Git Cookbook for DevOps, Network & Systems Management

DevOps & DevNet Associate

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Amsterdam 11 May and Geel 13 May 2022

Cisco Networking Academy

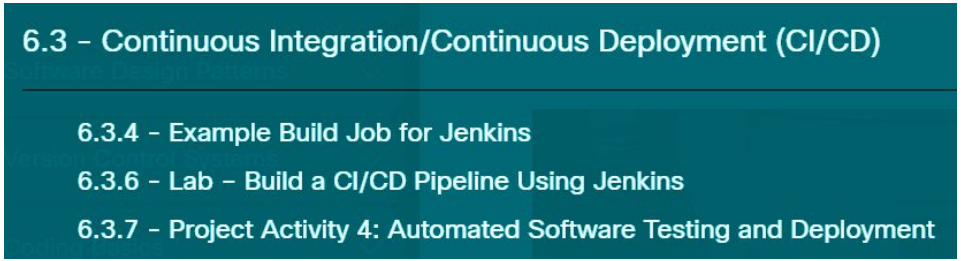
Topics

Cisco NetAcad DevNet Associate Course

Git repositories are an integral part of the Cisco Networking Academy DevNet Associate Course.

Git is able to manage:

- Source code (software)
- Configuration scripts (systems, networks, security)
- Documentation



Managing Git (and CI/CD Pipelines)

Git Repositories

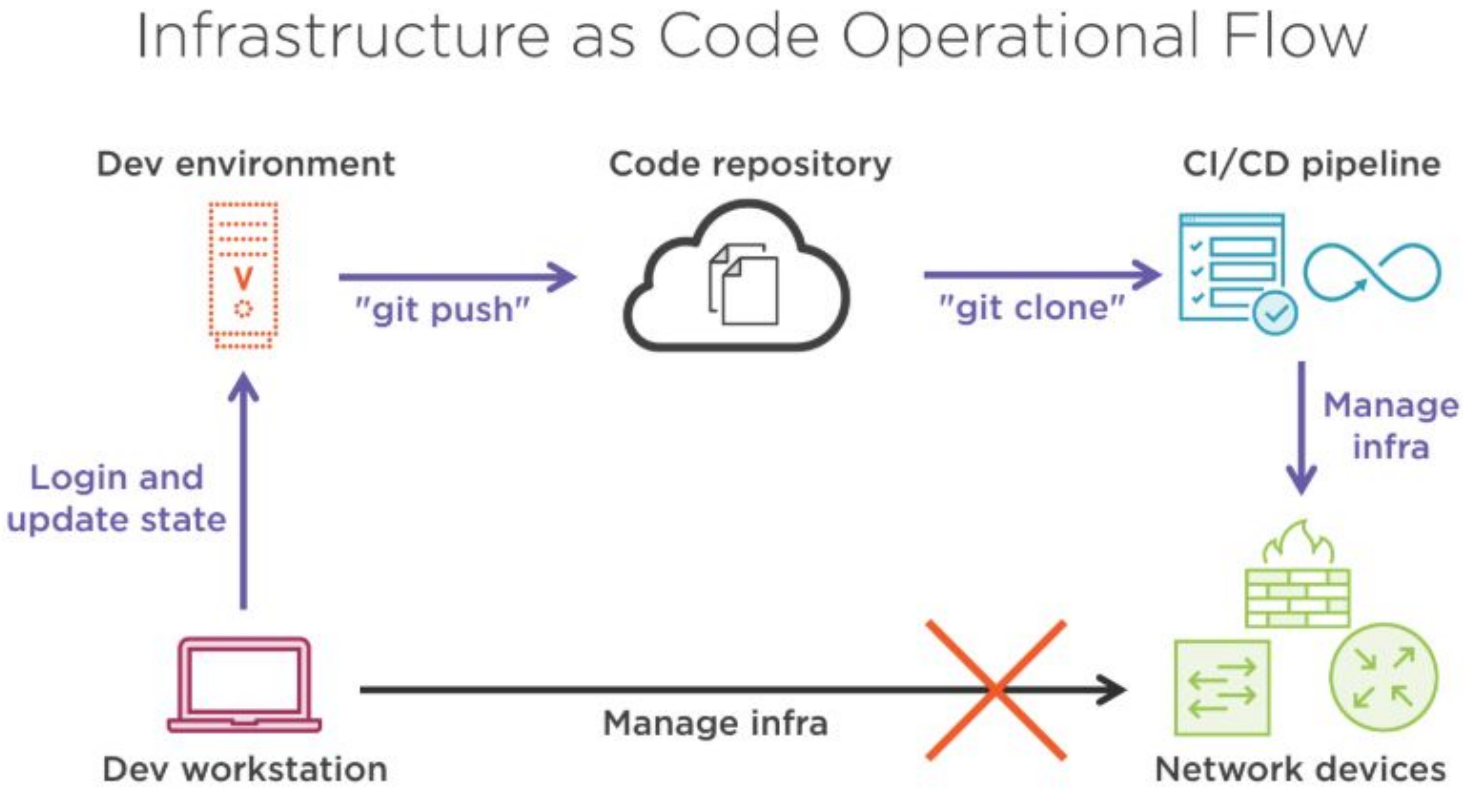
- Planning, creating and managing repositories
- Local and Remote repositories
- Updating repositories
- Adding and removing folders and files
- Comparing versions
- Logging
- Giving access to repositories
- Creating and managing branches and mergers
- Best practices
- Git Hands-on lab

Continuous Integration/ Continuous Deployment (CI/CD) Pipelines => only FYI

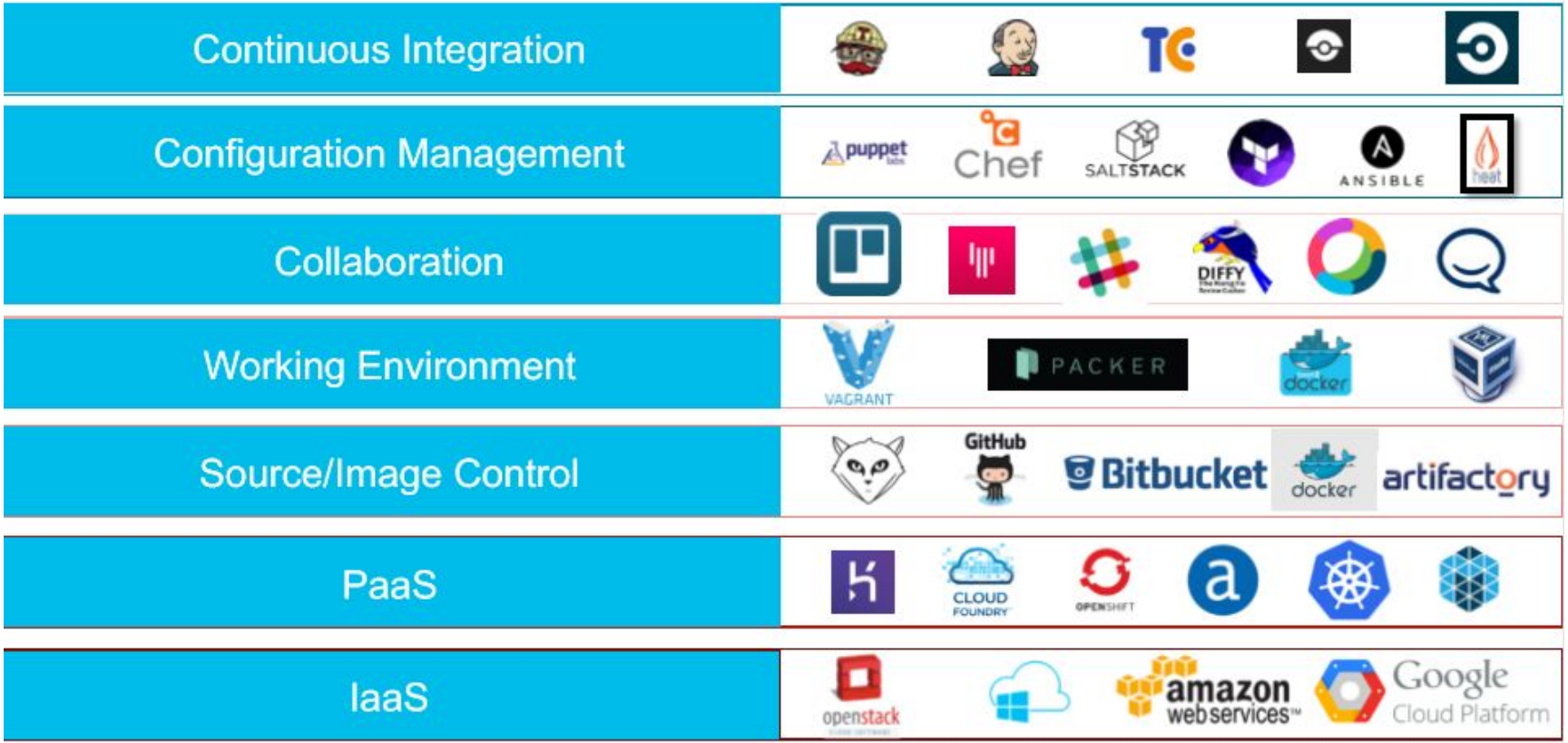
- Pipeline scripting: Commit, Build, Test, Stage, Deploy
- Deployment of Python apps in an agile, containerized environment
- CI/CD Hands-on lab

Context

Network Programmability



Network Programmability -- NetDevOps Toolbag Overview



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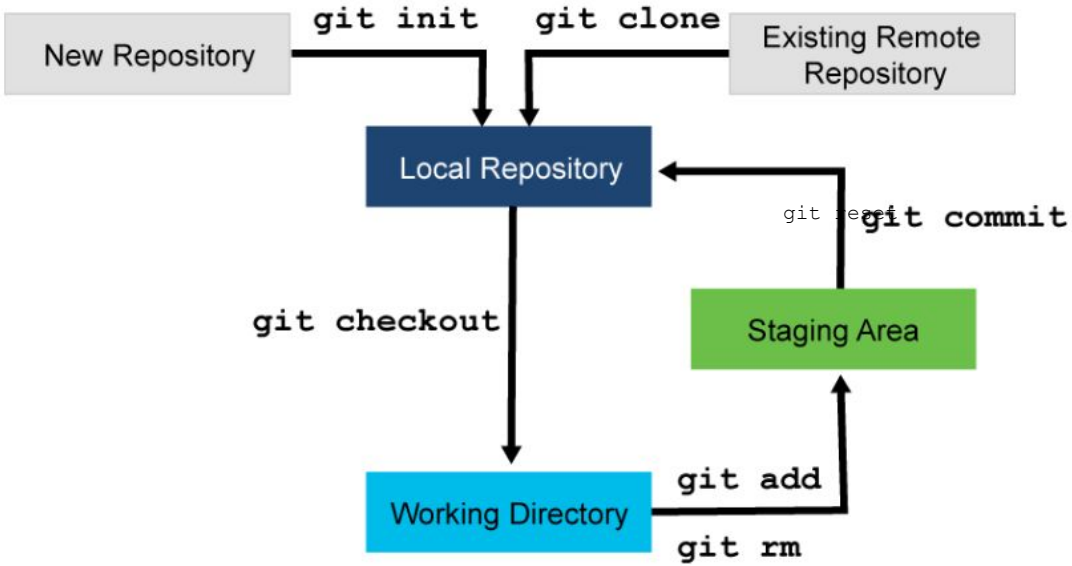
Five major phases of release and monitor

Source	Build	Test	Deploy	Monitor
• Check-in source code such as .java files. • Peer review new code	• Compile code • Unit tests • Style checkers • Code metrics • Create container images	• Integration tests with other systems • Load testing • UI tests • Penetration testing	• Deployment to production environments	• Monitor code in production to quickly detect unusual activity or errors

aws SUMMIT

Git Version Control

Version Control



Git

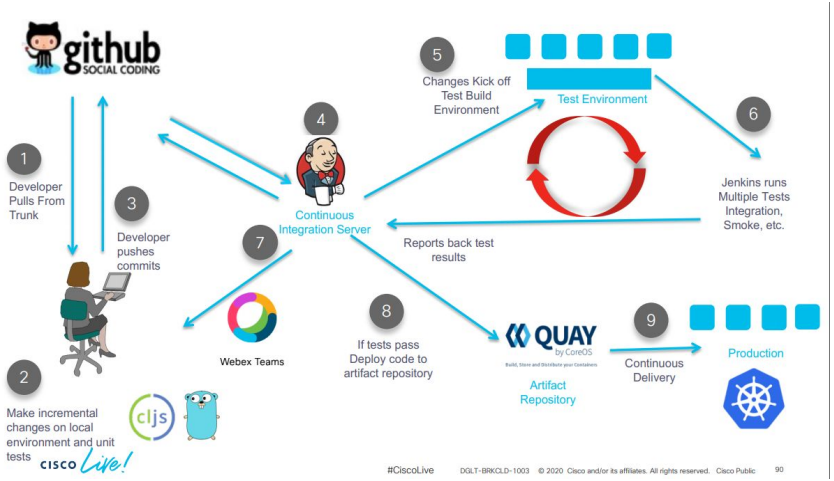
Open source

Distributed version control system

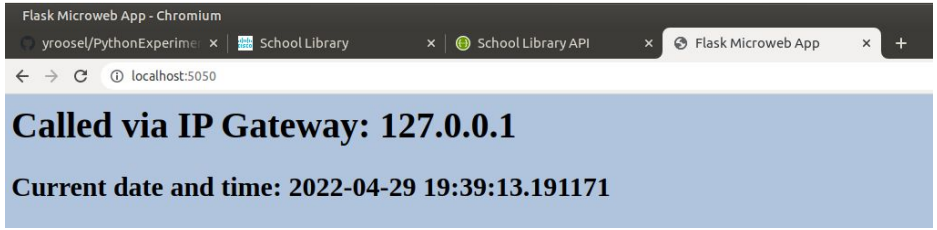
Stream of snapshots

Key difference between Git and other version control systems is that Git stores data as snapshots instead of differences (the delta between the current file and the previous version)

Repositories are often used in automation and CI/CD pipelines


github
SOCIAL CODING
1
Developer Pulls From Trunk
2
Make incremental changes on local environment and unit tests
3
Developer pushes commits
4
Continuous Integration Server
5
Changes Kick off Test Build Environment
Test Environment
6
Jenkins runs Multiple Tests Integration, Smoke, etc.
Reports back test results
7
Webex Teams
8
If tests pass Deploy code to artifact repository
QUAY
by CoreOS
Artifact Repository
9
Continuous Delivery
Production
cljs
cisco Live!
#CiscoLive
DGLT-BRKCLD-1003 © 2020 Cisco and/or its affiliates. All rights reserved. Cisco Public
90

Demo


Flask Microweb App - Chromium
yroosel/PythonExperimer
School Library
School Library API
Flask Microweb App
localhost:5050
Called via IP Gateway: 127.0.0.1
Current date and time: 2022-04-29 19:39:13.191171

Preparing Git

Preparing Git => Cheat Sheet

Install

GitHub for Windows
https://windows.github.com

GitHub for Mac
https://mac.github.com

Git for All Platforms
http://git-scm.com

Git distributions for Linux and POSIX systems are available on the official Git SCM web site.

Configure tooling

Configure user information for all local repositories

```
$ git config --global user.name "[name]"
```
Sets the name you want attached to your commit transactions

```
$ git config --global user.email "[email address]"
```
Sets the email you want attached to your commit transactions

```
$ git config --global color.ui auto
```
Enables helpful colorization of command line output

Create repositories

When starting out with a new repository, you only need to do it once; either locally, then push to GitHub, or by cloning an existing repository.

```
$ git init
```
Turn an existing directory into a git repository

```
$ git clone [url]
```
Clone (download) a repository that already exists on GitHub, including all of the files, branches, and commits

The .gitignore file

Sometimes it may be a good idea to exclude files from being tracked with Git. This is typically done in a special file named `.gitignore` . You can find helpful templates for `.gitignore` files at github.com/github/gitignore.

Git Cooking

Create a new git repository on the command line

Example

```
echo "# PythonExperiments" >> README.md
git init
git add README.md
git commit -m "first commit"
git branch -M main
git remote add origin https://github.com/yroosel/PythonExperiments.git
git push -u origin main
```

- `git branch -M` is a flag (shortcut) for --move --force
  allows renaming the branch even if the new branch name already exists

Push a new git repository on the command line

Example

```
git remote add origin https://github.com/yroosel/PythonExperiments.git
git branch -M main
git push -u origin main
```

git push -u
is important for syncing your local git repository with your remote git repository when pushing to remote for the **first time.** The advantage is, you may use **git pull** without any arguments.

Useful Git Commands

Useful Git Commands

Setup	Tell git who you are *one-time setup*	`git config --global user.name "your name"` `git config --global user.email your@email.com`
Clone	Clone ("download") a git repository	`git clone url`
Status	Check the Status of your local repository	`git status`
Checkout A Branch	Create and Checkout a local Branch Creates a "safe place" for your changes	`git checkout -b new-branch-name`
Add	Add a file to your next commit.	`git add filename`
Commit	Commit your changes.	`git commit -m "Your commit message."`
Checkout	Checks-out a file from the last commit.	`git checkout filename`

Git clone

When using git clone (from GitHub, or any source repository) the default name for the source of the clone is "origin".

Using git remote show will display the information about this remote name.

Example 1: $ git remote show
Response: origin

Here is a method to find the url of the remote repo

Example 2: $ git remote get-url origin
Response: https://github.com/yro/python_scripts.git

Remote Git Repository URL

Here is a method to find the url of the remote url for the name origin

Example $ git config --get remote.origin.url

Response:
https://github.com/yroosel/python_scripts.git

Remote Git Repository URL (2)

Here is a method to find the url of the remote url both for fetching or for pushing

Example $ git remote -v

Response:

origin https://github.com/yro/python_scripts.git (fetch)
origin https://github.com/yro/python_scripts.git (push)

Remote Git Remote Repository Details

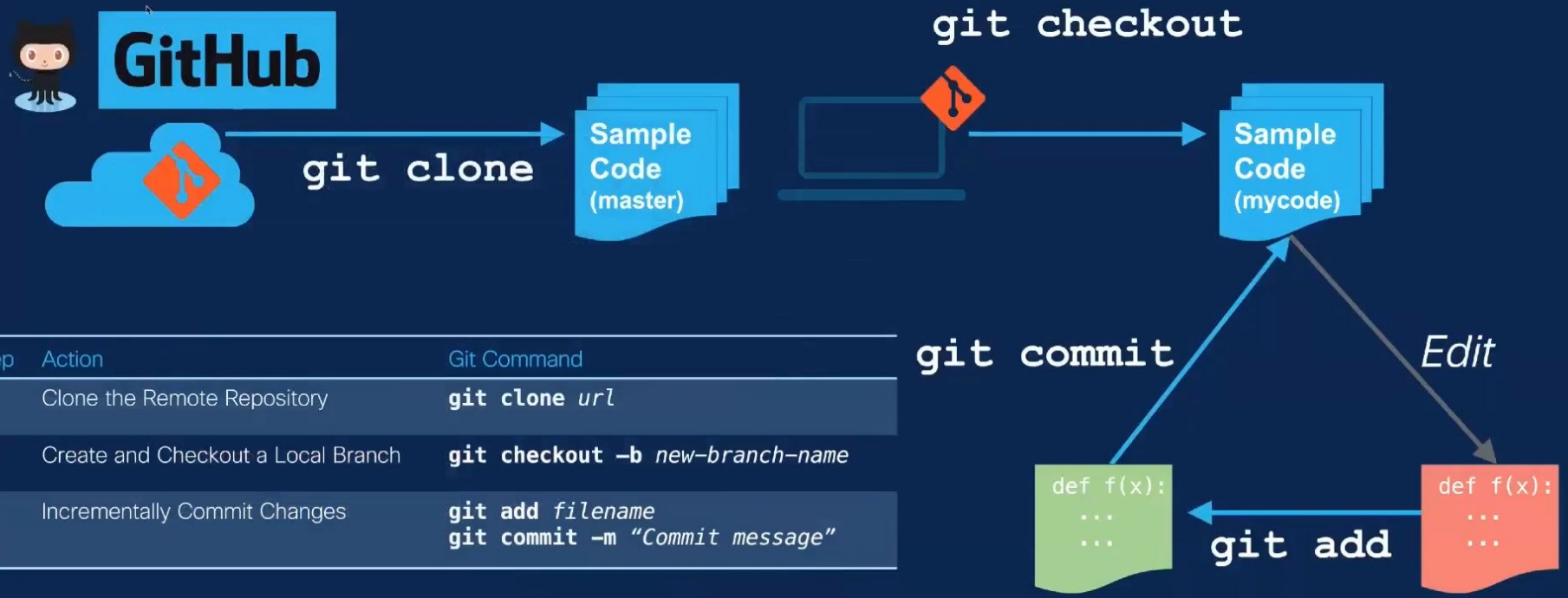
Example $ git remote show origin

Response:

```
* remote origin
  Fetch URL: https://github.com/yro/python_scripts.git
  Push  URL: https://github.com/yro/python_scripts.git
  HEAD branch: main
  Remote branches:
    main   tracked
    master tracked
  Local branch configured for 'git pull':
    master merges with remote master
  Local ref configured for 'git push':
    master pushes to master (up to date)
```

Git Workflow

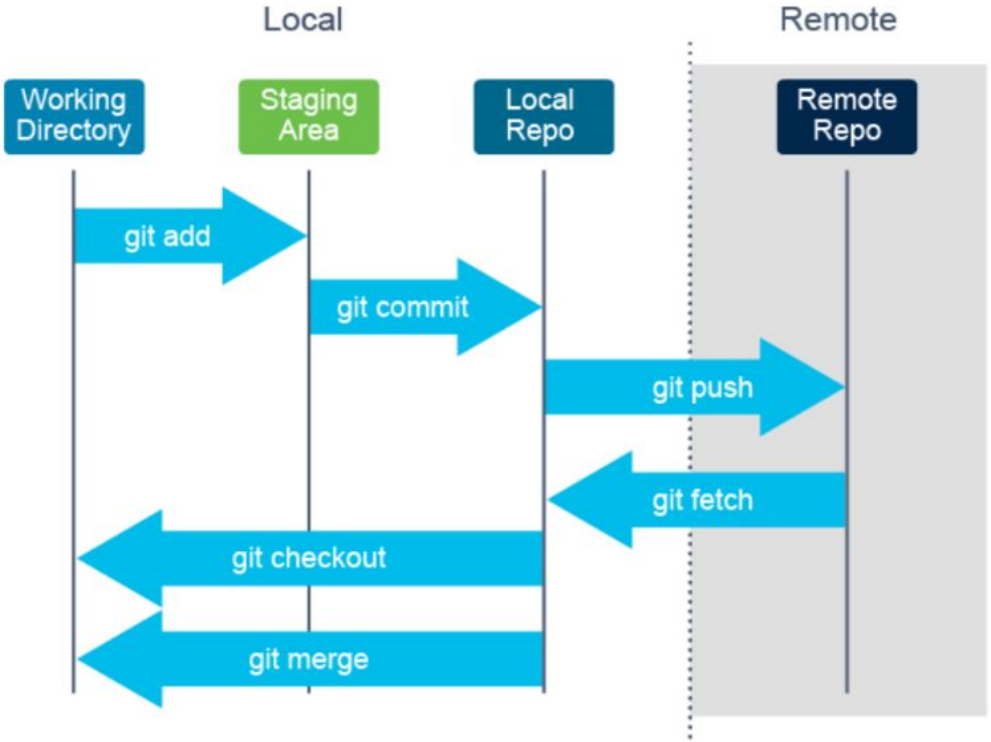
DevNet Sample-Code Workflow



Step	Action	Git Command
1.	Clone the Remote Repository	**git clone** *url*
2.	Create and Checkout a Local Branch	**git checkout -b** *new-branch-name*
3.	Incrementally Commit Changes	**git add** *filename* **git commit -m** *"Commit message"*

DEVASC Topics #1: Software Development and Design (15%)

- 1.8 Utilize common version control operations with Git



git config --global user.name "Jozef J"
git config --global user.email "jj@example.com"

git init
- Setup a local git repository

git add <files…>
- Add files to be tracked in the repository

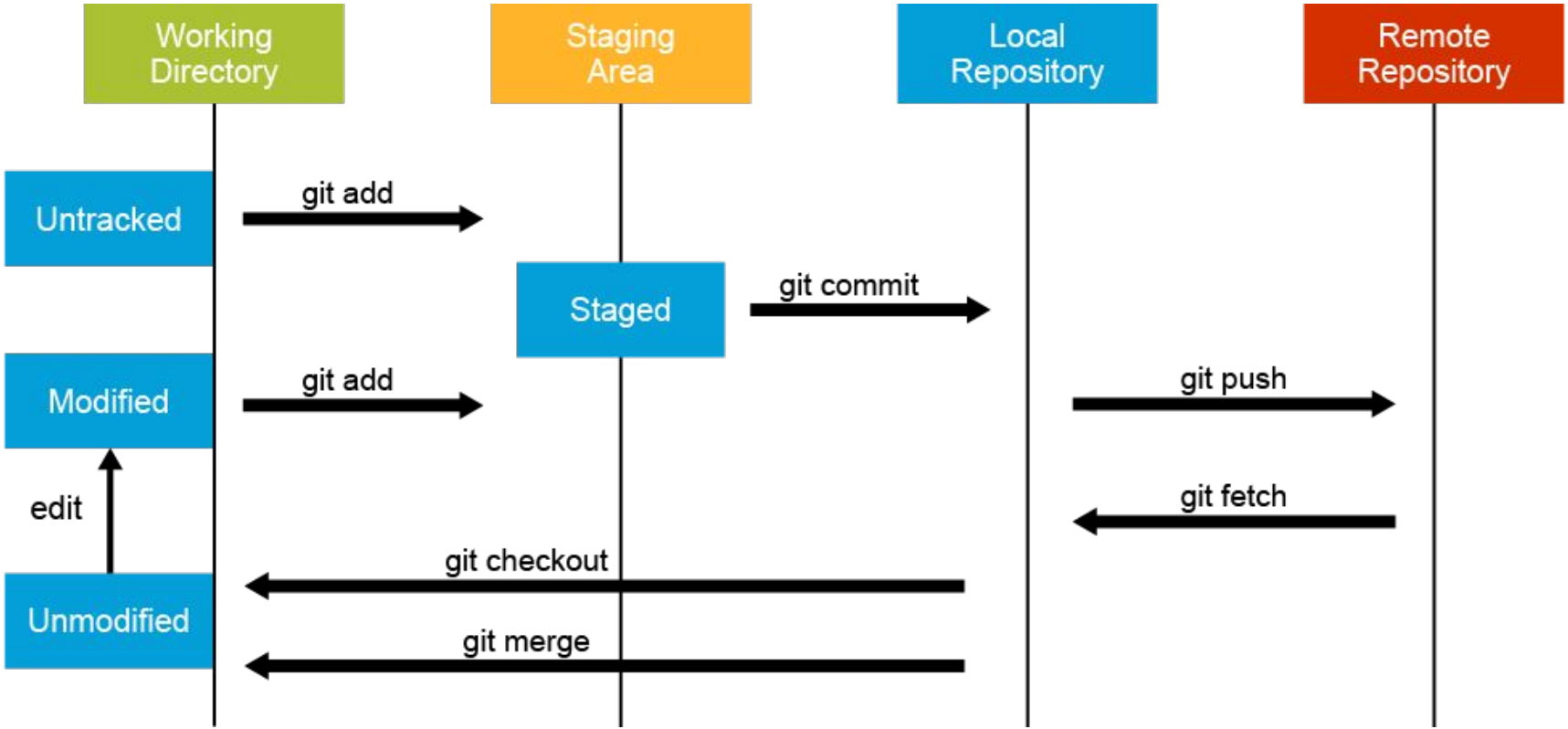
git rm <files…>
- Remove files from the repository tracking

git commit –m "description of the commit"
- Commit the changes

git push
- Send local repository to remote server

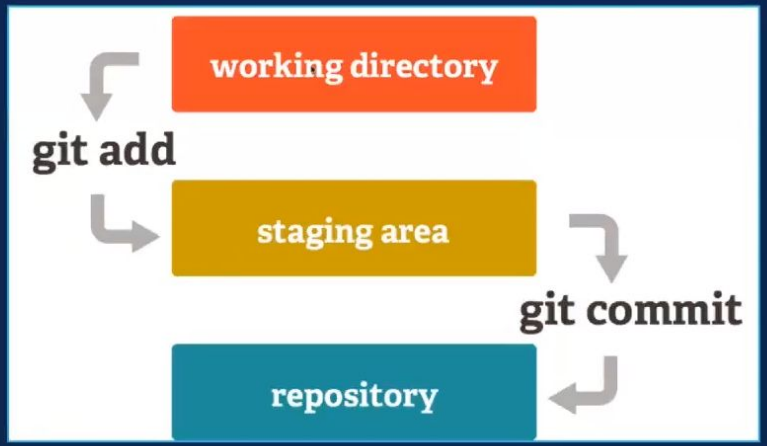
git pull
- Pull data from the remote server

git diff
- Display the differences since last commit


Working Directory
Staging Area
Local Repository
Remote Repository
Untracked
git add
Staged
git commit
Modified
git add
git push
edit
git fetch
git checkout
Unmodified
git merge

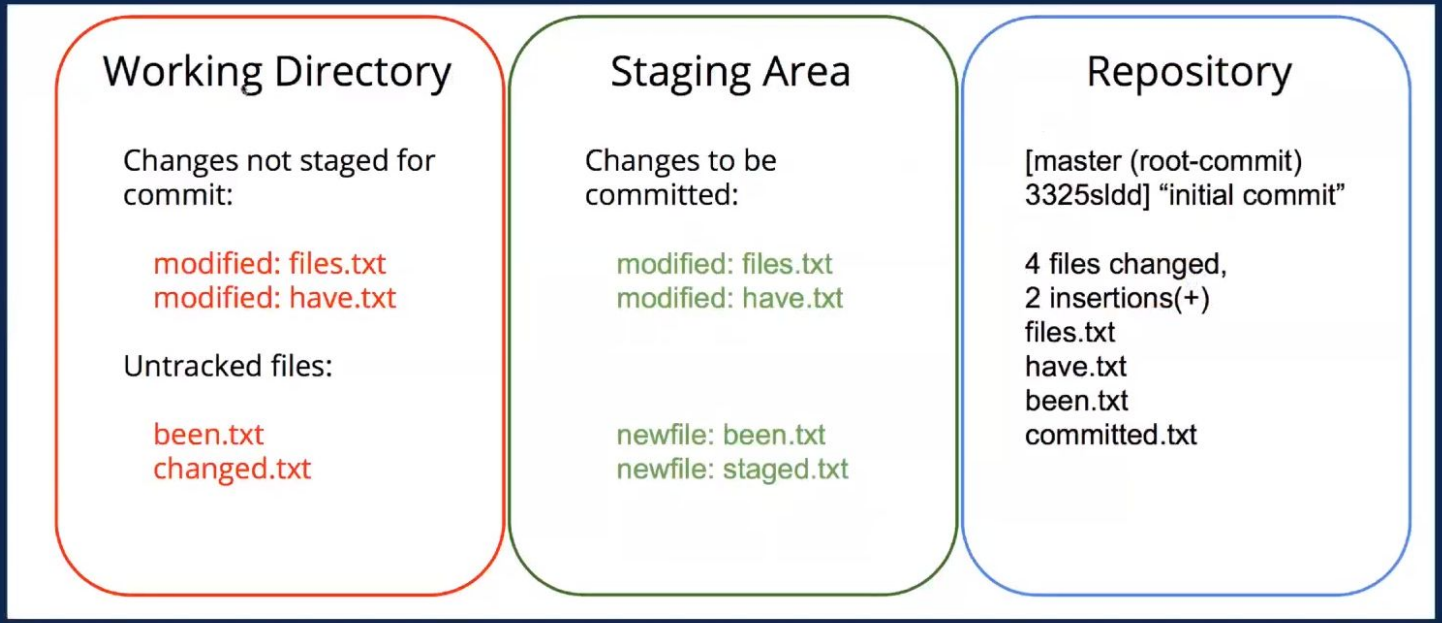
GIT ADD

- Add any files in your repository to git “stage”




```
$ git add .
```

STAGING AREA



GIT COMMIT

- Store your changes into a commit
- Saves all of your changes together / save point
- Commit does NOT push

```
$ git commit -m 'Initial commit'
```

Git Log: History of commits

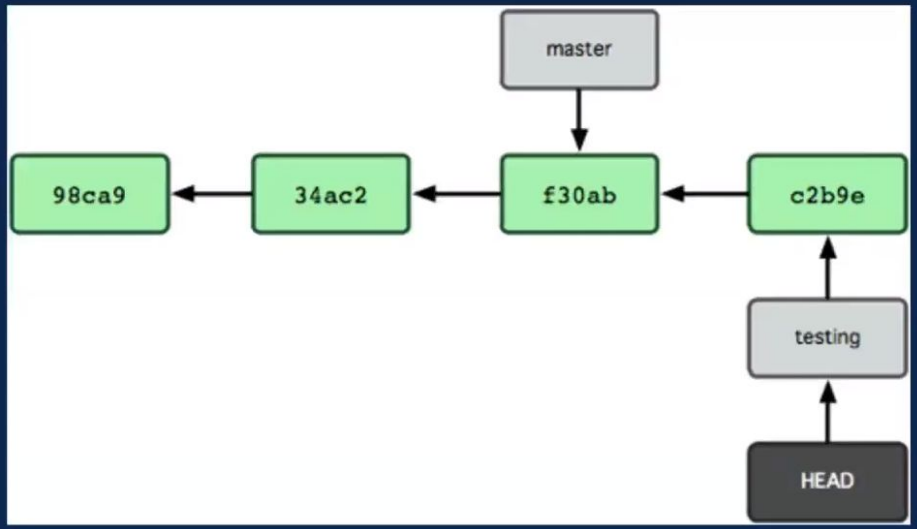
```
commit 37895108669192892df1056cae020131c775facc (HEAD -> master, github/master)
Author: Ashley Roach <asroach@cisco.com>
Date:   Thu Dec 7 16:47:54 2017 -0700

    remove proxy

commit 4c51b91c3fe974f9b929c64ad7cb2be7a7ae85e9 (origin/master, origin/HEAD)
Merge: fe54f3b 34987c1
Author: Ashley Roach <asroach@cisco.com>
Date:   Tue Feb 7 08:23:31 2017 -0700

    Merge branch 'master' of wwwin-github.cisco.com:DevNet/sandbox-devbox

commit fe54f3b3ef8e96ad09924bb7c46ae7eb29d55034
Author: Ashley Roach <asroach@cisco.com>
Date:   Tue Feb 7 08:19:49 2017 -0700

    Add License

commit 34987c15e4e2deefda9b9d5ae2730ef672a49358
Author: asroach <asroach@cisco.com>
Date:   Thu Jan 12 13:44:46 2017 -0700

    Add prereqs
```

```
$ git log
```

BRANCHING: Your safe place

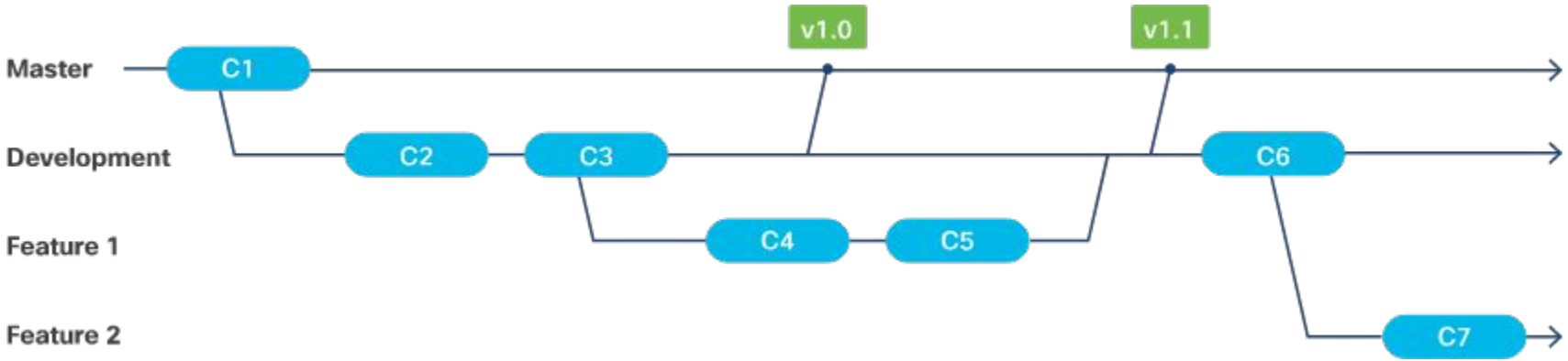
- Makes a pointer to your code
- Moves HEAD around

```
$ git branch <name>
$ git branch testing
$ git commit -m "new"
$ git checkout master
```



*Main is often used as a replacement of master

Git branching



- **Branching** is one of Git's major selling points
- Branching enables users to work on code **independently** without affecting the main code in the repository
- When a **repository** is created, the code is automatically put on a branch named **master**
- Users can have multiple branches and those are independent of each other as well

MERGING

- git merge <topic>
- You must be on the branch you want to merge INTO when you execute this command (e.g. master

```
$ git merge <branch>
```

$ git merge testing

GOING BACKWARDS

- Generate a new commit that undoes all of the changes introduced in <commit>, then apply it to the current branch

```
$ git revert <commit>
```

SHARE YOUR CHANGES

- git push <destination> <branch>
- git push origin master

```
$ git remote add <name> <url>
$ git push <name> <branch>
$ git push origin master
```

*Main is often used as a replacement of master

** Branches will "remember" the remote after first push.*

What's the difference?

Comparing changes with git diff

- *Diffing* is a function that takes two input data sets and outputs the changes between them
- git diff is a multi-use Git command that when executed runs a diff function on Git data sources.
- These data sources can be commits, branches, files and more

Comparing changes with git diff (2)

Comparison input

```
$ diff --git a/diff_test.txt b/diff_test.txt
```

Metadata displayed by git

Internally git works with version hash identifiers and therefore shows (part of the) the hashes of the two files.

Example:

index 5c3b621..a0d8bf9 100644

Comparing changes with git diff (3)

Markers for changes

```
--- a/diff_test.txt
+++ b/diff_test.txt
```

These lines are a **legend** that assigns symbols to each diff input source.

In this case, changes from a/diff_test.txt are marked with a **---** and the changes from b/diff_test.txt are marked with the **+++** symbol.

Comparing changes with git diff (4)

Diff chunks

The main diff output is a list of diff 'chunks'

A diff only displays the sections of the file that have changes.

```
@@ -1 +1 @@
-this is a git diff test example
+this is a diff example
```

added.

This indicates a replacement or an update

Comparing changes with git diff (5)

Comparing files from two branches

```
$ git diff main new_branch ./diff_test.txt
```

To compare a specific file across branches, pass in the path of the file as the third argument to git diff

Practising git diff

```
def add(n1,n2):
    return n1+n2

def subtract(n1, n2):
    return n1-n2

def multiply(n1, n2):
    return n1*n2

def divide(n1, n2):
    return n1/n2

def main():
    print (add(100,10))

if __name__ == "__main__":
   main()
```

⇐ line 8

CHANGED FILE

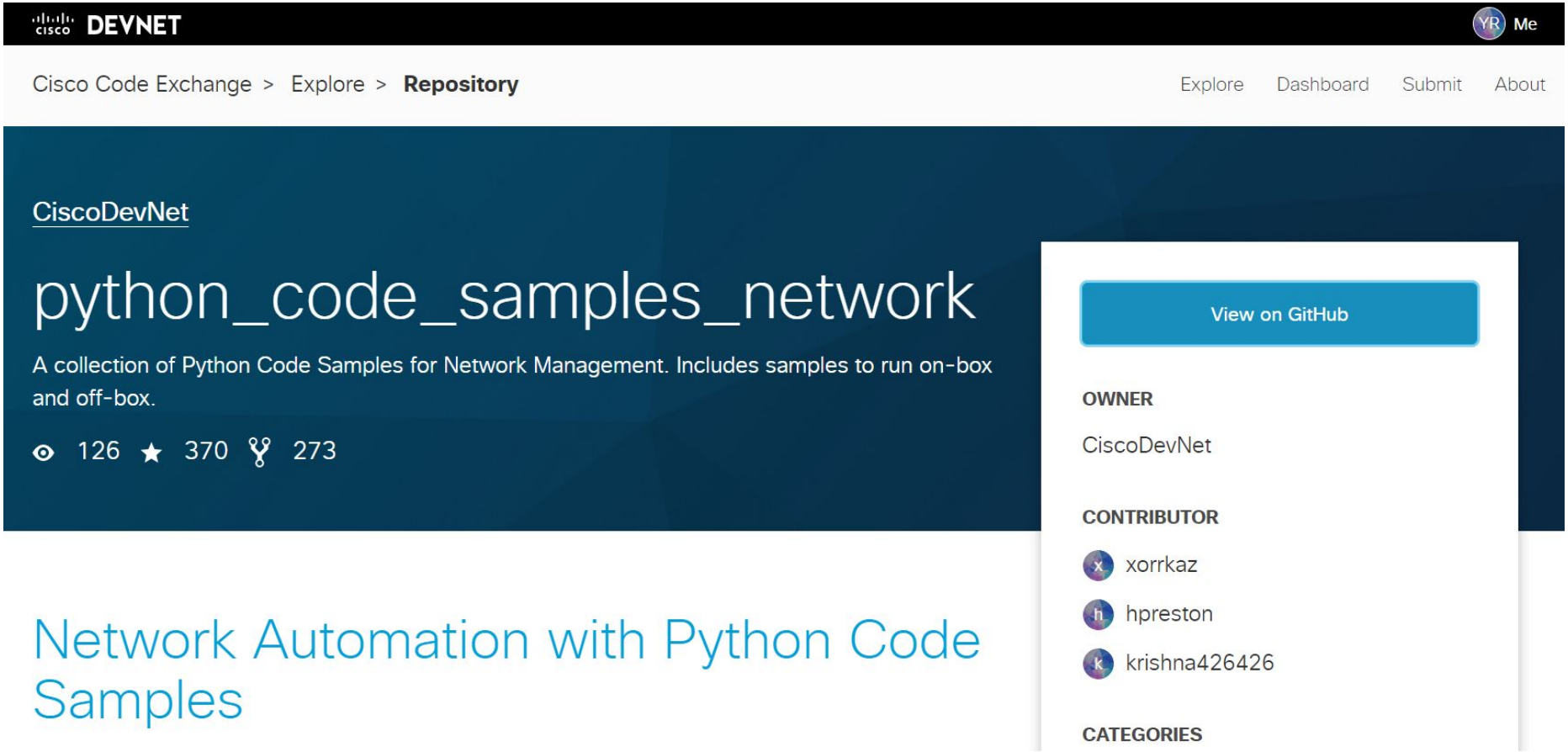
```
def add(n1,n2):
    return n1+n2

def subtract(n1, n2):
    return n1-n2

def multiply(n1, n2):
    return n1*n2

def divide(n1, n2):
    if n2 != 0:
        return n1/n2
    else:
        return ("Error: Division by Zero")

def main():
    print (add(100,10))
    print (subtract(100,10))
    print (multiply(100,10))
    print (divide(100,10))
```

⇐ line 8

Practising git diff --B

```
>git diff
diff --git a/calc.py b/calc.py
index 2519d86..57a02fd 100644
--- a/calc.py
+++ b/calc.py
@@ -8,10 +8,16 @@ def multiply(n1, n2):
     return n1*n2

 def divide(n1, n2):
-    return n1/n2
+    if n2 != 0:
+        return n1:n2
+    else:
+        return ("Error: Division by Zero")

 def main():
     print (add(100,10))
+    print (subtract(100,10))
+    print (multiply(100,10))
+    print (divide(100,10))
```

Python Code Samples on GitHub


DEVNET
Me
Cisco Code Exchange > Explore > Repository
Explore
Dashboard
Submit
About
CiscoDevNet
python_code_samples_network
A collection of Python Code Samples for Network Management. Includes samples to run on-box and off-box.
126
370
273
View on GitHub
OWNER
CiscoDevNet
CONTRIBUTOR
xorrkaz
hpreston
krishna426426
CATEGORIES
Network Automation with Python Code Samples

Downloading git existing repository

$ git config --global user.email "yro@biasc.com"

$ git config --list

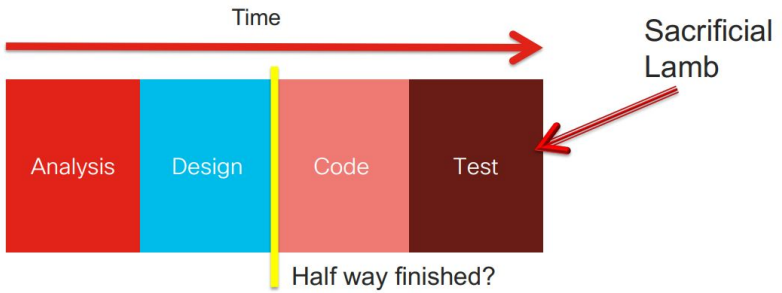
$ git init

$ git clone https://github.com/CiscoDevNet/python_code_samples_network

$ git status

Pipelines

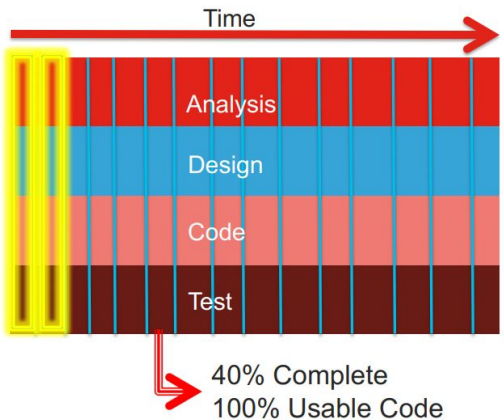
Before Agile Methodologies



Agile & Scrum

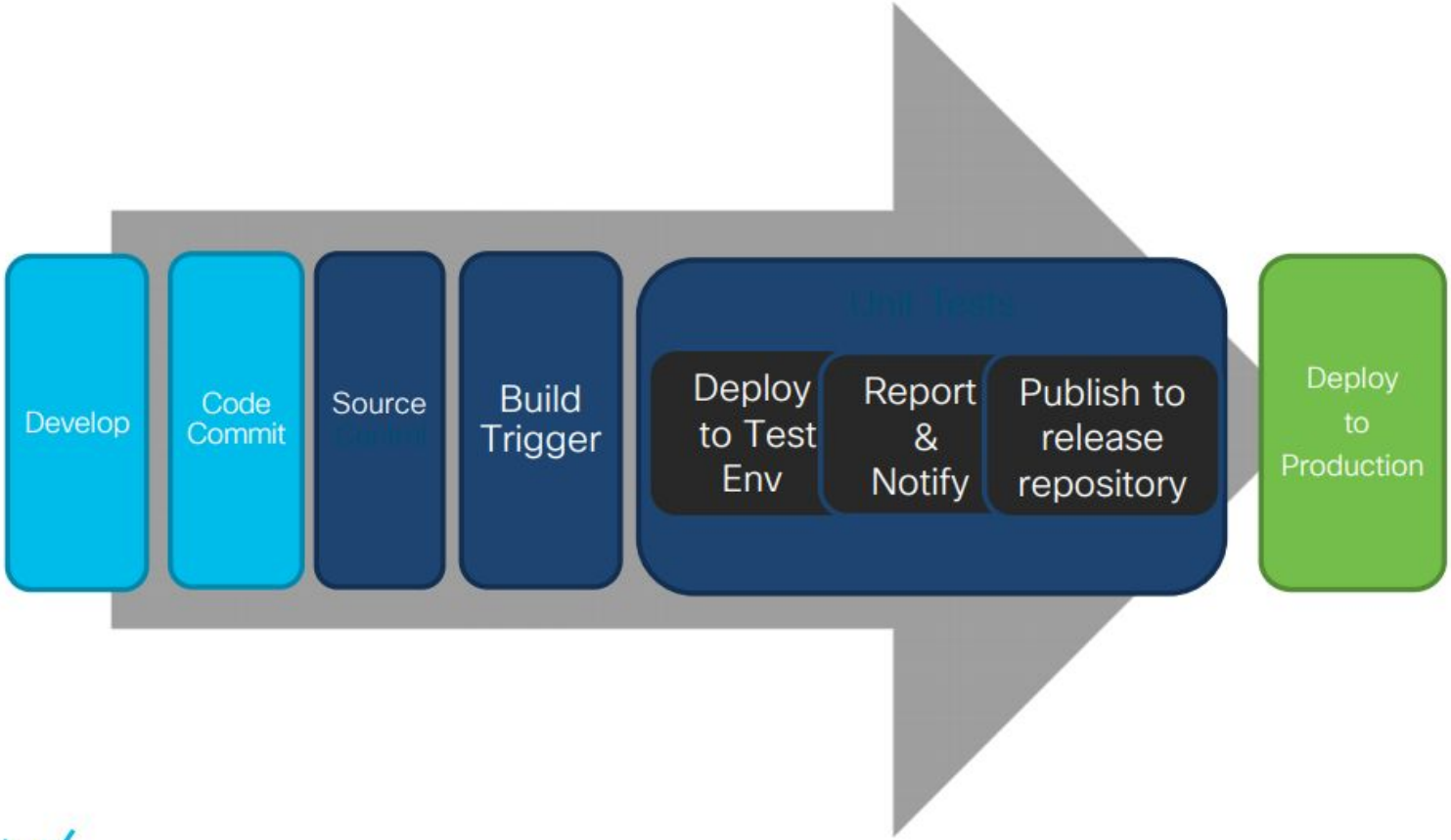
=> More Releases

Benefits of Agile Development



SCRUM Agile Project Management

Continuous Deployment



Tips for Deploying Python Applications

Create a Python Virtual Environment

Install the necessary libraries and functionalities

Create a git repository

Push, Pull or Clone when necessary

Create branches and test code before merging into main branch

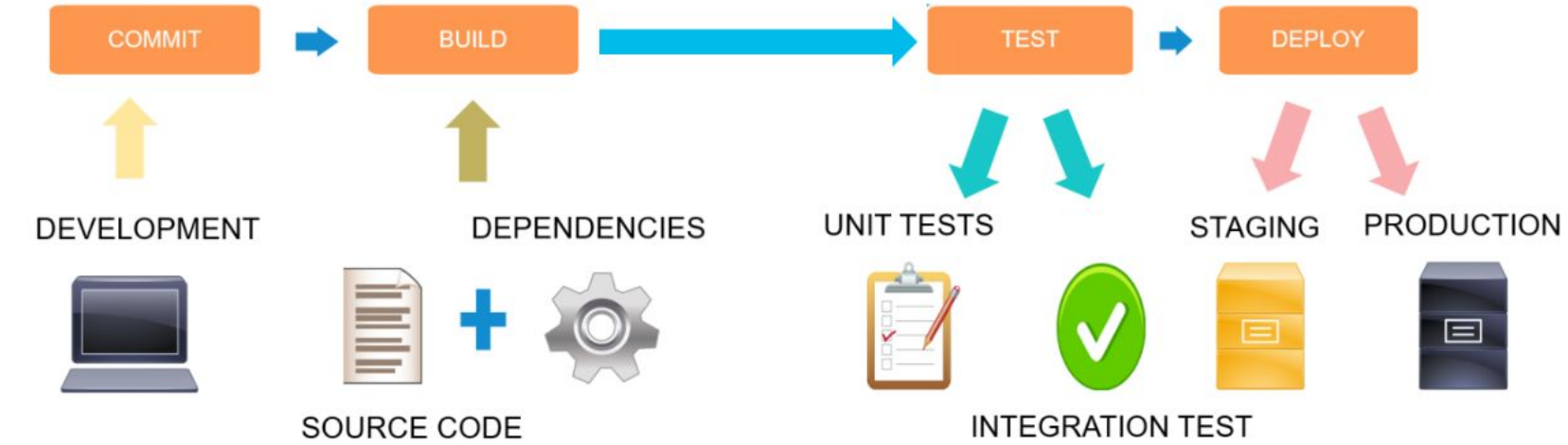
Use pipelines to automate deployment => CI/CD

DEVASC Topics #4: Application Deployment and Security (15%)

- 4.4 Describe components for a CI/CD pipeline in application deployments

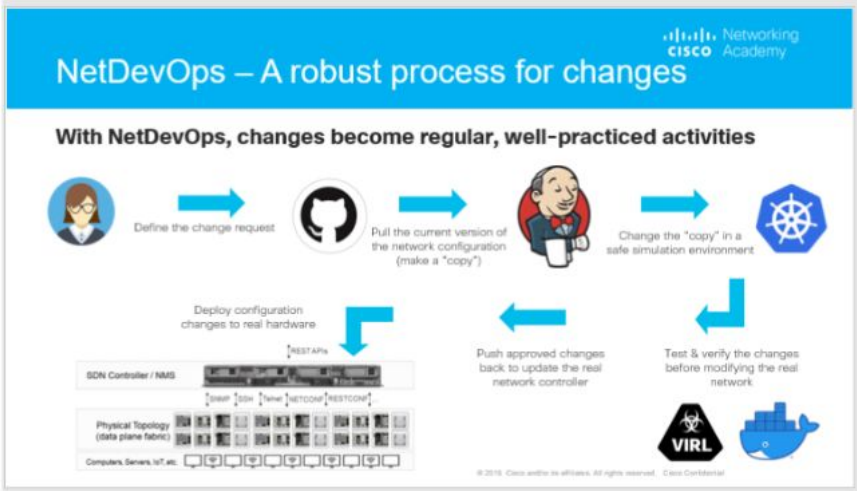
Continuous Integration, Continuous Deployment

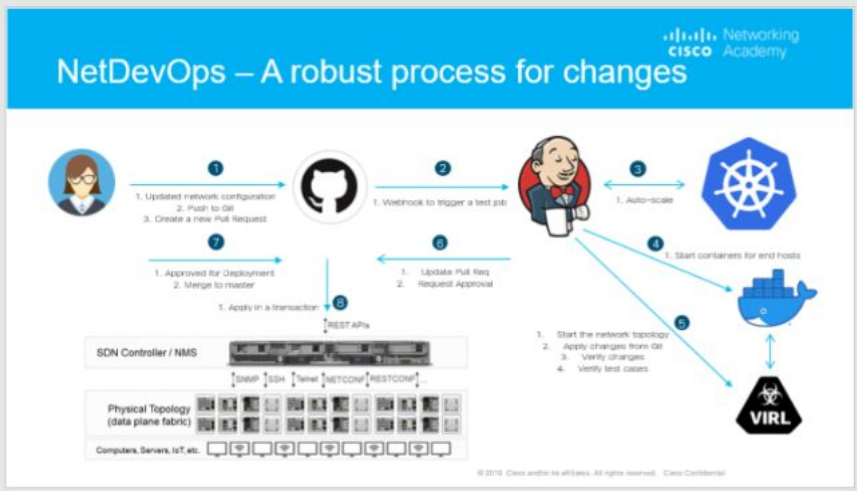
A common pipeline process:



DEVASC Topics #5: Infrastructure and Automation (20%)

- 5.4 Describe the components and benefits of CI/CD pipeline in infrastructure automation





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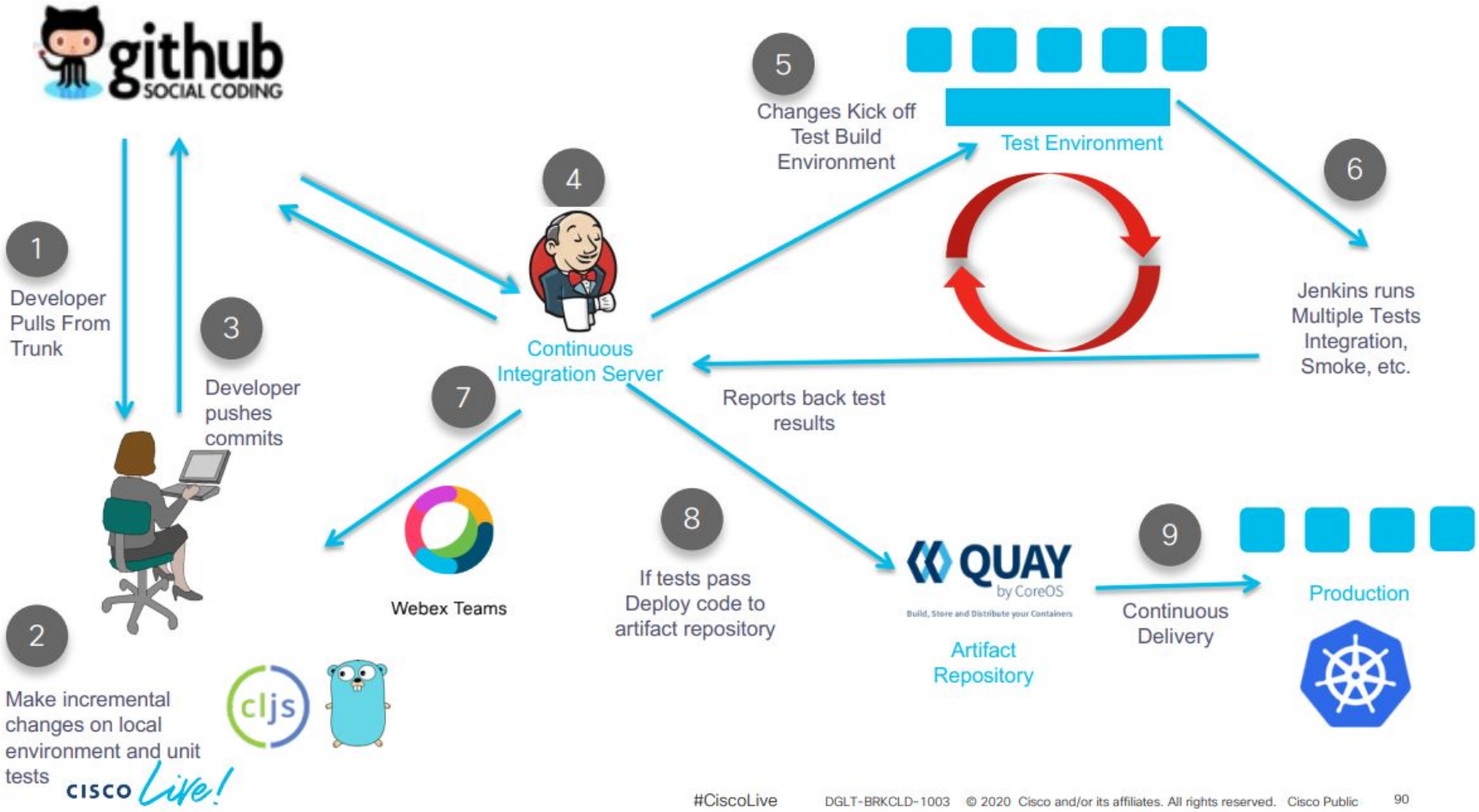
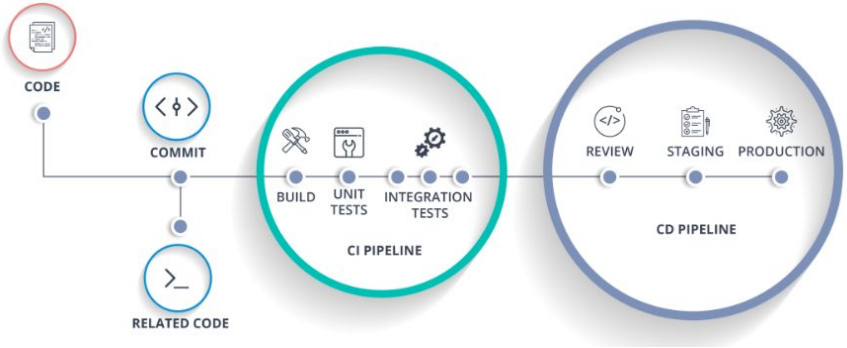
General best practices used by Amazon developers

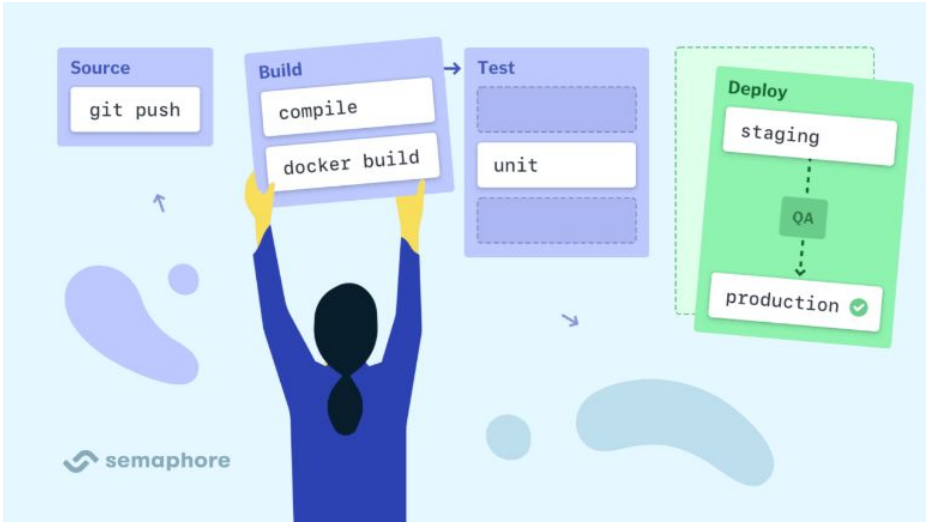
- CI/CD is a MUST!
  - Commit frequently
  - Builds on every commit
  - Build once in a given execution flow
  - Deploy to a running environment for further testing
- Everything that is code (application, infrastructure, documentation) goes into a repository
  - If its not in a repository, it doesn't go into production environments!
- Start with continuous delivery ("gated" promotion) and build up to continuous deployment once evidence of a high-level of excellence in testing is clear
- Deploy to canaries, test, deploy to an AZ, test, deploy to a Region, test



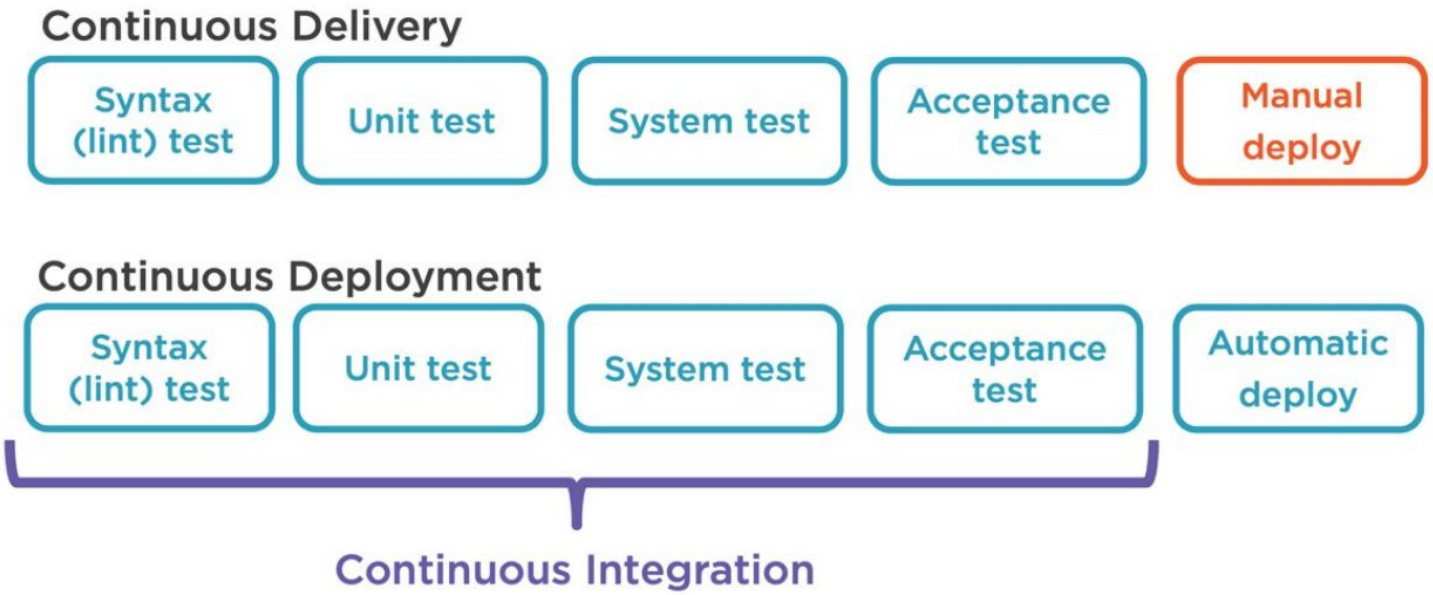
DevASC 4.0 -- Continuous Integration/ Continuous Delivery

CI/CD Pipeline





CI/CD Pipelines – DevOps, NetDevOps, DevSecOps



CI/CD Platforms: The Automated Software Bakery

Classic Mode

- Centralized Configuration
- Responsibility of CI/CD administrator
- Examples:
  - Jenkins, Microsoft TFS

Emerging Mode

- Configuration pushed into the Repositories not centralized
- Responsibility of Developers
- Examples: GitLab
  - Drone.io, Travis CI, Circle CI

Jenkins Pipeline => Stages

The main role of Jenkins is to execute the stages of a pipeline and to verify/ test the results

Jenkins Pipeline is a suite of plugins that supports implementing and integrating continuous delivery pipelines into Jenkins. Pipeline provides an extensible set of tools for modeling simple-to-complex delivery pipelines "as code"

There are plugins for: Bash, Git, Docker, Ansible, and many more ...

Jenkins

Software

Jenkins is an open source automation server. It helps automate the parts of software development related to building, testing, and deploying, facilitating continuous integration and continuous delivery. It is a server-based system that runs in servlet containers such as Apache Tomcat. Wikipedia

Repository: github.com/jenkinsci/jenkins

License: MIT License

Platform: Java 8, Java 11

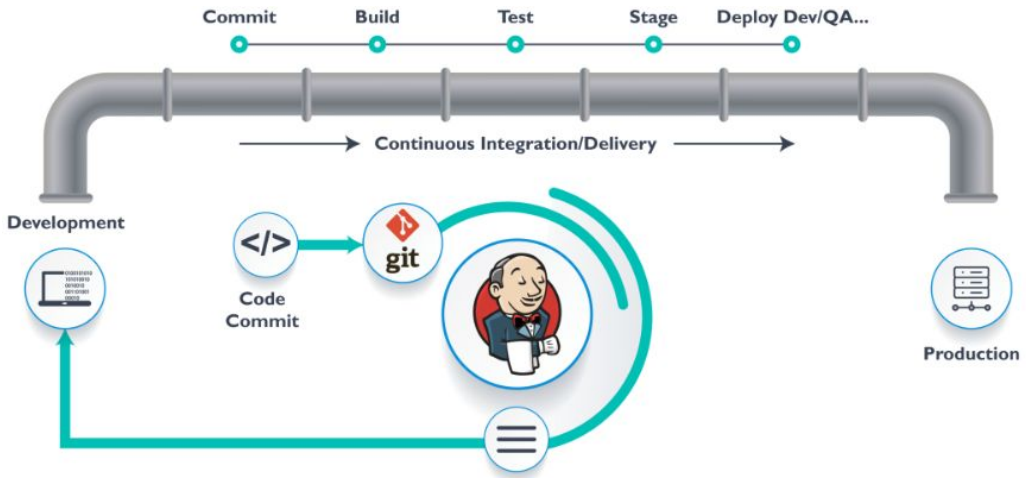
Initial release date: February 2, 2011

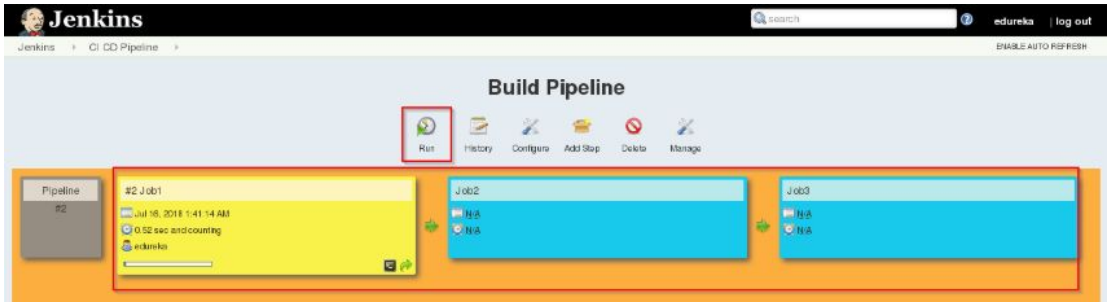
Programming language: Java

Developer: CloudBees, Kohsuke Kawaguchi

Original author: CloudBees, Kohsuke Kawaguchi

DevASC 4.0 -- Components of a CI/CD pipeline





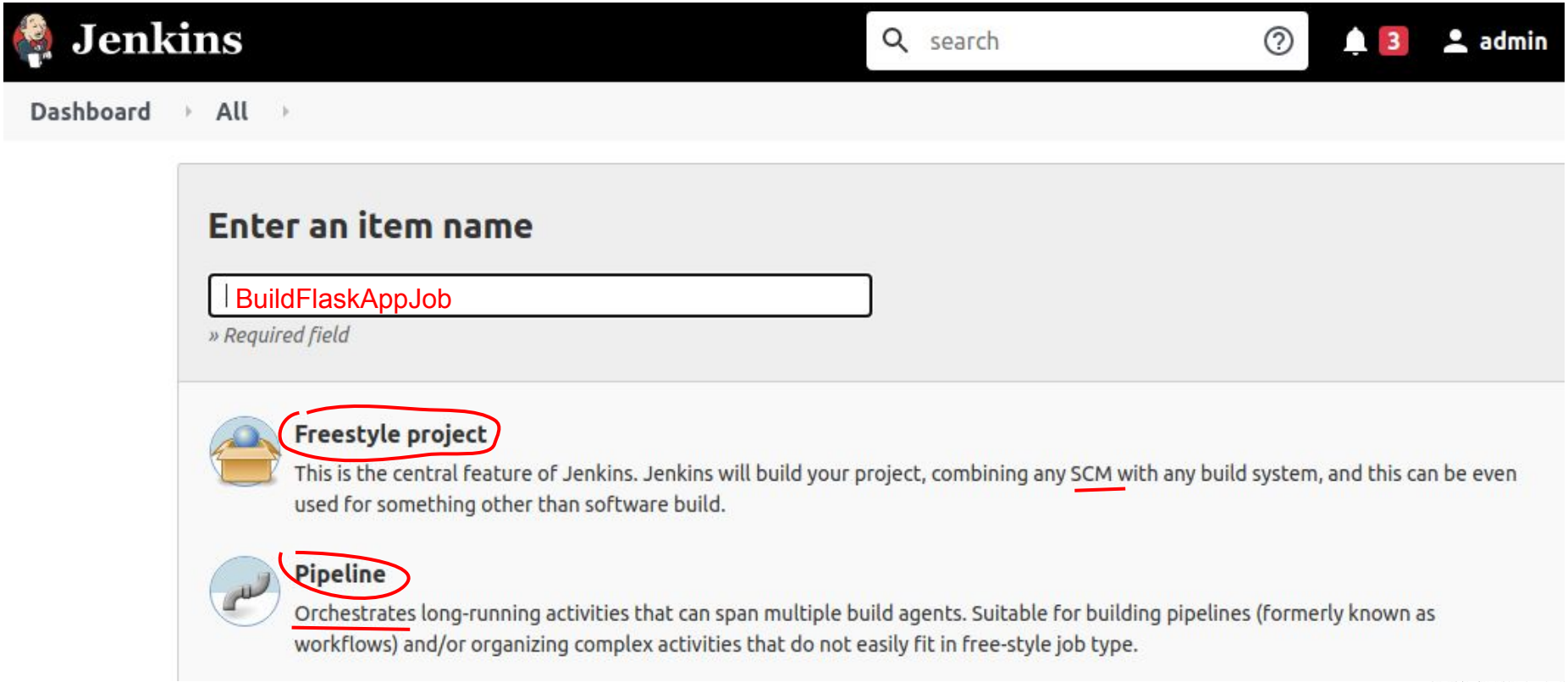
Jenkins Jobs

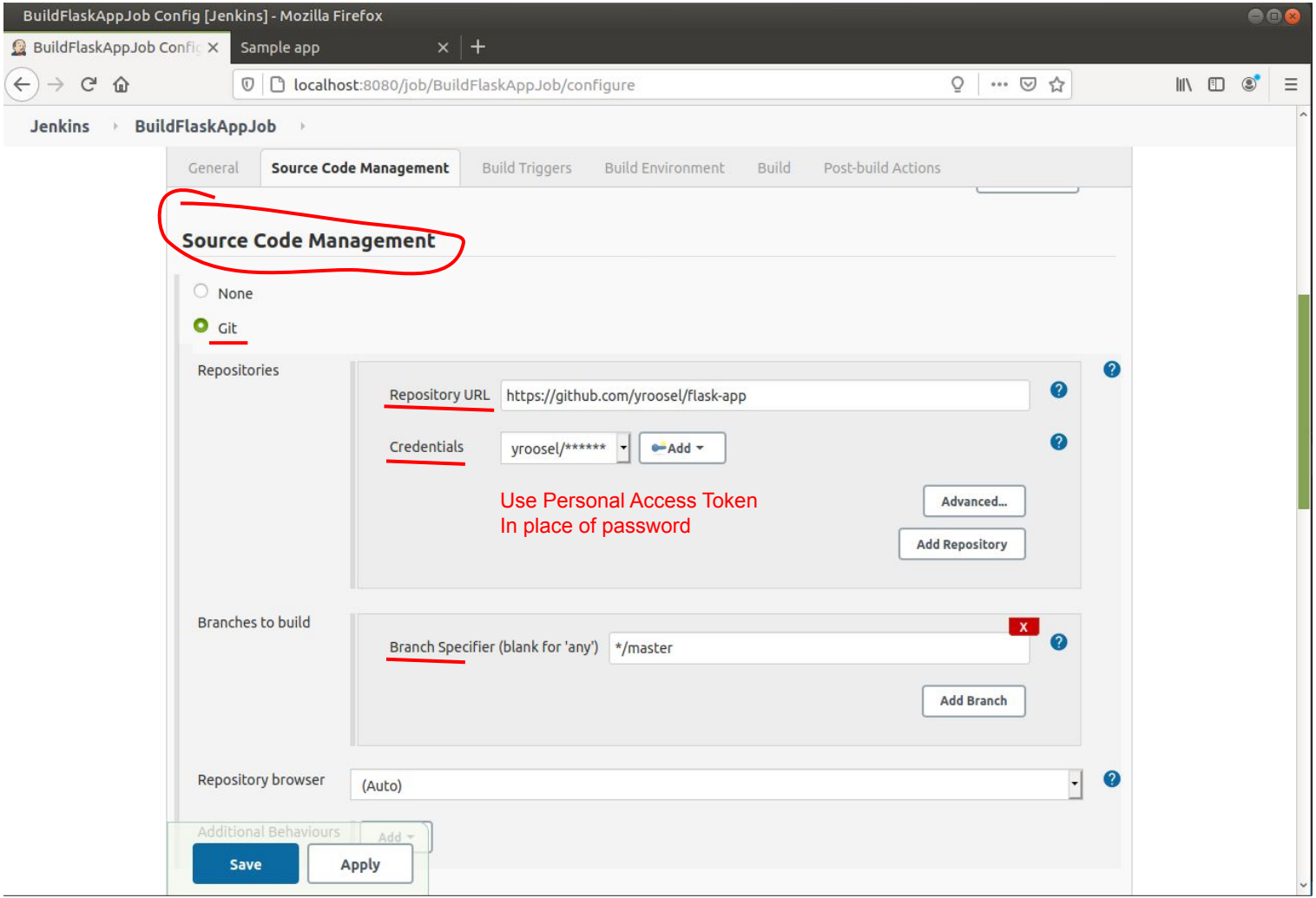
Preparation
Retrieve a version of the code from GitHub
Build
Run the build script
Testing
Test the build to ensure that it's working properly

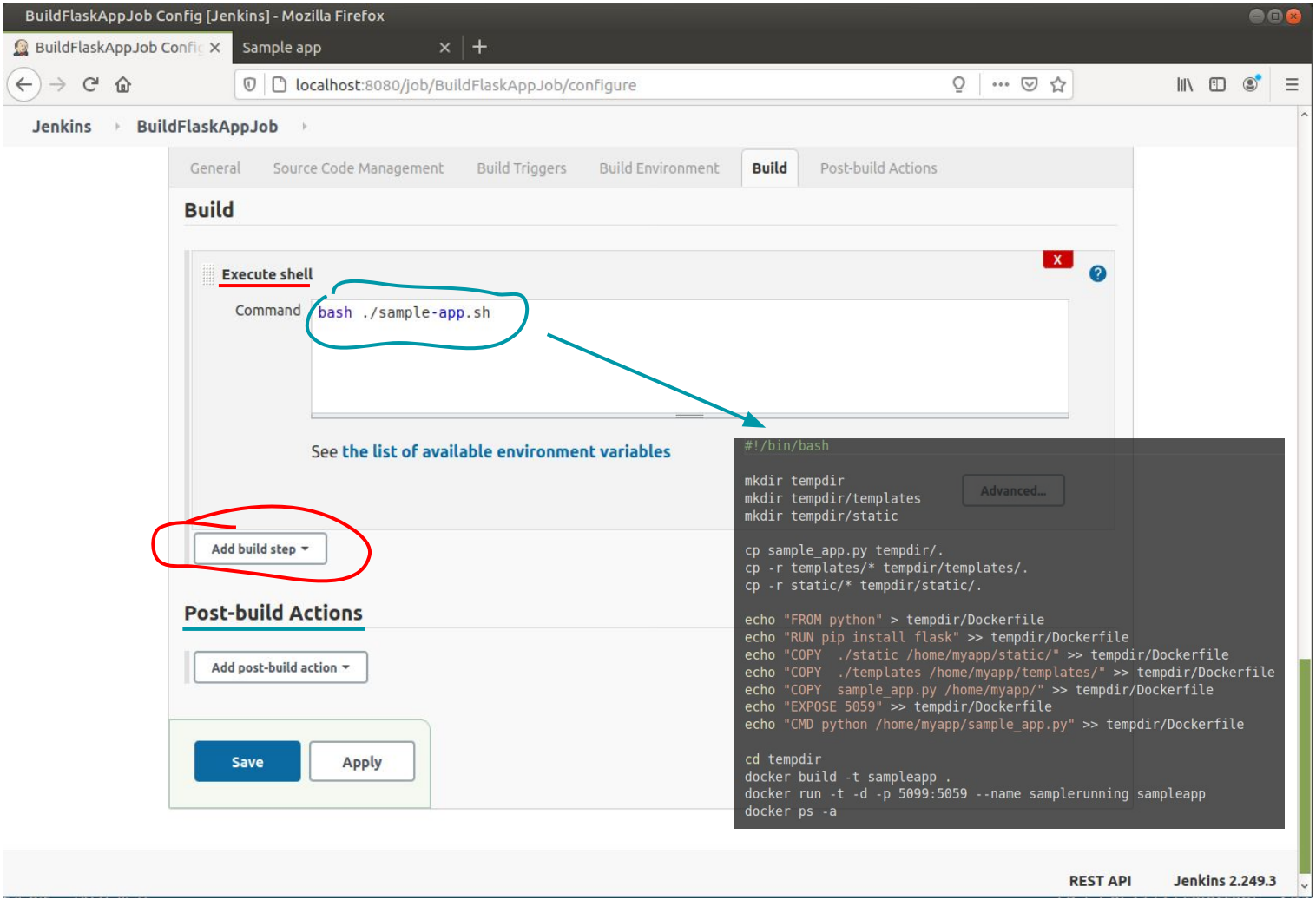
Pipeline in three stages
Preparation
Build
Testing

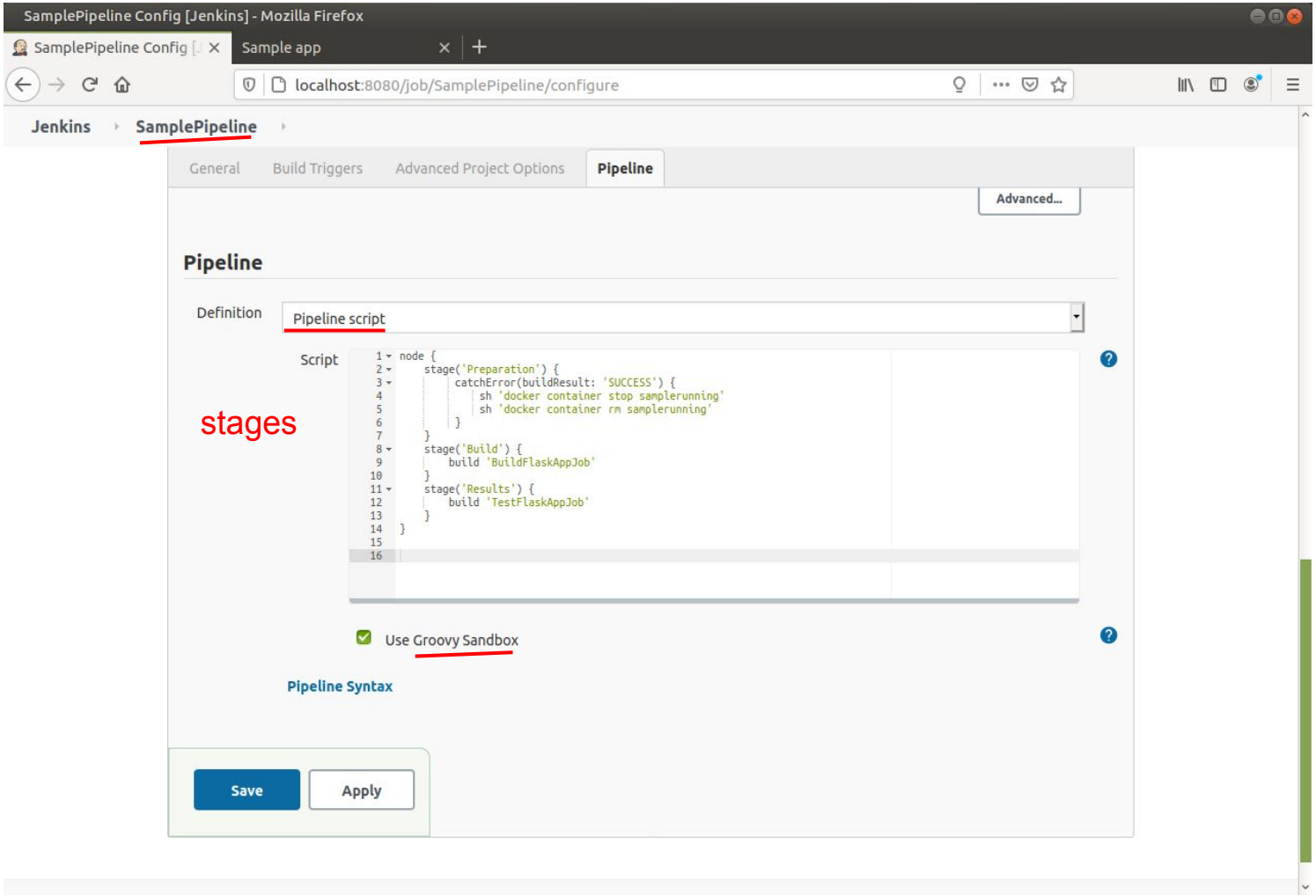
Stages are run sequentially. If an early stage fails, the pipeline stops

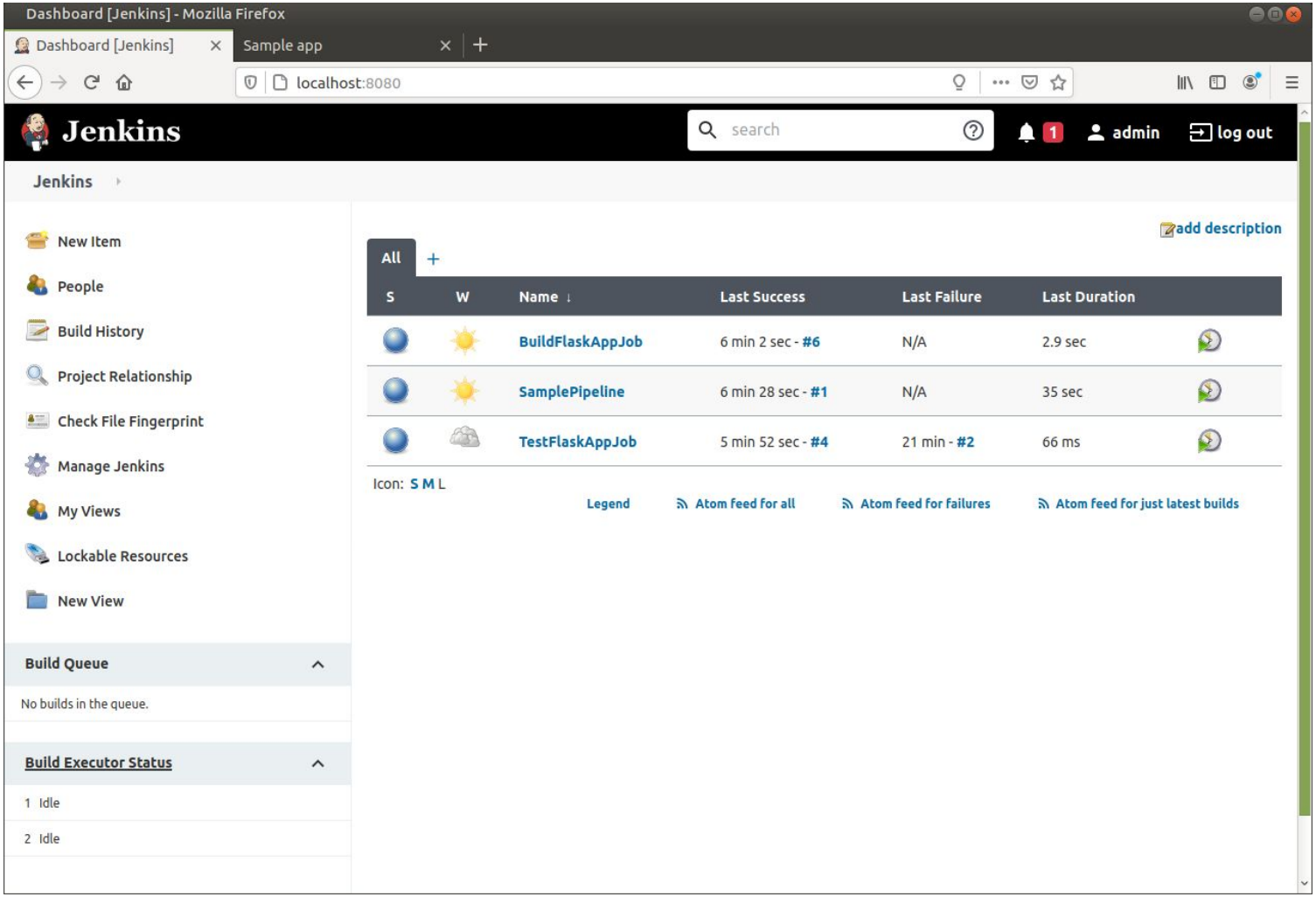
Create a Jenkins job or pipeline: new item

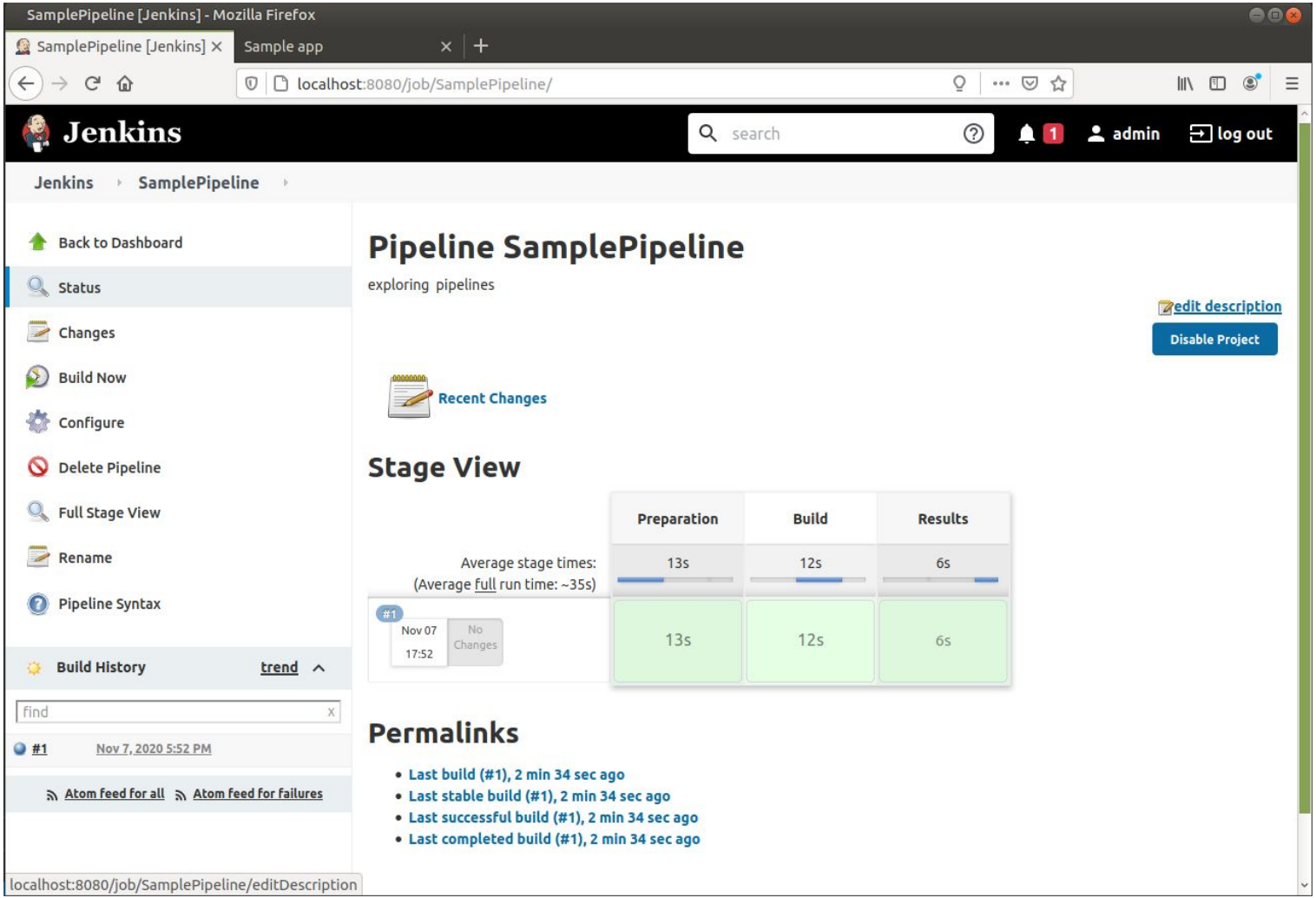


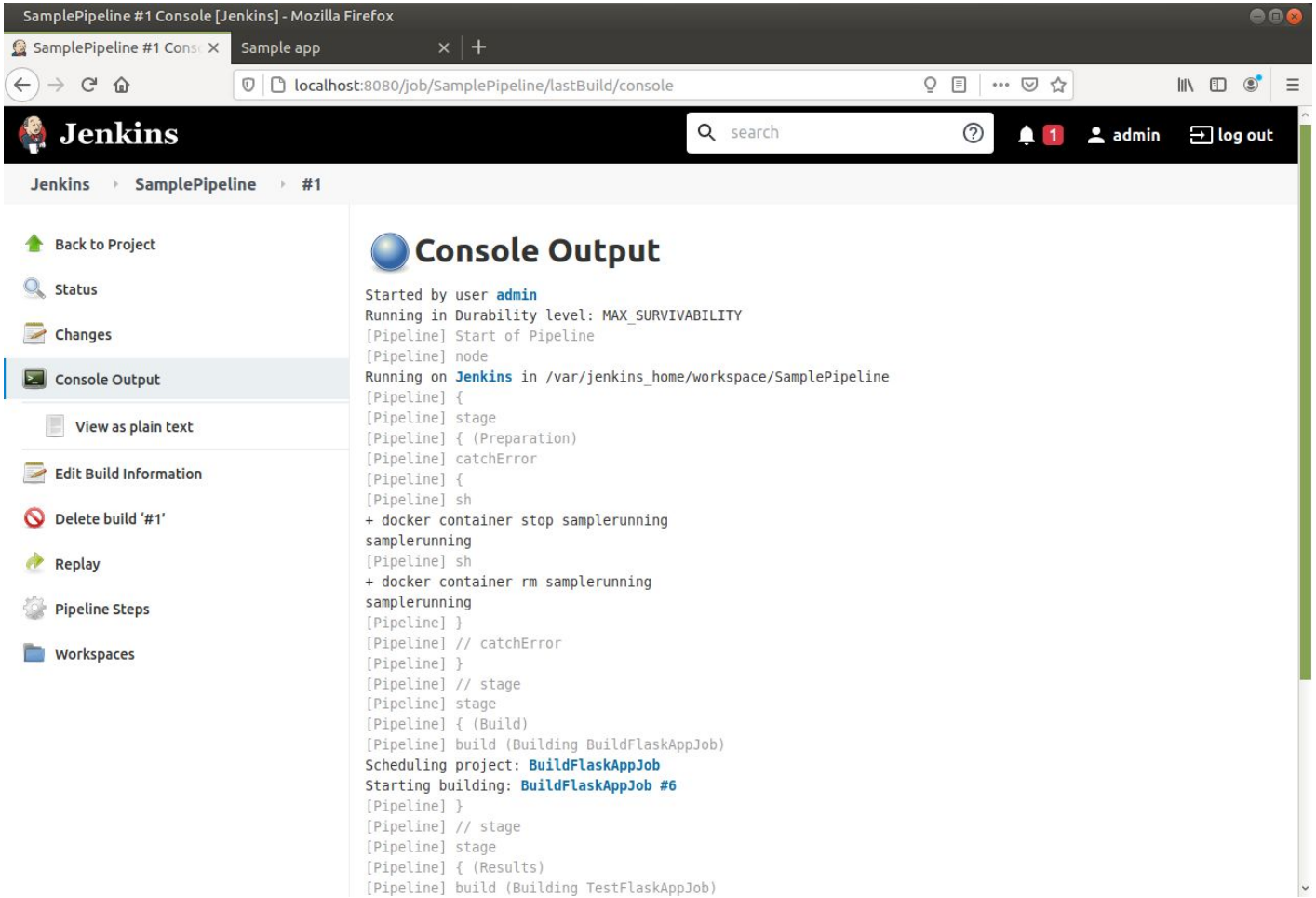

BuildFlaskAppJob Config [Jenkins] - Mozilla Firefox
BuildFlaskAppJob Confi
Sample app
localhost:8080/job/BuildFlaskAppJob/configure
Jenkins
BuildFlaskAppJob
General
Source Code Management
Build Triggers
Build Environment
Build
Post-build Actions
Source Code Management
None
Git
Repositories
Repository URL
https://github.com/yroosel/flask-app
Credentials
yroosel/******
Add
Use Personal Access Token
In place of password
Advanced...
Add Repository
Branches to build
Branch Specifier (blank for 'any')
*/master
Add Branch
Repository browser
(Auto)
Additional Behaviours
Add
Save
Apply


BuildFlaskAppJob Config [Jenkins] - Mozilla Firefox
BuildFlaskAppJob Confi
Sample app
localhost:8080/job/BuildFlaskAppJob/configure
Jenkins
BuildFlaskAppJob
General
Source Code Management
Build Triggers
Build Environment
Build
Post-build Actions
Build
Execute shell
Command
bash ./sample-app.sh
See the list of available environment variables
Add build step
Post-build Actions
Add post-build action
Save
Apply
#!/bin/bash
mkdir tempdir
mkdir tempdir/templates
mkdir tempdir/static
Advanced...
cp sample_app.py tempdir/.
cp -r templates/* tempdir/templates/.
cp -r static/* tempdir/static/.
echo "FROM python" > tempdir/Dockerfile
echo "RUN pip install flask" >> tempdir/Dockerfile
echo "COPY ./static /home/myapp/static/" >> tempdir/Dockerfile
echo "COPY ./templates /home/myapp/templates/" >> tempdir/Dockerfile
echo "COPY sample_app.py /home/myapp/" >> tempdir/Dockerfile
echo "EXPOSE 5059" >> tempdir/Dockerfile
echo "CMD python /home/myapp/sample_app.py" >> tempdir/Dockerfile
cd tempdir
docker build -t sampleapp .
docker run -t -d -p 5099:5059 --name samplerunning sampleapp
docker ps -a
REST API
Jenkins 2.249.3


SamplePipeline Config [Jenkins] - Mozilla Firefox
SamplePipeline Config
Sample app
localhost:8080/job/SamplePipeline/configure
Jenkins
SamplePipeline
General
Build Triggers
Advanced Project Options
Pipeline
Advanced...
Pipeline
Definition
Pipeline script
Script
node {
stage('Preparation') {
catchError(buildResult: 'SUCCESS') {
sh 'docker container stop samplerunning'
sh 'docker container rm samplerunning'
}
}
stage('Build') {
build 'BuildFlaskAppJob'
}
stage('Results') {
build 'TestFlaskAppJob'
}
}
stages
Use Groovy Sandbox
Pipeline Syntax
Save
Apply


Dashboard [Jenkins] - Mozilla Firefox
Dashboard [Jenkins]
Sample app
localhost:8080
Jenkins
search
1
admin
log out
Jenkins
New Item
People
Build History
Project Relationship
Check File Fingerprint
Manage Jenkins
My Views
Lockable Resources
New View
Build Queue
No builds in the queue.
Build Executor Status
1 Idle
2 Idle
add description
All
S
W
Name ↓
Last Success
Last Failure
Last Duration
BuildFlaskAppJob
6 min 2 sec - #6
N/A
2.9 sec
SamplePipeline
6 min 28 sec - #1
N/A
35 sec
TestFlaskAppJob
5 min 52 sec - #4
21 min - #2
66 ms
Icon: S M L
Legend
Atom feed for all
Atom feed for failures
Atom feed for just latest builds

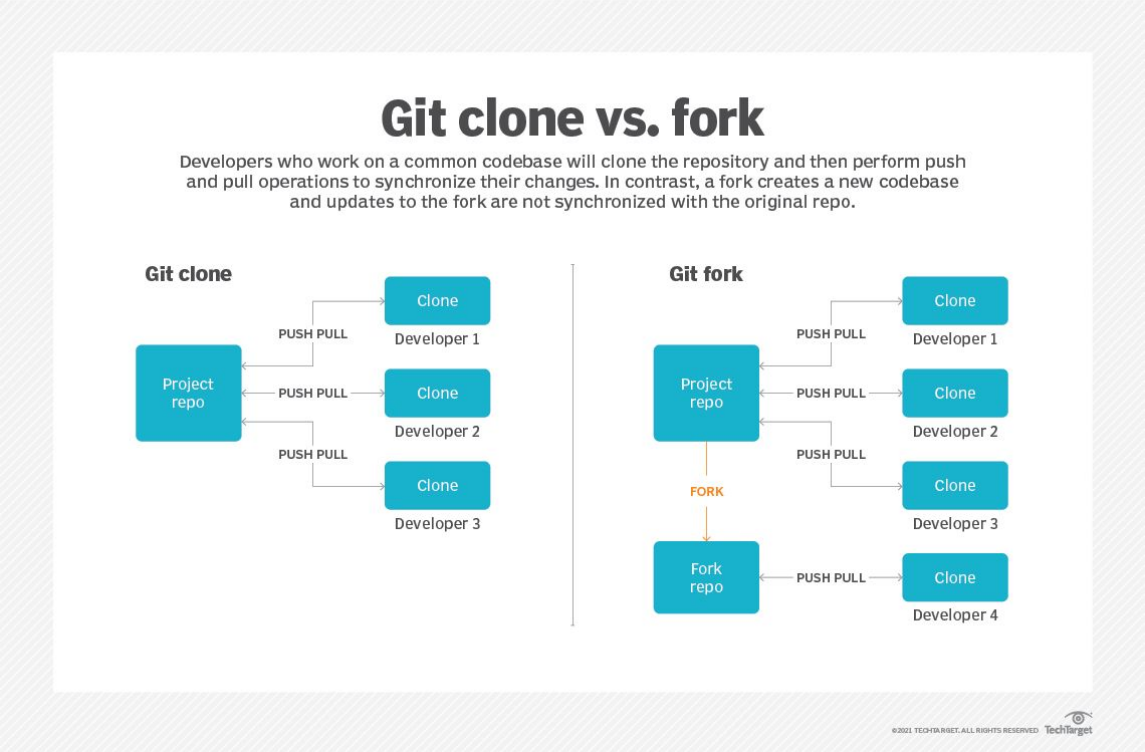

SamplePipeline [Jenkins] - Mozilla Firefox
SamplePipeline [Jenkins]
Sample app
localhost:8080/job/SamplePipeline/
Jenkins
search
1
admin
log out
Jenkins
SamplePipeline
Back to Dashboard
Status
Changes
Build Now
Configure
Delete Pipeline
Full Stage View
Rename
Pipeline Syntax
Build History
trend
find
#1
Nov 7, 2020 5:52 PM
Atom feed for all
Atom feed for failures
Pipeline SamplePipeline
exploring pipelines
edit description
Disable Project
Recent Changes
Stage View
Preparation
Build
Results
Average stage times:
(Average full run time: ~35s)
13s
12s
6s
#1
Nov 07
17:52
No Changes
13s
12s
6s
Permalinks
Last build (#1), 2 min 34 sec ago
Last stable build (#1), 2 min 34 sec ago
Last successful build (#1), 2 min 34 sec ago
Last completed build (#1), 2 min 34 sec ago
localhost:8080/job/SamplePipeline/editDescription


SamplePipeline #1 Console [Jenkins] - Mozilla Firefox
SamplePipeline #1 Cons
Sample app
localhost:8080/job/SamplePipeline/lastBuild/console
Jenkins
search
1
admin
log out
Jenkins
SamplePipeline
#1
Back to Project
Status
Changes
Console Output
View as plain text
Edit Build Information
Delete build '#1'
Replay
Pipeline Steps
Workspaces
Console Output
Started by user admin
Running in Durability level: MAX_SURVIVABILITY
[Pipeline] Start of Pipeline
[Pipeline] node
Running on Jenkins in /var/jenkins_home/workspace/SamplePipeline
[Pipeline] {
[Pipeline] stage
[Pipeline] { (Preparation)
[Pipeline] catchError
[Pipeline] {
[Pipeline] sh
+ docker container stop samplerunning
samplerunning
[Pipeline] sh
+ docker container rm samplerunning
samplerunning
[Pipeline] }
[Pipeline] // catchError
[Pipeline] }
[Pipeline] // stage
[Pipeline] stage
[Pipeline] { (Build)
[Pipeline] build (Building BuildFlaskAppJob)
Scheduling project: BuildFlaskAppJob
Starting building: BuildFlaskAppJob #6
[Pipeline] }
[Pipeline] // stage
[Pipeline] stage
[Pipeline] { (Results)
[Pipeline] build (Building TestFlaskAppJob)

Git clone vs fork

Git fork vs. clone: What's the difference?

Any public Git repository can be forked or cloned. A fork creates a completely independent copy of Git repository. In contrast to a fork, a Git clone creates a linked copy that will continue to synchronize with the target repository.



Review

What’s the aim of the following git commands?

$ git config --global user.email "yro@biasc.com"

$ git config --list

$ git checkout -b test origin /main

$ git branch

$ git fetch

$ git diff

$ git remote -v

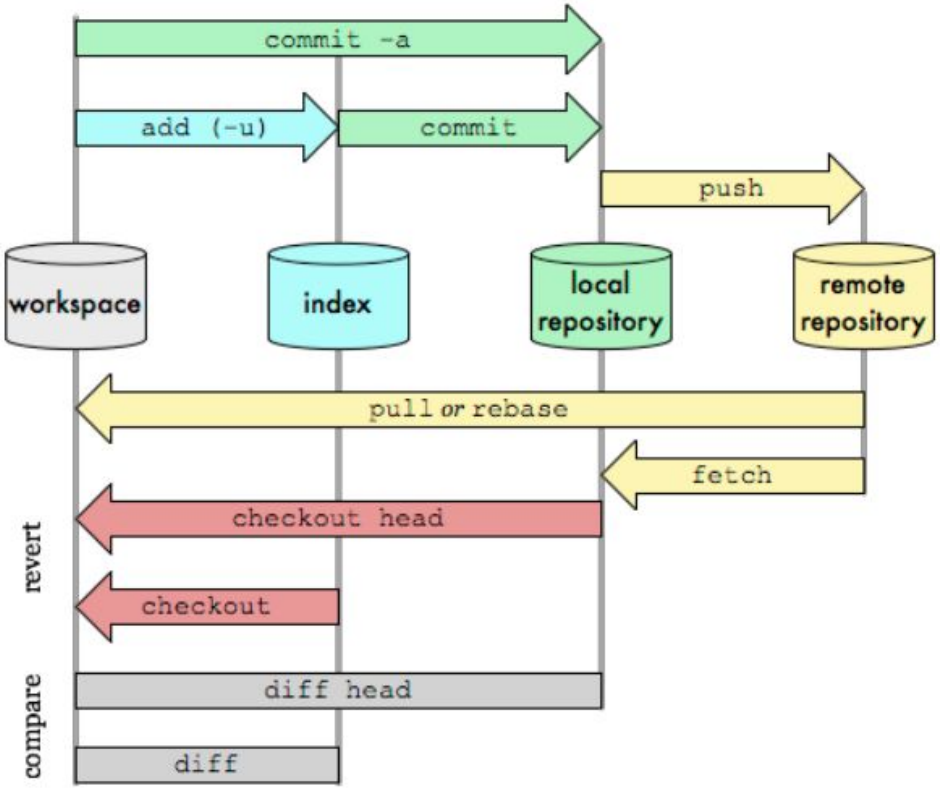
$ git add .

$ git status

Git Cheat Sheet

Git Data Transport Commands

http://osteele.com



Need a Place to Store Code

- A place to store current and past versions of code
  - Ability to merge, branch, fork
  - Ability to see who has changed which file
  - Highly available service
  - Ability to revert to prior versions
  - Public or Private / OnPrem / OffPrem
  - Social

Infrastructure Automation: IaC Tooling Comparison

Infrastructure as Code, Repositories => Git

Infrastructure as Code, Cloud Provisioning => Terraform

Infrastructure as Code, Configuration management => Ansible

Continuous Integration/Deployment => Docker, Kubernetes

Continuous Integration/Pipelines => Jenkins, Github Actions, Gitlab

Config/Secret Management => Consul, etcd, Vault

Monitoring => Prometheus

Connecting, managing, and securing microservices (service mesh) => Istio

Devops Terms & Concepts

Repository => git

A collection of **scripts, programs and documents** is called a repository.
It is possible to **manage** and **store** files locally or on github. One repo per application. One application per repository.

Image => docker build

It is possible to create a (**micro)service** for a specific application.
An **image** is the file containing all the necessary artifacts for that **(micro)service**.
Typically, we use a **dockerfile** to create an image.
An image is **stored** on a file system or on docker hub. One image per application. One application per image.

Container => docker run, docker compose, kubernetes

A container is a (**micro)service** available to users by means of an **IP address and a Port**. IN order to make an application available it is necessary to run or deploy the image. As many services as necessary for one application.

Pipeline => jenkins

A jenkins pipeline consists of stages in order to **deploy a (micro)service**. The pipeline starts with **fetching** the relevant version of the application code from a git repository. Then a docker image is created and stored locally (or on github). In the next phase it is possible to make the application image available (run) to make sure that users can connect to it.

References

Git Cheat Sheet - 2

Install

GitHub for Windows
https://windows.github.com

GitHub for Mac
https://mac.github.com

Git for All Platforms
http://git-scm.com

Git distributions for Linux and POSIX systems are available on the official Git SCM web site.

Configure tooling

Configure user information for all local repositories

```
$ git config --global user.name "[name]"
```
Sets the name you want attached to your commit transactions

```
$ git config --global user.email "[email address]"
```
Sets the email you want attached to your commit transactions

```
$ git config --global color.ui auto
```
Enables helpful colorization of command line output

Create repositories

When starting out with a new repository, you only need to do it once; either locally, then push to GitHub, or by cloning an existing repository.

```
$ git init
```
Turn an existing directory into a git repository

```
$ git clone [url]
```
Clone (download) a repository that already exists on GitHub, including all of the files, branches, and commits

The .gitignore file

Sometimes it may be a good idea to exclude files from being tracked with Git. This is typically done in a special file named `.gitignore` . You can find helpful templates for `.gitignore` files at github.com/github/gitignore.

Git Cheat Sheet - 1

GitHub

Git Cheat Sheet

Git is the open source distributed version control system that facilitates GitHub activities on your laptop or desktop. This cheat sheet summarizes commonly used Git command line instructions for quick reference.

Git Cheat Sheet - 3

Branches

Branches are an important part of working with Git. Any commits you make will be made on the branch you're currently "checked out" to. Use `git status` to see which branch that is.

`$ git branch [branch-name]`
Creates a new branch

`$ git checkout [branch-name]`
Switches to the specified branch and updates the working directory

`$ git merge [branch]`
Combines the specified branch's history into the current branch. This is usually done in pull requests, but is an important Git operation.

`$ git branch -d [branch-name]`
Deletes the specified branch

Synchronize changes

Synchronize your local repository with the remote repository on GitHub.com

`$ git fetch`
Downloads all history from the remote tracking branches

`$ git merge`
Combines remote tracking branch into current local branch

`$ git push`
Uploads all local branch commits to GitHub

`$ git pull`
Updates your current local working branch with all new commits from the corresponding remote branch on GitHub. `git pull` is a combination of `git fetch` and `git merge`

Git Cheat Sheet - 4

Make changes

Browse and inspect the evolution of project files

`$ git log`
Lists version history for the current branch

`$ git log --follow [file]`
Lists version history for a file, including renames

`$ git diff [first-branch]...[second-branch]`
Shows content differences between two branches

`$ git show [commit]`
Outputs metadata and content changes of the specified commit

`$ git add [file]`
Snapshots the file in preparation for versioning

`$ git commit -m "[descriptive message]"`
Records file snapshots permanently in version history

Redo commits

Erase mistakes and craft replacement history

`$ git reset [commit]`
Undoes all commits after [commit], preserving changes locally

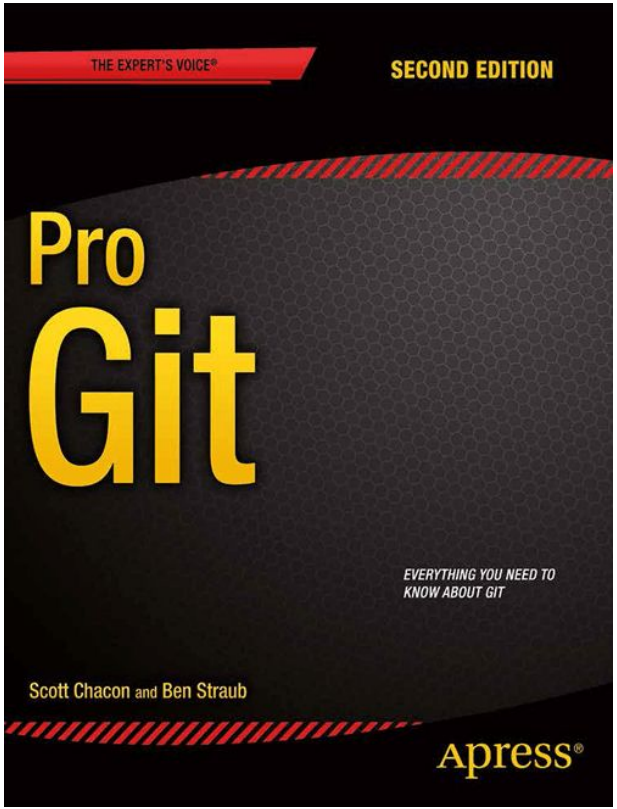
`$ git reset --hard [commit]`
Discards all history and changes back to the specified commit

CAUTION! Changing history can have nasty side effects. If you need to change commits that exist on GitHub (the remote), proceed with caution. If you need help, reach out at github.community or contact support.

Git Cheat Sheet - Glossary

- **git**: an open source, distributed version-control system
- **GitHub**: a platform for hosting and collaborating on Git repositories
- **commit**: a Git object, a snapshot of your entire repository compressed into a SHA
- **branch**: a lightweight movable pointer to a commit
- **clone**: a local version of a repository, including all commits and branches
- **remote**: a common repository on GitHub that all team member use to exchange their changes
- **fork**: a copy of a repository on GitHub owned by a different user
- **pull request**: a place to compare and discuss the differences introduced on a branch with reviews, comments, integrated tests, and more
- **HEAD**: representing your current working directory, the HEAD pointer can be moved to different branches, tags, or commits when using git checkout

Pro Git book, written by Scott Chacon and Ben Straub



Getting Started
Git Basics
Git Branching
Git on the Server
Distributed Git
GitHub
Git Tools
…

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Done