Intro to Git


HackCU

Learning Goals

- What is **version control** and **Git**?
- Create your first **repository**
- What is **GitHub**?
- What are **branches** and **pull requests**?
- Make your first contribution to open source

bold = you will know these terms and be able to explain them by the end of this workshop

Leave this room feeling confident that you will be able to use Git and collaborate on a group project

What is **version control**?

Version Control

- A system that records and tracks changes to a set of files
- Allows you to efficiently revert files to an earlier state
- Compare changes over time
- What broke the app?

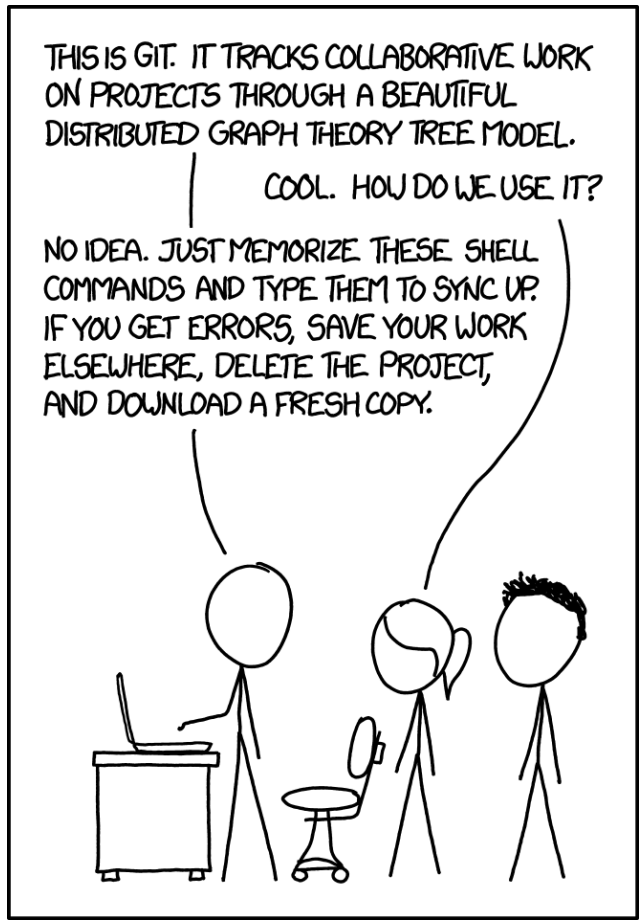
Think of it as a backup. Roll back to a previous version if you screw up.

Essentially a time machine for your project.

Version Control

- Some analogies – not as robust
  - Google Drive (multiple versions)
  - Adobe Photoshop's History
  - Microsoft Words' 'Track Changes'
- 1972 – SCCS with Unix
- 1982 – RCS
- 1986 – CVS
- 2000 – SVN
- April 2005 - Git

What is **Git**?



Source: https://xkcd.com/1597/

Git

- Created by Linus Torvalds https://www.youtube.com/watch?v=4XpnKHJAok8&t=756s
- Distributed Version Control
  - No *master* repository*
  - Each user maintains their own code base
  - Encourages participation allowing everyone to work independently
- Essentially stores snapshots of your repository at different points in time

*No such master repository is built into the Git architecture itself.

Let’s install (G)it

Install Git - Linux

- Most Linux distributions come natively with Git

```
$ sudo apt-get install git
```

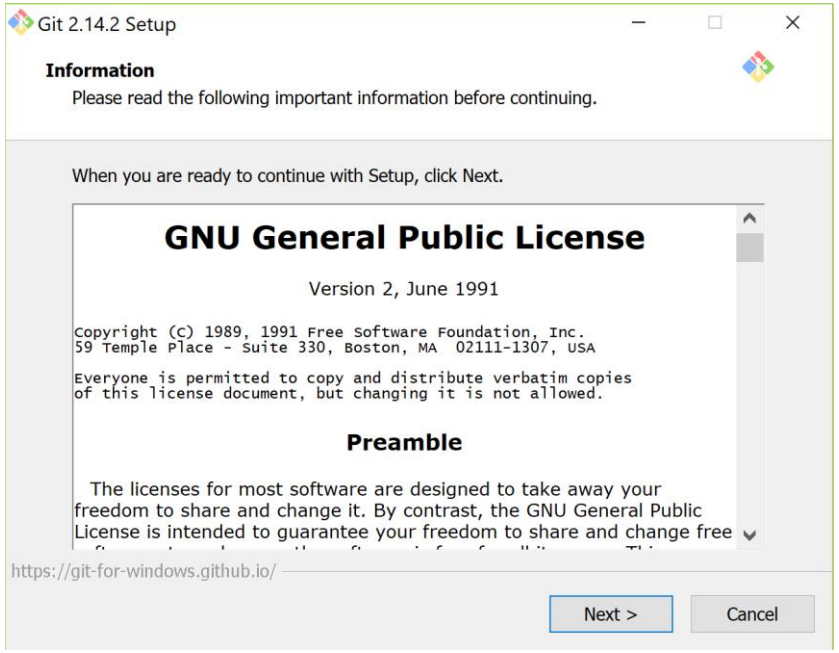
Install Git - MacOS

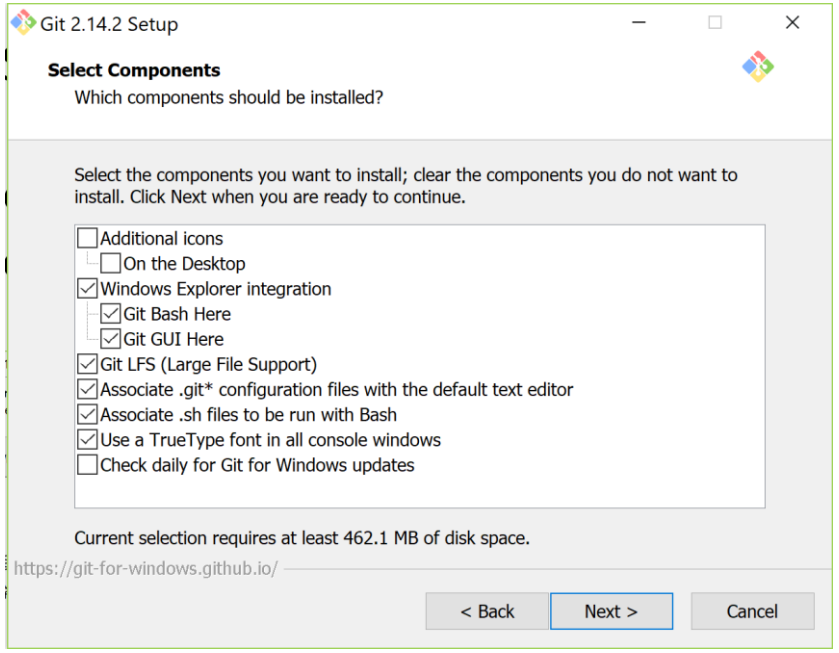
- Install Homebrew from https://brew.sh/
- Install Git with brew

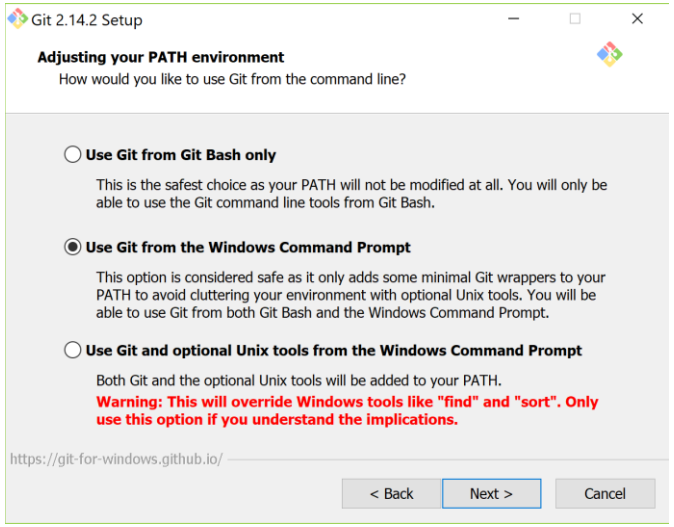
```
$ brew install git
```

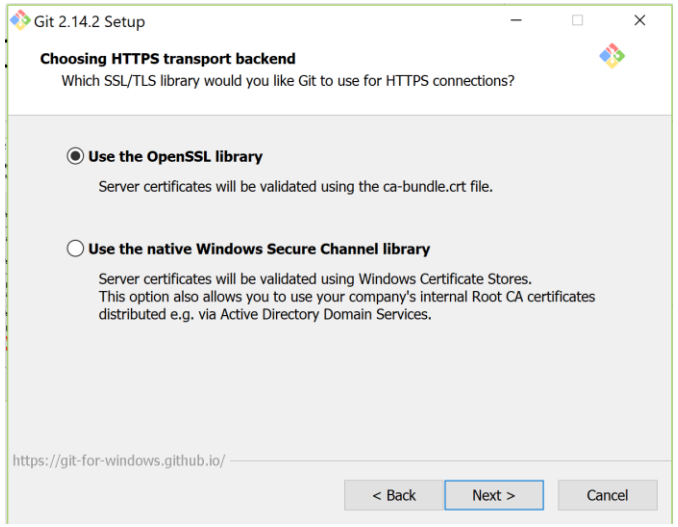
Install Git - Windows

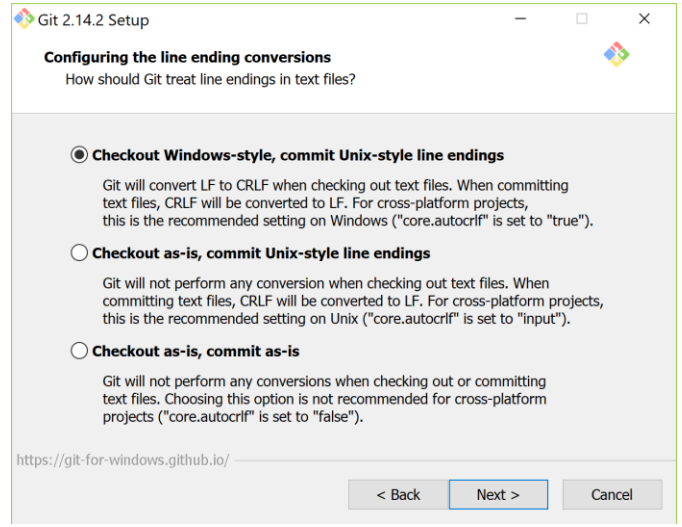
- Go to https://git-scm.com/download/win
- Download **64-bit Git for Windows Setup**

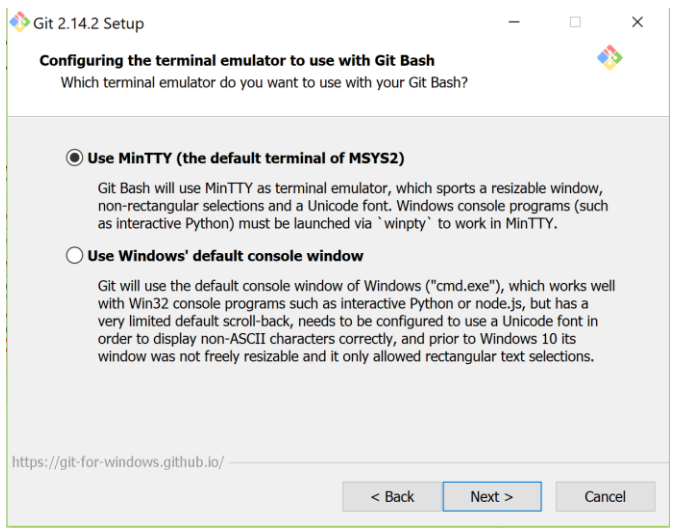


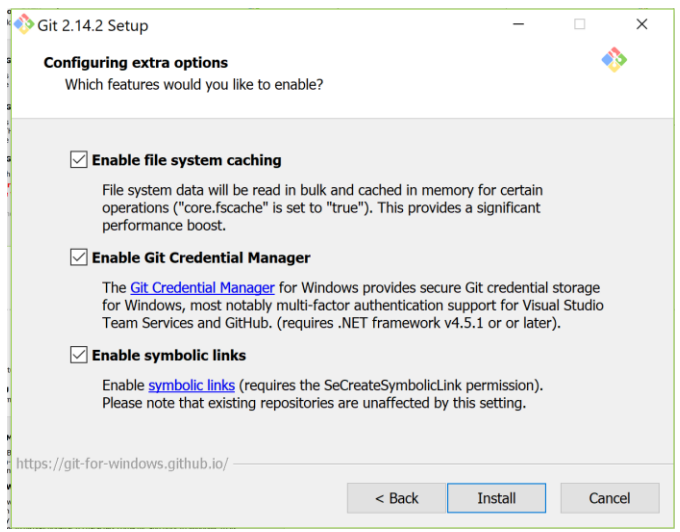



Git 2.14.2 Setup
Adjusting your PATH environment
How would you like to use Git from the command line?
Use Git from Git Bash only
This is the safest choice as your PATH will not be modified at all. You will only be able to use the Git command line tools from Git Bash.
Use Git from the Windows Command Prompt
This option is considered safe as it only adds some minimal Git wrappers to your PATH to avoid cluttering your environment with optional Unix tools. You will be able to use Git from both Git Bash and the Windows Command Prompt.
Use Git and optional Unix tools from the Windows Command Prompt
Both Git and the optional Unix tools will be added to your PATH.
Warning: This will override Windows tools like "find" and "sort". Only use this option if you understand the implications.
https://git-for-windows.github.io/
< Back
Next >
Cancel


Git 2.14.2 Setup
Choosing HTTPS transport backend
Which SSL/TLS library would you like Git to use for HTTPS connections?
Use the OpenSSL library
Server certificates will be validated using the ca-bundle.crt file.
Use the native Windows Secure Channel library
Server certificates will be validated using Windows Certificate Stores.
This option also allows you to use your company's internal Root CA certificates distributed e.g. via Active Directory Domain Services.
https://git-for-windows.github.io/
< Back
Next >
Cancel


Git 2.14.2 Setup
Configuring the line ending conversions
How should Git treat line endings in text files?
Checkout Windows-style, commit Unix-style line endings
Git will convert LF to CRLF when checking out text files. When committing text files, CRLF will be converted to LF. For cross-platform projects, this is the recommended setting on Windows ("core.autocrlf" is set to "true").
Checkout as-is, commit Unix-style line endings
Git will not perform any conversion when checking out text files. When committing text files, CRLF will be converted to LF. For cross-platform projects, this is the recommended setting on Unix ("core.autocrlf" is set to "input").
Checkout as-is, commit as-is
Git will not perform any conversions when checking out or committing text files. Choosing this option is not recommended for cross-platform projects ("core.autocrlf" is set to "false").
https://git-for-windows.github.io/
< Back
Next >
Cancel


Git 2.14.2 Setup
Configuring the terminal emulator to use with Git Bash
Which terminal emulator do you want to use with your Git Bash?
Use MinTTY (the default terminal of MSYS2)
Git Bash will use MinTTY as terminal emulator, which sports a resizable window, non-rectangular selections and a Unicode font. Windows console programs (such as interactive Python) must be launched via `winpty` to work in MinTTY.
Use Windows' default console window
Git will use the default console window of Windows ("cmd.exe"), which works well with Win32 console programs such as interactive Python or node.js, but has a very limited default scroll-back, needs to be configured to use a Unicode font in order to display non-ASCII characters correctly, and prior to Windows 10 its window was not freely resizable and it only allowed rectangular text selections.
https://git-for-windows.github.io/
< Back
Next >
Cancel


Git 2.14.2 Setup
Configuring extra options
Which features would you like to enable?
Enable file system caching
File system data will be read in bulk and cached in memory for certain operations ("core.fscache" is set to "true"). This provides a significant performance boost.
Enable Git Credential Manager
The Git Credential Manager for Windows provides secure Git credential storage for Windows, most notably multi-factor authentication support for Visual Studio Team Services and GitHub. (requires .NET framework v4.5.1 or or later).
Enable symbolic links
Enable symbolic links (requires the SeCreateSymbolicLink permission). Please note that existing repositories are unaffected by this setting.
https://git-for-windows.github.io/
< Back
Install
Cancel

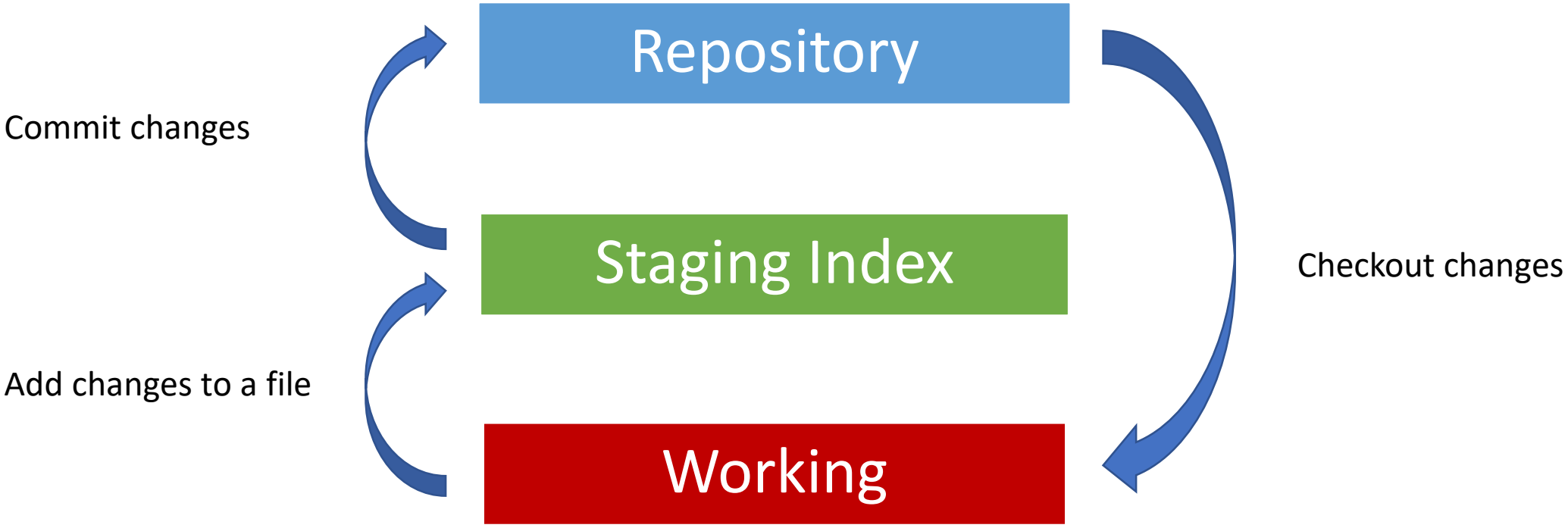
git config

```
$ git config --global user.name “Apara V”
$ git config --global user.email “name@domain.com”
$ git config --global core.editor “notepad.exe”
```

- Git(Hub) makes use of your name and email in the *commits*
- Automatically opens up your editor *when it needs to*
- Use `git config` to create shorter versions of long *commands*

But, how does it work?

The Three-Tree Architecture



The basic commands

- Initialize your repository – ask Git to start tracking files

```
$ git init
```

- Check status of your changes – are they staged or not

```
$ git status
```

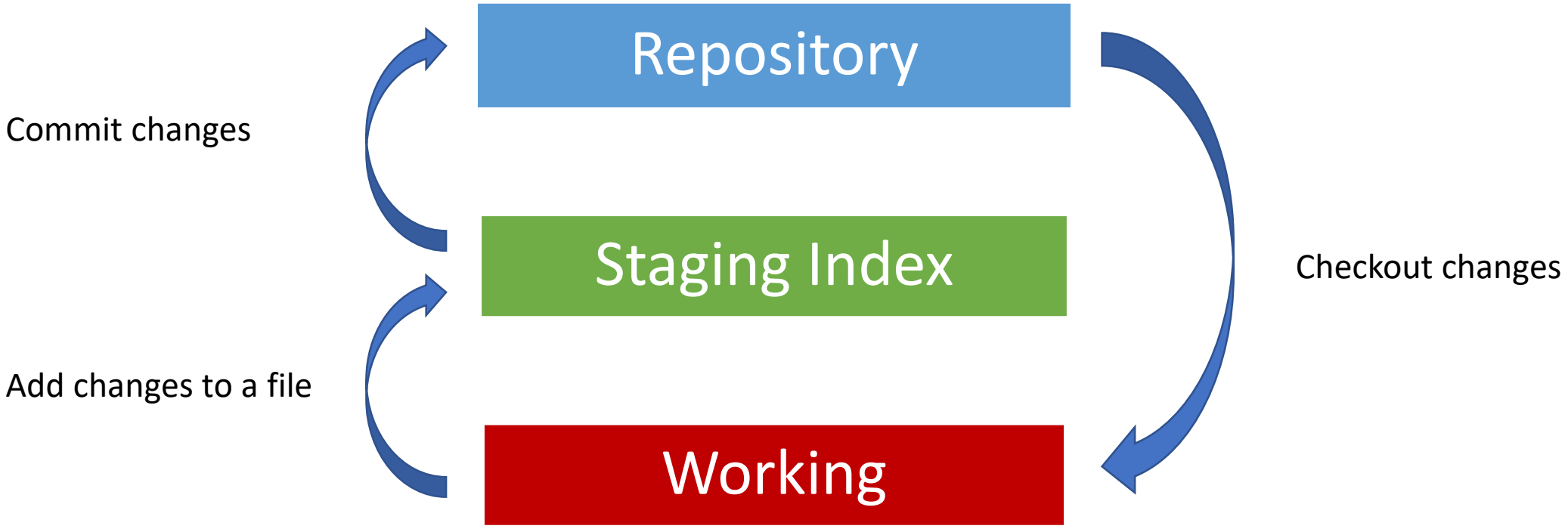
- Add your changes to Staging Index

```
$ git add [files-to-stage]
```

- Commit changes to your repository

```
$ git commit –m “commit message”
```

The Three-Tree Architecture



See it in action

Hello Git!

We need a plan of action!

1. Make a new folder
2. Initialize a repository in this folder
3. Create a file introducing yourself
4. Check status of the repository
5. Commit the file
6. Make some changes to this file
7. Commit these changes

Hello Git!

```
$ mkdir hello_git
$ cd hello_git
$ git init .
$ touch hello.txt
```

Edit this file

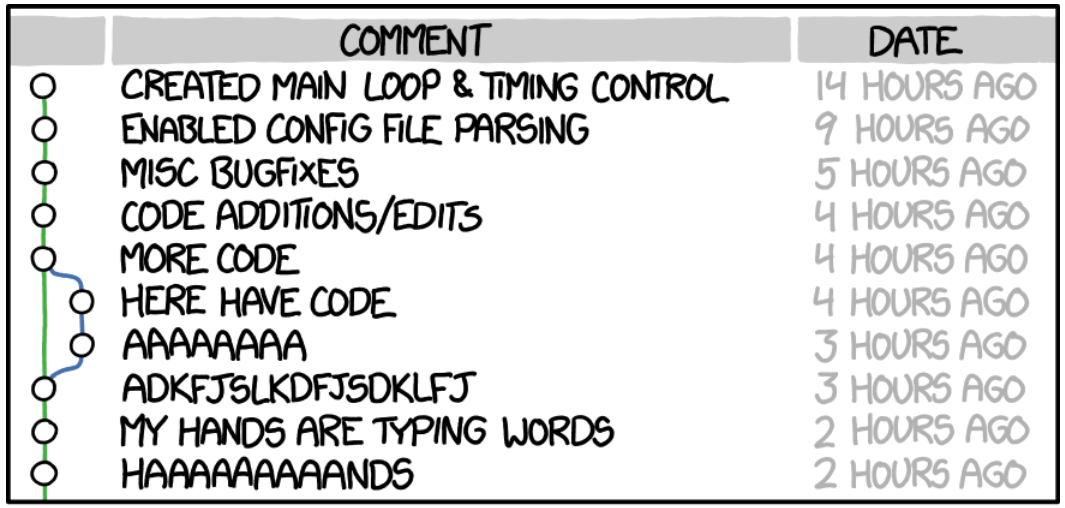
Hello Git!

```
$ git status
$ git add hello.txt
$ git status
$ git commit –m “Introduce myself”
```

Note the style of commit message. They should be imperative.

Make changes.

Repeat cycle.



Source: https://xkcd.com/1296/

Some important commands

- Check your commit history – very important when collaborating with your team

```
$ git log
```

- Checkout a snapshot of your repository

```
$ git checkout <commit>
```

- Compare changes to files

```
$ git diff [file]
```

.gitignore

- Ignore unwanted files

```
$ touch .gitignore
$ touch unwanted_file.txt
$ git status
```

Open `.gitignore` and add `unwanted_file.txt` to it

```
$ git status
```

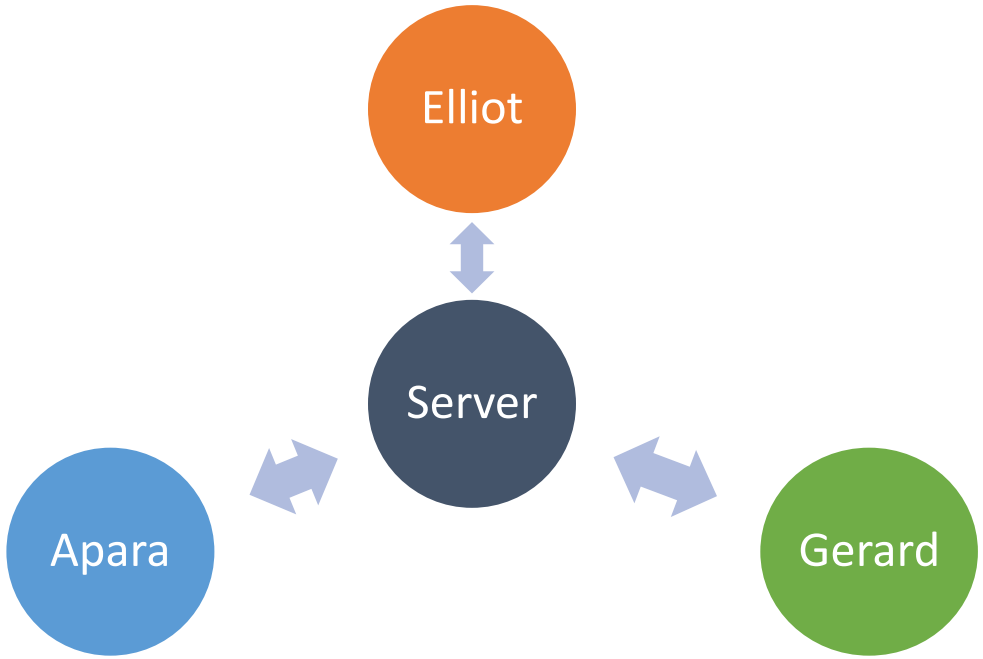
GitHub

GitHub

- A web based Git service
- Offers functionalities of Git and more
- Host all of your code
- In April 2017
  - 20 million users!
  - 57 million repositories!!!
- Basically the party ground for open source communities

Collaboration

- Now we have a remote server where we can store our code
- Opens up opportunities for collaborating with others



Collaboration

- Push your commits to remote server

```
$ git push
```

- Pull other people’s commits from remote server

```
$ git pull
```

Push your repository to GitHub

Our plan of action

1. Create a GitHub account
2. Create a new repository
3. Use the commands GitHub suggests to push our repository for everyone to see

Let’s do this together

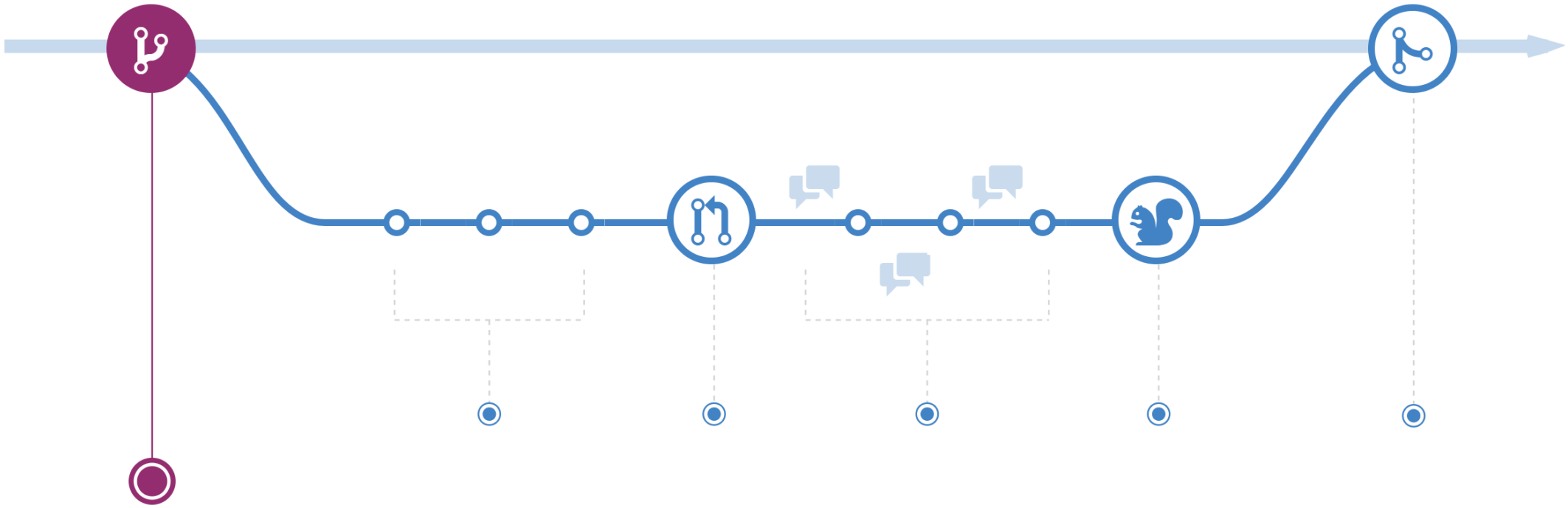
Branches

- Diverge from the main line of development and continue to work without changing the main code base
- Essentially branch off the main code base a.k.a. the *master branch*
- Why?
  - Don’t want to ruin the production code with your experimental feature
  - Different people writing code at the same time

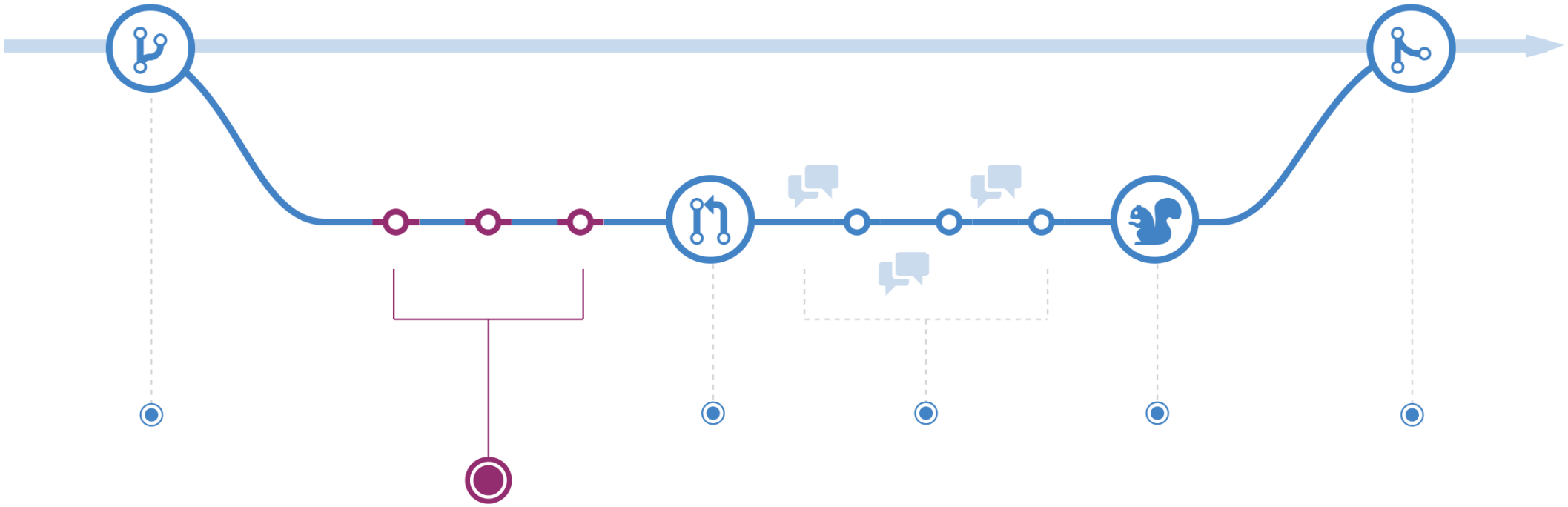
Branch off -> Work on a set of new features -> Merge these into master

Voila! Release the next update!

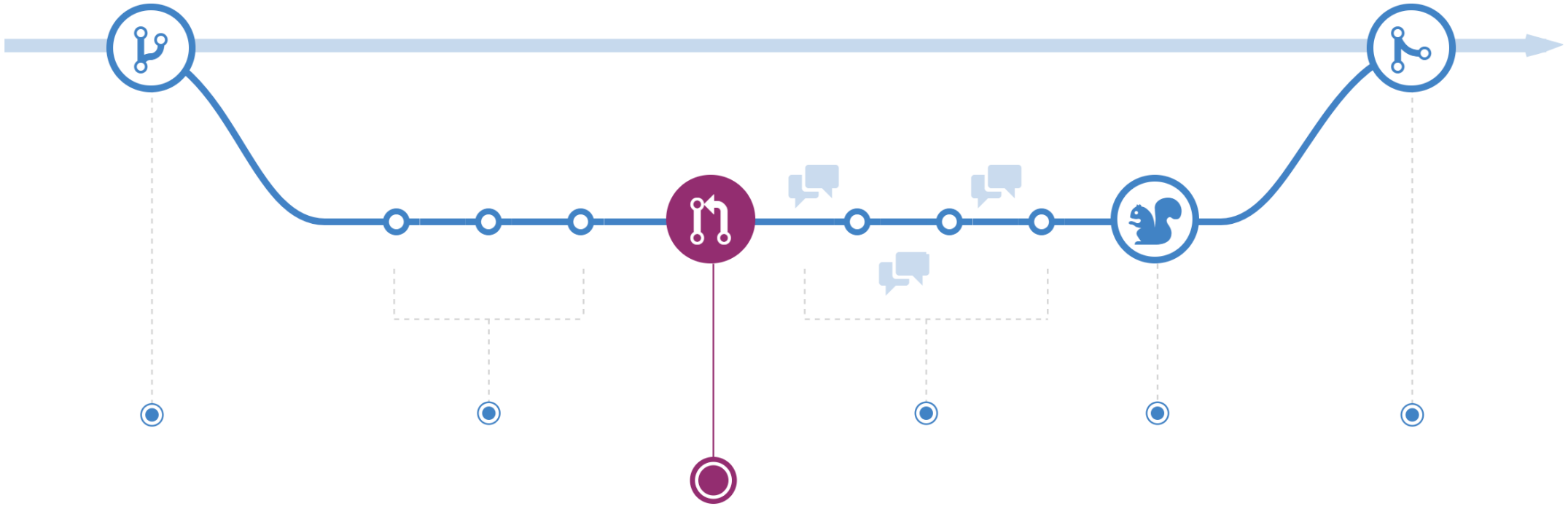
GitHub Flow



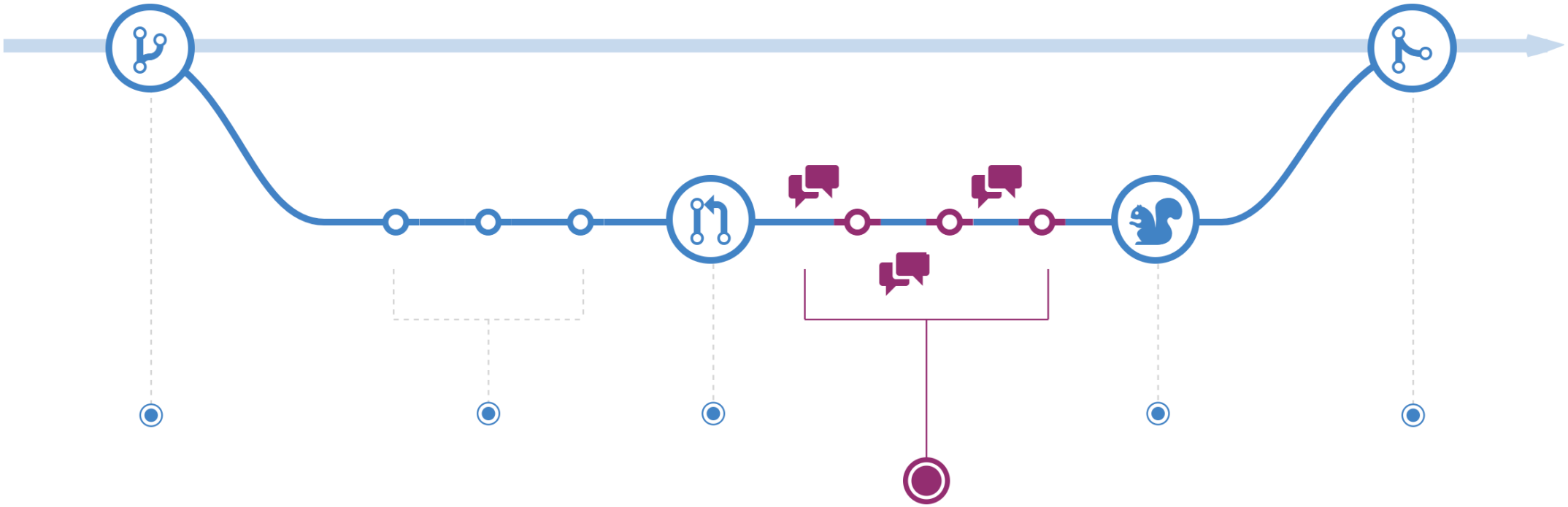
GitHub Flow



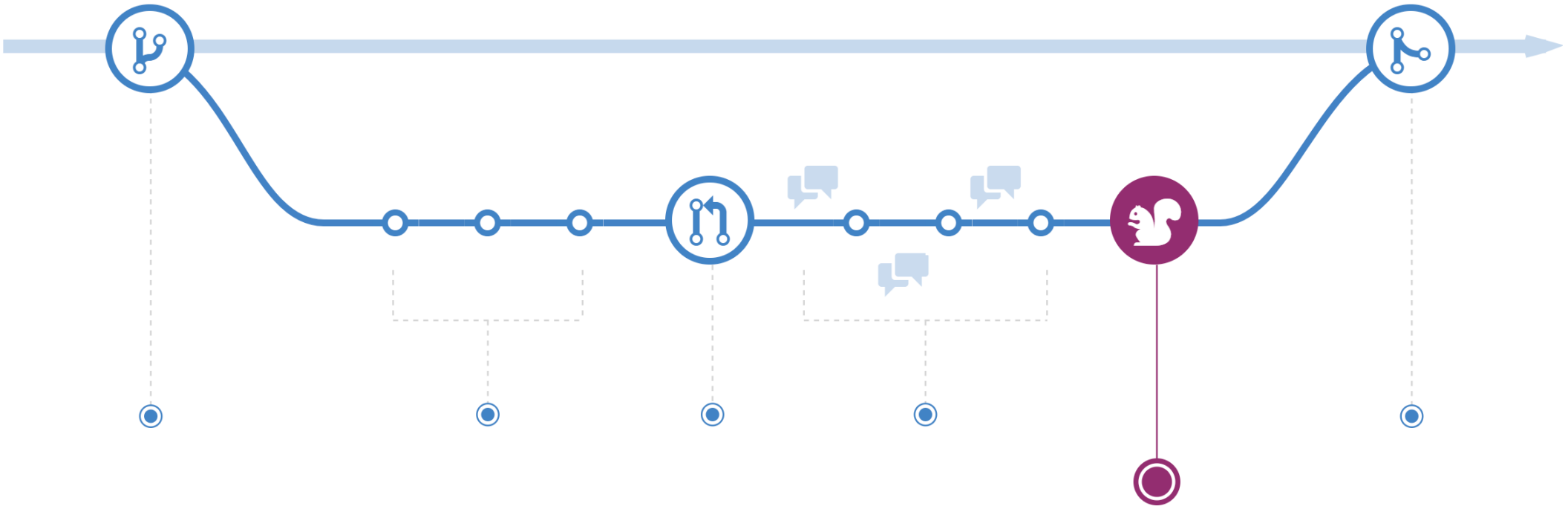
GitHub Flow



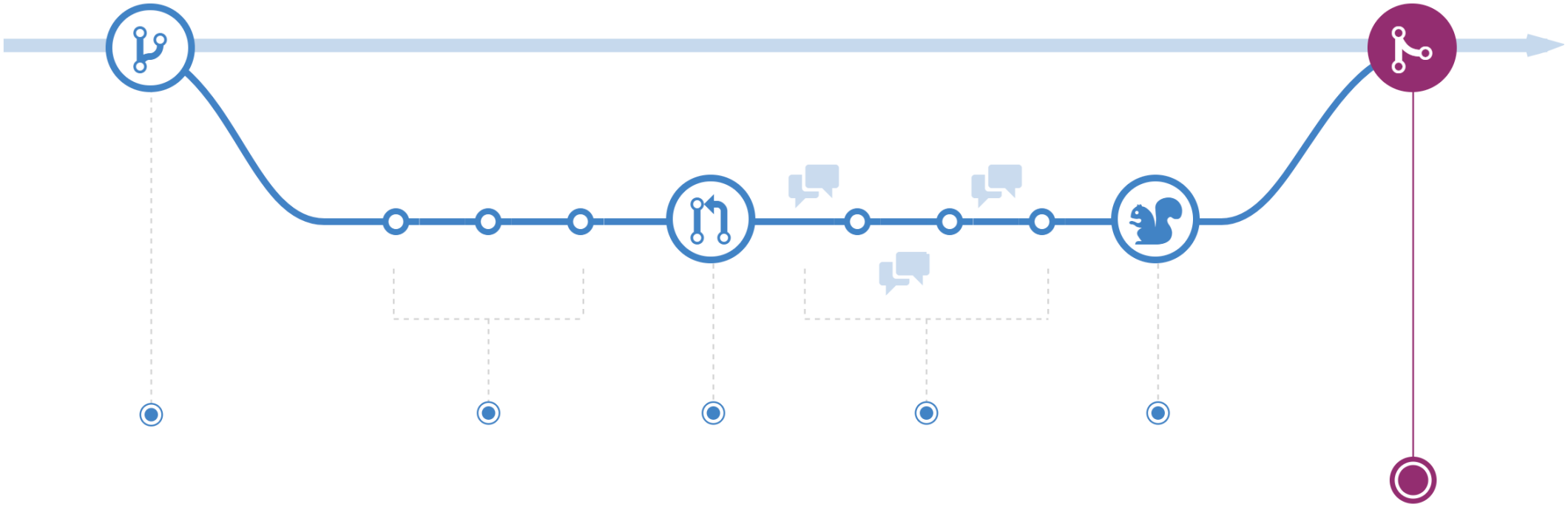
GitHub Flow



GitHub Flow



GitHub Flow



More commands

- Create a new branch

```
$ git branch new_branch
```

- Checkout an existing branch

```
$ git checkout new_branch
```

- Create a new branch and check it out

```
$ git checkout –b newer_branch
```

Merging branches

- Checkout the branch into which you want to merge
- Then `$ git merge branch_to_merge`

Example: I want to merge `dev` into `master`

```
$ git checkout master
$ git merge dev
```

Pull Requests

- Merge Request = Pull Request
- A GitHub feature
- Make process of merging branches a breeze
- You request your changes to be merged to another branch
- Goes through a process of review and changes are evaluated
- Code owners request changes
- Eventually your Pull Request gets merged (or closed ☹)

* Pull Request is colloquially referred to as PR

Take a moment to consider what you have learnt

- Version control
- Git architecture
- Git commands
- Git workflow
- How to open source your code

That’s a lot! Congratulations! Now let’s use Git to collaborate!

Let’s open a PR

Make your first contribution

- Fork the repo
  - Essentially your account has it’s own version of the original repo

- Clone the fork locally
  - Make your version of the repo available to you on your computer

```
$ git clone fork_url
```

Make your first contribution

- Checkout a new branch

```
$ git checkout –b your_name-changes
```

- Add your files

- Commit and push to your fork

```
$ git add .
$ git commit –m <msg>
$ git push origin your_name-changes
```

*Note the variant of `git push` command used here

Make your first contribution

Go to https://github.com/HackCU/git-workshop

What's next?

- Use your Git skills to work on a project with your friend

Get help!

- Join the HackCU community
  - https://slack.hackcu.org
  - https://community.hackcu.org
- Get the *Pro Git* at https://git-scm.com/book/en/v2
- Get your handy Git cheat sheet
  - https://education.github.com/git-cheat-sheet-education.pdf

Advanced Git Workshop

There is an Advanced Git workshop in the works

Dive deeper into Git and get dirty

Other workshops

Other workshops are also in the works

Launch your personal website

Learn technologies like Docker, Amazon Alexa, and more…

Hackathons!

Use your Git skills at hackathons

Local Hack Day is coming up on Dec 2nd at Idea Forge

HackCU IV is coming up in February at CU Boulder

Sign up at https://hackcu.org to be notified


GitHub