Git 101:

Git and GitHub for Beginners

HubSpot

Git for Version Control

These slides are heavily based on slides created by Ruth Anderson for CSE 390a. Thanks, Ruth!

images taken from http://git-scm.com/book/en/

http://www.cs.washington.edu/403/

About Git

- Created by Linus Torvalds, creator of Linux, in 2005
  - Came out of Linux development community
  - Designed to do version control on Linux kernel

- Goals of Git:
  - Speed
  - Support for non-linear development (thousands of parallel branches)
  - Fully distributed
  - Able to handle large projects efficiently
  - *(A "git" is a cranky old man. Linus meant himself.)*

Installing/learning Git

- Git website: http://git-scm.com/
  - Free on-line book: http://git-scm.com/book
  - Reference page for Git: http://gitref.org/index.html
  - Git tutorial: http://schacon.github.com/git/gittutorial.html
  - Git for Computer Scientists:
    - http://eagain.net/articles/git-for-computer-scientists/

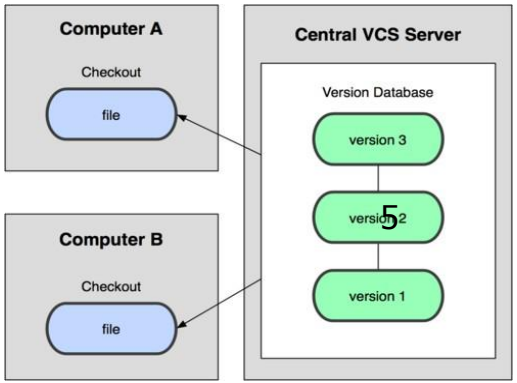
- At command line: *(where verb = config, add, commit, etc.)*
  - `git help verb`

Centralized VCS

- In Subversion, CVS, Perforce, etc.
  A central server repository (repo)
  holds the "official copy" of the code
  - the server maintains the sole
    version history of the repo

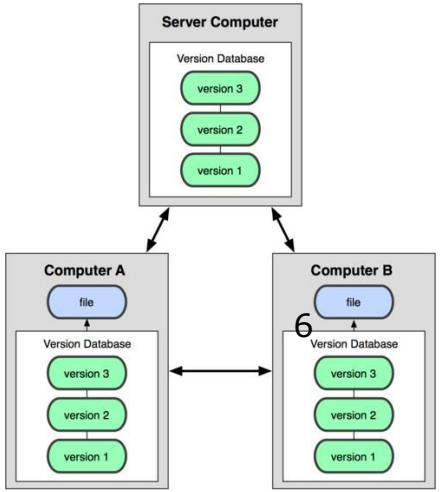
- You make "checkouts" of it
  to your local copy
  - you make local modifications
  - your changes are not versioned

- When you're done, you
  "check in" back to the server
  - your checkin increments the repo's version



Distributed VCS (Git)

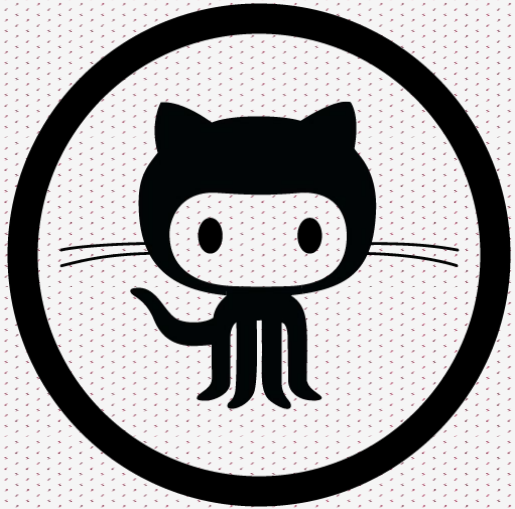
- In git, mercurial, etc., you don't "checkout" from a central repo
  - you "clone" it and "pull" changes from it
- Your local repo is a complete copy of everything on the remote server
  - yours is "just as good" as theirs
- Many operations are local:
  - check in/out from *local* repo
  - commit changes to *local* repo
  - local repo keeps version history



- When you're ready, you can "push" changes back to server

Overview

1. Install git and create a Github account
2. What is git?
3. How does git work?
4. What is GitHub?
5. Quick example using git and GitHub



Github icon

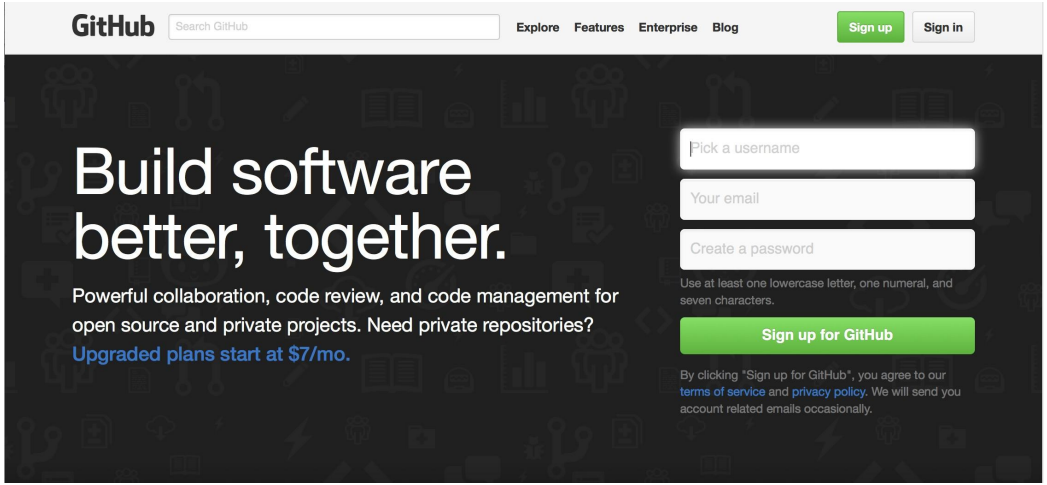
1 Install git and a create GitHub account

Install git

- **Linux (Debian)**
  - Command: `sudo apt-get install git`
- **Linux (Fedora)**
  - Command: `sudo yum install git`
- **Mac**
  - http://git-scm.com/download/mac
- **Windows**
  - http://git-scm.com/download/win

Create Github account

- www.github.com
- Free for public repositories



What is version control?

- A system that keeps records of your changes
- Allows for collaborative development
- Allows you to know who made what changes and when
- **Allows you to revert any changes and go back to a previous state**

2 What is git?

What is version control?

- Distributed version control
- Users keep entire code and history on their location machines
  - Users can make any changes without internet access
  - (Except pushing and pulling changes from a remote server)

What is git?

- Started in 2005
- Created by Linus Torvald to aid in Linux kernel development

Git icon

What is git?

- Git isn’t the only version control system

- But (we think) it’s the best

3 How does git work?

How does git work?

- Can be complicated at first, but there are a few key concepts
- Important git terminology in following slides are blue

Key Concepts: Snapshots

- The way git keeps track of your code history
- Essentially records what all your files look like at a given point in time
- You decide when to take a snapshot, and of what files
- Have the ability to go back to visit any snapshot
  - Your snapshots from later on will stay around, too

Key Concepts: Commit

- The act of creating a snapshot
- Can be a noun or verb
  - “I commited code”
  - “I just made a new commit”
- Essentially, a project is made up of a bunch of commits

Key Concepts: Commit

- Commits contain three pieces of information:

1. Information about how the files changed from previously
2. A reference to the commit that came before it
   - Called the "parent commit"
3. A hash code name
   - Will look something like: fb2d2ec5069fc6776c80b3ad6b7cbde3cade4e

Key Concepts: Repositories

- Often shortened to ‘repo’
- A collection of all the files and the history of those files
  - Consists of all your commits
  - Place where all your hard work is stored

Key Concepts: Repositories

- Can live on a local machine or on a remote server (GitHub!)
- The act of copying a repository from a remote server is called cloning
- Cloning from a remote server allows teams to work together

Key Concepts: Repositories

- The process of downloading commits that don’t exist on your machine from a remote repository is called pulling changes
- The process of adding your local changes to the remote repository is called pushing changes

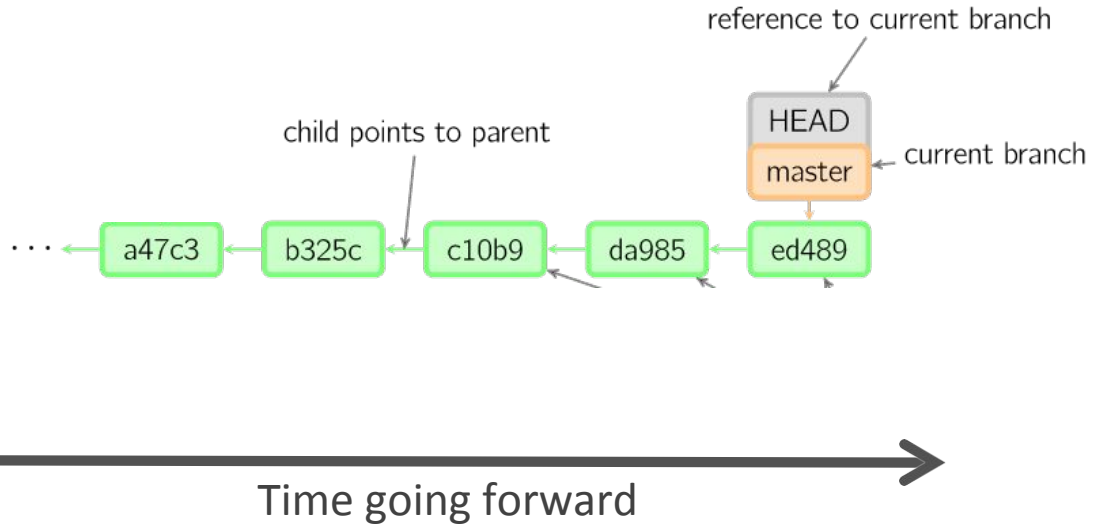
Key Concepts: Branches

- All commits in git live on some branch
- But there can be many, many branches
- The main branch in a project is called the master branch

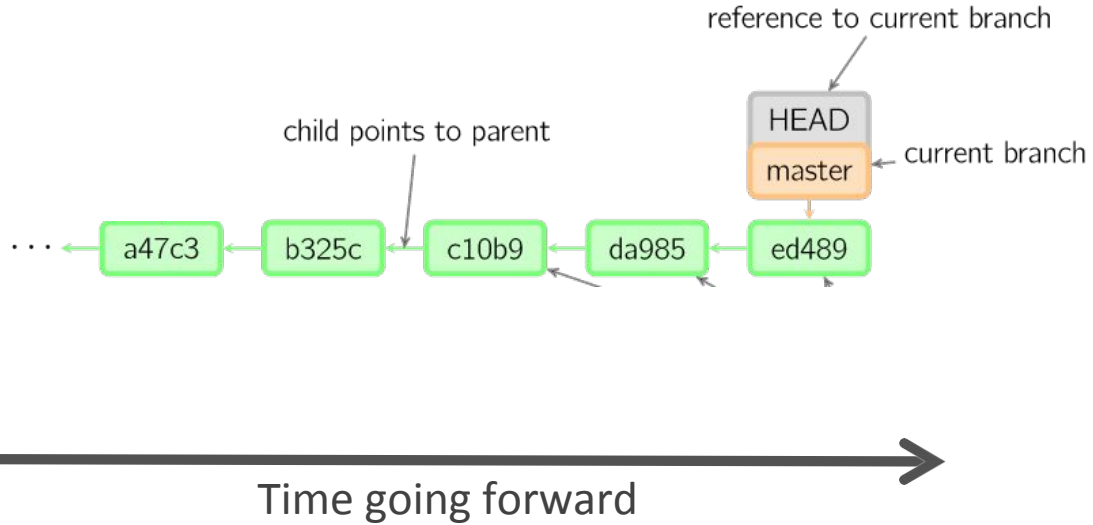
So, what does a typical project look like?

- A bunch of commits linked together that live on some branch, contained in a repository
- Following images taken and modified from:
  - http://marklodato.github.io/visual-git-guide/index-en.html
  - Also a good tutorial!

So, what does a typical project look like?

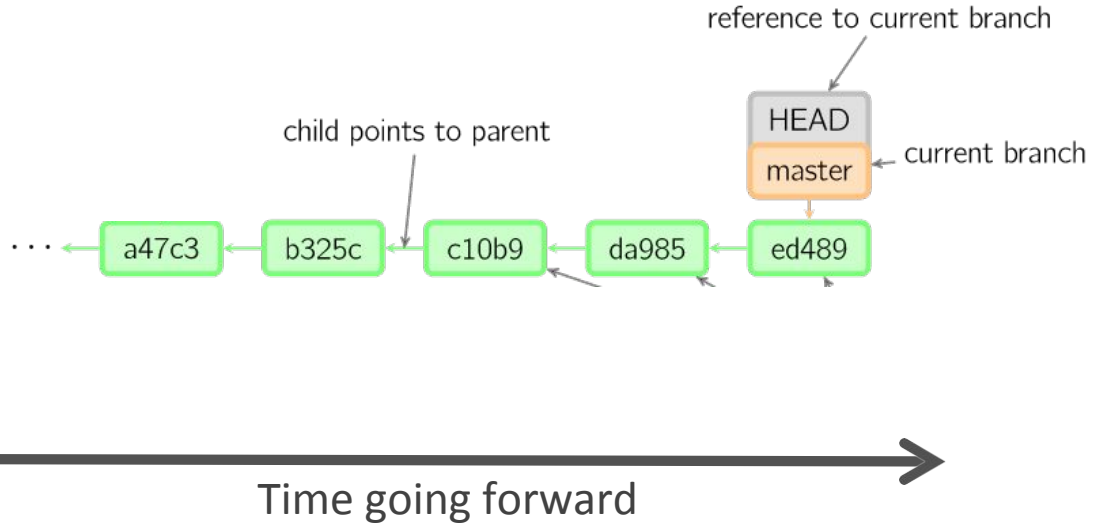


So, what is HEAD?



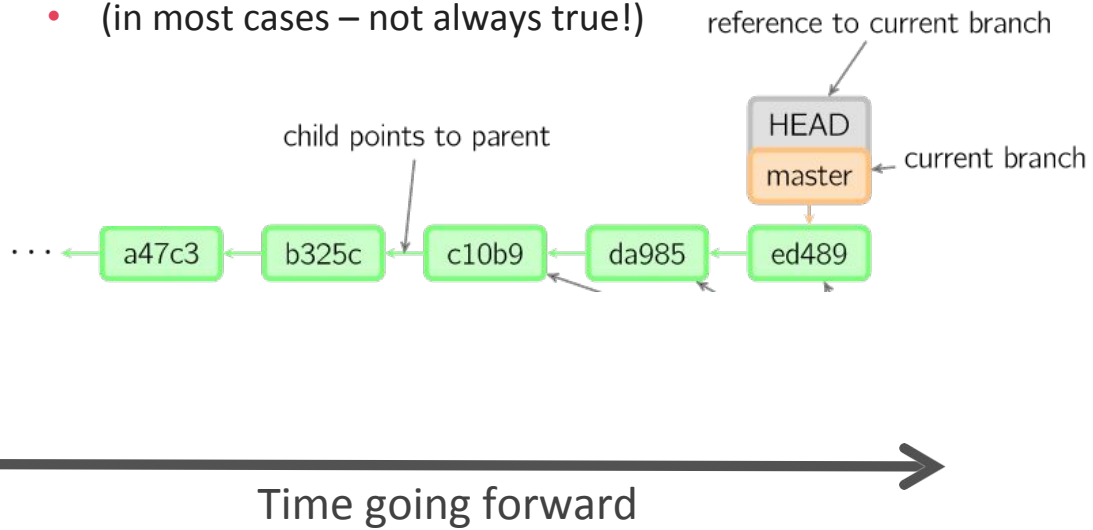
So, what is HEAD?

- A reference to the most recent commit



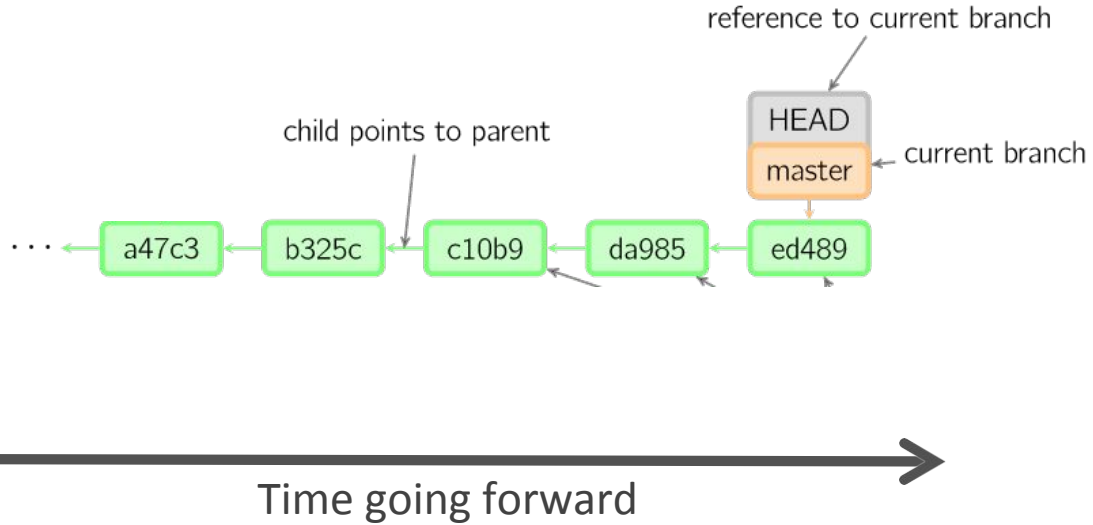
So, what is HEAD?

- A reference to the most recent commit
  - (in most cases – not always true!)



So, what is MASTER?

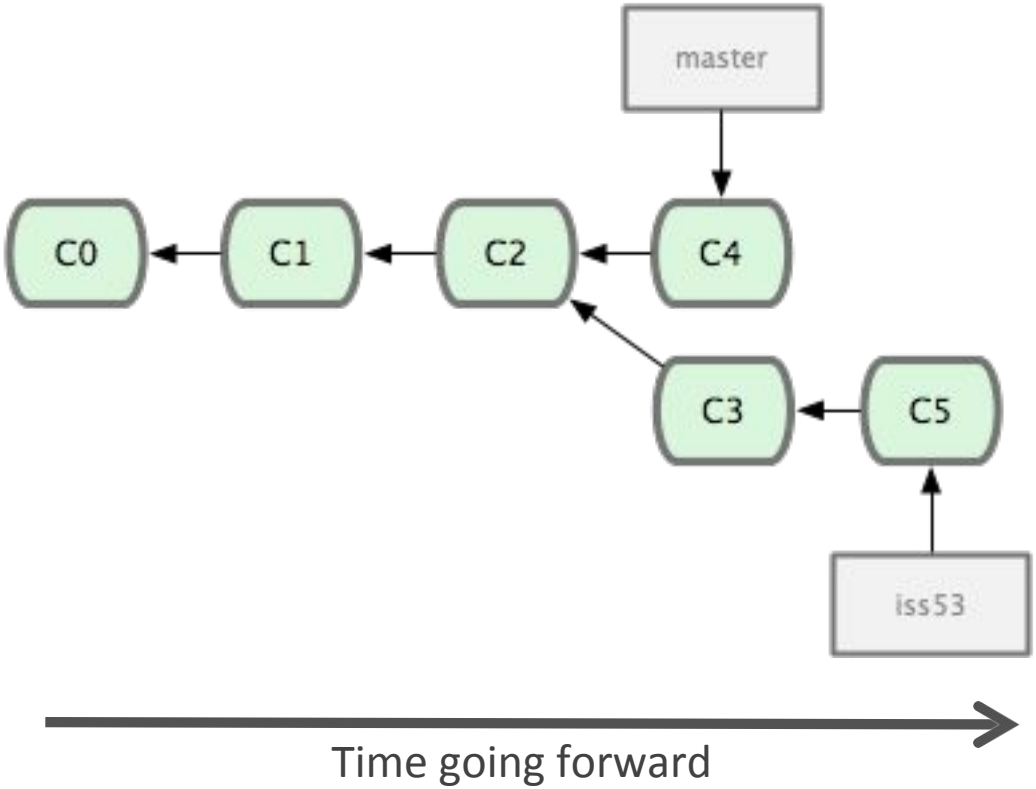
- The main branch in your project
- Doesn't *have* to be called master, but almost always is!



Key Concepts: Branching off of the master branch

- The start of a branch points to a specific commit
- When you want to make any changes to your project you make a new branch based on a commit

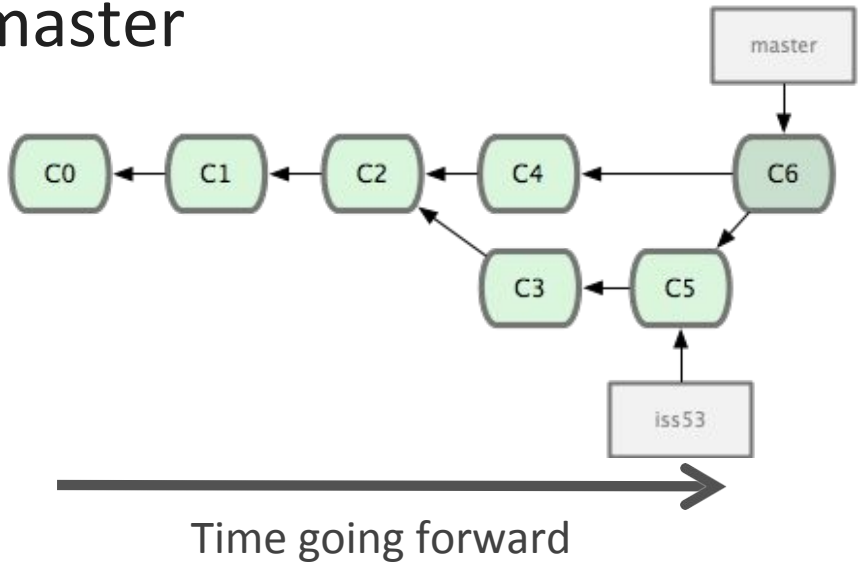
Key Concepts: Branching off of the master branch



Images from:
http://codingdomain.com/git/merging/

Key Concepts: Merging

- Once you're done with your feature, you merge it back into master



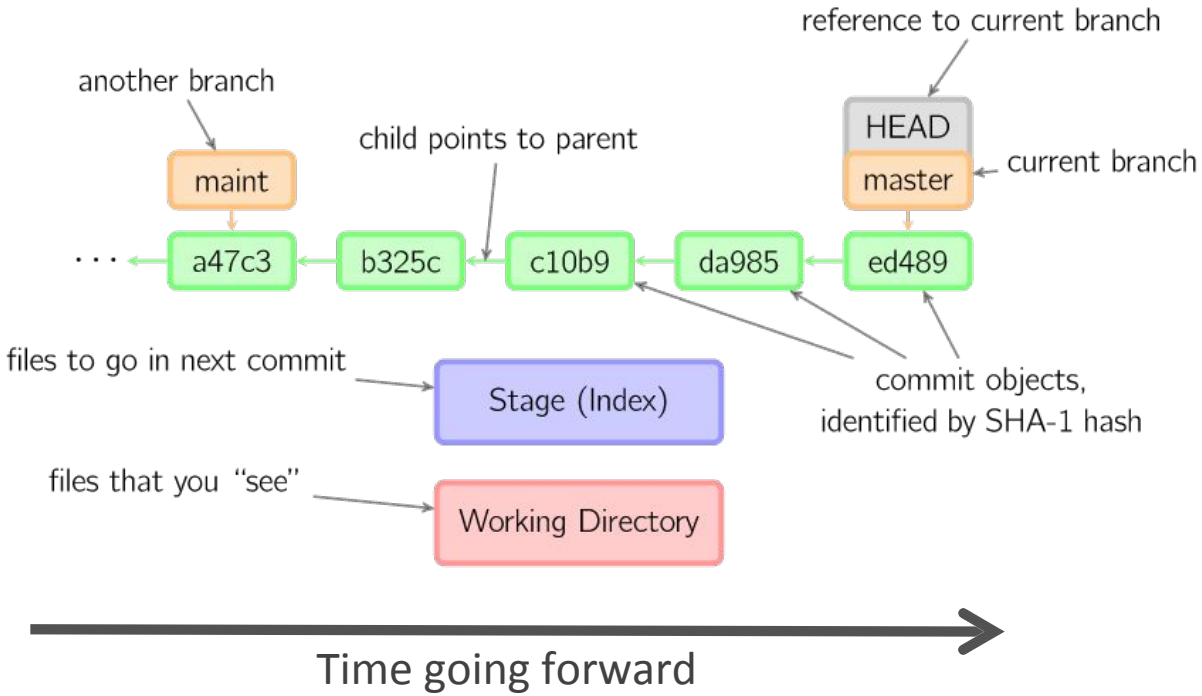
Key Concepts: How do you make a commit anyway?

- There are a lot of ‘states’ and ‘places’ a file can be
- Local on your computer: the ‘working directory’
- When a file is ready to be put in a commit you add it onto the ‘index’ or ‘staging’
  - Staging is the new preferred term – but you can see both ‘index’ and ‘staging’ being used

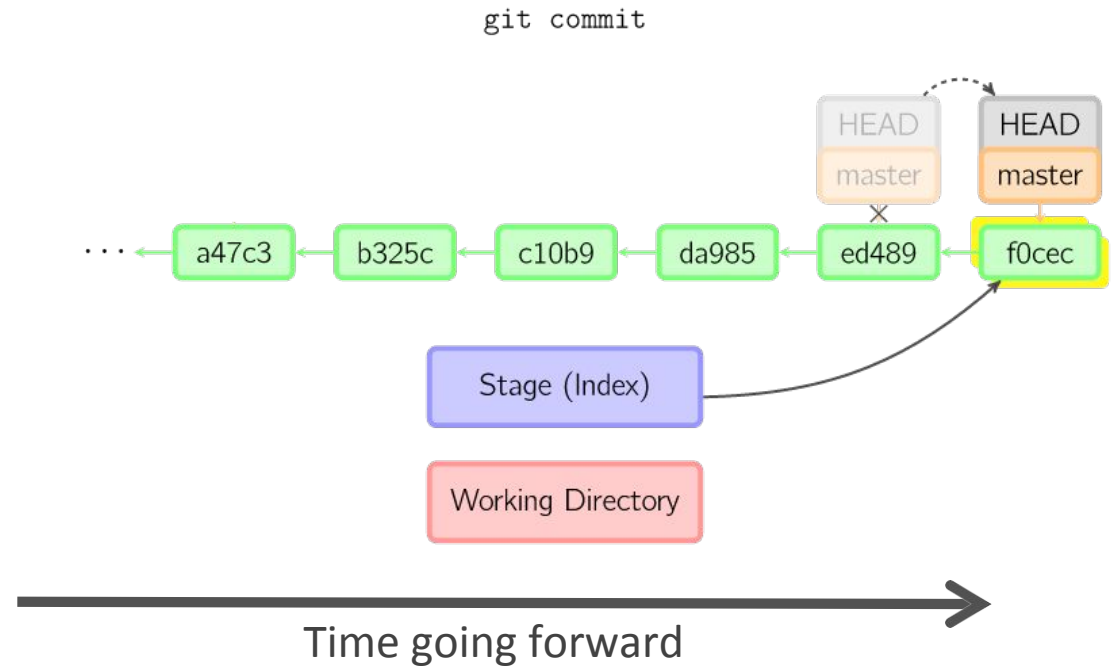
Key Concepts: How do you make a commit anyway?

- The process:
  - Make some changes to a file
  - Use the ‘git add’ command to put the file onto the staging environment
  - Use the ‘git commit’ command to create a new commit’

Key Concepts: How do you make a commit anyway?



Key Concepts: How do you make a commit anyway?



4 What is GitHub?

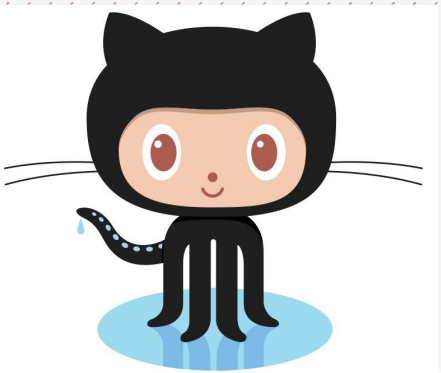
What is GitHub?

- www.github.com
- Largest web-based git repository hosting service
  - Aka, hosts 'remote repositories'
- Allows for code collaboration with anyone online
- Adds extra functionality on top of git
  - UI, documentation, bug tracking, feature requests, pull requests, *and more!*

Octocat!

What is GitHub?

- Founded in 2008
- Also has an Enterprise edition for businesses



Octocat!

Additional Resources

Additional Resources

- Official git site and tutorial:

  https://git-scm.com/
- GitHub guides:

  https://guides.github.com/
- Command cheatsheet:

  https://training.github.com/kit/downloads/github-git-cheat-sheet.pdf
- Interactive git tutorial:

  https://try.github.io/levels/1/challenges/1
- Visual/interactive cheatsheet:

  http://ndpsoftware.com/git-cheatsheet.html

Git- No Deep Shit Guide

https://rogerdudler.github.io/git-guide/