Lecture 2 recap

Clarifications

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  - VT100, VT102, VT220 are the gold standard of terminals
  - Additional functionality with ANSI escape codes (colors and cursor movement, anyone?)
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- Nowadays no one uses *real* terminals, so we have *virtual* terminals to provide our text-based interfaces
  - You can find these as `/dev/tty*` and friends
  - (This is a pretty deep topic with lots of semantics...I'm not going to even talk about pseudo-terminals: `man pty` is left as an exercise for those interested)

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  - (This is a pretty deep topic with lots of semantics...I'm not going to even talk about pseudo-terminals: `man pty` is left as an exercise for those interested)
- Terminal emulators are software that serve as visible front-ends to virtual terminals
  - Examples: xterm, GNOME Terminal, Konsole, macOS Terminal, iTerm2, Windows Terminal (Preview)™

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- For modern everyday use, "terminal" refers to a terminal emulator
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  - You can change this with `chsh`
  - `SHELL` environment variable can tell you what yours is
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- In a general sense, a shell is a program that serves as an interface between a user and the operating system
- Command line shells: `bash`, `zsh`, `fish`
  - Most common interpretation of "shell"
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- Graphical shells: GNOME, KDE Plasma, Windows shell, macOS Quartz + Finder + Dock + other components
  - Handle mice/other input devices to do things like launch a program when its icon is clicked

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- Basic file redirection: `<`, `>`, `>>`, `|`
- Environment variables: `PATH`, `HOME`, `USER`, `PWD`
  - There's a subtle difference regarding "shell variables" which are managed and used by the shell itself and not the overal execution environment, e.g. `PS1`
  - You can set and echo them like environment variables, but they don't get passed onto processes that get created

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  - `$ source ~/.bashrc`

Announcements

- HW1 due tonight
- ADV1 due next Friday (Jan 31)
- HW2, ADV2 due Feb 3

GITing Started

Week 3

I bet you've been waiting for this lecture

Overview

1. What is version control?
2. Git basic flow
3. Git branches
4. A taste of Git remotes

Version control

- Keep track of changes of files over time, allowing you to roll back to previous versions
- Software to handle this are known as "version control systems" (VCS)

Two paradigms

Centralized (CVCS)

- Central server keeps track of all the changes and history
- Each developer has local copies of files they need, but need to check in with the server to do any versioning
- Sever down? Good luck.
- Examples: CVS, SVN, Perforce

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Decentralized (DVCS)

- Each developer has a local copy of the entire codebase and its history
- Developers can perform versioning locally without needing to contact a server
- Server optional
- Examples: Git, Mercurial

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  - Have you ever emailed code or sent code in some messaging app?
  - Have you tried to coordinate people working on the same file?

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That's it, lecture's over!

Git Overview

- Repository: a directory of stuff that Git is versioning
  - `.git` is the directory that holds all this metadata
- Commit: a checkpoint for the files in the repository
  - Given a hash for identification
  - (Unlike other VCS, has actual snapshots of files rather than diffs)
- History is a linked list of commits pointing to their parent

Basic commands

- `git init`
- `git status`
- `git log`
- `git add`
- `git reset`
- `git checkout`
- `git commit`

Some neat resources

- `man git`
- `man git-<command>` or `help git <command>`
- Official Git documentation
- Official Git tutorial
  - `man gittutorial`
- Official Git minimal set of useful commands
  - `man giteveryday`
- *Pro Git* book
  - Free and comprehensive
  - Besides being on the web, has `.pdf`, `.epub`, and `.mobi` formats!
  - A really great read

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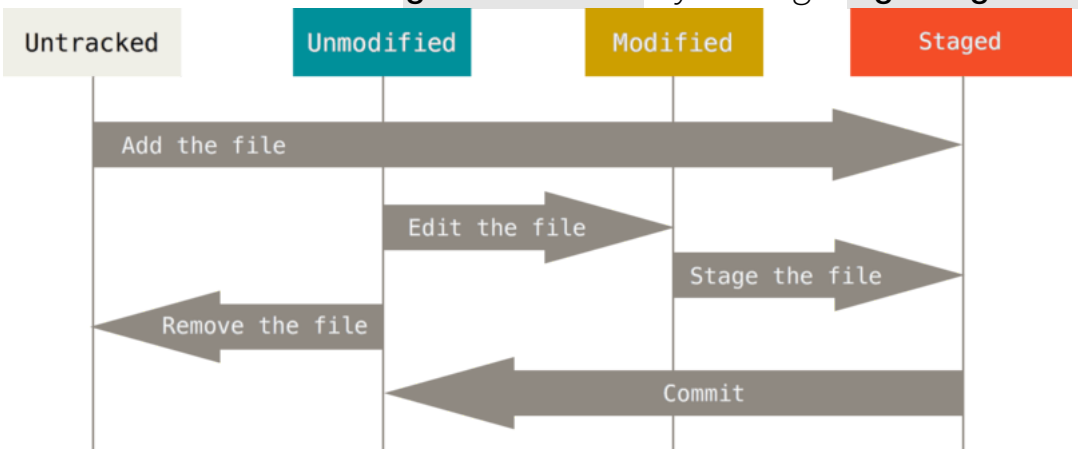
- **Staged**: This file differs, and is set to be in the next commit
- **Untracked**: This file does not exist in the current commit
  - It's pretty similar to **Modified**; it "differs" by existing while the current commit says it doesn't exist
  - You can hide these from `git status` by adding a `.gitignore` file



From *Pro Git*

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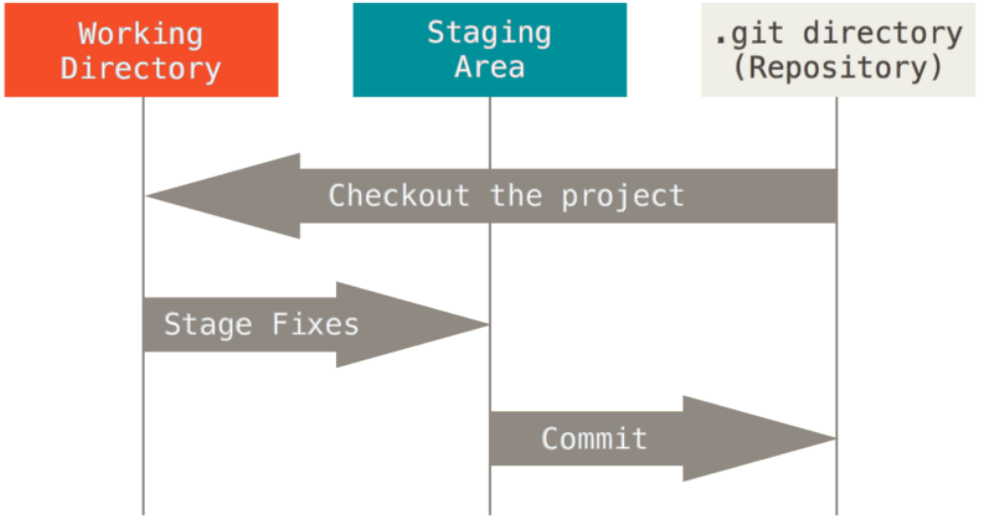
- Files and their snapshots will work their way through these three areas



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7. Goto 4, rinse and repeat

Commits

- `git commit -m <message>` is a quick and dirty way to make a commit
- Not super ideal when it's a project that you're going to collaborate with others on
- `git commit` will open the configured editor and allow you to fully fill out a commit message

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- Capitalize the first letter
- Imperative ("Fix xyz", "Remove abc")
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Body

- Limit to 72 characters per line
- Explain what changed and why, not how: your code (ideally) is the "how"
- (Depending on your team/workplace: references to bug/issue number e.g. "Issue #22772", "Bug #1337")

No, I'm not making this up, it's straight from the horse's mouth

Ultimately these are just guidelines, not rules. Do what your team does, but try to keep good habits when you start something yourself

Branching

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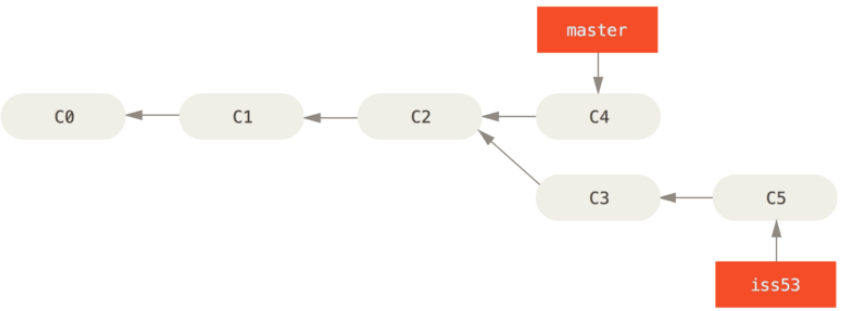
  - Super lightweight compared to other VCS, go wild
- Lots of applications:
  - Make a "backup" of branch
  - Manage a feature ("topic"/"feature" branches)
  - Have a separate line of development (e.g. taking two different approaches)
  - Represent release schedules (e.g. a development branch and a release branch)



From *Pro Git*

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  - `git switch` also switches to a branch; added in Git 2.23.0 and is experimental at the moment
  - `git checkout -b <branch-name>` creates **and checks out** the branch
- `git merge <branch-name>` will replay commits from `<branch-name>` onto the current branch
  - If the branches diverged (`<branch-name>` and the current branch both got new commits before merging), a special "merge commit" will be produced linking the two branches
  - (This is where things get a bit more messy and complicated: we'll take a closer look later)

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Remote hosting services (a.k.a. Git != GitHub)

- GitHub
- BitBucket
- GitLab
  - GitLab is also a Git host server software that you can use to host your own repos

Questions?

Addenda

Core commands

- `git init`
- `git status`
- `git log`
- `git add`
- `git reset`
- `git commit`
- `git branch`
- `git checkout`
  - (`git switch`)
  - (`git restore`)
- `git merge`

Remote and Collaboration commands

- `git clone`
- `git fetch`
- `git pull`
- `git push`
- `git remote`

Additional Commands

- `git help`
- `git stash`
- `git show`
- `git diff`
- `git rebase`
- `git blame`