Working with Python Jenkins

Javier Salas

What is Python Jenkins?

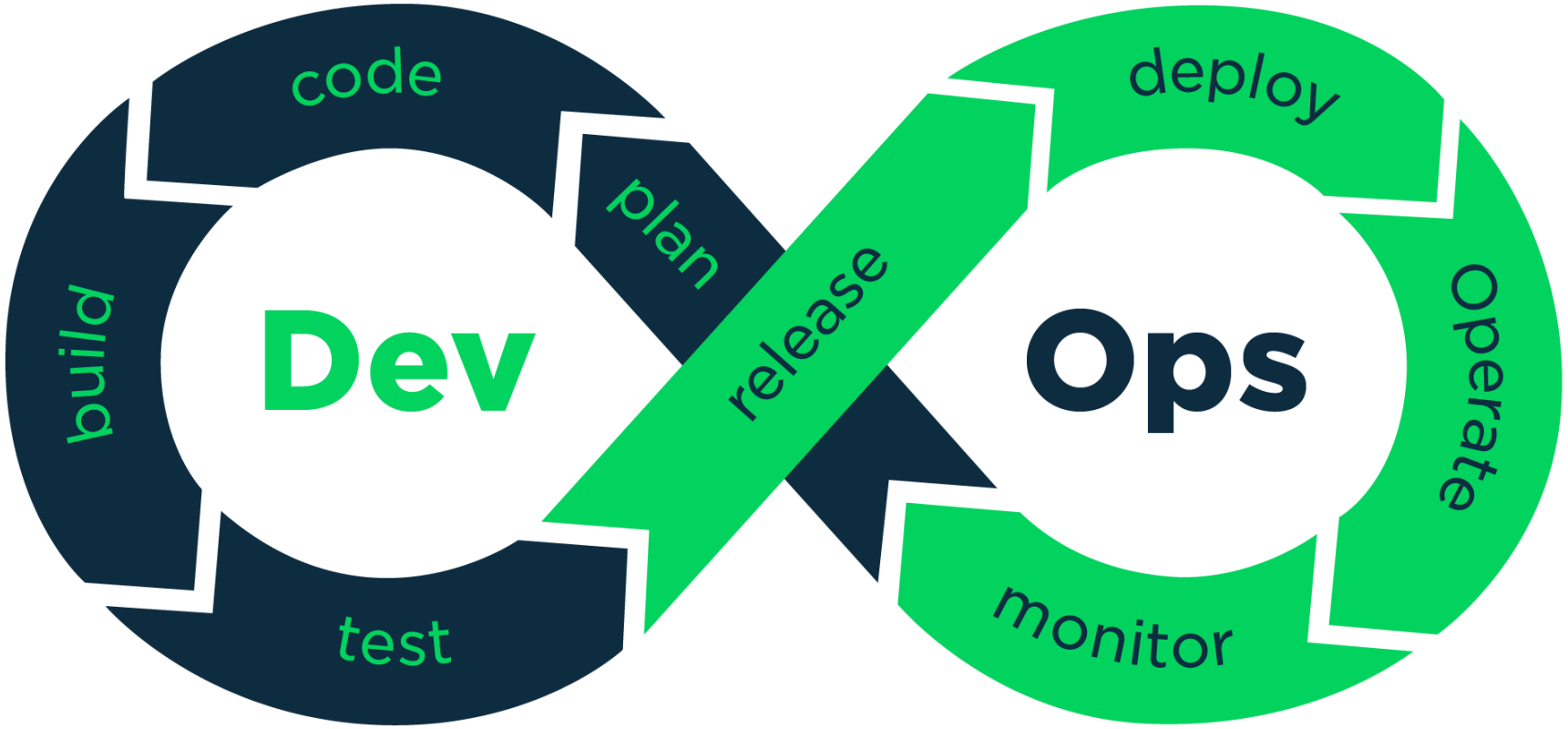
Python Jenkins is a **python wrapper** for the Jenkins REST API which aims to provide a more **conventionally pythonic way** of controlling a Jenkins server. It provides a higher-level API containing a number of convenience functions.

In terms of abstraction, we will see that instead of dealing with **json objects and http requests**, we will deal with **python objects** to interact with Jenkins

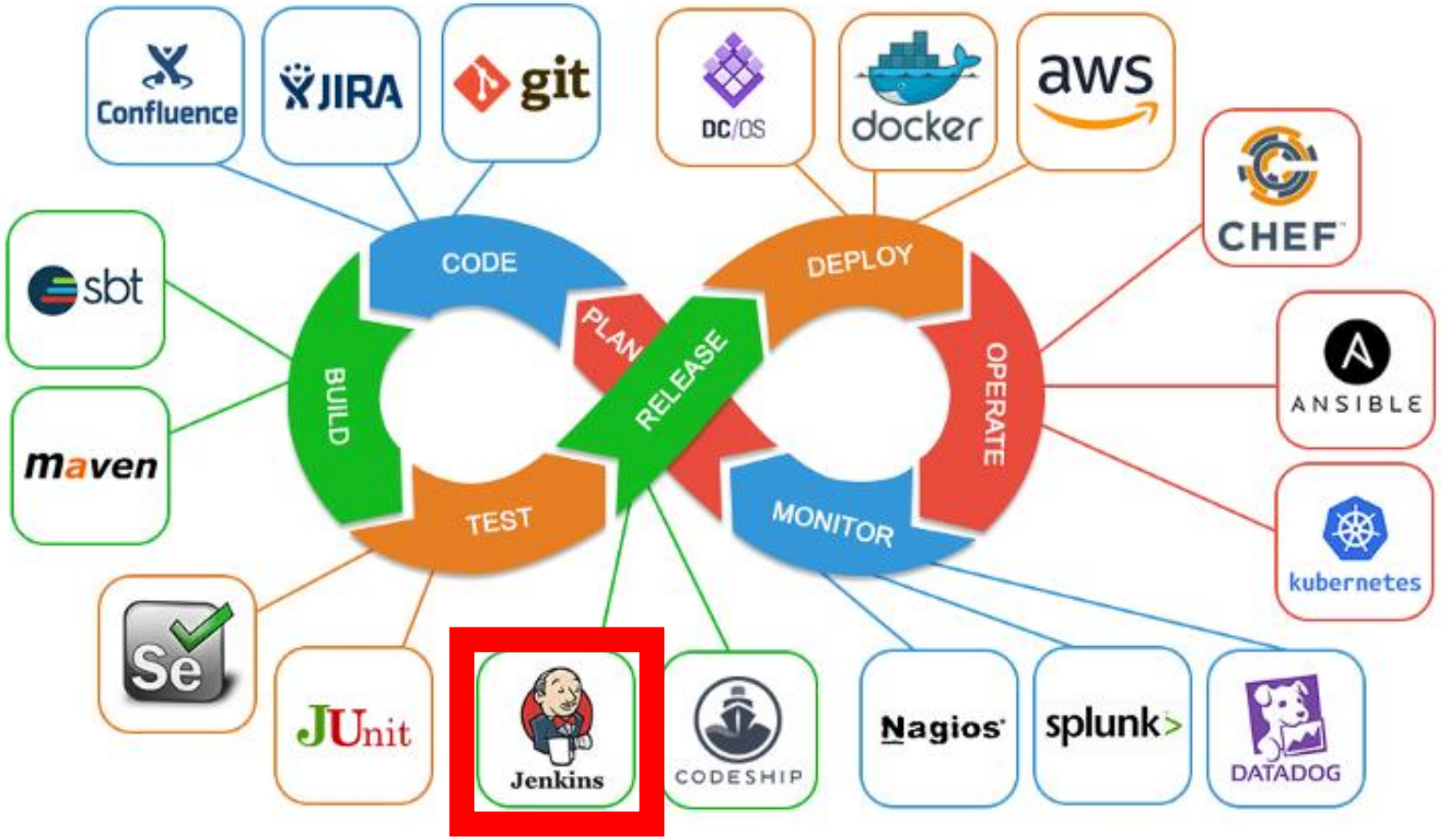
What is Jenkins?

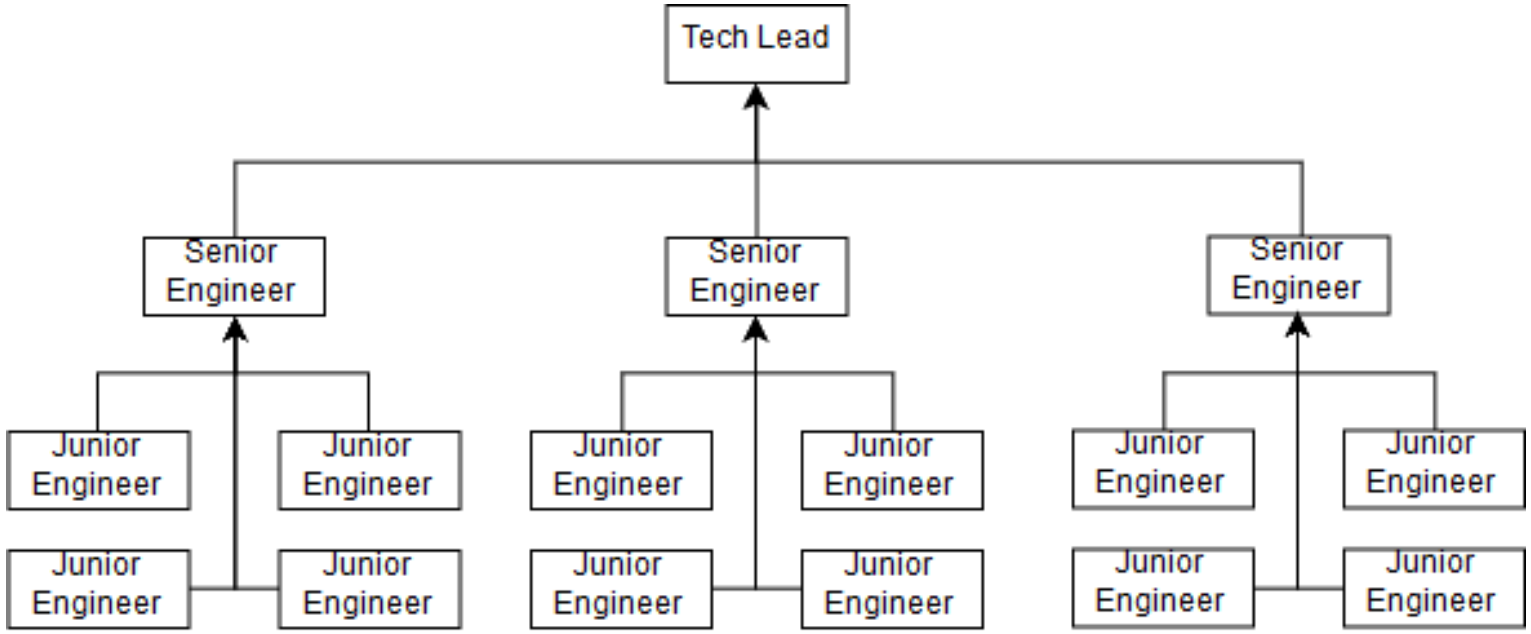
Jenkins is a *devops* tool that performs tests, listens for commits, generates reports and much more.

Big Picture: Devops



Where we are in the process:





Consider the following scenario

- What if you are the Tech Lead at a company and you wanted make a program to improve your organization's programming.

What should the program do?

- Build stability
- Project progression
- Unit tests
- Automated reporting of errors
- Report generating periodically

Motivating factors: CI/CD

Continuous Integration:

- Test your application with every change
- Detect failures as the arise

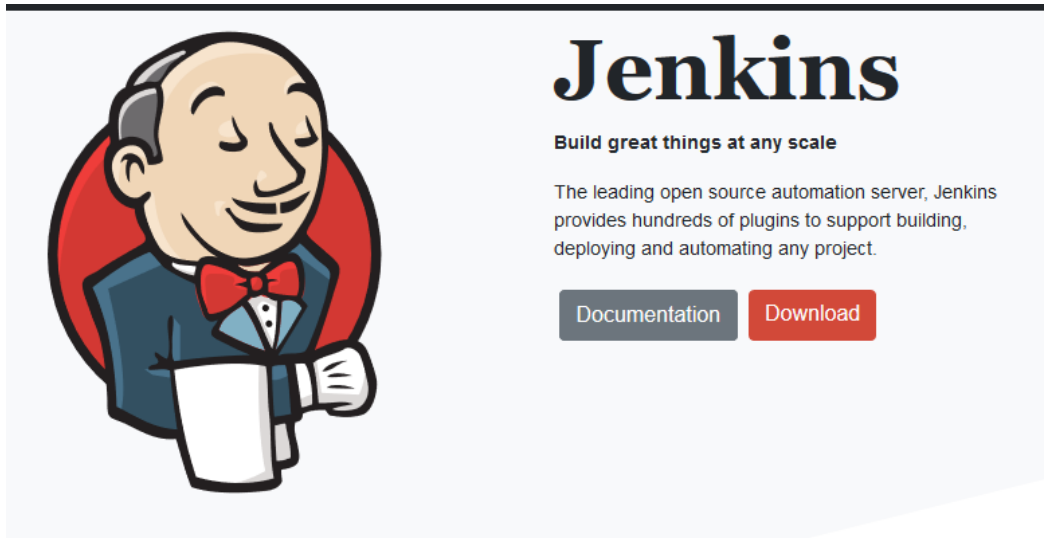
Continuous Deployment

- Automate deployments
- Limit risk of human error
- git commit -m “a commit message”
  - This should do everything

Getting started: Installing Jenkins and Jenkins-Python

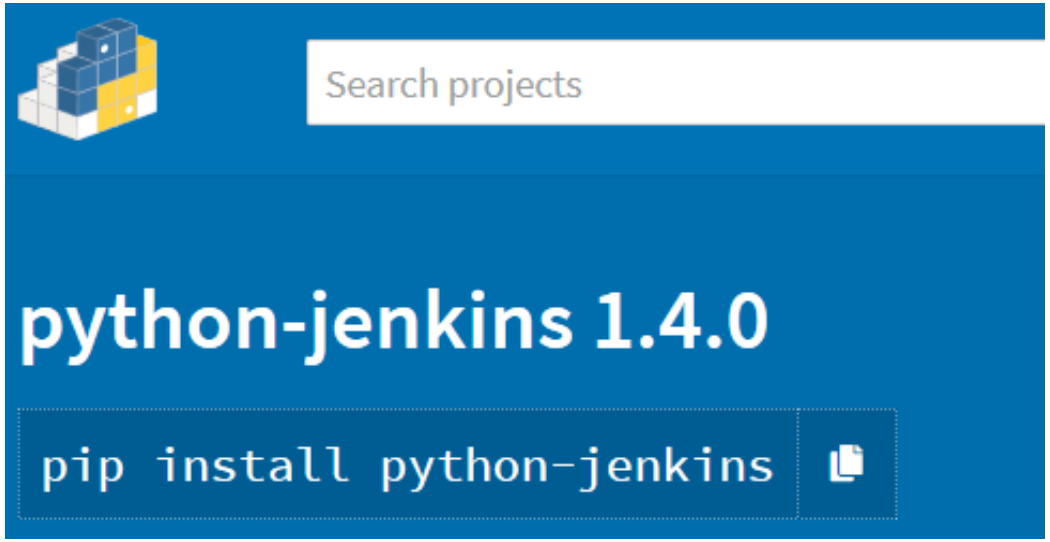
Installing Jenkins

- Download the standalone .war



Installing python-jenkins

- pip install python-jenkins



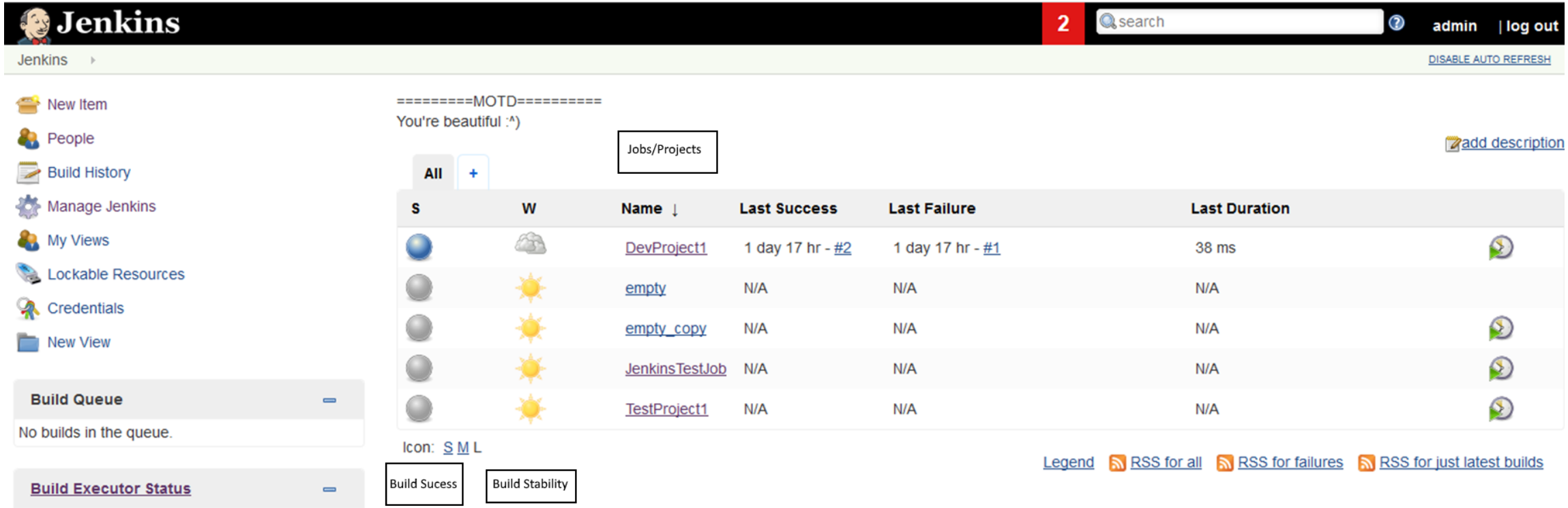
Starting Jenkins

- Jenkins is a Java application (.war)
  - java –jar Jenkins.war
- Jenkins will begin a service that will let you connect to it via a web browser.
  - In the real world, the UI doesn't need to be used since it's irrelevant to Jenkin's job
  - Along side a REST API, we also have a Jenkins client that can connect to the server which can send CLI commands.
  - Default is localhost:8080
- Out of the box, Jenkins is useless, we must configure it before we can do anything.

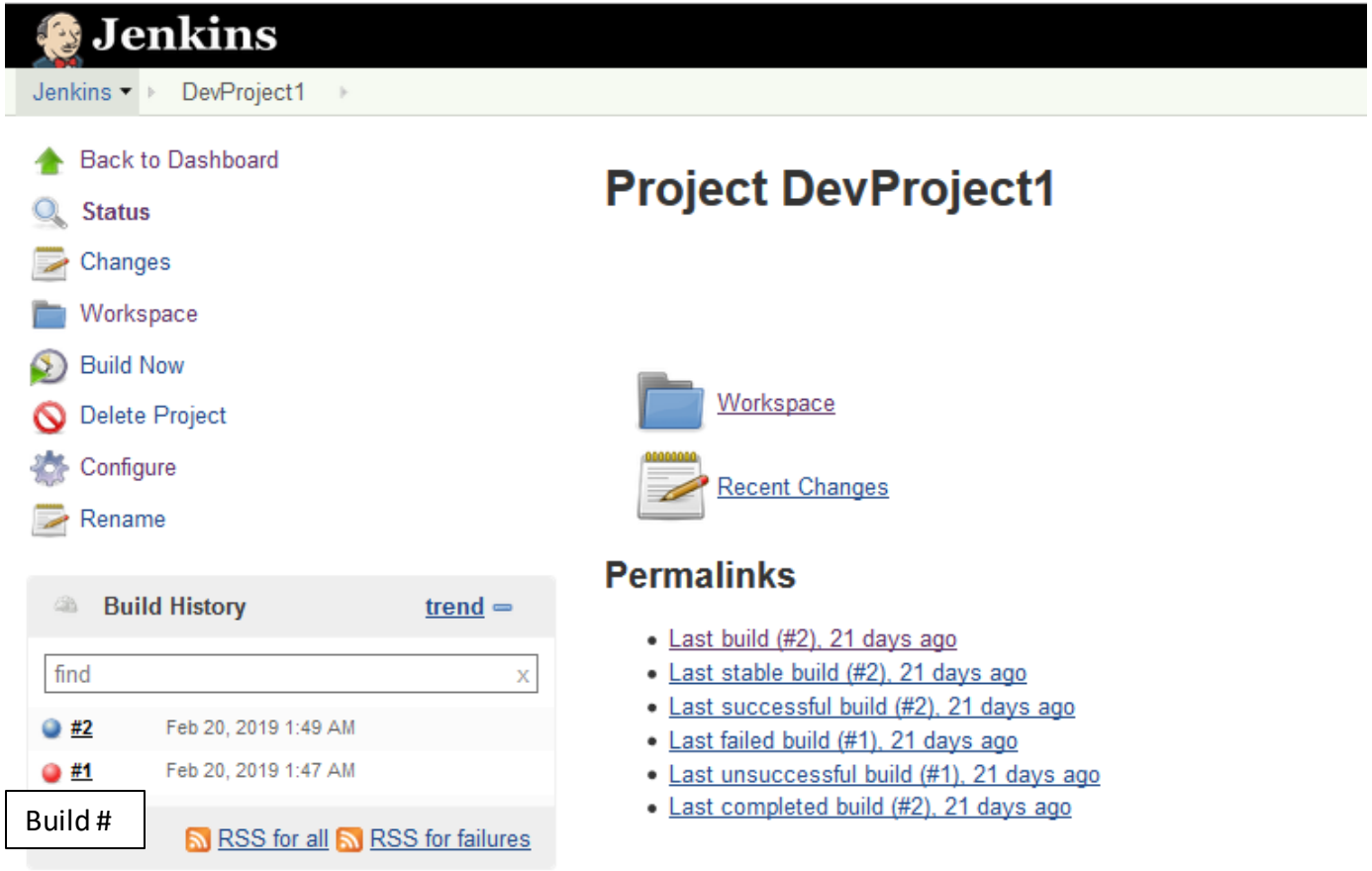
Jenkins Terminology

Name	Definition
Job/Project	Refers to a runnable task that are controller / monitored by Jenkins
Build	Result of one run of a Project
Node/Slave	Slaves are computers that are set up to build projects for a master. Jenkins runs a separate program called “slave agent” on slaves. The term node is used to refer to all machines that are part of the Jenkins grid
Stable build	A build is stable if it was build successfully and no publisher reports it as unstable
Unstable build	A build is unstable if it was build successfully and one or more publisher report it unstable. A test publisher may report a project as unstable
Publisher	A publisher is part of the build process other than compilation for example, Junit test runs

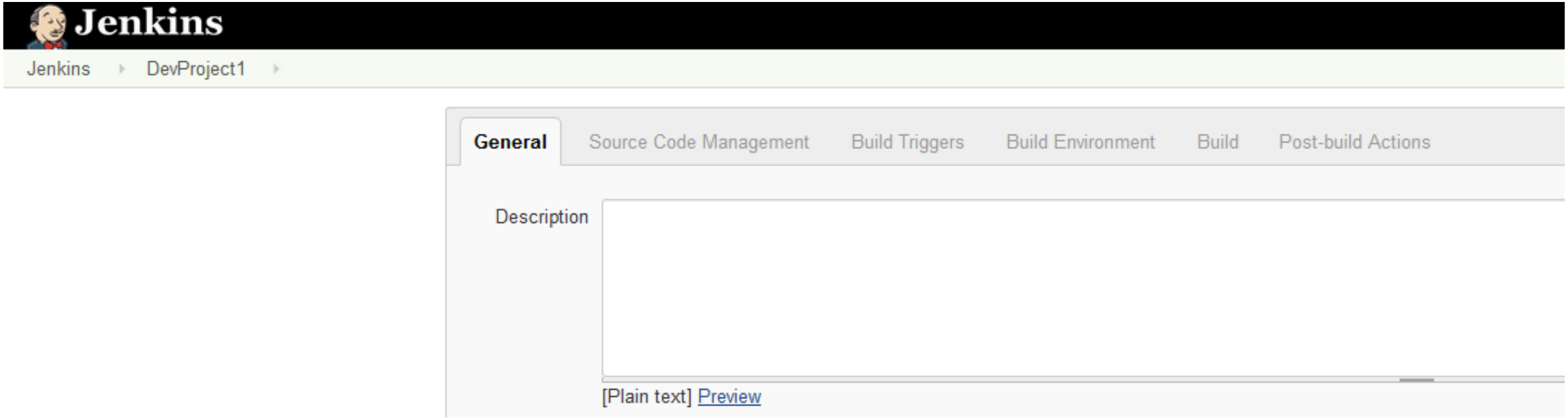
Identifying components of the UI



Understanding a project



Configuring a project



Looking at build

Build

Execute shell

Command

```
# Execute a command and see if it returns successful
ls -l
```

Console Output

```
Started by user admin
Building in workspace /home/salas/.jenkins/workspace/DevProject1
[DevProject1] $ /bin/sh -xe /tmp/jenkins5623244251682341223.sh
+ ls -l
total 0
Finished: SUCCESS
```

Constructor: establishing connection

class **`jenkins.Jenkins`**(*url, username=None, password=None, timeout=<object object>, resolve=True*)

Create handle to Jenkins instance.

All methods will raise `JenkinsException` on failure.

Parameters:

- **url** – URL of Jenkins server, `str`
- **username** – Server username, `str`
- **password** – Server password, `str`
- **timeout** – Server connection timeout in secs (default: not set), `int`
- **resolve** – Attempts to resolve and auto-correct API redirection. default: True `bool`

Important methods: Getting all jobs

`get_all_jobs(folder_depth=None)`

Get list of all jobs recursively to the given folder depth.

Each job is a dictionary with 'name', 'url', 'color' and 'fullname' keys.

Parameters: **folder_depth** – Number of levels to search, `int`. By default None, which will search all levels. 0 limits to toplevel.

Returns: list of jobs, `[ { str: str} ]`

Recommended: pout

- pip3 install pout

```
In [4]:  1  print(server.get_all_jobs())

[{'_class': 'hudson.model.FreeStyleProject', 'name': 'DevProject1', 'url': 'http://localhost:8080/job/DevProje
ct1/', 'color': 'blue', 'fullname': 'DevProject1'}, {'_class': 'hudson.model.FreeStyleProject', 'name': 'empty
', 'url': 'http://localhost:8080/job/empty/', 'color': 'disabled', 'fullname': 'empty'}, {'_class': 'hudson.mo
del.FreeStyleProject', 'name': 'empty_copy', 'url': 'http://localhost:8080/job/empty_copy/', 'color': 'notbuil
t', 'fullname': 'empty_copy'}, {'_class': 'hudson.model.FreeStyleProject', 'name': 'GitProject', 'url': 'http:
//localhost:8080/job/GitProject/', 'color': 'notbuilt', 'fullname': 'GitProject'}, {'_class': 'hudson.model.Fr
eeStyleProject', 'name': 'JenkinsTestJob', 'url': 'http://localhost:8080/job/JenkinsTestJob/', 'color': 'notbu
ilt', 'fullname': 'JenkinsTestJob'}, {'_class': 'hudson.model.FreeStyleProject', 'name': 'TestProject1', 'url'
: 'http://localhost:8080/job/TestProject1/', 'color': 'notbuilt', 'fullname': 'TestProject1'}]
```

In [3]:

```python
import pout
pout.v(server.get_all_jobs())
```

```
server.get_all_jobs() (6) =
[
        0:
                {
                        '_class': "hudson.model.FreeStyleProject",
                        'name': "DevProject1",
                        'url': "http://localhost:8080/job/DevProject1/",
                        'color': "blue",
                        'fullname': "DevProject1"
                },
        1:
                {
                        '_class': "hudson.model.FreeStyleProject",
                        'name': "empty",
                        'url': "http://localhost:8080/job/empty/",
                        'color': "disabled",
                        'fullname': "empty"
                },
        2:
                {
                        '_class': "hudson.model.FreeStyleProject",
                        'name': "empty_copy",
                        'url': "http://localhost:8080/job/empty_copy/",
                        'color': "notbuilt",
                        'fullname': "empty_copy"
                },
        3:
                {
                        '_class': "hudson.model.FreeStyleProject",
                        'name': "GitProject",
                        'url': "http://localhost:8080/job/GitProject/",
                        'color': "notbuilt",
                        'fullname': "GitProject"
                },
        4:
                {
                        '_class': "hudson.model.FreeStyleProject",
                        'name': "JenkinsTestJob",
                        'url': "http://localhost:8080/job/JenkinsTestJob/",
                        'color': "notbuilt",
                        'fullname': "JenkinsTestJob"
                },
        5:
                {
```

Recommended: pout

Important methods: Getting job info

`get_job_info`(*name, depth=0, fetch_all_builds=False*)

Get job information dictionary.

Parameters:

- **name** – Job name, `str`
- **depth** – JSON depth, `int`
- **fetch_all_builds** – If true, all builds will be retrieved from Jenkins. Otherwise, Jenkins will only return the most recent 100 builds. This comes at the expense of an additional API call which may return significant amounts of data. `bool`

Returns: dictionary of job information

Example: getting job info

```
In [8]:  1  pout.v(server.get_job_info('DevProject1'))

server.get_job_info('DevProject1') (31) =
{
        '_class': "hudson.model.FreeStyleProject",
        'actions':
                [
                        0: {},
                        1: {},
                        2: {},
                        3:
                                {
                                        '_class': "com.cloudbees.plugins.credentials.ViewCredentialsAction"
                                }
                ],
        'description': "",
        'displayName': "DevProject1",
        'displayNameOrNull': None,
        'fullDisplayName': "DevProject1",
        'fullName': "DevProject1",
        'name': "DevProject1"
```

Important methods: Getting build info

`get_build_info`(*name, number, depth=0*)

Get build information dictionary.

Parameters:

- **name** – Job name, `str`
- **number** – Build number, `int`
- **depth** – JSON depth, `int`

Returns: dictionary of build information, `dict`

Example: getting build info

```
In [17]:  1  pout.v(server.get_build_info('DevProject1',3))
```

```
server.get_build_info('DevProject1',3) (20) =
{
        'artifacts': [],
        'building': False,
        'description': None,
        'displayName': "#3",
        'duration': 344,
        'estimatedDuration': 362,
        'executor': None,
        'fullDisplayName': "DevProject1 #3",
        'id': "3",
        'keepLog': False,
        'number': 3,
        'queueId': 5,
        'result': "SUCCESS",
        'timestamp': 1552492693541,
        'url': "http://localhost:8080/job/DevProject1/3/",
        'builtOn': ""
```

Important methods:

```
In [15]:  1  print(server.get_job_config('DevProject1'))
```

```
<?xml version='1.1' encoding='UTF-8'?>
<project>
  <actions/>
  <description></description>
  <keepDependencies>false</keepDependencies>
  <properties/>
  <scm class="hudson.scm.NullSCM"/>
  <canRoam>true</canRoam>
  <disabled>false</disabled>
  <blockBuildWhenDownstreamBuilding>false</blockBuildWhenDownstreamBuilding>
  <blockBuildWhenUpstreamBuilding>false</blockBuildWhenUpstreamBuilding>
  <triggers/>
  <concurrentBuild>false</concurrentBuild>
  <builders>
    <hudson.tasks.Shell>
      <command># Execute a command and see if it returns successful
ls -l</command>
    </hudson.tasks.Shell>
  </builders>
  <publishers/>
  <buildWrappers/>
</project>
```

Jenkins and Python

- Using Jenkins, we can run **nosetests**. By configuring Jenkins to convert the output of nosetests into to an xml file we can process it as a **Post-Build Action**.
- We can also use **pylint** for checking our style.

And

Build

Execute shell

Command

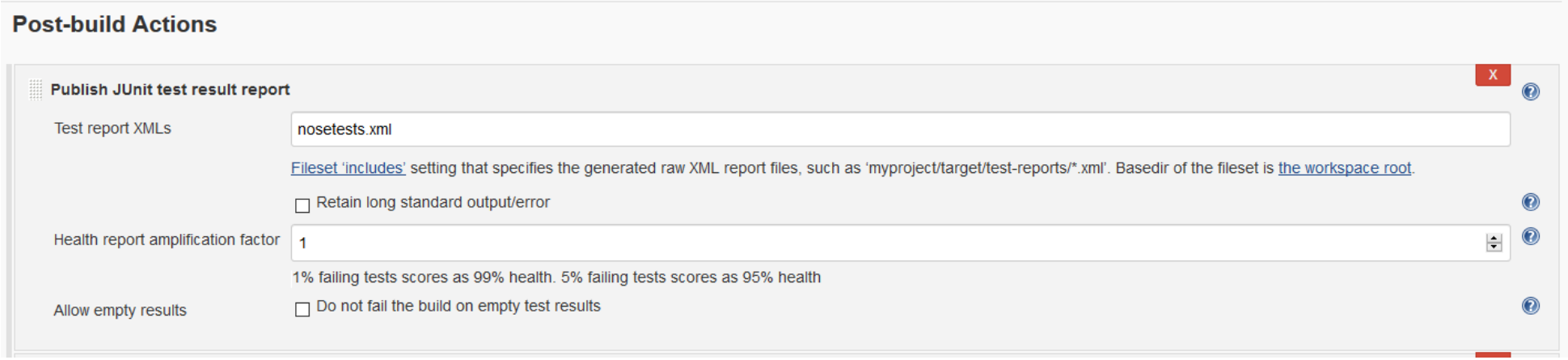
```
nosetests --with-xunit --all-modules --traverse-namespace --with-coverage --cover-package=project1 --cover-inclusive ;
python -m coverage xml --include=project1*  ;
pylint -f parseable -d I0011,R0801 project1 | tee pylint.out
```

See the list of available environment variables

Add build step

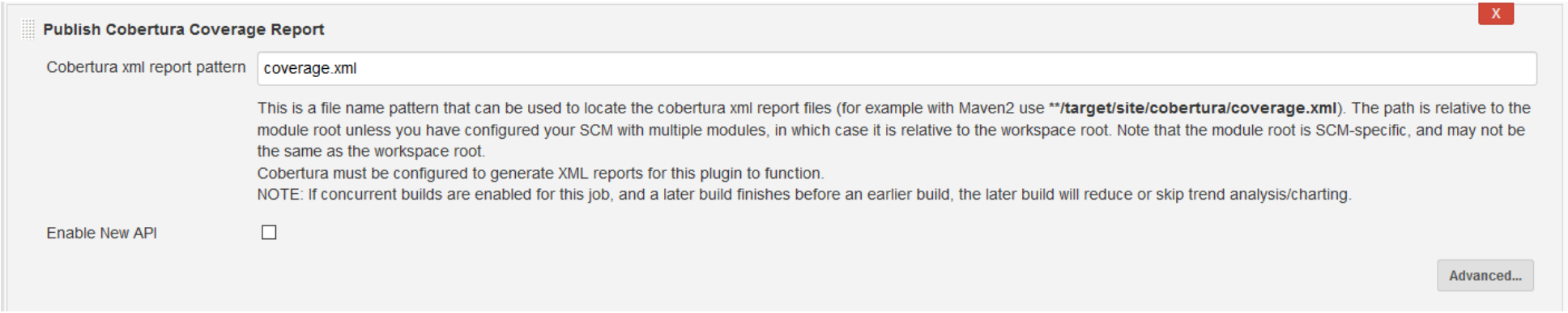
Building: using nosetests and python

After installing nosetests and pylint on the machine. Install the Jenkins Cobertura Plugin (for nosetests) and Jenkins Violations (for pylint)



Post-build action: nosetests

When nosetests runs the code coverage, it generates a .coverage file. Jenkins can't read that. The second line of the script (python -m coverage xml...) converts the .coverage file to an xml format that Jenkins Cobertura plugin can read.



Post-build action: pylint

The last line (pylint...) runs pylint on the project and outputs it in a format that the Violations Jenkins plugin can read.

Looking at the results of our new build

Project PythonProject

add description

Disable Project

Coverage Report

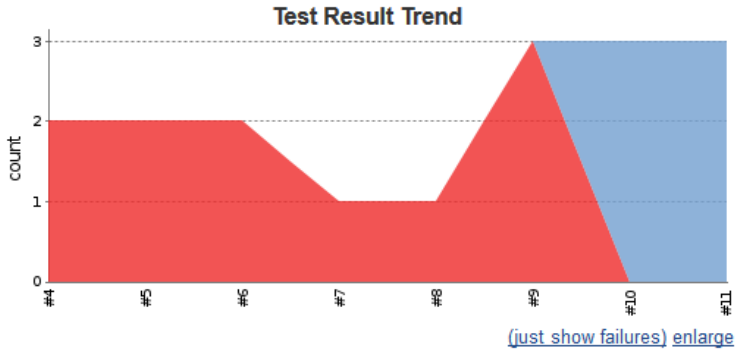
Workspace

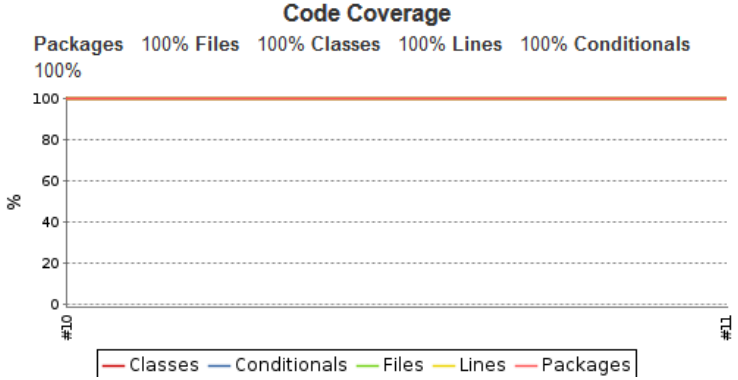
Recent Changes

Latest Test Result (no failures)

Permalinks

- Last build (#11), 1 hr 37 min ago
- Last stable build (#11), 1 hr 37 min ago
- Last successful build (#11), 1 hr 37 min ago
- Last failed build (#9), 2 hr 10 min ago
- Last unsuccessful build (#9), 2 hr 10 min ago
- Last completed build (#11), 1 hr 37 min ago





Important methods: Getting build test reports

`get_build_test_report`(*name, number, depth=0*)

Get test results report.

Parameters:

- **name** – Job name, `str`
- **number** – Build number, `int`

Returns: dictionary of test report results, `dict` or None if there is no Test Report

Example: getting test reports

```
In [29]:  1  pout.v(server.get_build_test_report('PythonProject',11))

server.get_build_test_report('PythonProject',11) (8) =
{
        '_class': "hudson.tasks.junit.TestResult",
        'testActions': [],
        'duration': 0.002,
        'empty': False,
        'failCount': 0,
        'passCount': 3,
        'skipCount': 0,
        'suites':
                [
                        0:
                                {
                                        'cases':
                                                [
                                                        0:
                                                                {
                                                                        'testActions': [],
```

Putting it all together:

- Creating a new Jenkins project from existing source code
  - executing ‘python script.py’ – This script will do the following:
    - Installs Jenkins Plugins
    - Set the git path to cwd by replacing the git element using xpath
    - Starts a build
    - Prints the build’s debug info

```python
def installPlugins(plugins):
    '''
    Installs the plugins given in the list
    Returns bool if restart is required
    '''
    plugins_list=[key[0] for key in (server.get_plugins()).keys()]
    restart = True
    for plugin in plugins:
        if plugin not in plugins_list:
            restart = restart and server.install_plugin(plugin)
    return restart
```

Installing Jenkins Plugins

```python
file_path='PythonProject.xml'
output_path='config_new.xml'

def createNewConfig(file_path,output_path):
    '''
    Makes a copy of the example PythonProject's build script and repalces the Git URL to the current working directory
    '''
    doc = etree.parse(file_path)
    root=doc.getroot()

    # The path for the node that contains the location of our git folder
    code = root.xpath('//scm/userRemoteConfigs/hudson.plugins.git.UserRemoteConfig/url')

    if code:
        # Replaces <url> text
        code[0].text = os.getcwd()
        # Save back to the XML file
        etree.ElementTree(root).write(output_path, pretty_print=True)
```

Replaces the git element using xpath

```
73      server.build_job(project_name)
74
75      print(server.debug_job_info(project_name))
```

Start a build and print debug info

JavierTSalas / JenkinsRepo

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Sample repo for CIS4930 for using Jenkins with nosetests and pylint

Edit

Manage topics

6 commits | 1 branch | 0 releases | 1 contributor

Branch: master | New pull request | Create new file | Upload files | Find File | Clone or download

JavierTSalas Update README.md — Latest commit 276b4ee just now

JenkinsRepo	Renamed folders and added a check for plugins installed	7 minutes ago
tests	Renamed folders and added a check for plugins installed	7 minutes ago
PythonProject.xml	Updated xml to match renaming of folders	5 minutes ago
README.md	Update README.md	just now
script.py	Renamed folders and added a check for plugins installed	7 minutes ago

Try it for yourself

```
(py3) salas@DESKTOP-P3FFU98:/mnt/c/Users/Javier/Desktop/Python/JenkinsQuickStart/JenkinsRepo$ python scri
Hello admin from Jenkins 2.150.2
Starting JenkinsQuickStart
_class hudson.model.FreeStyleProject
actions [{'_class': 'hudson.plugins.violations.ViolationsProjectAction'}, {}, {}, {}, {'_class': 'com.clo
description
displayName NewPythonProject
displayNameOrNull None
fullDisplayName NewPythonProject
fullName NewPythonProject
name NewPythonProject
url http://localhost:8080/job/NewPythonProject/
buildable True
builds []
color notbuilt
firstBuild None
healthReport []
inQueue True
keepDependencies False
lastBuild None
lastCompletedBuild None
lastFailedBuild None
lastStableBuild None
lastSuccessfulBuild None
lastUnstableBuild None
lastUnsuccessfulBuild None
nextBuildNumber 1
property []
queueItem {'_class': 'hudson.model.Queue$WaitingItem', 'blocked': False, 'buildable': False, 'id': 46, 'i
Project', 'url': 'http://localhost:8080/job/NewPythonProject/'}, 'url': 'queue/item/46/', 'why': 'In the
concurrentBuild False
downstreamProjects []
labelExpression None
scm {'_class': 'hudson.plugins.git.GitSCM'}
upstreamProjects []
None
```

Try it for yourself