



IEEE SERVICES 2019 TUTORIALS DEVOPS, MICROSERVICES, & CONTAINERS - THE PERFECT STORM

Instructor:

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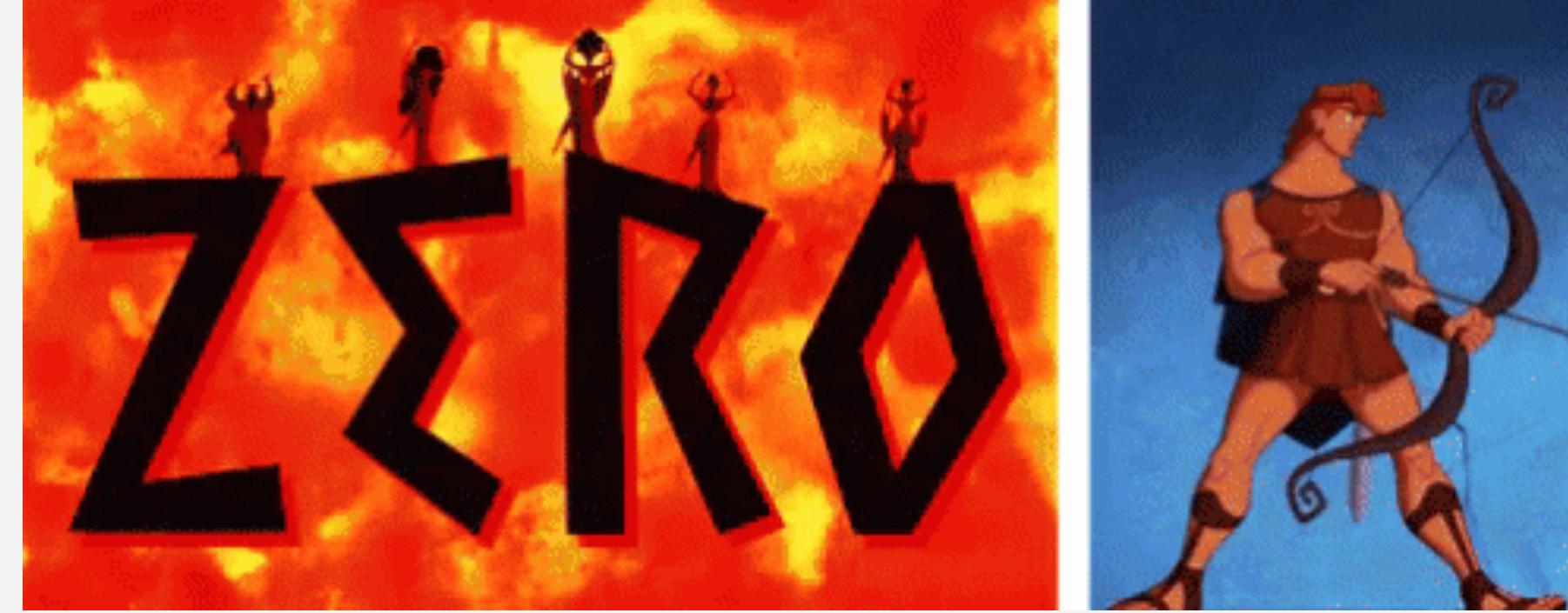


Agenda

- Introduction & Software Installation
- DevOps Overview
- Clone the workshop repo and vagrant up
- Cloud Native and Microservices
- Create a service using Python Flask
- What makes an API RESTful?
- Test Driven Development
- Travis CI
- Introduction to Docker
- Introduction to Kubernetes

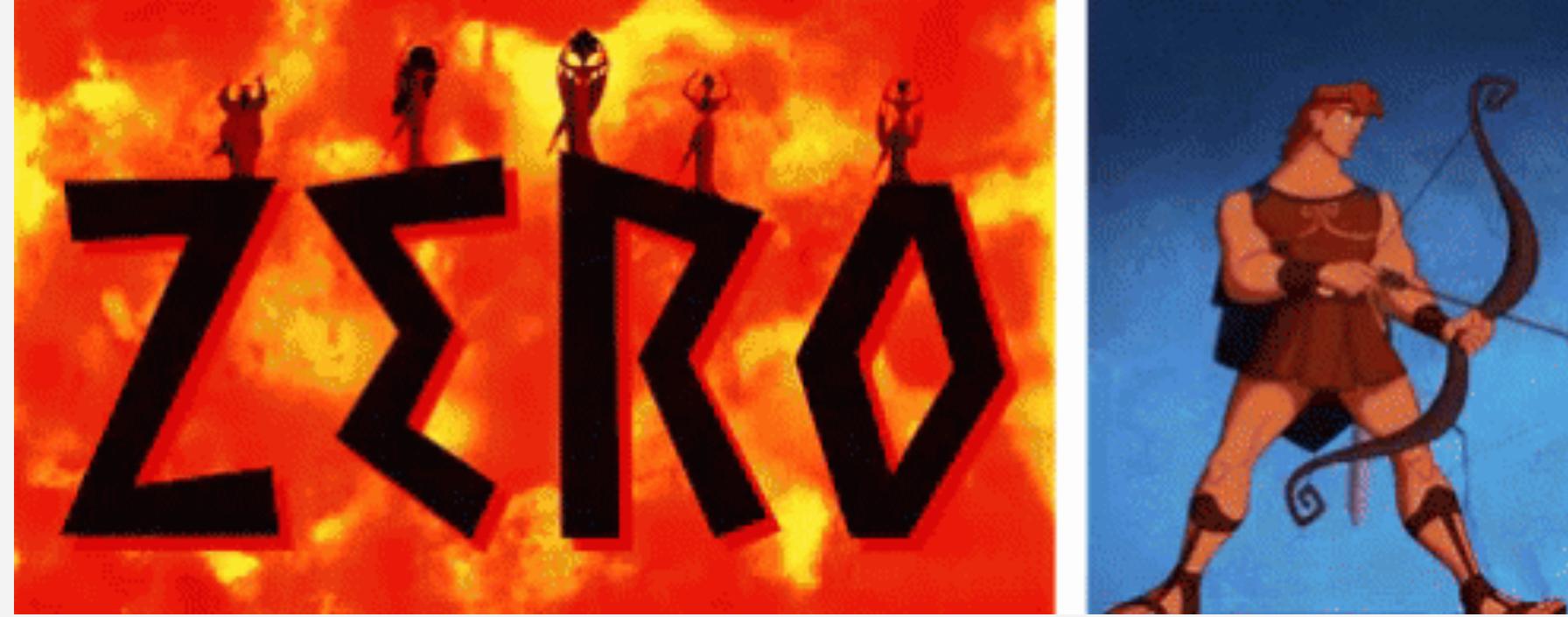


"Zero to Hero" Training



- This training assumes you know nothing about the subject matter
- It does assume that you have a good grasp of software engineering
- I will take you from Zero to Hero on the following topics:
 - DevOps Culture
 - Infrastructure as Code
 - Cloud Native Applications (12-Factor)
 - Test Driven Development
 - Continuous Integration and Continuous Delivery (CI/CD)
 - Docker Containers & Kubernetes

"Zero to Hero" Training

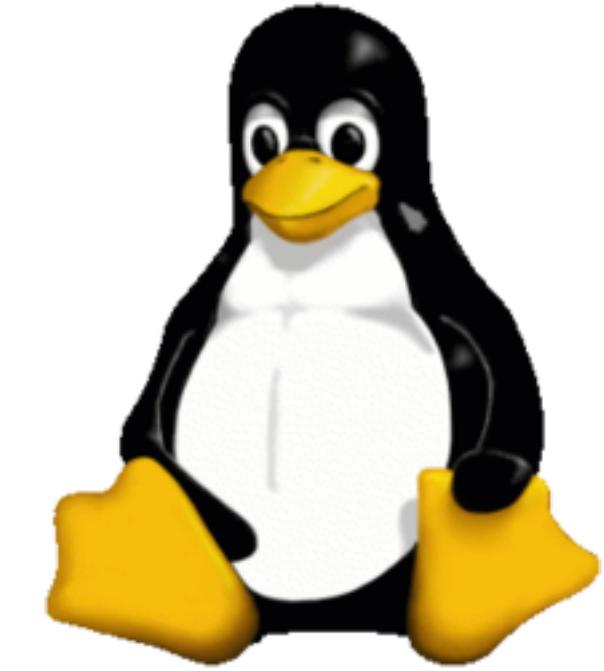
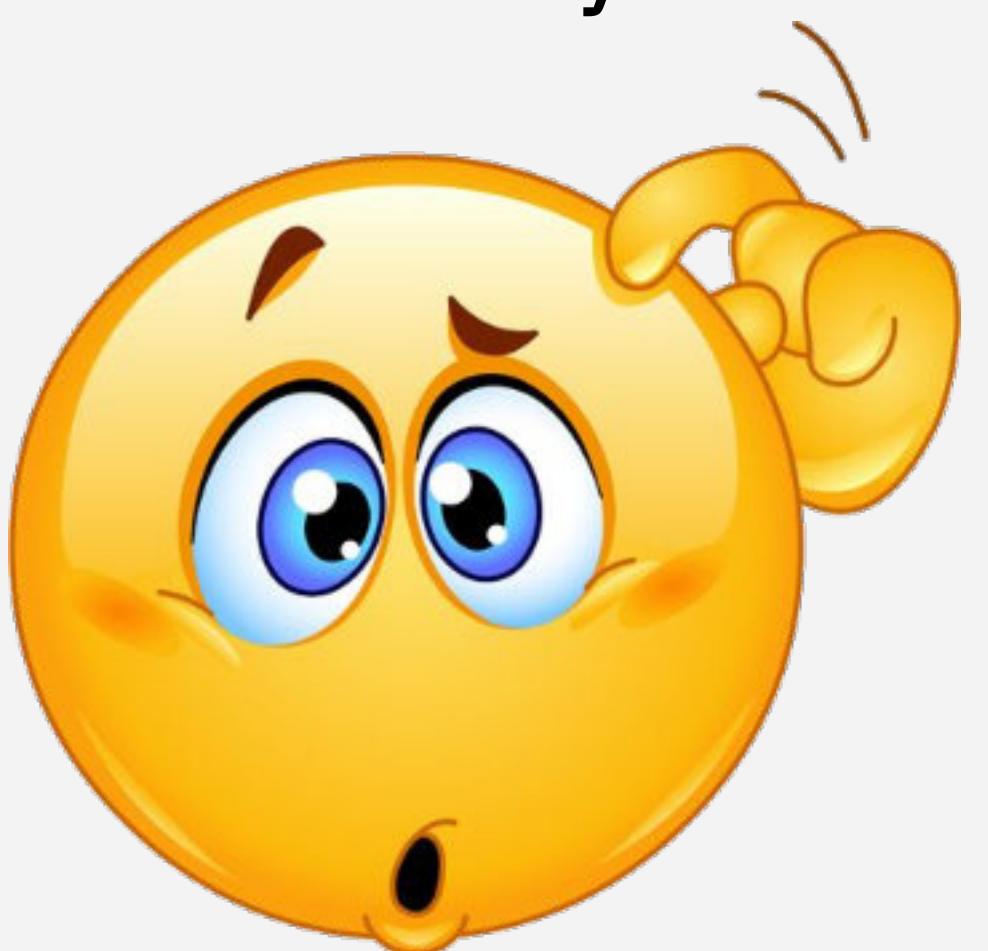


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 - Docker Containers & Kubernetes

Coke-a-Cola Wars

...I can't take it anymore

- Pepsi - Coke
- Paper - Plastic
- Windows - Mac
- So many choices
- So little productivity



Mac OS



I'm a PC.



I'm a Mac.

We will be using Ubuntu 18.04

A scene from the movie WarGames. Two young boys, Matt (Mathew Broderick) and Andrew (Ally Sheedy), are sitting in front of a computer monitor. Matt is on the left, wearing a brown leather jacket, and Andrew is on the right, wearing a dark t-shirt. They both have surprised or concerned expressions. The computer screen is visible behind them, showing a blue and white graphical interface.

**It's a UNIX system.
I know this.**

Some Assembly Required

- Tools you will need to complete this lab:
 - Computer running macOS/OS X, Linux, or Windows*
 - Internet Access to download boxes
 - Text Editor (...i will use Atom.io)
 - GitHub Account
 - PC users must have "VT-x/AMD-V hardware acceleration" turned on in your BIOS for VirtualBox to work.



* Windows users will need an ssh client

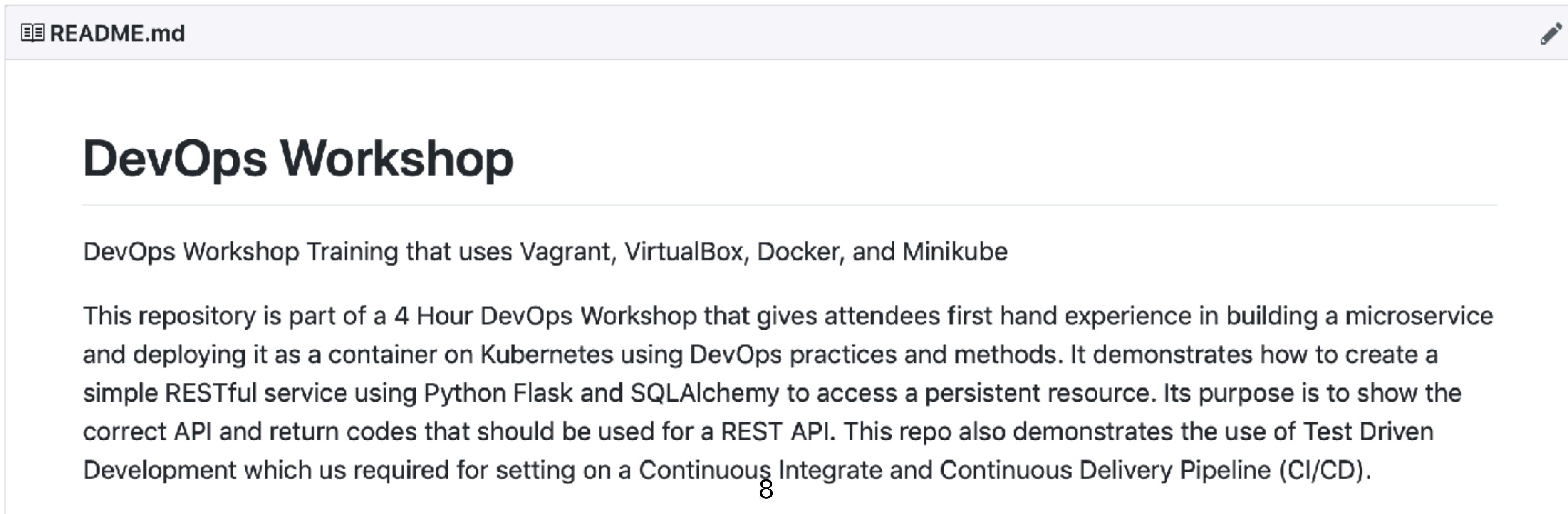
Prerequisite Software for Hands-On Sessions



Prerequisite Software Installation Instructions

<https://github.com/rofrano/devops-workshop>

Cut-n-paste from the README.md



The screenshot shows a GitHub README.md editor interface. The title bar says "README.md". The main content area contains the following text:

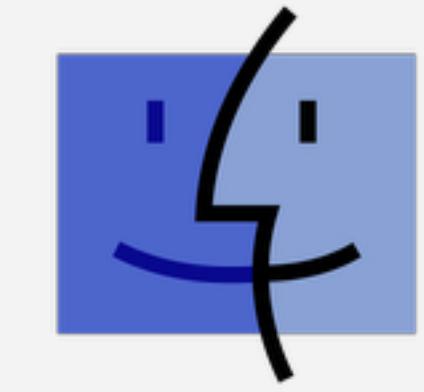
DevOps Workshop

DevOps Workshop Training that uses Vagrant, VirtualBox, Docker, and Minikube

This repository is part of a 4 Hour DevOps Workshop that gives attendees first hand experience in building a microservice and deploying it as a container on Kubernetes using DevOps practices and methods. It demonstrates how to create a simple RESTful service using Python Flask and SQLAlchemy to access a persistent resource. Its purpose is to show the correct API and return codes that should be used for a REST API. This repo also demonstrates the use of Test Driven Development which us required for setting on a Continuous Integrate and Continuous Delivery Pipeline (CI/CD).

macOS Users

If you are using a Mac you can use Homebrew*



Mac OS

Install Homebrew: (<https://brew.sh>)

```
ruby -e "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/master/install)"
```

Install VirtualBox and Vagrant using Homebrew:

```
brew cask install virtualbox  
brew cask install vagrant
```

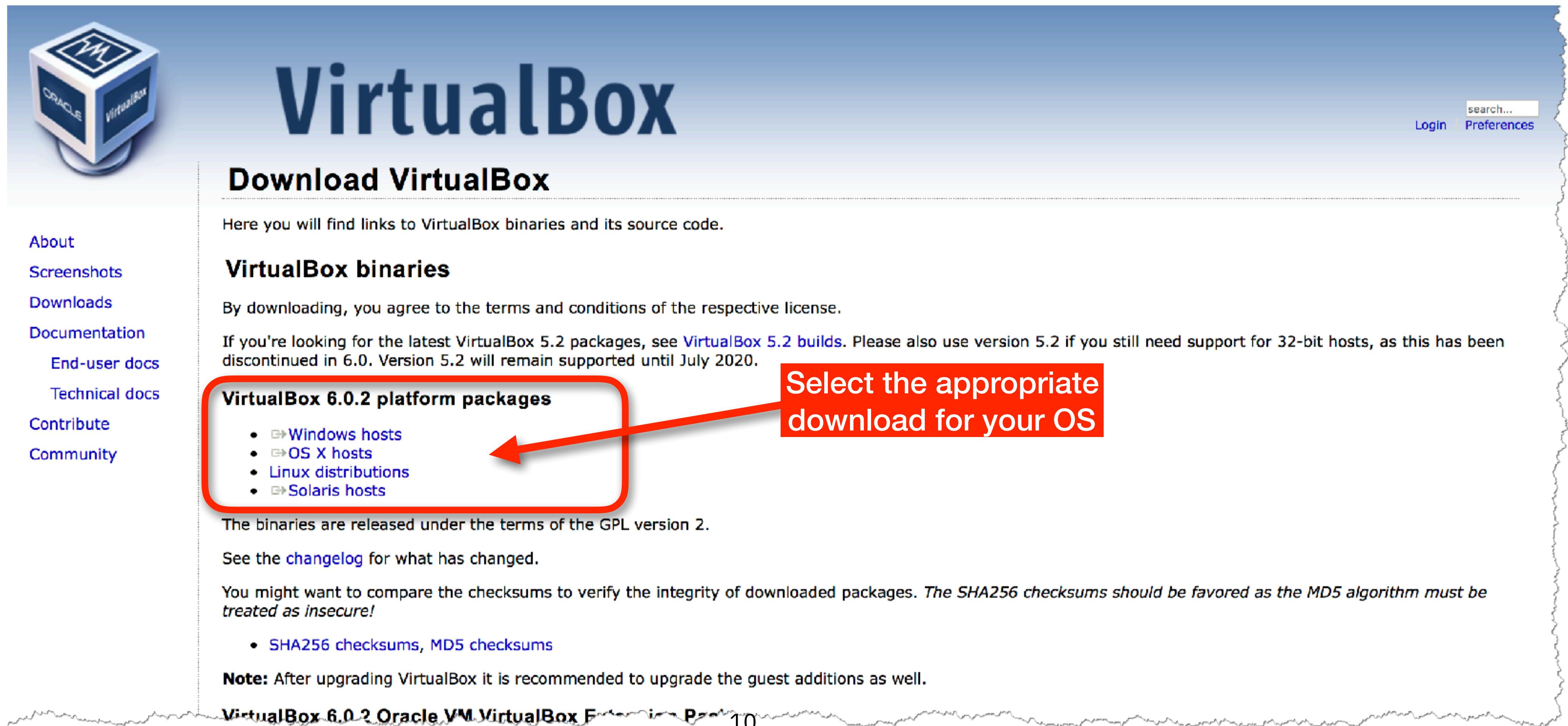


* You must open a terminal (shell) to execute these commands

Windows Users Download and Install VirtualBox



<https://www.virtualbox.org/wiki/Downloads>



The screenshot shows the 'Download VirtualBox' page of the VirtualBox website. At the top left is the Oracle VM VirtualBox logo. On the right are links for 'Login', 'search...', and 'Preferences'. The main title 'VirtualBox' is in large blue letters. Below it is a sub-section title 'Download VirtualBox'. A text block says: 'Here you will find links to VirtualBox binaries and its source code.' A section titled 'VirtualBox binaries' contains a note about agreeing to terms and conditions. Another note mentions that version 5.2 is discontinued in 6.0 and supported until July 2020. A red box highlights the 'VirtualBox 6.0.2 platform packages' section, which lists 'Windows hosts', 'OS X hosts', 'Linux distributions', and 'Solaris hosts'. A red callout arrow points from a red box containing the text 'Select the appropriate download for your OS' to the highlighted section. The bottom of the page includes a note about GPL version 2, a changelog link, a note about checksums, and a note about upgrading guest additions.

Select the appropriate download for your OS

VirtualBox 6.0.2 platform packages

- [Windows hosts](#)
- [OS X hosts](#)
- [Linux distributions](#)
- [Solaris hosts](#)

The binaries are released under the terms of the GPL version 2.

See the [changelog](#) for what has changed.

You might want to compare the checksums to verify the integrity of downloaded packages. *The SHA256 checksums should be favored as the MD5 algorithm must be treated as insecure!*

- [SHA256 checksums](#), [MD5 checksums](#)

Note: After upgrading VirtualBox it is recommended to upgrade the guest additions as well.

Windows Users Download and Install Vagrant



<https://www.vagrantup.com/downloads.html>

The screenshot shows the Vagrant download page. At the top, there's a navigation bar with the HashiCorp logo, a search bar, and links for HashiCorp Suite, Intro, Docs, Book, VMware, Community, Download, and GitHub. Below the navigation bar, the main heading is "Download Vagrant". A sub-section title "Downloads" is visible. The page lists four operating systems for download:

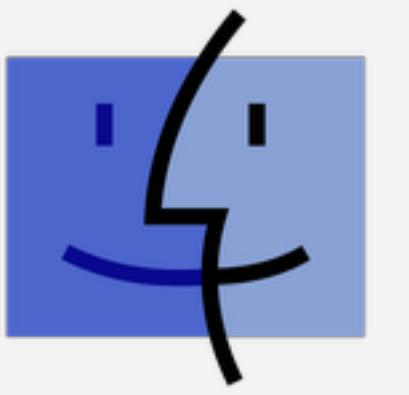
- Debian (32-bit | 64-bit)
- Windows (32-bit | 64-bit)
- Centos (32-bit | 64-bit)
- Mac OS X (64-bit)

A large red box highlights the first item, "Debian (32-bit | 64-bit)". A red arrow points from a text box containing the instruction "Select the appropriate download for your OS" towards the highlighted "Debian" entry.

Select the appropriate download for your OS

Operating System	Architecture
Debian	32-bit 64-bit
Windows	32-bit 64-bit
Centos	32-bit 64-bit
Mac OS X	64-bit

macOS Users



Mac OS

- If you are using a Mac you can skip the next two charts 😊
- Windows users need to do more configuration... 😞



I'm a PC.



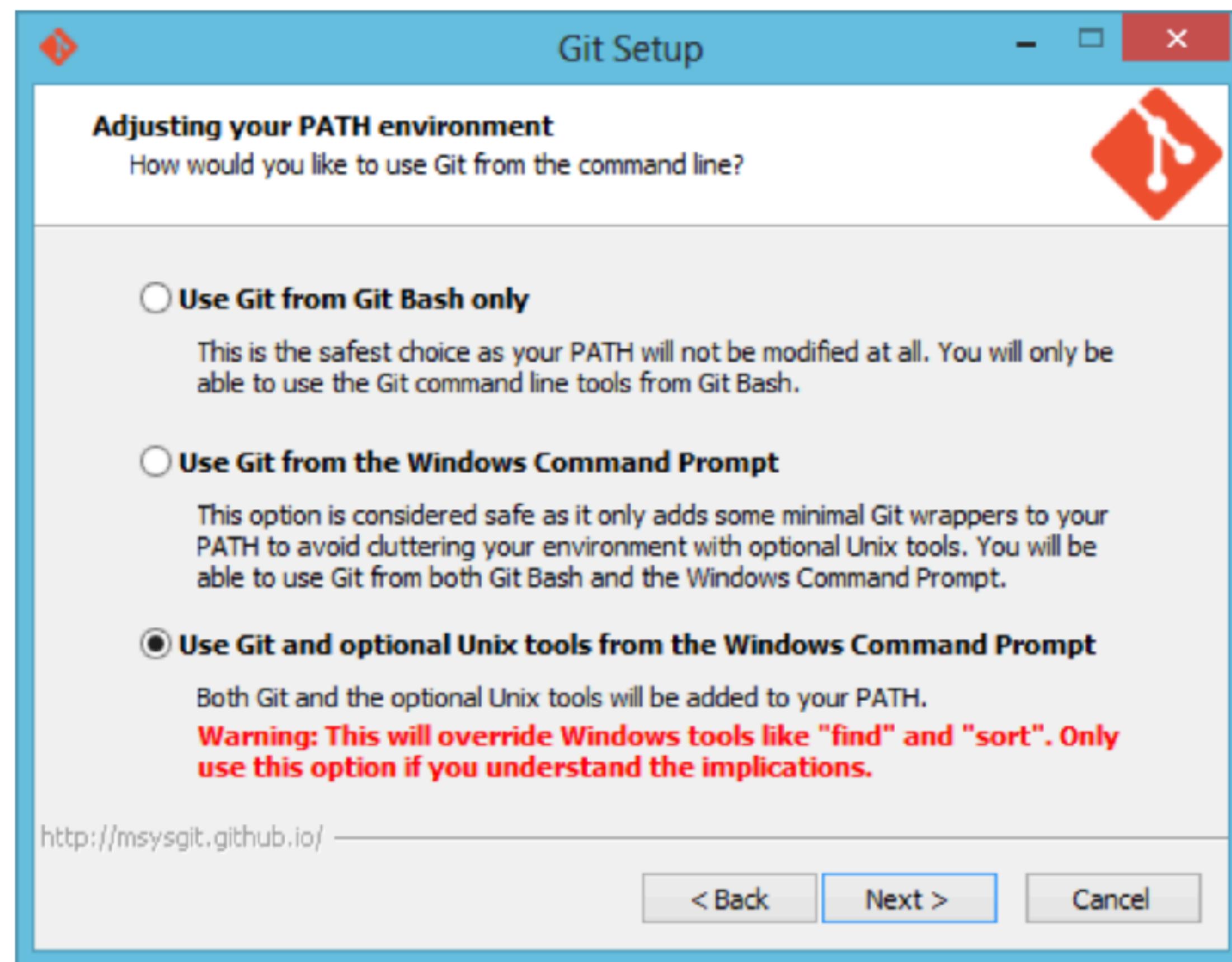
I'm a Mac.

Windows Install SSH



- Vagrant requires an SSH client which Windows doesn't have by default
- The easiest way to solve this is to install **git** with the optional unix tools from:
<http://git-scm.com/downloads>
- Here is a great tutorial:

<http://tech.osteel.me/posts/2015/01/25/how-to-use-vagrant-on-windows.html>



Windows VT-x/VT-d



- VirtualBox requires that Hardware-Assisted Virtualization is enabled in order to work in 64-bit mode.
- Some PC laptop manufacturers disable this by default. ^_(ツ)_/^
- If when you try and bring vagrant up you get an error that it cannot load the 64-bit VM then you need to change your BIOS settings to enable VT-x/VT-d
- If you don't know how to do this, you need to consult with your PC documentation because this is different for every manufacturer.
(... or just buy a Mac 😊)

Install VirtualBox and Vagrant

- Once you have the downloads for your OS:
 - Install VirtualBox taking all of the defaults
 - If prompted to download extensions say "Yes"
 - Install Vagrant taking all of the defaults
- You should now have the pre-requisite software installed

**AND NOW BACK TO
OUR REGULARLY
SCHEDULED
PROGRAM**

How many of you know Git?



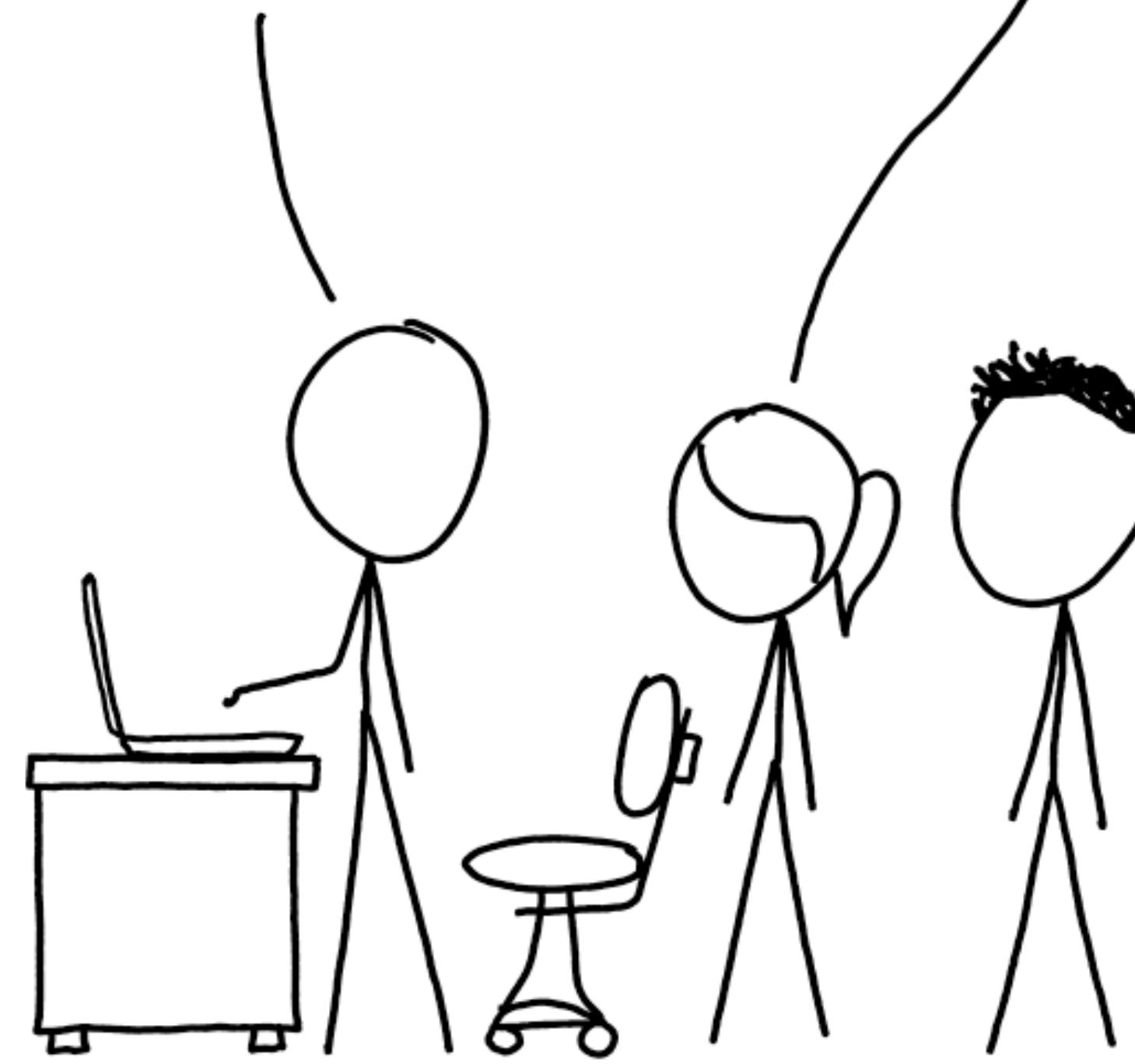
How many of you know Git?



THIS IS GIT. IT TRACKS COLLABORATIVE WORK ON PROJECTS THROUGH A BEAUTIFUL DISTRIBUTED GRAPH THEORY TREE MODEL.

COOL. HOW DO WE USE IT?

NO IDEA. JUST MEMORIZIZE THESE SHELL COMMANDS AND TYPE THEM TO SYNC UP. IF YOU GET ERRORS, SAVE YOUR WORK ELSEWHERE, DELETE THE PROJECT, AND DOWNLOAD A FRESH COPY.



EDI



HOW TO BECOME A GIT JEDI



HOW TO BECOME A GIT JEDI

Rule #1: Create a Git repository for every new project



HOW TO BECOME A GIT JEDI

Rule #1: Create a Git repository for every new project

Rule #2: Create a new branch for every new feature



HOW TO BECOME A GIT JEDI

Rule #1: Create a Git repository for every new project

Rule #2: Create a new branch for every new feature

Rule #3: Use Pull Requests to merge code to Master



Git Command Workflow



workspace

staging

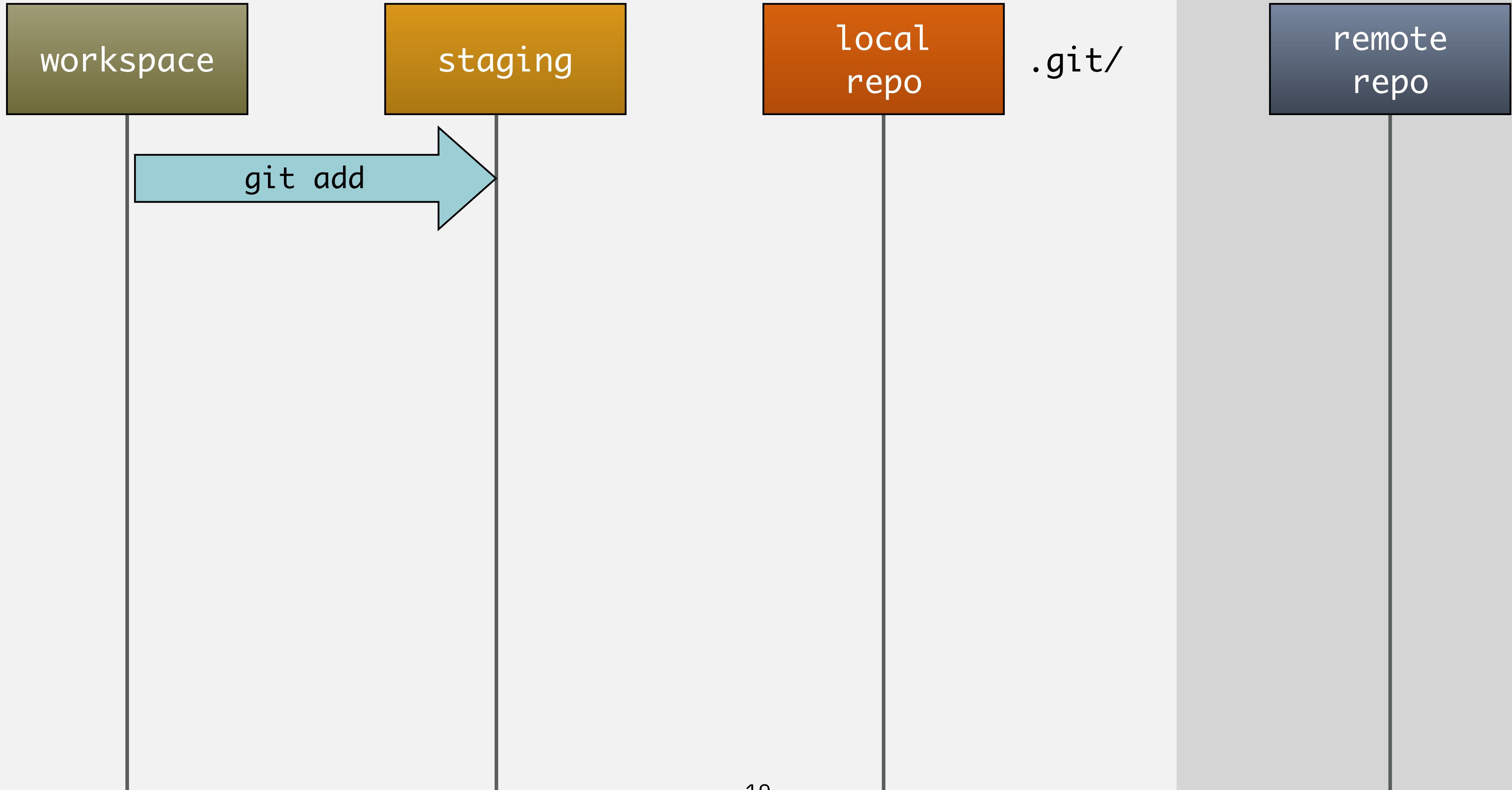
local
repo

.git/

remote
repo

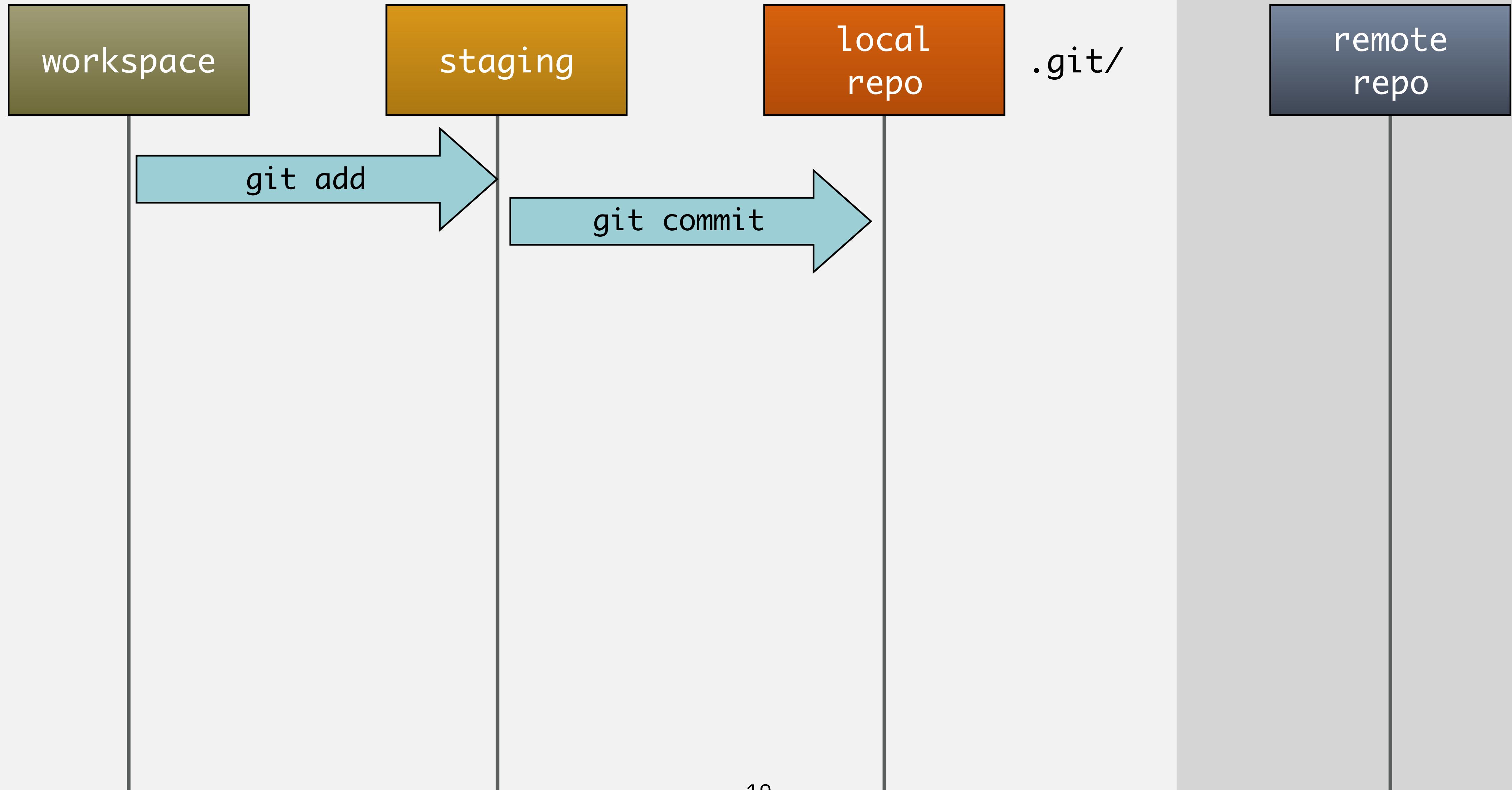


Git Command Workflow



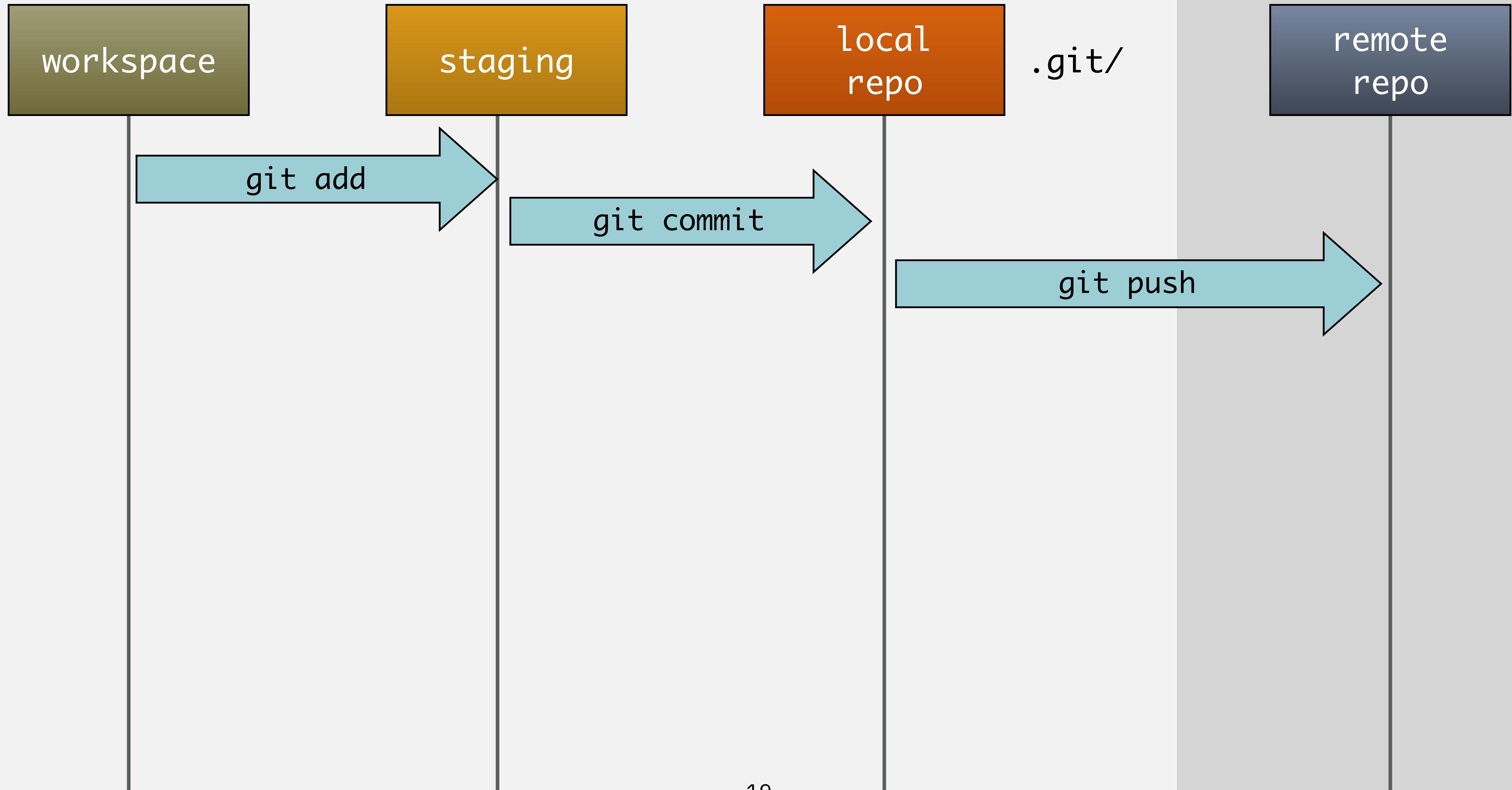


Git Command Workflow



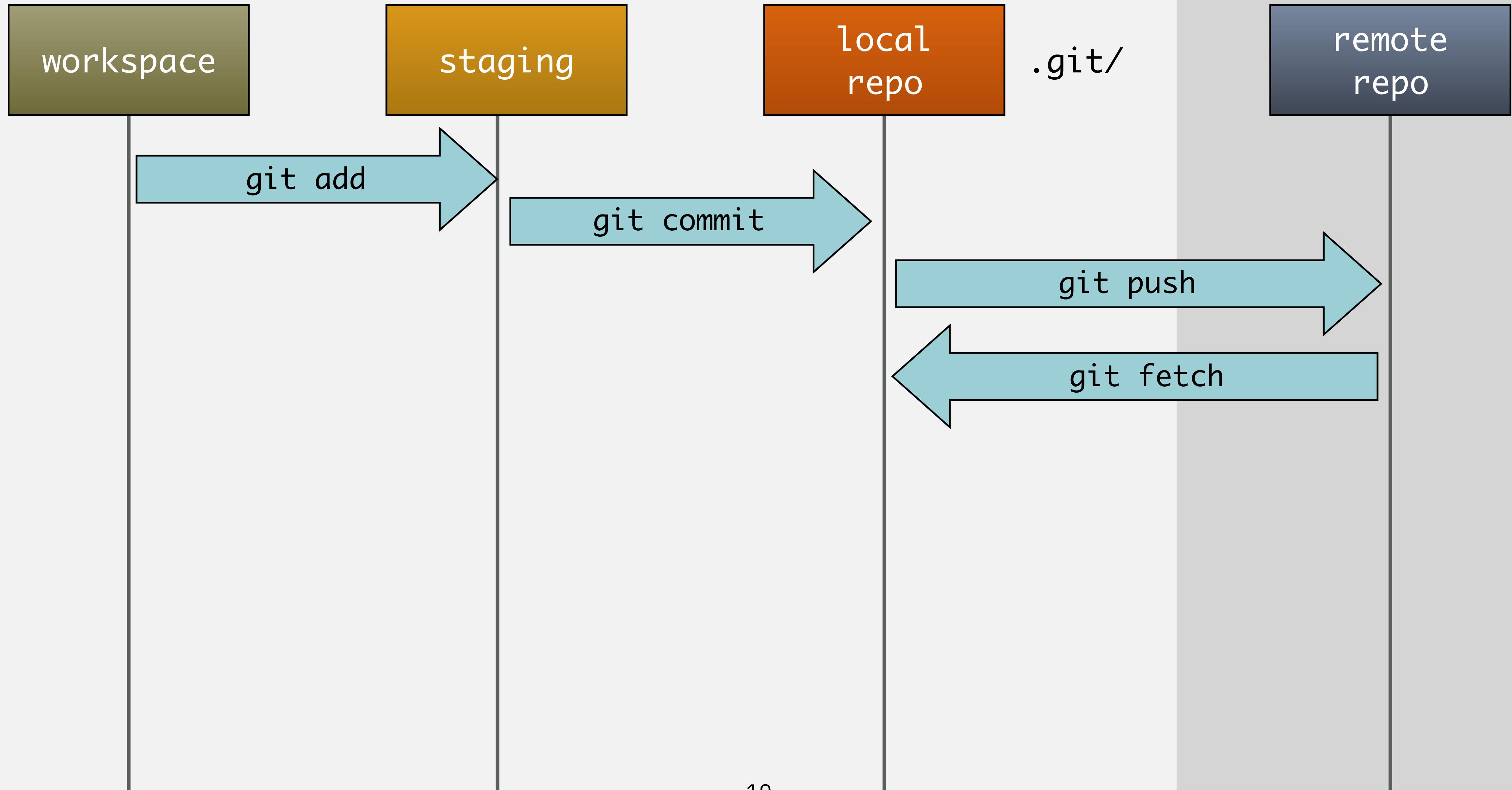


Git Command Workflow



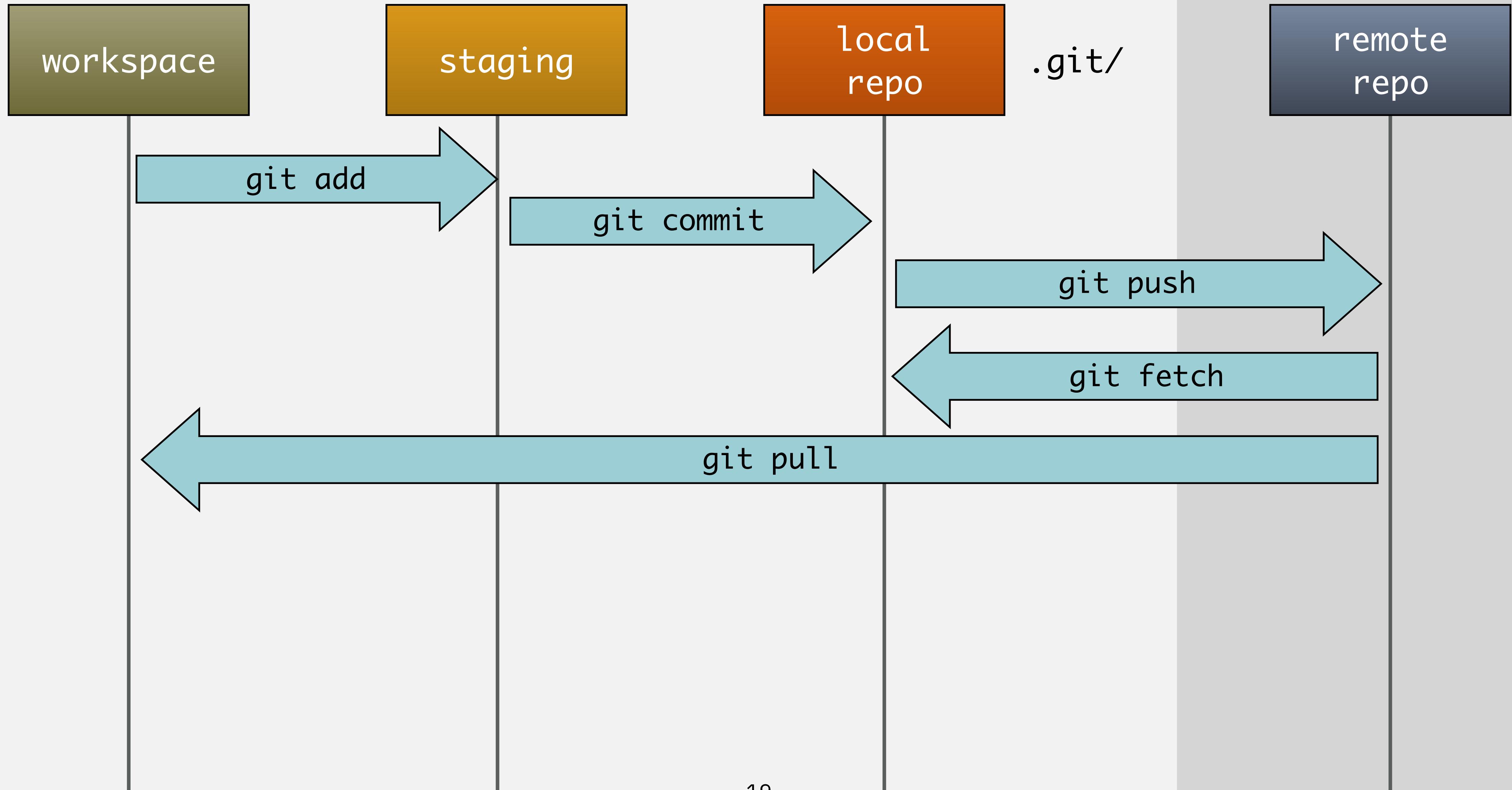


Git Command Workflow



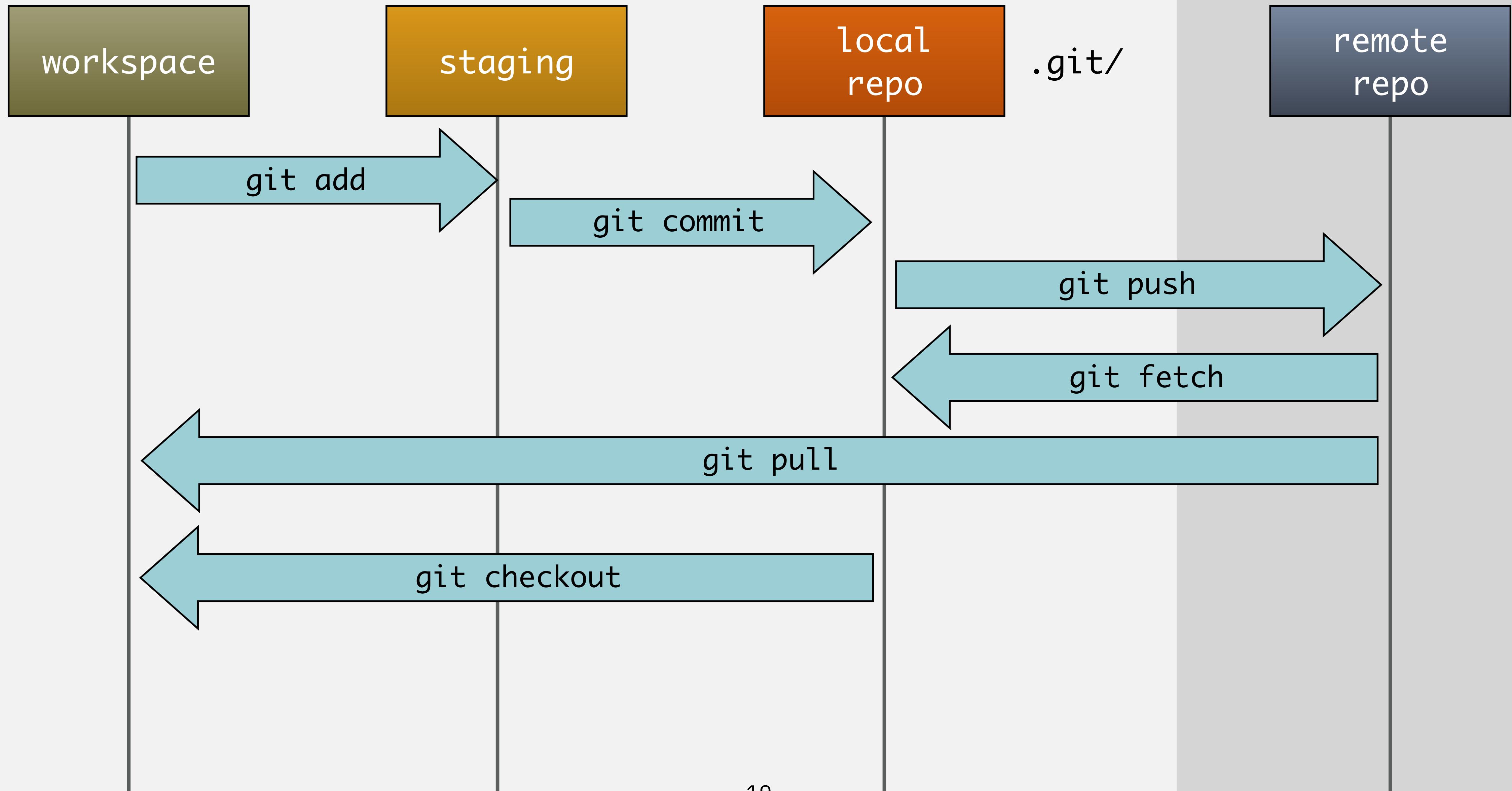


Git Command Workflow



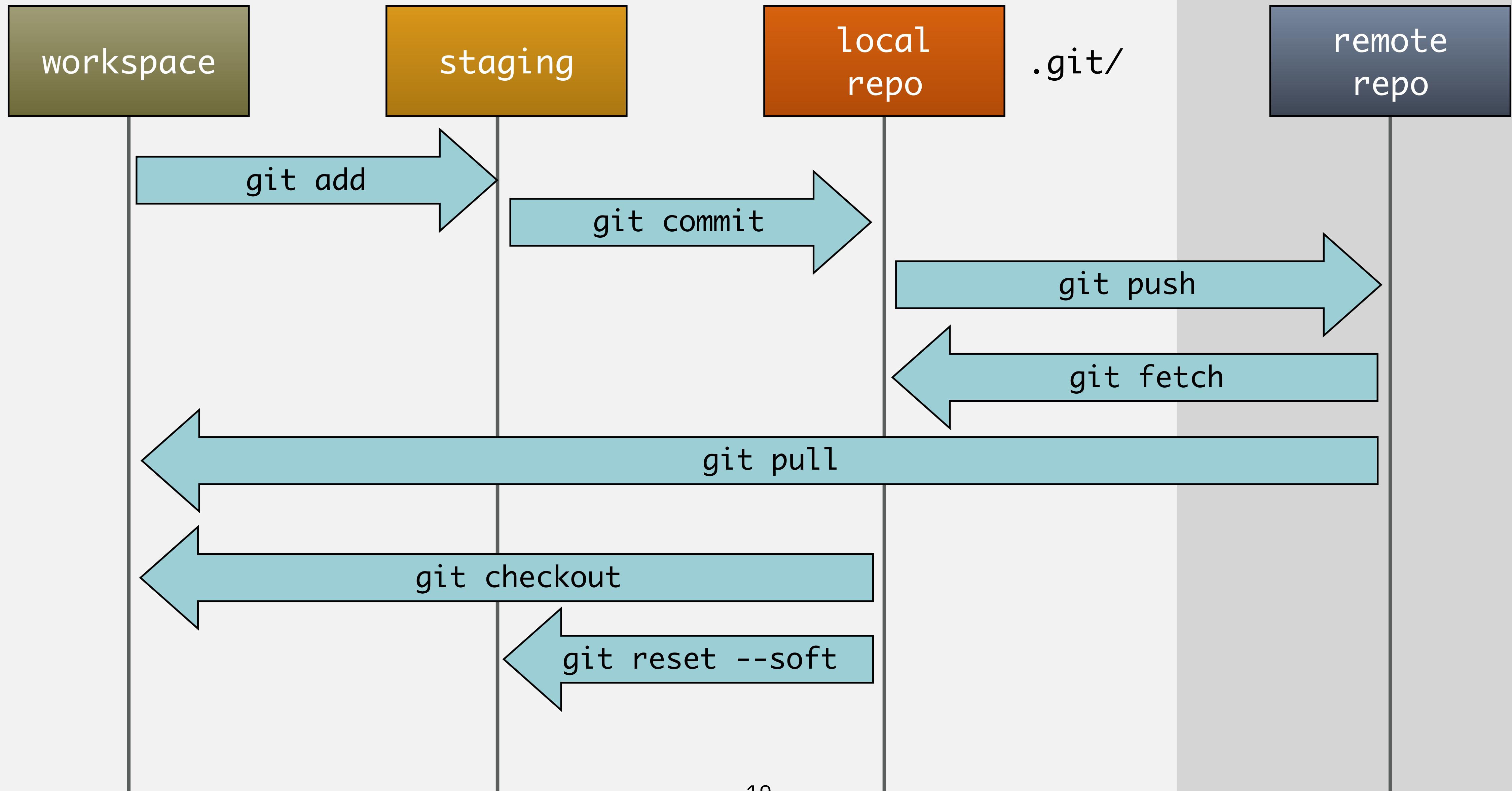


Git Command Workflow



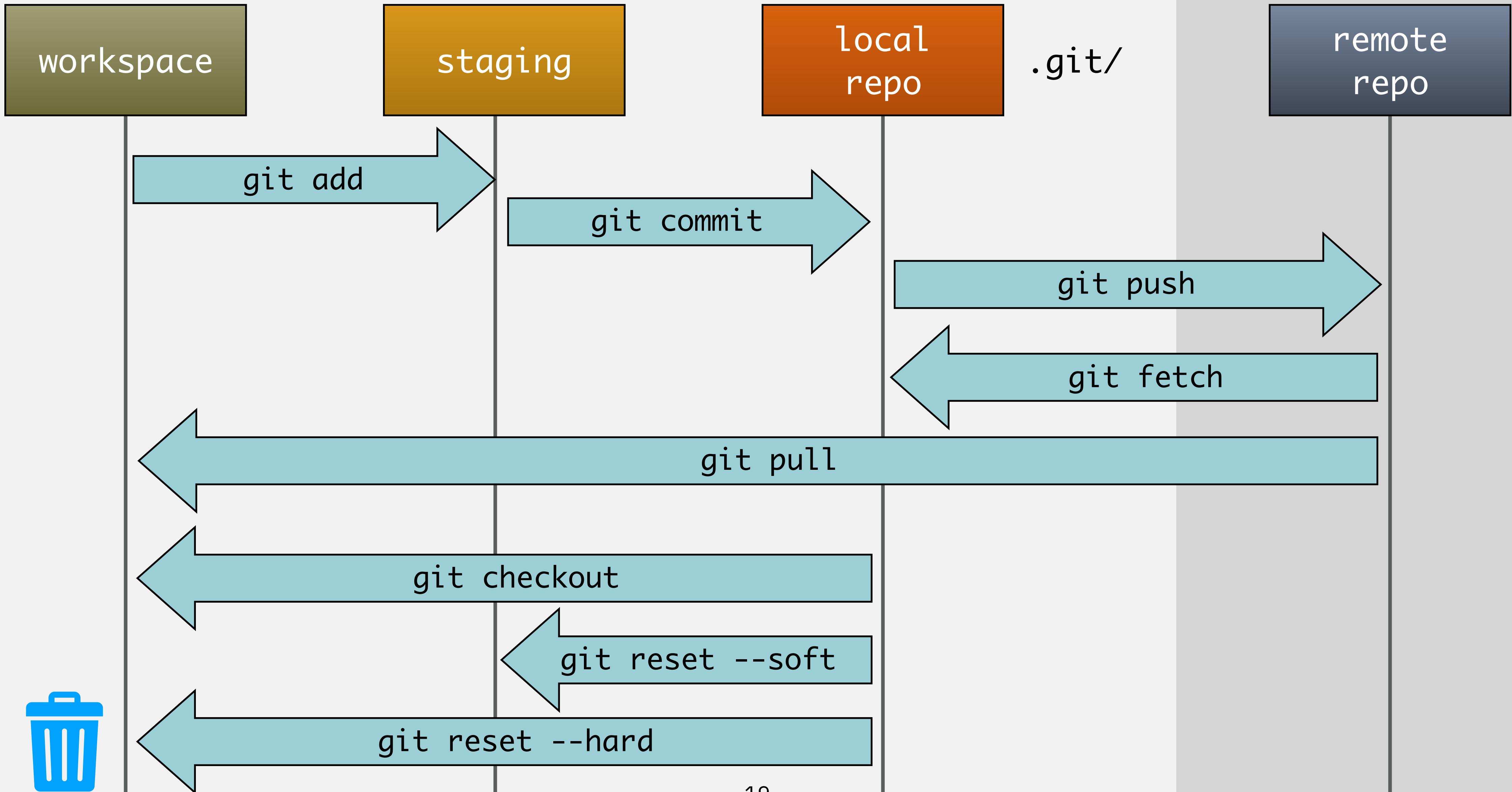


Git Command Workflow

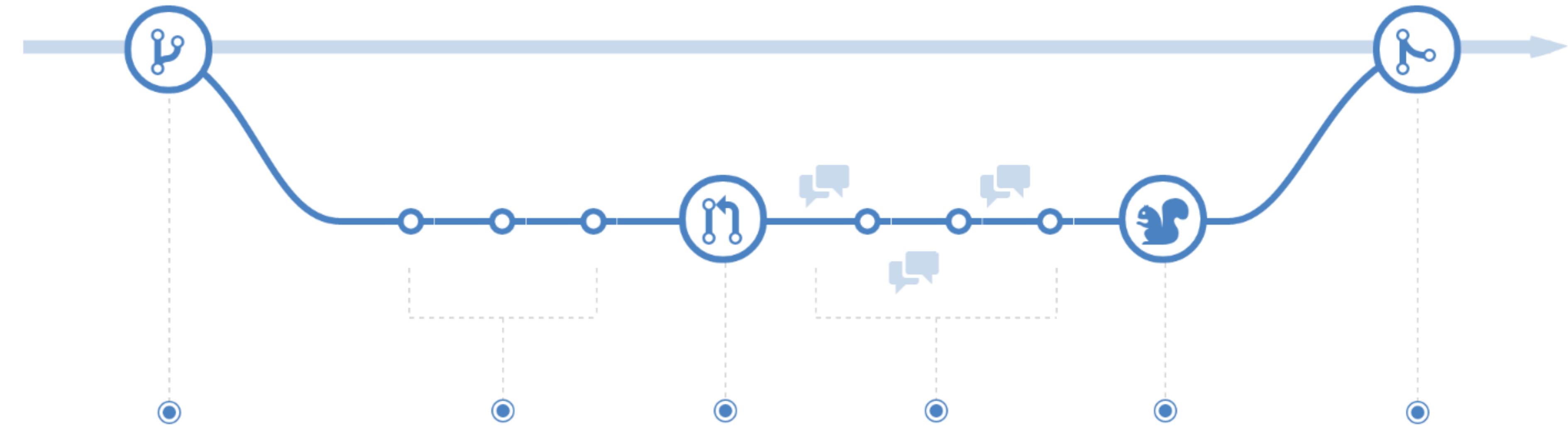




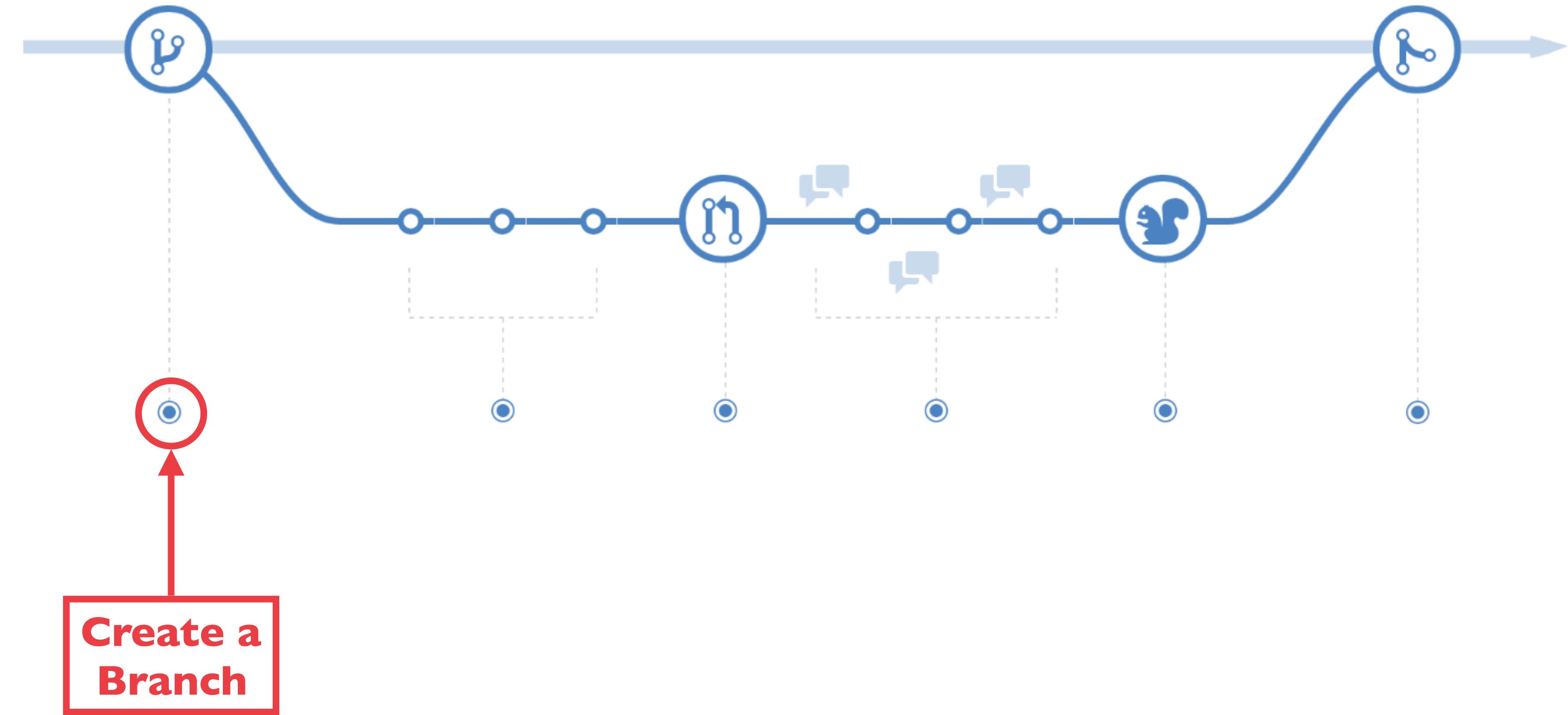
Git Command Workflow



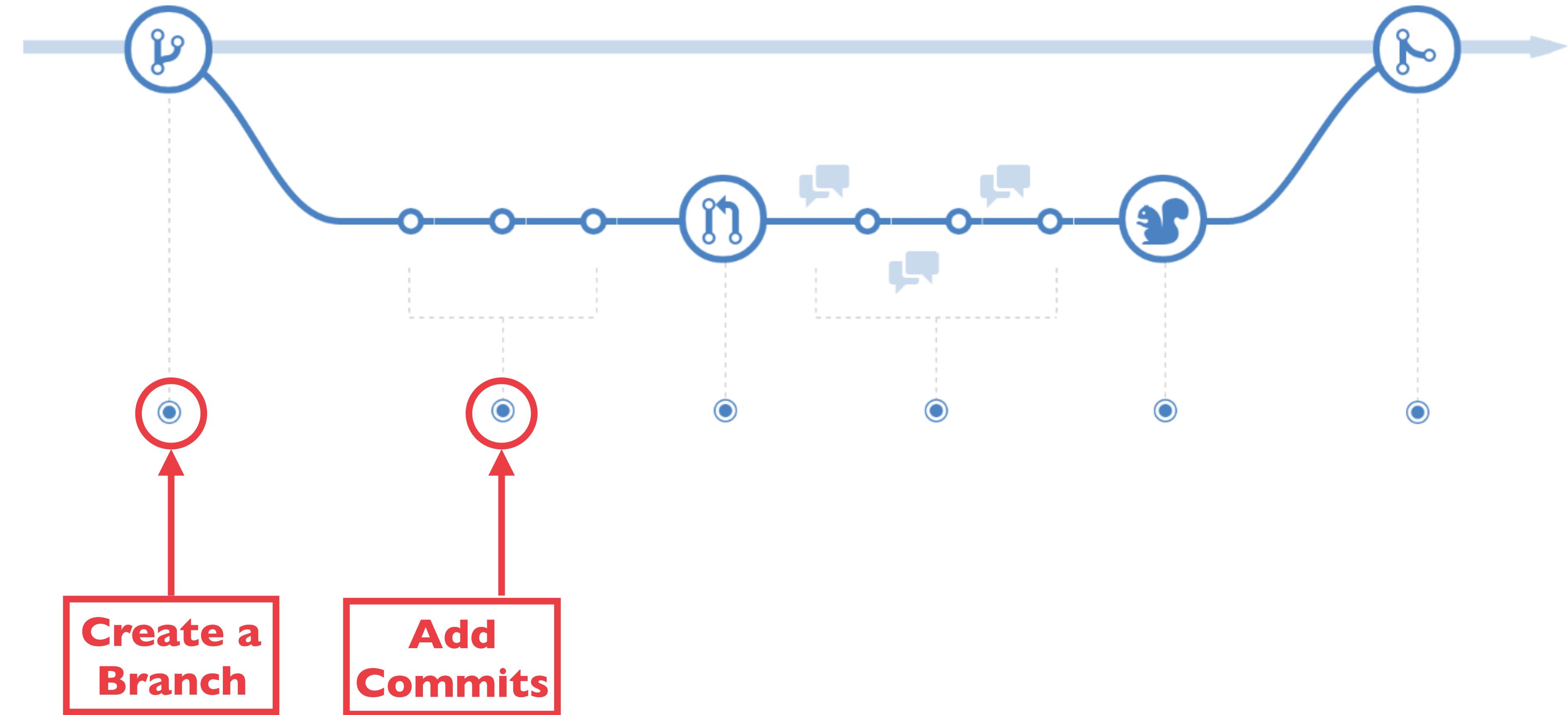
Git Feature Branch Workflow



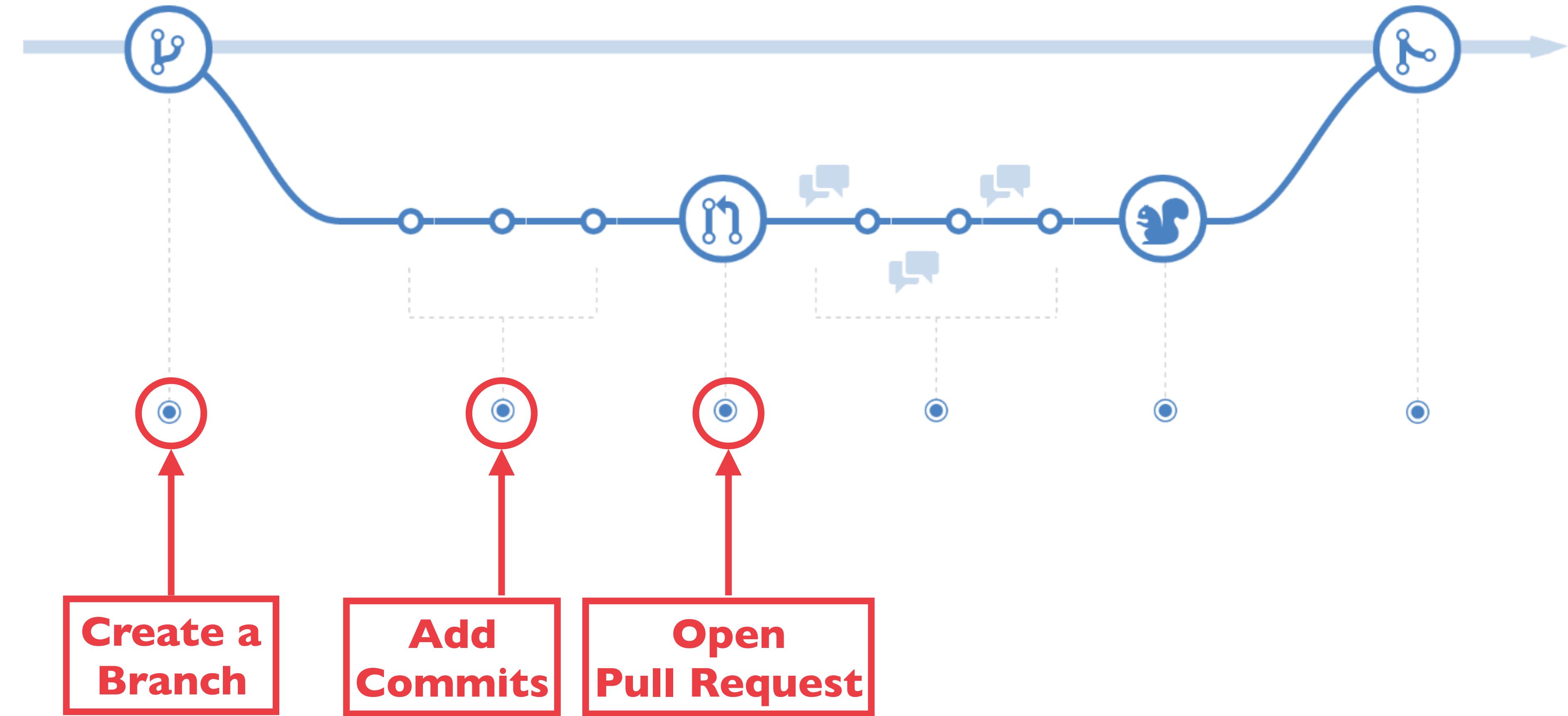
Git Feature Branch Workflow



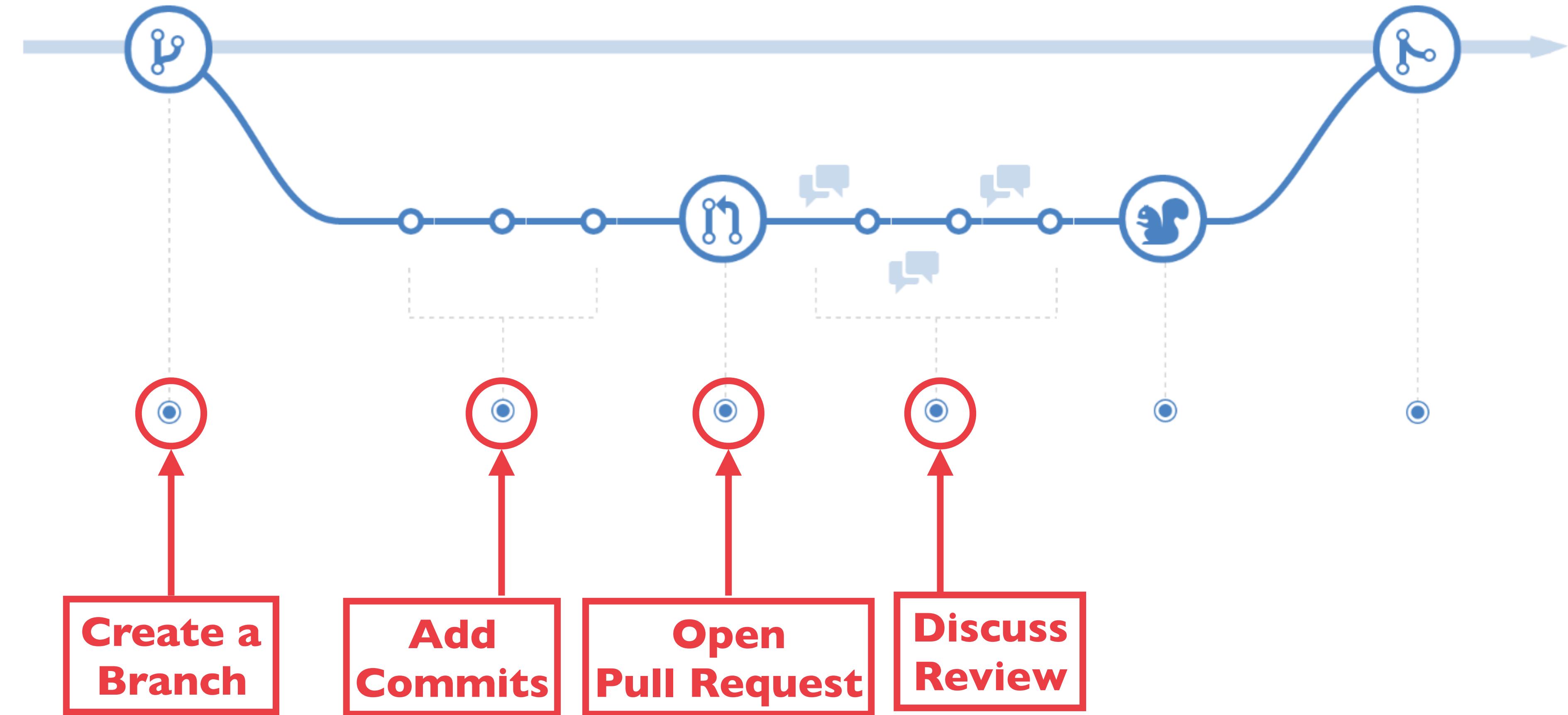
Git Feature Branch Workflow



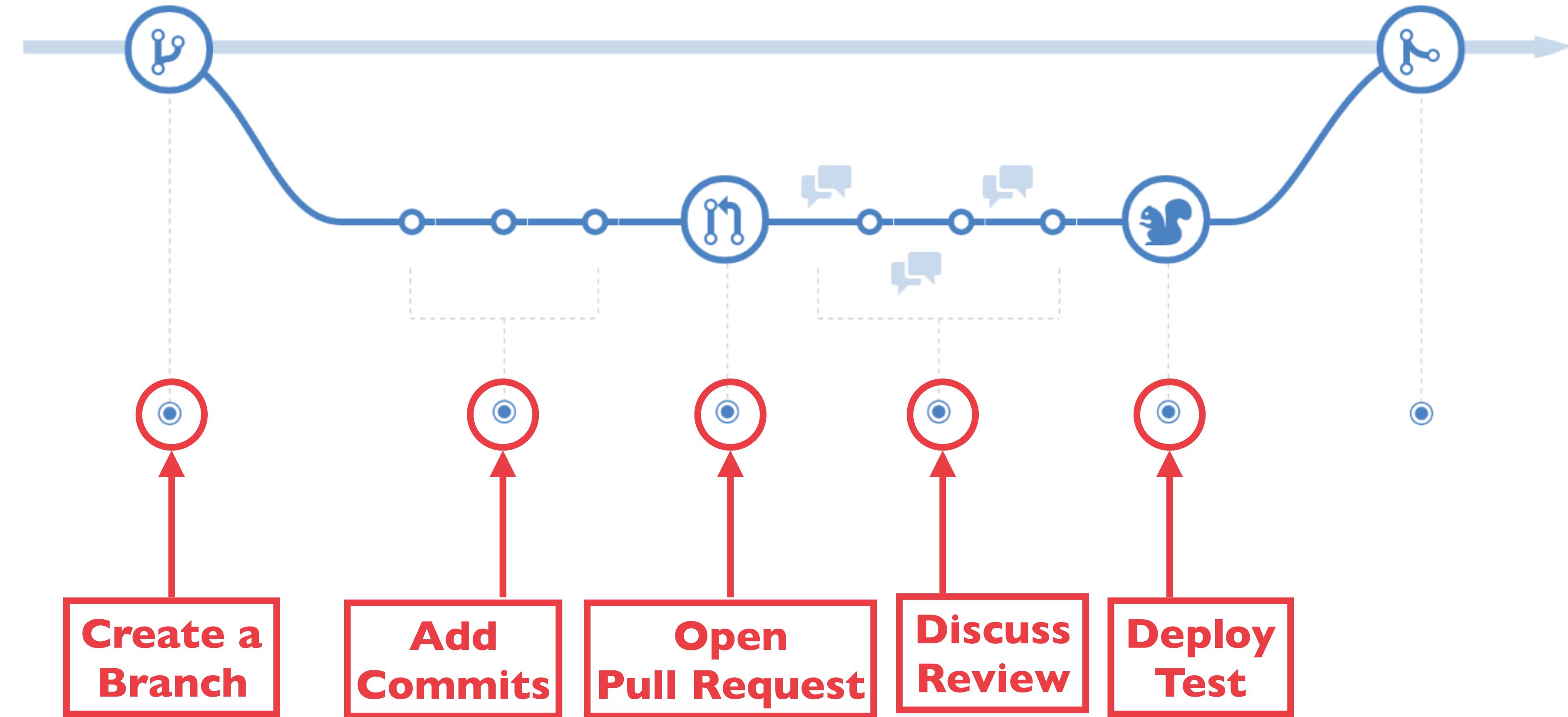
Git Feature Branch Workflow



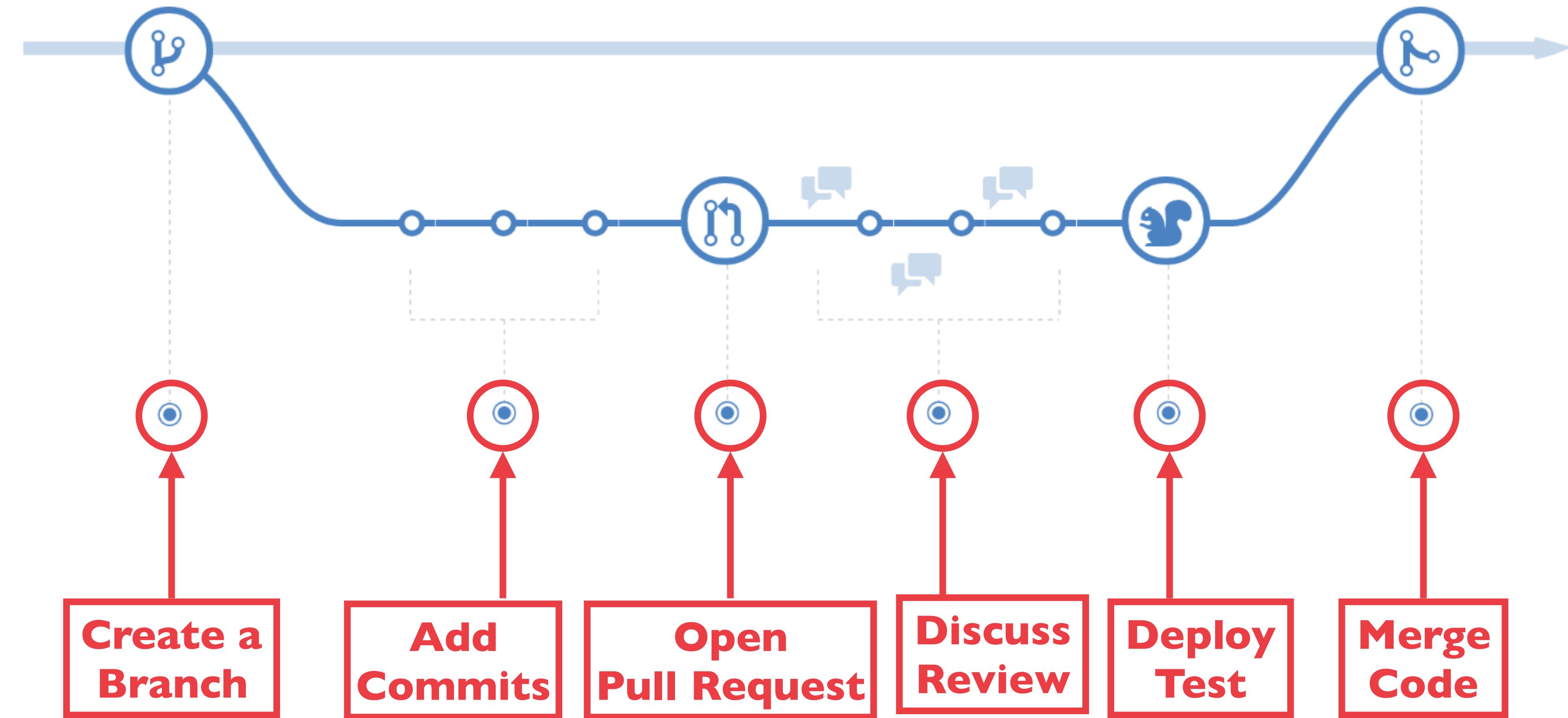
Git Feature Branch Workflow



Git Feature Branch Workflow



Git Feature Branch Workflow



Let's Get Forkin'



- The source for this lab can be FORKED from:

<https://github.com/rofrano/devops-workshop>



**You must fork the code so that you can push back
to your own copy and trigger the DevOps Pipeline
that we will set up**

Fork Me On GitHub

The screenshot shows a GitHub repository page for the user 'rofrano' named 'devops-workshop'. The page includes a navigation bar with links for Pull requests, Issues, Marketplace, and Explore. Below the navigation is a search bar and a header with the repository name and statistics: 0 Watchers, 0 Stars, and 0 Forks. A 'Code' tab is selected, showing 4 commits, 1 branch, 0 releases, 1 contributor, and an Apache-2.0 license. The commit history lists four commits by 'rofrano': 'Expanded on using vagrant commands' (7 days ago), '.gitignore' (Initial load, 7 days ago), 'LICENSE' (Initial commit, 8 days ago), and 'README.md' (Expanded on using vagrant commands, 7 days ago). A 'Vagrantfile' commit (Initial load, 7 days ago) is also listed. At the bottom, there is a large 'DevOps Workshop' heading.

rofrano / devops-workshop

Code Issues 0 Pull requests 0 Projects 0 Wiki Security Insights Settings

DevOps Workshop Training that uses Vagrant, VirtualBox, Docker, and Minikube

Manage topics

4 commits 1 branch 0 releases 1 contributor Apache-2.0

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

rofrano Expanded on using vagrant commands Latest commit 123fcce 7 days ago

.gitignore Initial load 7 days ago

LICENSE Initial commit 8 days ago

README.md Expanded on using vagrant commands 7 days ago

Vagrantfile Initial load 7 days ago

README.md

DevOps Workshop

Fork me on GitHub

Fork Me On GitHub

Fork me on GitHub

The screenshot shows a GitHub repository page for 'rofrano / devops-workshop'. A red box highlights the URL in the browser's address bar: <https://github.com/rofrano/devops-workshop>. A red arrow points from this URL to the main repository URL displayed prominently in a large orange box at the top of the page.

<https://github.com/rofrano/devops-workshop>

DevOps Workshop Training that uses Vagrant, VirtualBox, Docker, and Minikube

Manage topics

4 commits 1 branch 0 releases 1 contributor Apache-2.0

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

File	Description	Time
.gitignore	Initial load	7 days ago
LICENSE	Initial commit	8 days ago
README.md	Expanded on using vagrant commands	7 days ago
Vagrantfile	Initial load	7 days ago

Latest commit 123fcce 7 days ago

DevOps Workshop

Fork Me On GitHub

Fork me on GitHub

A screenshot of a GitHub repository page for 'rofrano / devops-workshop'. The page shows basic repository statistics: 4 commits, 1 branch, and a master branch. A large orange callout box with the text 'Fork the code to your own account' points to the 'Fork' button in the top right corner of the header. The 'Fork' button is highlighted with a red border. The URL in the browser bar is <https://github.com/rofrano/devops-workshop>.

rofrano / devops-workshop

Code Issues Pull requests Projects Wiki Security Insights Settings

DevOps Workshop Training that uses Vagrant, VirtualBox, Docker, and Minikube

Manage topics

4 commits 1 branch

Branch: master New pull request

Create new file Upload files Find File Clone or download

rofrano Expanded on using vagrant commands

.gitignore Initial load 7 days ago

LICENSE Initial commit 8 days ago

README.md Expanded on using vagrant commands 7 days ago

Vagrantfile Initial load 7 days ago

README.md

DevOps Workshop

A Forked Repo Example

This repo demonstrates how to deploy a simple Python Flask RESTful service using Bluemix Cloud Foundry

This repo knows that it was forked from nyu-devops

14 commits · 1 branch · 0 releases · 1 contributor

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

This branch is 4 commits ahead of nyu-devops:master.

John J. Rofrano synced with upstream · Latest commit 272169c 40 minutes ago

static synced with upstream 40 minutes ago

tests fixed problems with GUI and search a day ago

.cfignore fixed problems with GUI and search a day ago

File	Status	Last Commit
static	synced with upstream	40 minutes ago
tests	fixed problems with GUI and search	a day ago
.cfignore	fixed problems with GUI and search	a day ago

Clone your Fork and Vagrant UP!



- You need to clone your fork of my repo to bring it down to your computer

```
git clone https://github.com/<your_git_account>/devops-workshop.git  
cd devops-workshop  
vagrant up
```



Vagrant Plug-ins

- The `Vagrantfile` can check for required plug-ins and install them for you ...but you need to run `vagrant up` again.

```
$ vagrant up
Plugin missing.
Installing the 'vagrant-docker-compose' plugin. This can take a few minutes...
Fetching: vagrant-docker-compose-1.3.0.gem (100%)
Installed the plugin 'vagrant-docker-compose (1.3.0)'!
Dependencies installed, please try the command again.

$ vagrant up
```

You need to run `vagrant up` again!

What's in This Repo?

- Python 3 Pet Shop Demo using PostgreSQL as a persistent store
- `Vagrantfile` with:
 - Python 3 environment
 - PostgreSQL database in a Docker container
 - Minikube, Kubectl
 - Various Ports (e.g., 8080, 5000) forwarded