Version Control Workshop: Git and GitHub (Day 1)

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Overview

1. Introduction to Version Control
2. Work Flow in Computational Science
3. Setting Up Git On Your Machine
4. Basic Git Work Flow
5. Git Branches
6. Git Delete Commands
7. Combining Git With GitHub

We Encourage Participation!

- Post Questions That You Might Have in the Repo
- Recommend Other Sources That You Found Useful
- Remember, We Do Not Know Everything!

What is Version Control?

Version control is a system that records changes to a file or set of files over time so that you can recall specific versions later.

- *Pro Git*, Chapter 1

What is Version Control?

It allows you to revert files back to a previous state, revert the entire project back to a previous state, compare changes over time, see who last modified something that might be causing a problem, who introduced an issue and when, and more.

- *Pro Git*, Chapter 1

Why is Version Control Important?

1. Keep Track of Code History
2. Concurrent Teamwork
3. Coordinate Coding Environments
4. Due Diligence Checks
5. Share Code

Everybody Should Use Version Control!

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What Options Are Available?

Option #1: Client-Server Version Control Systems

Advantages

1. A Single Admin Keeps Track of the Project
2. There is a Single Master Version of the Code
3. It is Relatively Easy to Learn

Disadvantages

1. There Is Only One Admin/Server
2. You Need a Network Connection to Work
3. Operations Can Be Slow

Examples include Concurrent Versions System (CVS) and Subversion (SVN).

What Options Are Available?

Option #2: Distributed Version Control Systems

Advantages

1. You Don't Need a Network Connection
2. Multiple Coding Environments
3. It Encourages Collaboration and Modularity

Disadvantages

1. Can Be Difficult to Learn
2. Teams Need to Talk About Conventions
3. It is Really Easy To Create Unorganized Code

Examples include Git, Mercurial, and Bazaar.

Why Git and GitHub?

1. It Keeps Track of Detailed Metadata (More Than Others)
2. Branching is Encouraged (Which Modularizes Development)
3. Most Operations in Git are Local (Which Increases Speed)
4. GitHub Has a Great Social Community

Why Git and GitHub?

Full Disclosure...

1. It Isn't the Best for Binary Files
2. GitHub Distinguishes Between Public and Private Repos

Version Control in Academia

1. It Creates Reproducible Research
2. It Helps Train New Group Members
3. It Encourages Collaboration
4. It Encourages Good Code Practices

Version Control in Academia

Some Useful Skills That You Should Learn Are:

1. Bash
2. Markdown

Setting Up Git - Linux

You can use the package management tool that comes with your distribution (use sudo):

1. yum install git
2. apt-get install git

Setting Up Git - Mac

There are three main ways to install Git:

1. Install the Xcode Command Line Tools and Type “git” Into the Terminal
2. Binary Installer: http://git-scm.com/download/mac
3. Git/GitHub GUI: https://mac.github.com/

Setting Up Git - Windows

There are three main ways to install Git:

1. Binary Installer: http://git-scm.com/download/win
2. msysGit: http://msysgit.github.io/
3. Git/GitHub GUI: https://windows.github.com/

Setting Up Git - Installing From Source

You can also install GitHub from source. See the Git website for full instructions on how to do that.

Setting Up Git - Config File

Git stores user information in */etc/gitconfig*, */.gitconfig*, and */your-project/.git/config*. To set up your information:

- *git config --global user.name "Cyrus Vandrevala"*
- *git config --global user.email cyrus.vandrevala@gmail.com*
- *git config --global core.editor vim*

Setting Up Git - Config File

You can double check the information you entered by using:

- *git config --list*

Setting Up a Git Repo

1. Create a New Directory (mkdir my-awesome-directory)
2. Navigate Into the Directory (cd my-awesome-directory)
3. Initialize the Directory (git init)

The git init command creates a hidden directory called .git that contains all of the metadata for the project. *You should never change anything in .git directly!*

The Basic Git Work Flow

Files in your project can be in one of three states:

1. Modified
2. Staged
3. Committed

The Basic Git Work Flow

1. Synchronize Your Repo (git pull)
2. Make Changes to Your Code
3. Stage Changes for Commit (git add)
4. Commit Changes Locally (git commit)
5. Push Changes to Origin (git push)

What is Branching?

- Pretty much every version control system has some form of branching. This means that you diverge from the main line of development and continue to do work without changing the main line.
- Usually this is an expensive process because you have to copy all of the source code in the directory into a new branch.
- However, branching is where git truly shines. The git branch is extremely lightweight. This encourages branching in order to add new features.

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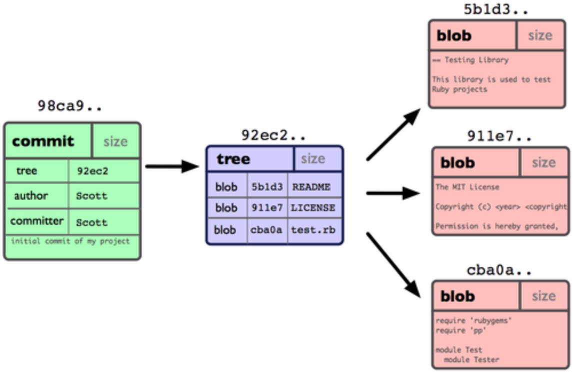
How Does Branching Work?

Let's look at a couple of examples from Pro Git (2nd Edition). This book is licensed under the Creative Commons Attribution Non-Commercial Share Alike 3.0 License.

How Does Branching Work?



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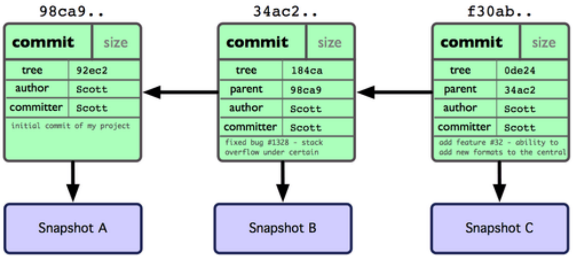

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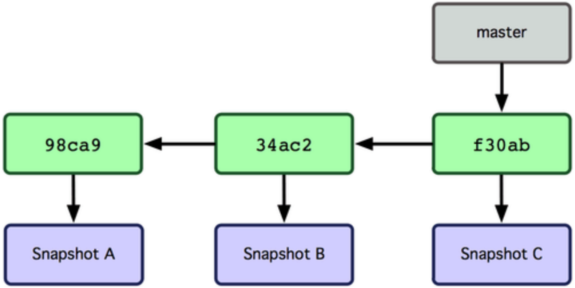

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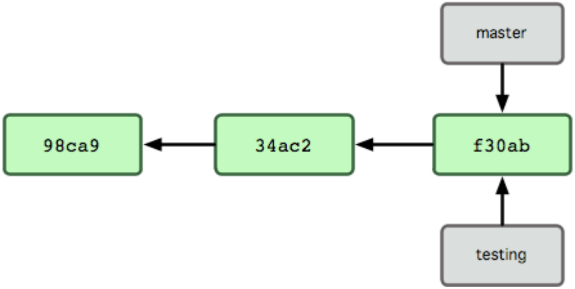

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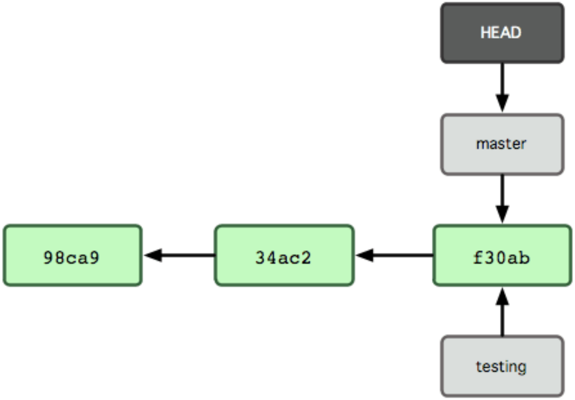

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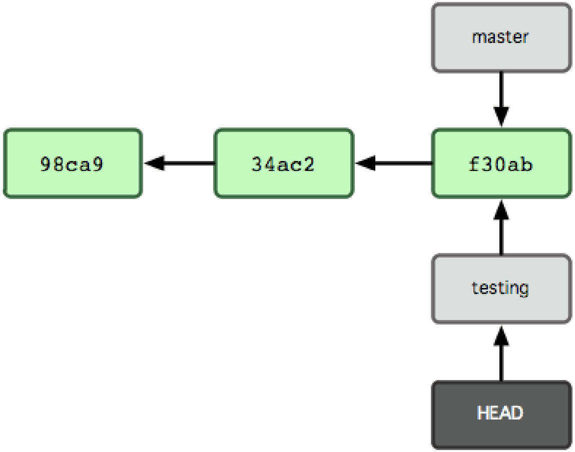

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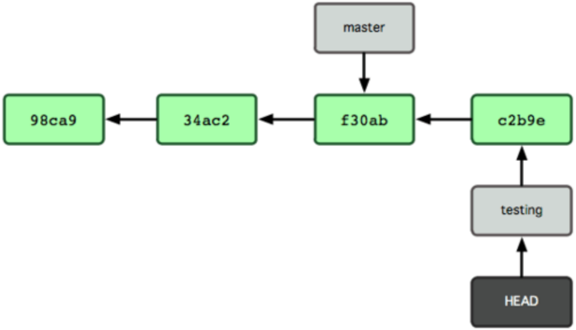

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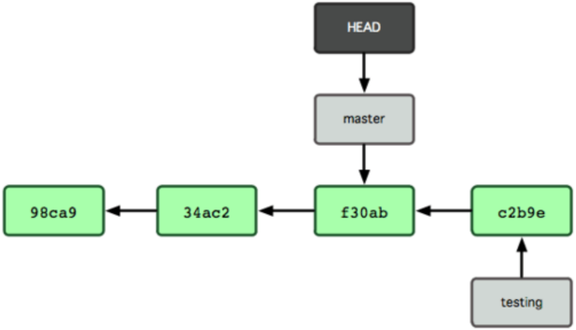

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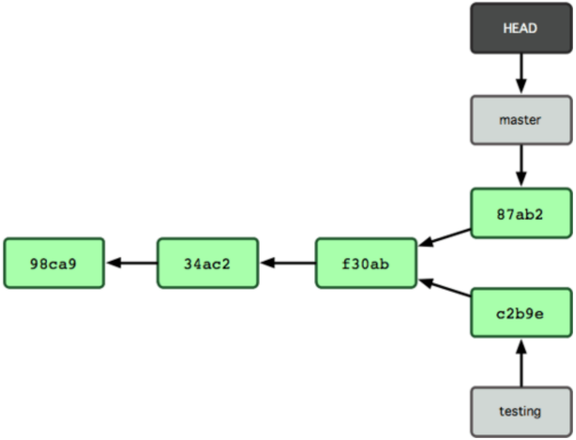

Delete a File (rm vs. git rm)

Public vs. Private Repositories

Bitbucket and GitHub

Thank you for your attention.