, functional programming, type inference, and static compilation

Domain-Specific Languages

Flexible & malleable syntax, advanced integration & customization mechanisms, to integrate readable business rules in your applications

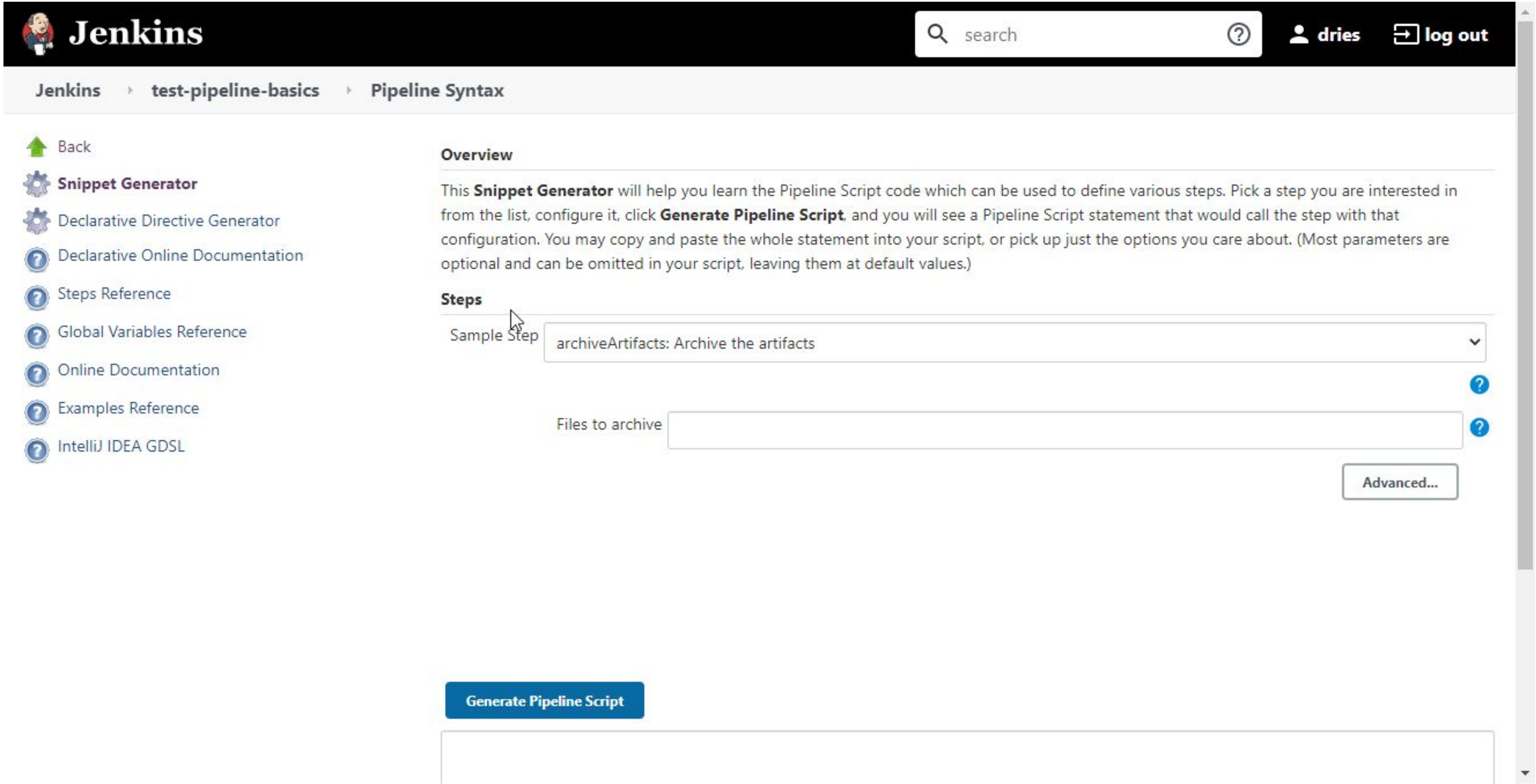
Scripting and testing glue

Great for writing concise and maintainable tests, and for all your build and automation tasks

https://www.jenkins.io/doc/book/pipeline/syntax/

https://groovy-lang.org/syntax.html

Jenkins - Helper & docs



Jenkins
search
dries
log out
Jenkins › test-pipeline-basics › Pipeline Syntax
Back
Snippet Generator
Declarative Directive Generator
Declarative Online Documentation
Steps Reference
Global Variables Reference
Online Documentation
Examples Reference
IntelliJ IDEA GDSL

Overview

This **Snippet Generator** will help you learn the Pipeline Script code which can be used to define various steps. Pick a step you are interested in from the list, configure it, click **Generate Pipeline Script**, and you will see a Pipeline Script statement that would call the step with that configuration. You may copy and paste the whole statement into your script, or pick up just the options you care about. (Most parameters are optional and can be omitted in your script, leaving them at default values.)

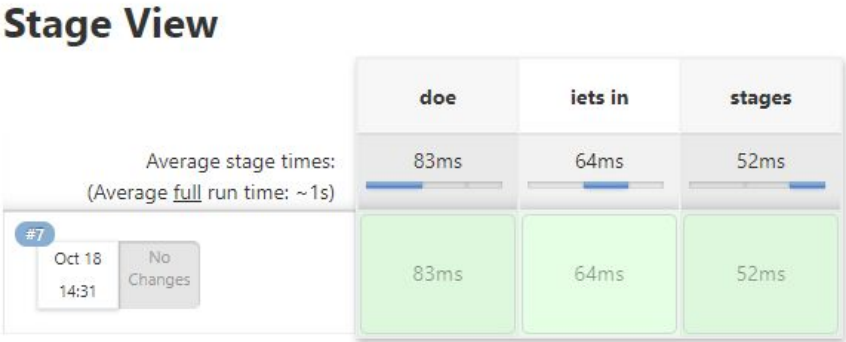
Steps

Sample Step: archiveArtifacts: Archive the artifacts

Files to archive:

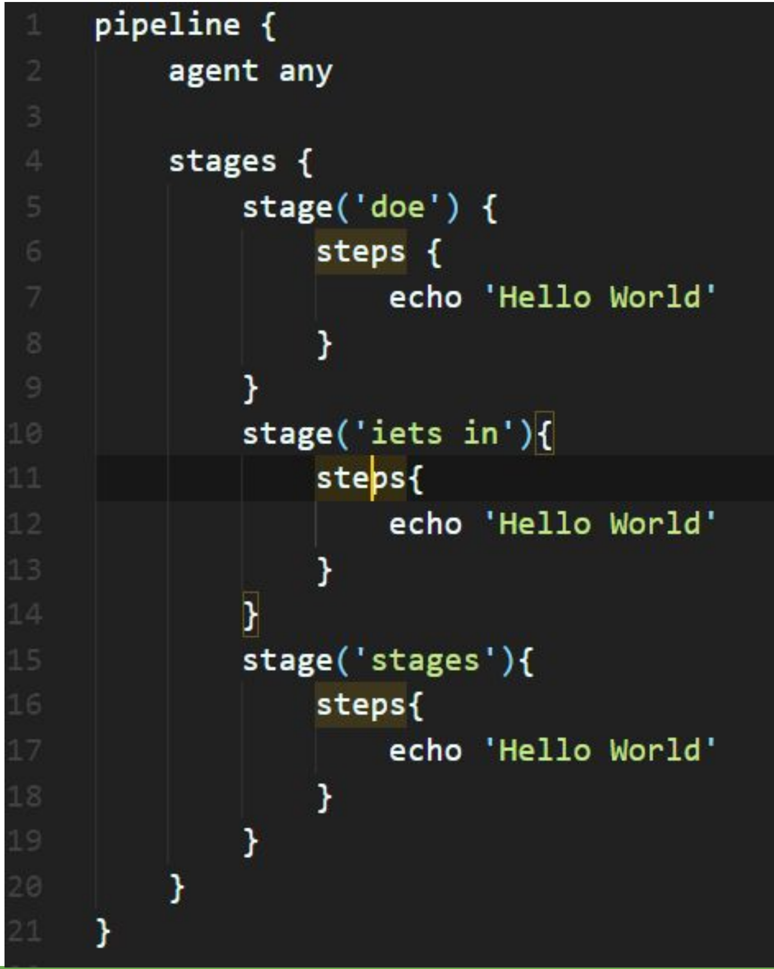
Jenkins - pipeline - stages

- Stages geven structuur aan de pipeline
- Worden opgenomen als kolom in de stage view



Stage View

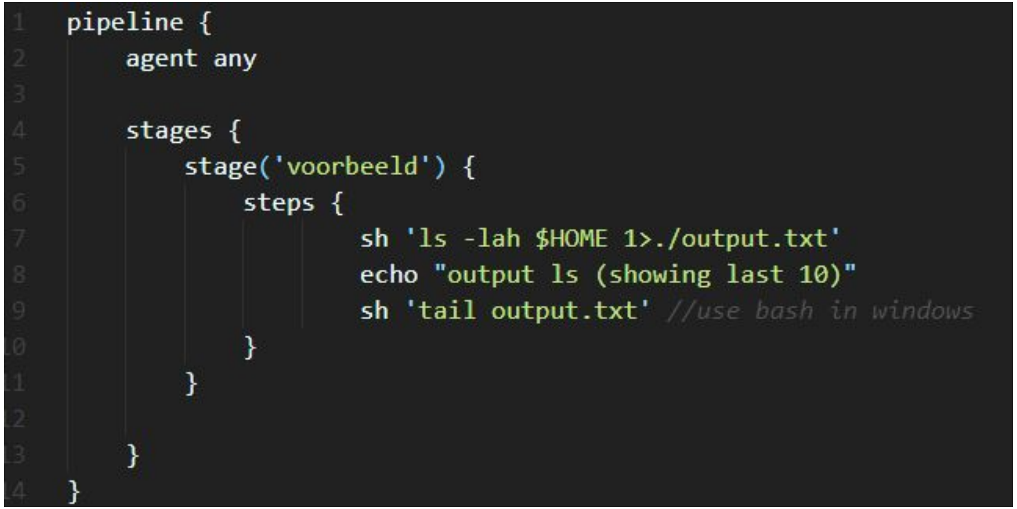
	doe	iets in	stages
Average stage times: (Average full run time: ~1s)	83ms	64ms	52ms
#7 Oct 18 14:31 No Changes	83ms	64ms	52ms



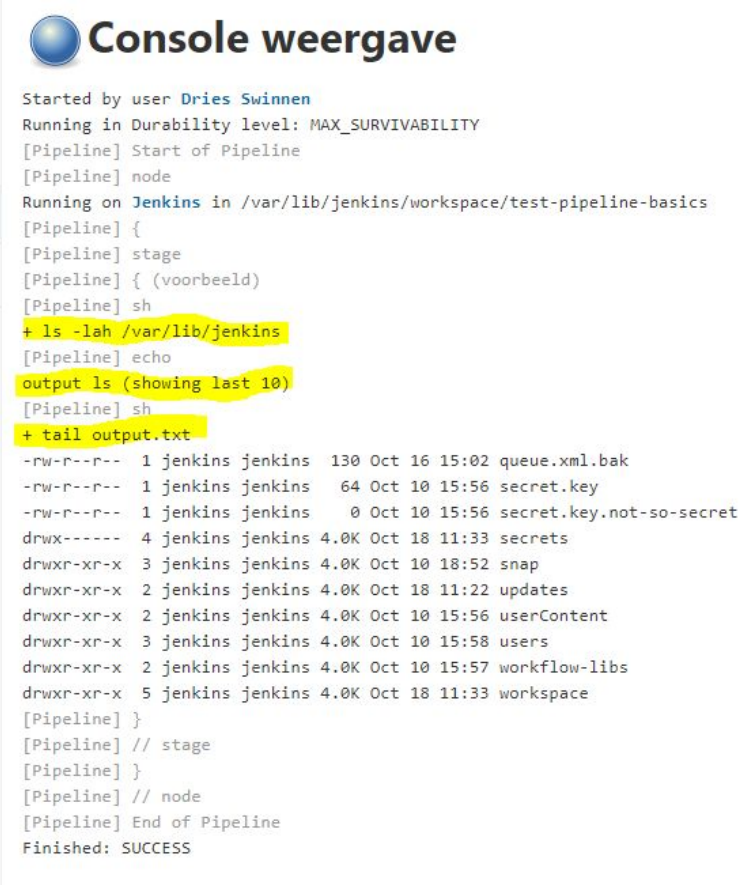
```
pipeline {
    agent any

    stages {
        stage('doe') {
            steps {
                echo 'Hello World'
            }
        }
        stage('iets in'){
            steps{
                echo 'Hello World'
            }
        }
        stage('stages'){
            steps{
                echo 'Hello World'
            }
        }
    }
}
```

Jenkins - pipeline - steps

- Steps definiëren stappen in een stage van de pipeline
- één of meerdere commando’s, triggers, plugins, ...



```
pipeline {
    agent any

    stages {
        stage('voorbeeld') {
            steps {
                    sh 'ls -lah $HOME 1>./output.txt'
                    echo "output ls (showing last 10)"
                    sh 'tail output.txt' //use bash in windows
            }
        }

    }
}
```

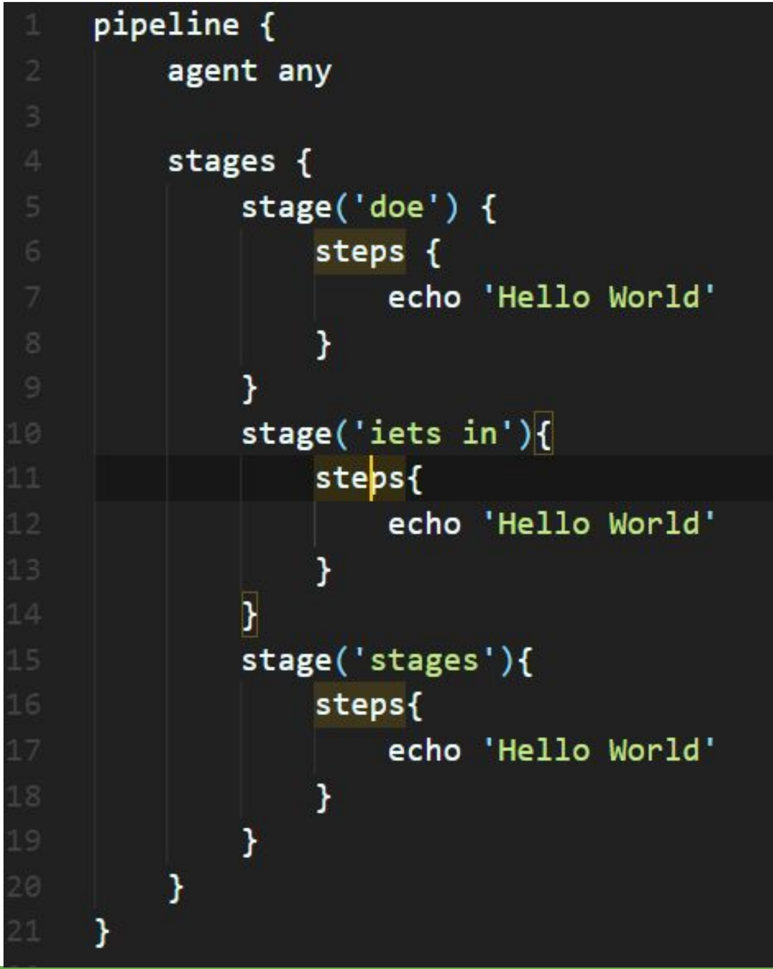


Console weergave

```
Started by user Dries Swinnen
Running in Durability level: MAX_SURVIVABILITY
[Pipeline] Start of Pipeline
[Pipeline] node
Running on Jenkins in /var/lib/jenkins/workspace/test-pipeline-basics
[Pipeline] {
[Pipeline] stage
[Pipeline] { (voorbeeld)
[Pipeline] sh
+ ls -lah /var/lib/jenkins
[Pipeline] echo
output ls (showing last 10)
[Pipeline] sh
+ tail output.txt
-rw-r--r--  1 jenkins jenkins  130 Oct 16 15:02 queue.xml.bak
-rw-r--r--  1 jenkins jenkins   64 Oct 10 15:56 secret.key
-rw-r--r--  1 jenkins jenkins    0 Oct 10 15:56 secret.key.not-so-secret
drwx------  4 jenkins jenkins 4.0K Oct 18 11:33 secrets
drwxr-xr-x  3 jenkins jenkins 4.0K Oct 10 18:52 snap
drwxr-xr-x  2 jenkins jenkins 4.0K Oct 18 11:22 updates
drwxr-xr-x  2 jenkins jenkins 4.0K Oct 10 15:56 userContent
drwxr-xr-x  3 jenkins jenkins 4.0K Oct 10 15:58 users
drwxr-xr-x  2 jenkins jenkins 4.0K Oct 10 15:57 workflow-libs
drwxr-xr-x  5 jenkins jenkins 4.0K Oct 18 11:33 workspace
[Pipeline] }
[Pipeline] // stage
[Pipeline] }
[Pipeline] // node
[Pipeline] End of Pipeline
Finished: SUCCESS
```

Jenkins - pipeline - agents

- Agents bepalen waar stages gedraaid worden
  - Op huidige server, docker containers, VM’s, …
- Buiten de scope van dit vak

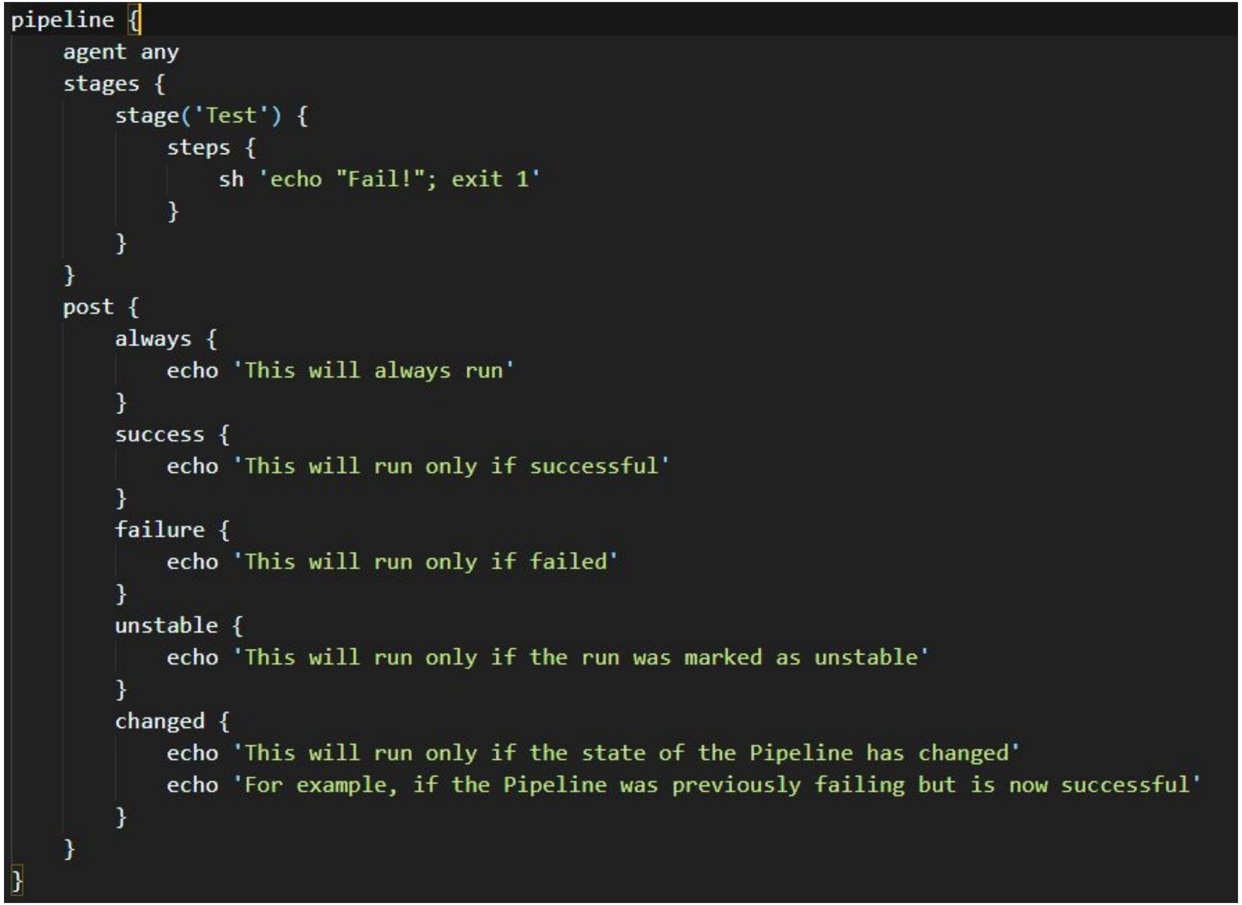


```
pipeline {
    agent any

    stages {
        stage('doe') {
            steps {
                echo 'Hello World'
            }
        }
        stage('iets in'){
            steps{
                echo 'Hello World'
            }
        }
        stage('stages'){
            steps{
                echo 'Hello World'
            }
        }
    }
}
```

Jenkins - pipeline - Post run steps

- Stappen uitvoeren na het runnen van de volledige pipeline
- Pipelines stoppen bij het falen van een stap
  - Stappen & stages na deze stap worden niet meer uitgevoerd
  - Post run steps worden wel nog uitgevoerd

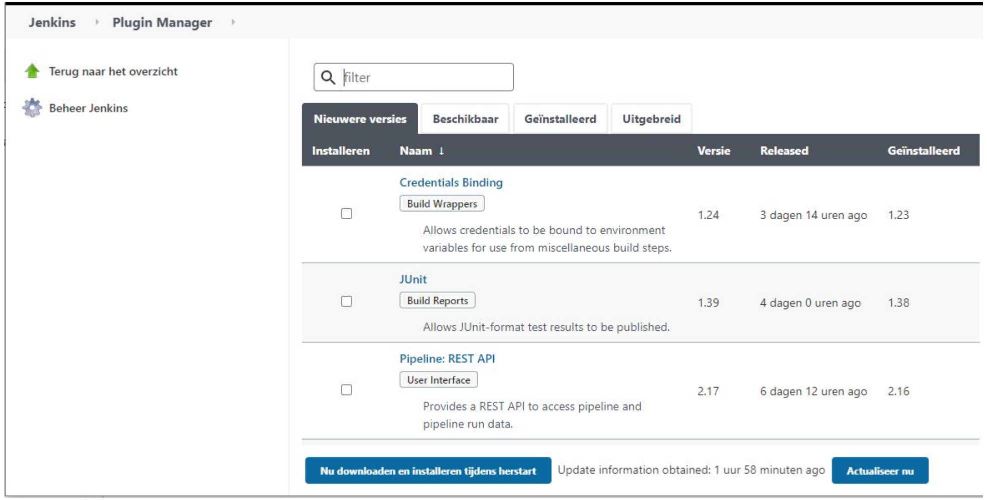
Jenkins - pipeline - Post run steps



```
pipeline {
    agent any
    stages {
        stage('Test') {
            steps {
                sh 'echo "Fail!"; exit 1'
            }
        }
    }
    post {
        always {
            echo 'This will always run'
        }
        success {
            echo 'This will run only if successful'
        }
        failure {
            echo 'This will run only if failed'
        }
        unstable {
            echo 'This will run only if the run was marked as unstable'
        }
        changed {
            echo 'This will run only if the state of the Pipeline has changed'
            echo 'For example, if the Pipeline was previously failing but is now successful'
        }
    }
}
```

Jenkins - pipeline - plugins

- Uitbreiding jenkins functionaliteit
  - Plugin manager
- Gebruik via freestyle project of integratie in jenkinsfile



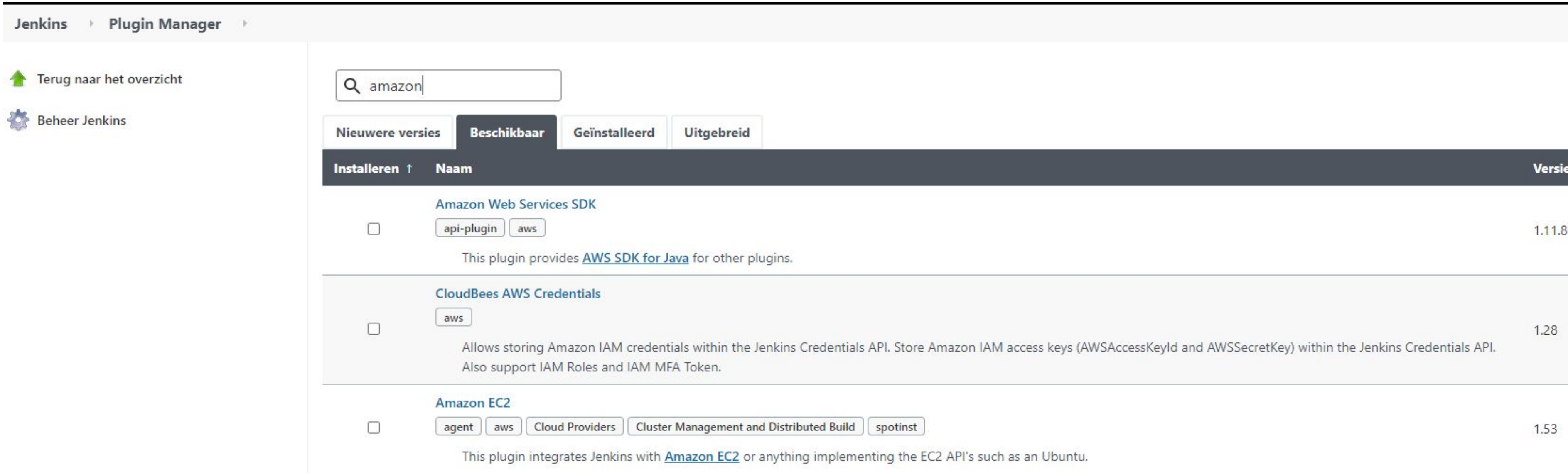
Installeren	Naam ↓	Versie	Released	Geïnstalleerd
☐	Credentials Binding Build Wrappers Allows credentials to be bound to environment variables for use from miscellaneous build steps.	1.24	3 dagen 14 uren ago	1.23
☐	JUnit Build Reports Allows JUnit-format test results to be published.	1.39	4 dagen 0 uren ago	1.38
☐	Pipeline: REST API User Interface Provides a REST API to access pipeline and pipeline run data.	2.17	6 dagen 12 uren ago	2.16

Update information obtained: 1 uur 58 minuten ago

- Geen plugin? script it!

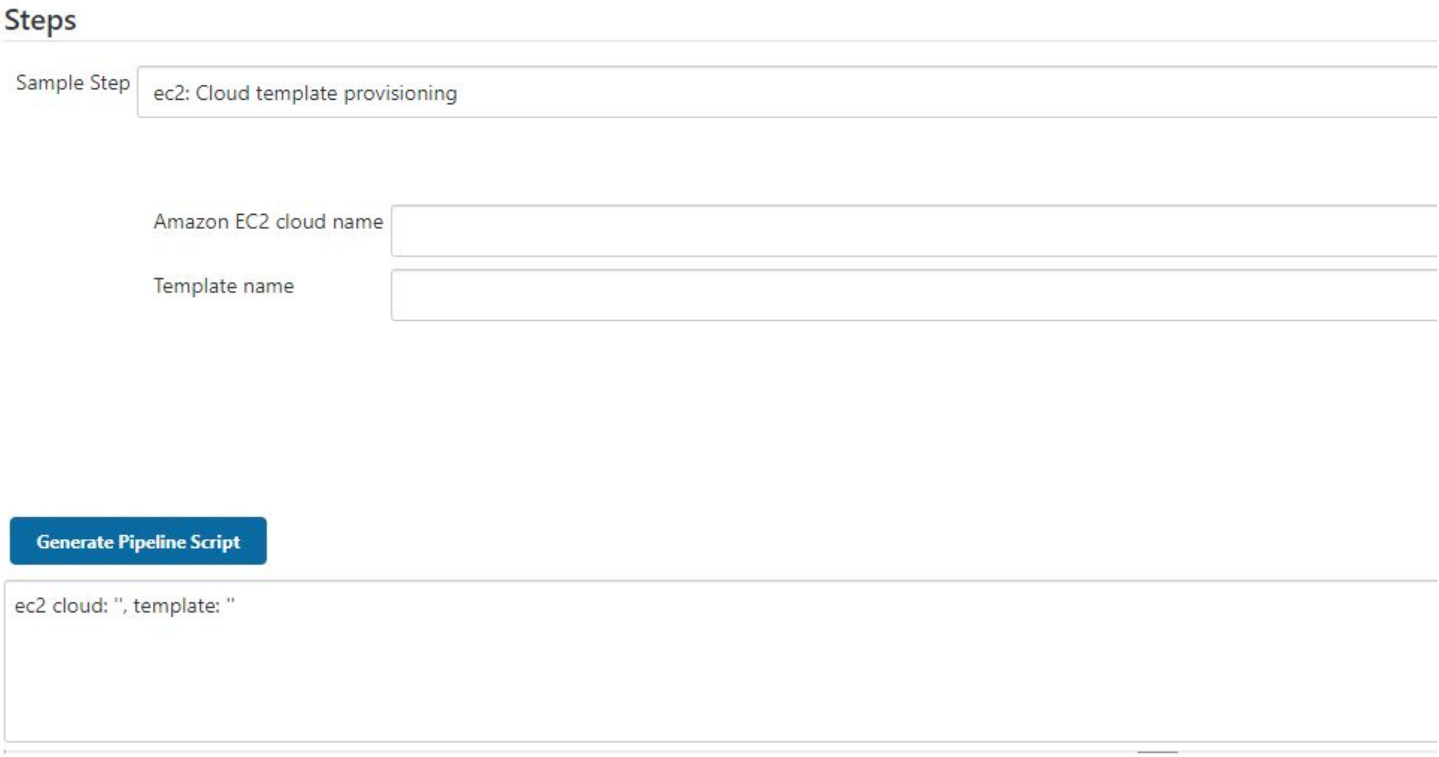
Jenkins - pipeline - plugins

Plugins voegen extra functionaliteit toe aan je pipeline script



Installeren ↑	Naam	Versie
□	Amazon Web Services SDK api-plugin aws This plugin provides AWS SDK for Java for other plugins.	1.11.8
□	CloudBees AWS Credentials aws Allows storing Amazon IAM credentials within the Jenkins Credentials API. Store Amazon IAM access keys (AWSAccessKeyId and AWSSecretKey) within the Jenkins Credentials API. Also support IAM Roles and IAM MFA Token.	1.28
□	Amazon EC2 agent aws Cloud Providers Cluster Management and Distributed Build spotinst This plugin integrates Jenkins with Amazon EC2 or anything implementing the EC2 API's such as an Ubuntu.	1.53

Jenkins - pipeline - plugins



Steps

Sample Step: ec2: Cloud template provisioning

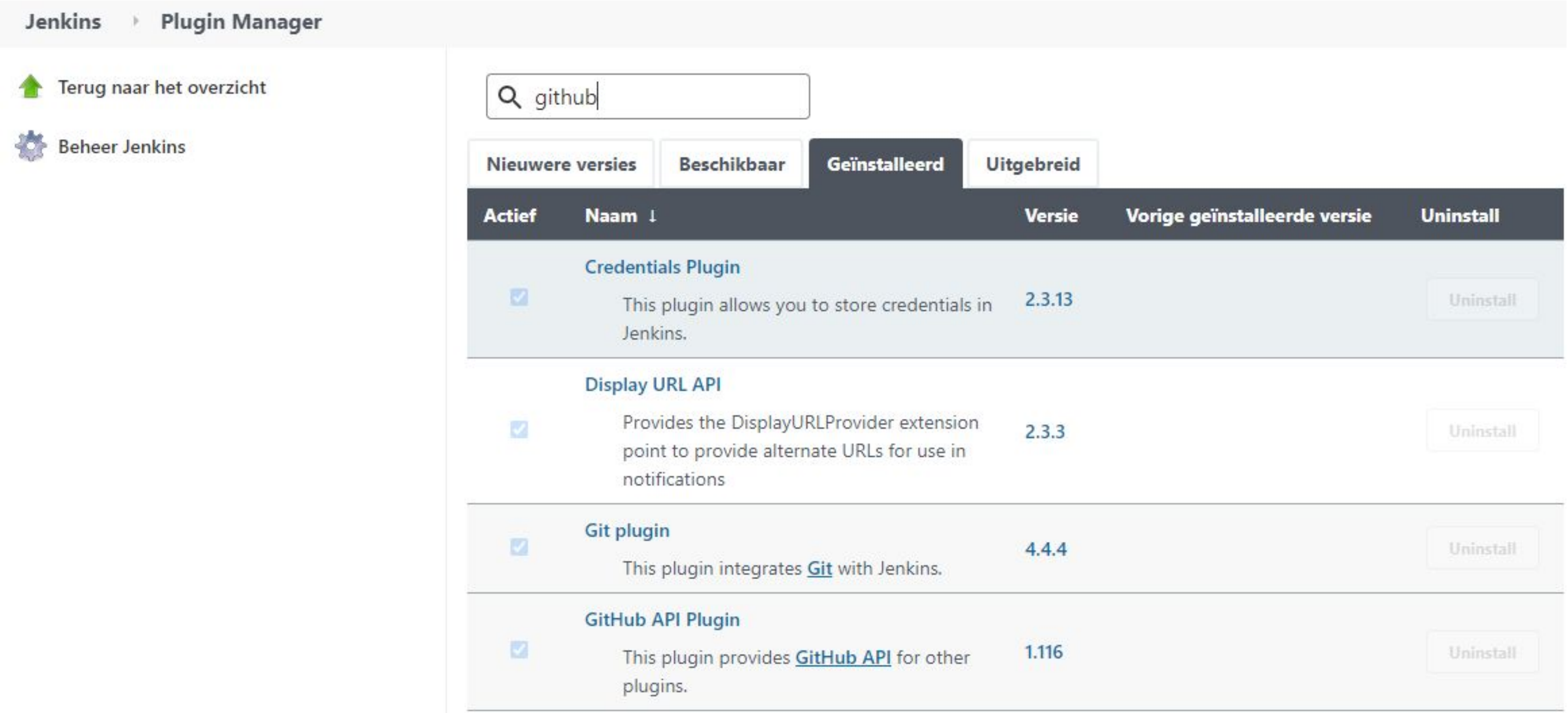
Amazon EC2 cloud name:

Template name:

```
ec2 cloud: '', template: ''
```

Jenkins - pipeline - plugin - git

- Git plugins zorgen voor integratie met GIT & Github



Jenkins › Plugin Manager

Actief	Naam ↓	Versie	Vorige geïnstalleerde versie	Uninstall
☑	Credentials Plugin This plugin allows you to store credentials in Jenkins.	2.3.13		Uninstall
☑	Display URL API Provides the DisplayURLProvider extension point to provide alternate URLs for use in notifications	2.3.3		Uninstall
☑	Git plugin This plugin integrates Git with Jenkins.	4.4.4		Uninstall
☑	GitHub API Plugin This plugin provides GitHub API for other plugins.	1.116		Uninstall

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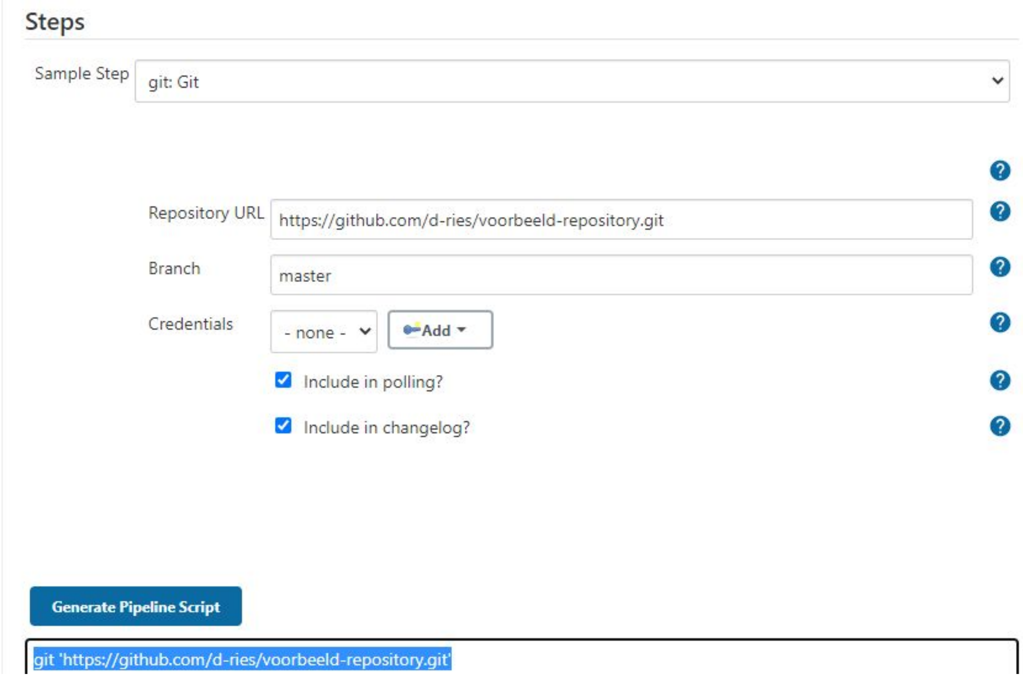

Steps

Sample Step: git: Git

Repository URL: https://github.com/d-ries/voorbeeld-repository.git

Branch: master

Credentials: - none -

☑ Include in polling?

☑ Include in changelog?

```
git 'https://github.com/d-ries/voorbeeld-repository.git'
```

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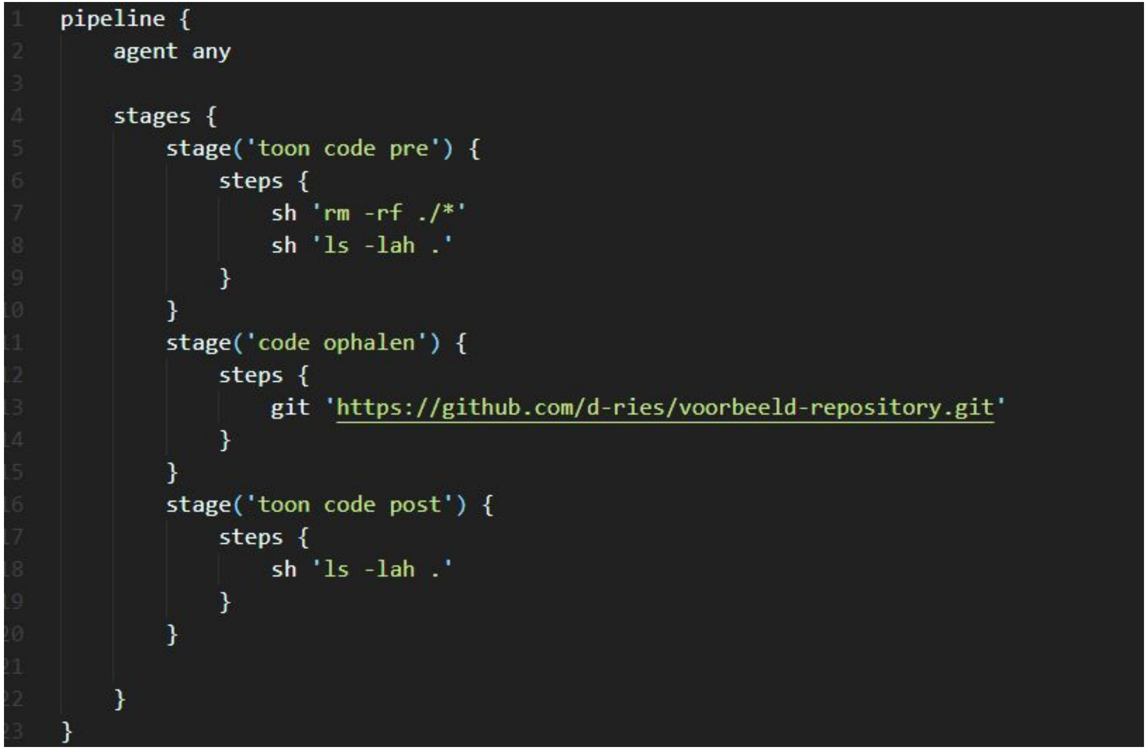

```
pipeline {
    agent any

    stages {
        stage('toon code pre') {
            steps {
                sh 'rm -rf ./*'
                sh 'ls -lah .'
            }
        }
        stage('code ophalen') {
            steps {
                git 'https://github.com/d-ries/voorbeeld-repository.git'
            }
        }
        stage('toon code post') {
            steps {
                sh 'ls -lah .'
            }
        }

    }
}
```

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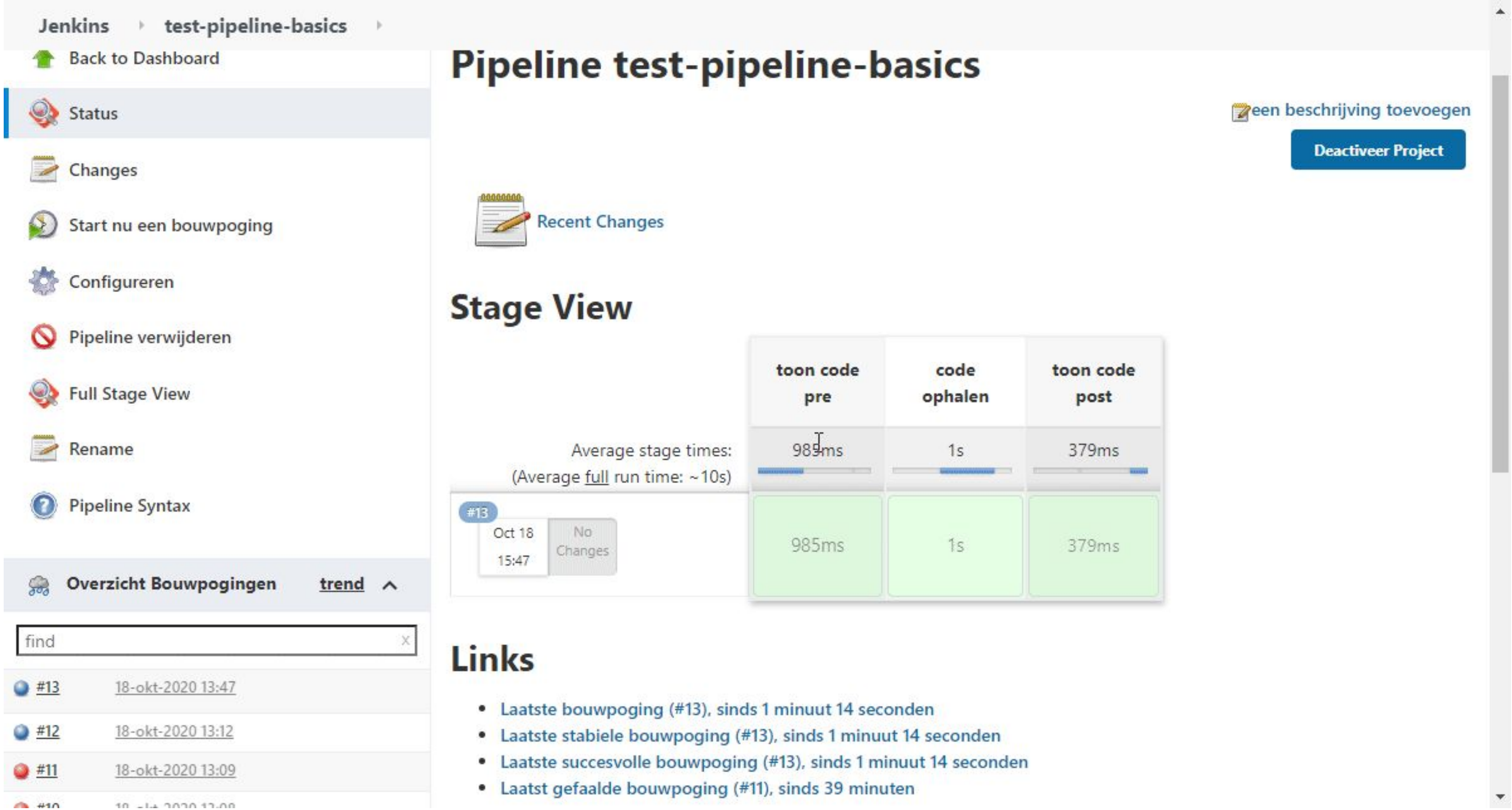


Pipeline test-pipeline-basics

#13	18-okt-2020 13:47
#12	18-okt-2020 13:12
#11	18-okt-2020 13:09

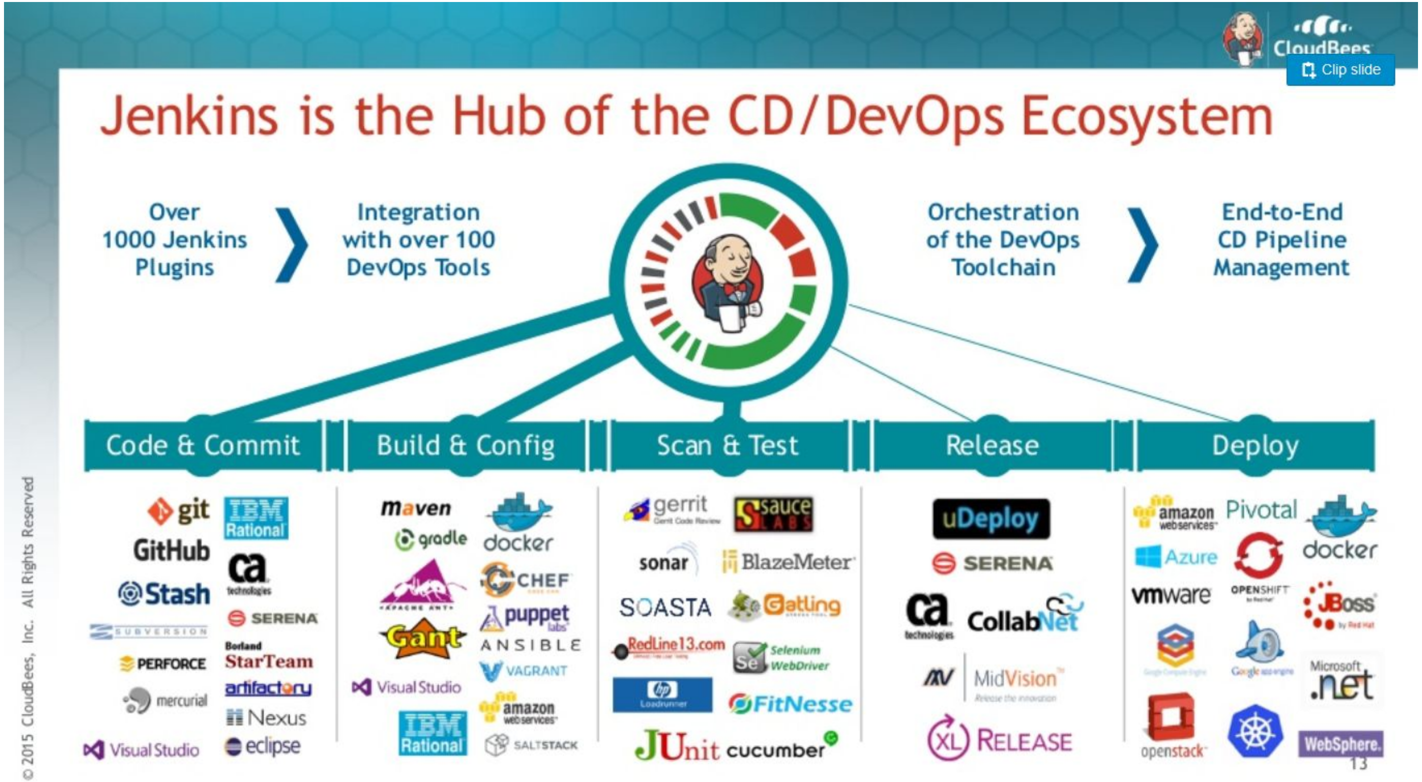
Stage View

	toon code pre	code ophalen	toon code post
Average stage times: (Average full run time: ~10s)	985ms	1s	379ms
#13 Oct 18 15:47 No Changes	985ms	1s	379ms

Links

- Laatste bouwpoging (#13), sinds 1 minuut 14 seconden
- Laatste stabiele bouwpoging (#13), sinds 1 minuut 14 seconden
- Laatste succesvolle bouwpoging (#13), sinds 1 minuut 14 seconden
- Laatst gefaalde bouwpoging (#11), sinds 39 minuten

Recap



Jenkins is the Hub of the CD/DevOps Ecosystem

Over 1000 Jenkins Plugins › Integration with over 100 DevOps Tools

Orchestration of the DevOps Toolchain › End-to-End CD Pipeline Management

Code & Commit | Build & Config | Scan & Test | Release | Deploy

Assignments

Pipelines - taak 2

HOGESCHOOL PXL