Introduction to Scientific Computing II

Lab 3

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“Shell”

- Without a GUI, the typical interface to a machine is a command-line shell.
    - Presents a prompt… indicating where in the filesystem you are.
    - You type in a command → press enter to execute
- Typically shells
    - Use to mostly run other programs… by just typing in the name of the program.
        - They have to know where to look for programs to run…
    - In Unix, almost everything is a program: ls, rm, mkdir, rmdir, …
    - Have some native keywords: e.g. cd
    - Allow manipulation of environment variables:
        - map of string → string that programs can use to communicate basic things, e.g. where to find libraries.
        - Shell use the “PATH” environment variable to know where to look for programs.

Coding Workflow

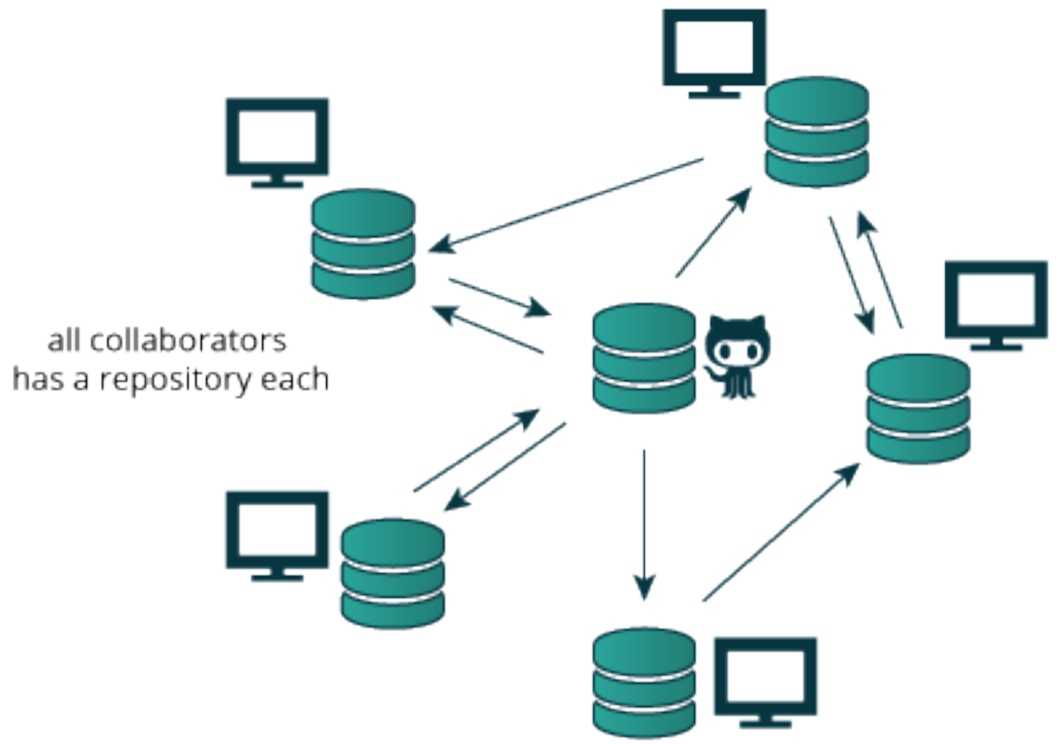
- Most basic:
  - Use a text editor to edit code files (e.g. foo.py)
    - Generally write explanations into the code as comments
  - If not interpreted: Compile/link
  - Test in a shell
- Integrated Development Environments (IDEs)
  - Provide a unified place where you write your code, execute for testing, and debug
- Notebooks
  - Combine text (e.g. instructions or explanations), code, and output

git

- git is a Version Control System (VCS)
    - Useful for code development or writing a large document
    - Keeps track of the evolution of files
    - Facilitates collaboration between multiple coders or authors
    - Allows concurrent development of multiple versions
    - Can be completely local or on a server
    - Enables establishing releases
- GitLab is a implementation of a git server.
    - Many companies or projects host their own GitLab service enabling their employees or participants to collaborate.
    - Can automate the process of incorporating new code or changes to code, testing, and building releases.
    - Also provides a browser, markdown documentation, wiki, and other convenient features.
- GitHub is a service that runs a public instance of a git server
    - Has become the de-facto mechanism for sharing open-source code

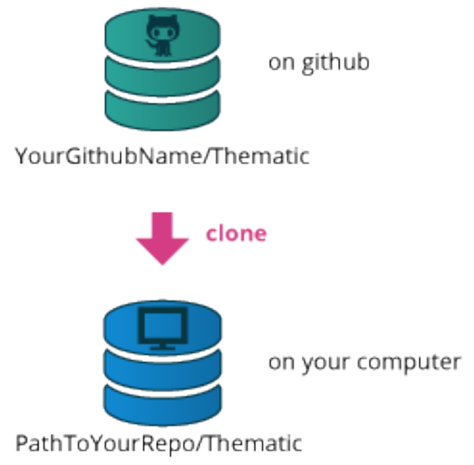
Git Concepts

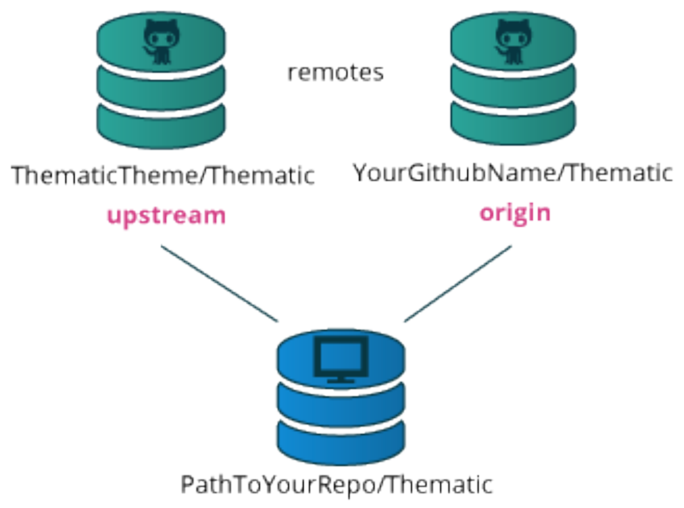
- ***Repository***: a container for all of the source code/docs for a specific project. Typically consists of:
    - ***Index:*** keeps all of the information about the files, including previous versions, comments, ….
    - ***Working directory:*** a copy of the files that you can use or modify.
- ***Add***: add a new file in the working directory to the index
- ***Commit***: puts the current state of file(s) into the index

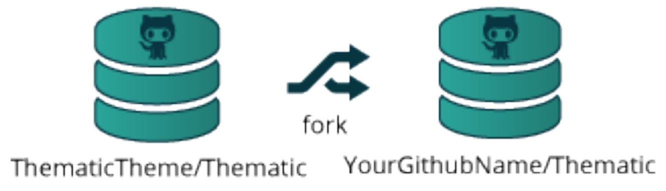


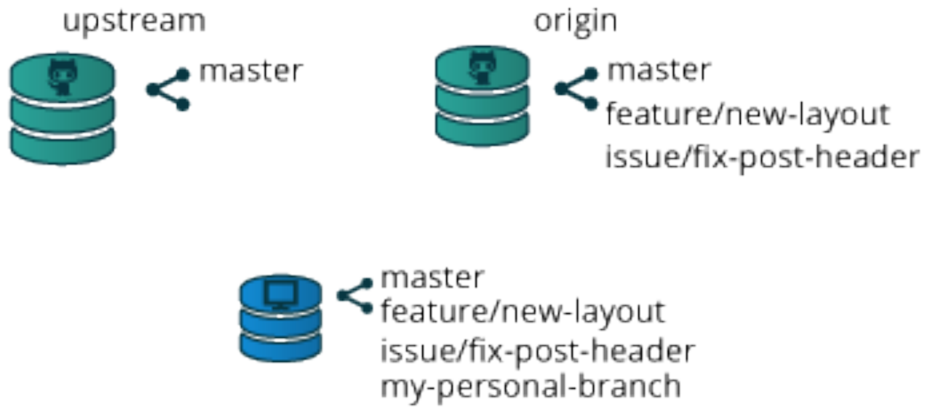
diagrams from: http://thepilcrow.net/explaining-basic-concepts-git-and-github/

- ***Clone***: a copy of a repository, usually local, and typically what the user interacts with.
- ***Remote:*** an instance of the repository in on a server.
    - ***origin:*** where your local commits are ***pushed***
    - ***upstream/fetch:*** where changes/updates are ***pulled*** into your ***local*** repository
    - for your own packages origin and upstream will likely be the same.
- ***Fork:*** a clone of a repository that can evolve independently from other clones.
- ***Branch:*** a parallel version of the repository that doesn't conflict with others.
    - ***Master:*** name of the main branch.
    - Branches can be later merged.
    - Typically, someone will develop something new in their own branch, and then merge it with master when tested.
- ***Tag:*** Name associated with a specific version of all of the files

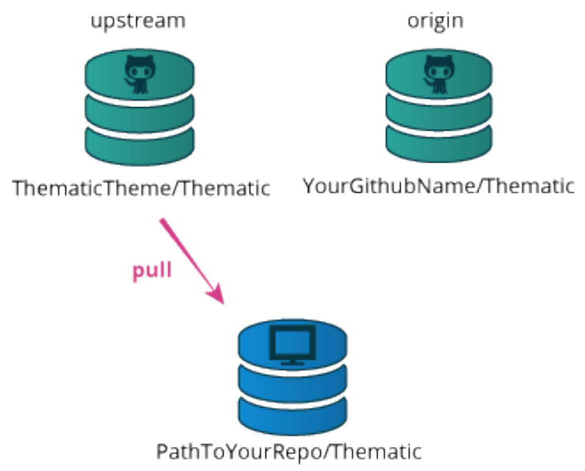


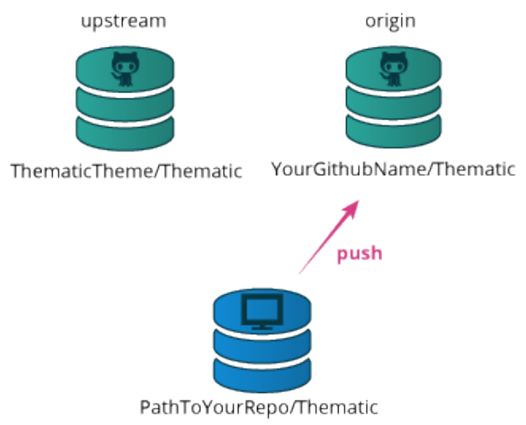






- ***Fetch***: getting updates from a remote into your index
- ***Merge:*** incorporation changes in index into your working directory
  - ***Merge conflict***: when incorporating changes isn't trivial and requires a manual ***merge resolution***.
    - For example if two different people work on same file simultaneously
      - The first person to push to the remote would have no issues
      - The second person would have to pull from the repository and resolve any conflicts
- ***Pull*** = fetch (from upstream) + merge
  - ***Pull request***: asking for pulling of your fork into another.
- ***Push:*** puts your index into your origin remote


upstream
origin
ThematicTheme/Thematic
YourGithubName/Thematic
pull
PathToYourRepo/Thematic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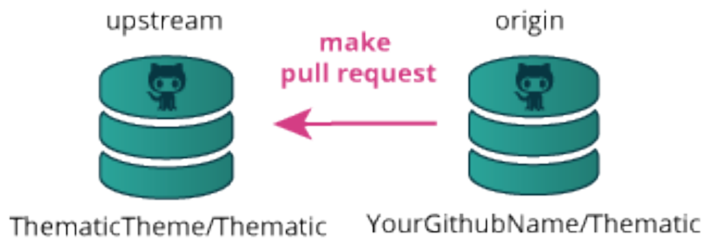
upstream
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