Fermilab U.S. DEPARTMENT OF ENERGY Office of Science

Git and Github introduction

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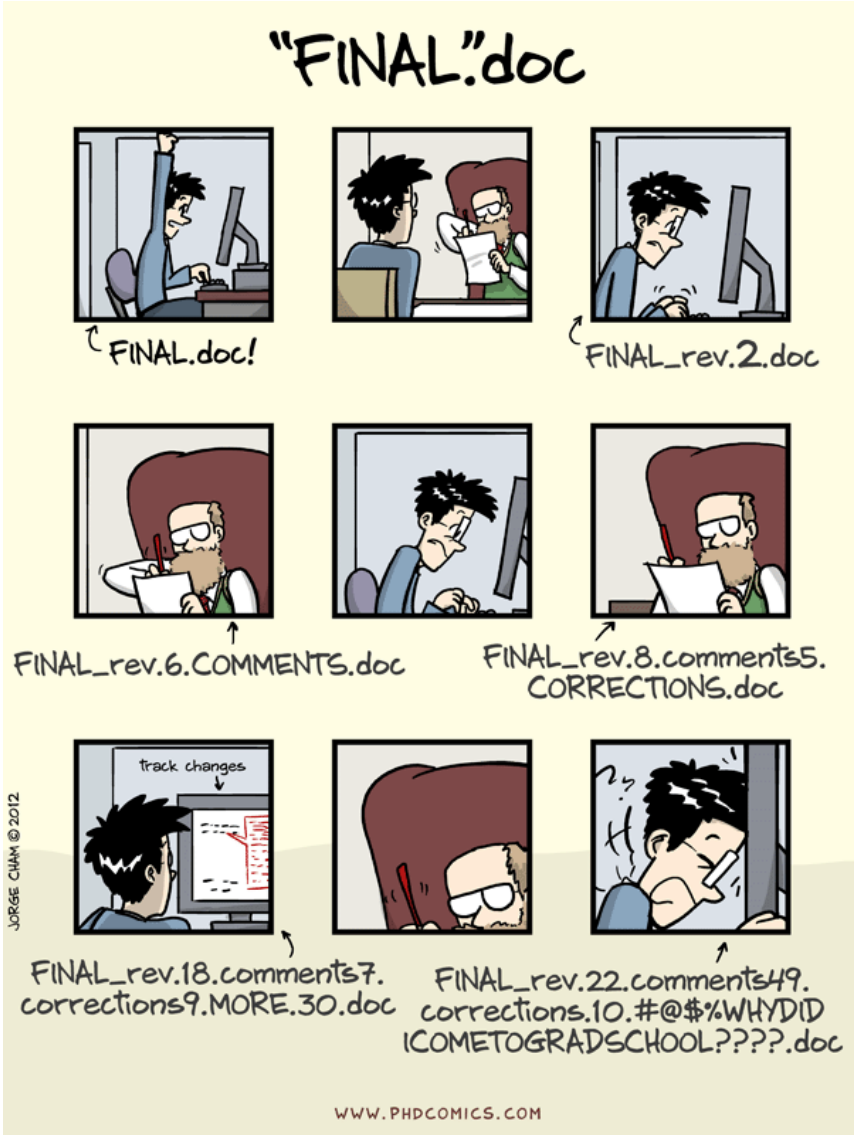
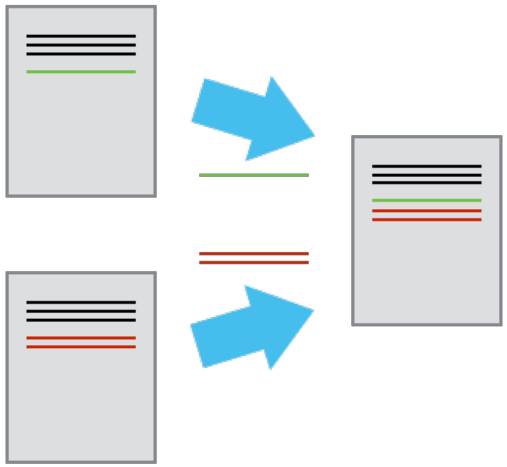
IRIS-HEP



"Piled Higher and Deeper" by Jorge Cham, http://www.phdcomics.com

Version Control System

- Preserves different
  version of a document
- Helps merging
  different contributions



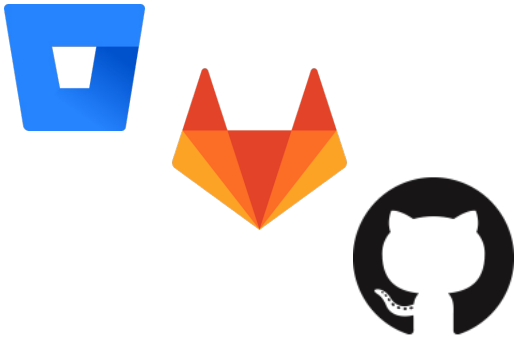
- Answers important questions on the documents
  - What changed?
  - Who changed it?
  - Why?

Image credit: https://swcarpentry.github.io/git-novice/01-basics/index.html

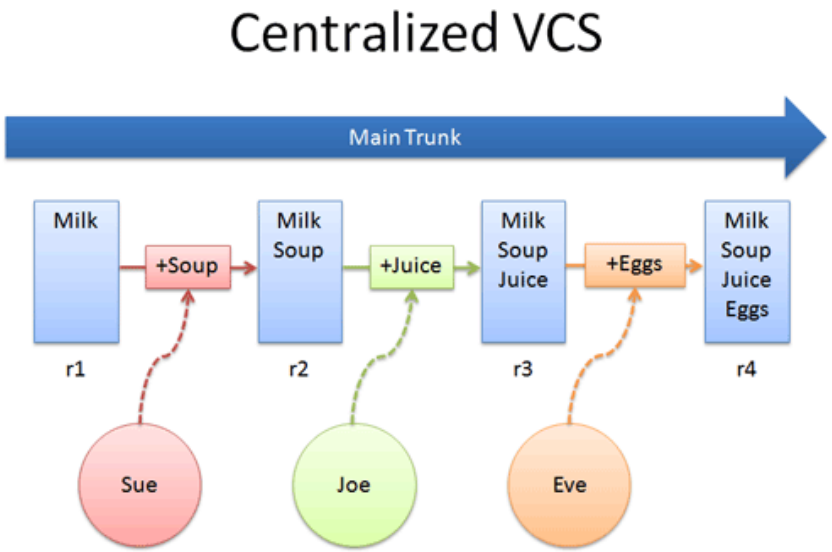
Git resources

- Clients for the major platforms
  - **Command line**
  - Fork (free evaluation) https://git-fork.com/
  - GitHub desktop https://desktop.github.com/
  - GitKraken (free version) https://www.gitkraken.com/
  - Tower (30 days trial) https://www.git-tower.com/
  - VS code https://code.visualstudio.com/docs/editor/github

- Online hosting
  - Bitbucket
  - GitLab
  - **GitHub**



Centralized vs distributed VCS



- CVS
- SVN

- Mercurial
- Git

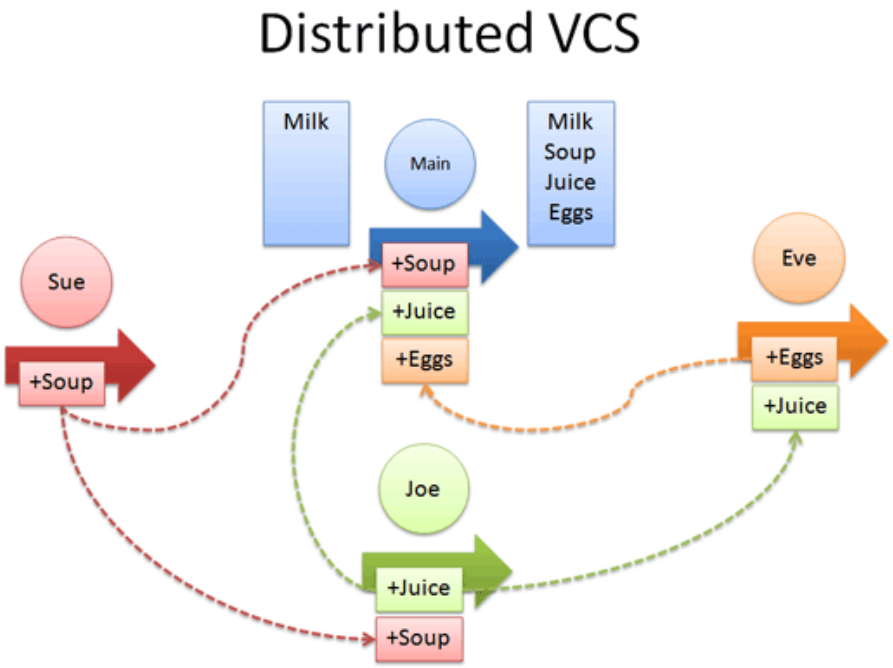
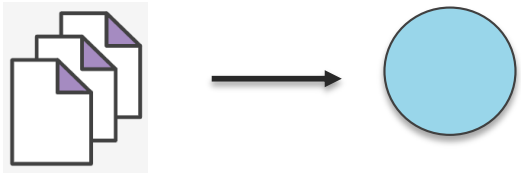


Image credit: https://betterexplained.com/articles/intro-to-distributed-version-control-illustrated/

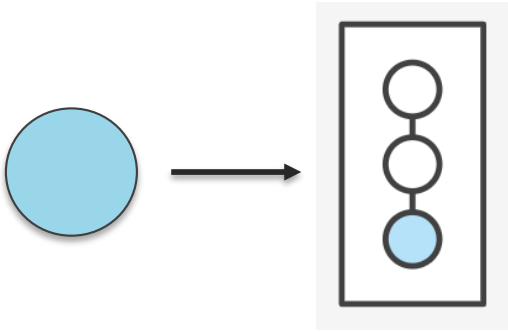
Git concepts – Local repository

- Snapshot with GUID (SHA1 hash)
  - git command [sub-command] [options] [arguments]
- Repository
  - init

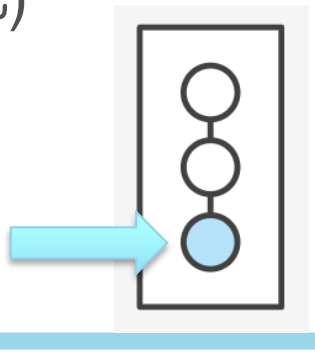
- Staging
  - add



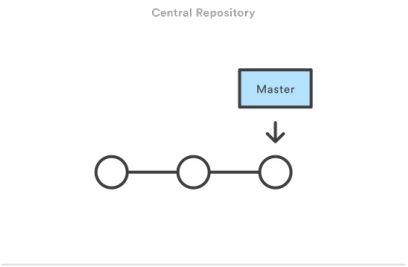
- Commit
  - commit (checkout)

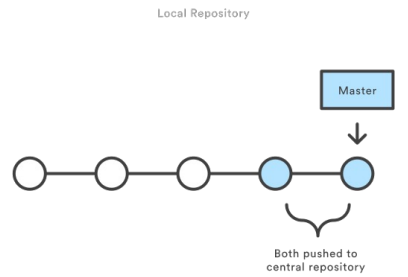


- Tag
  - tag (checkout)



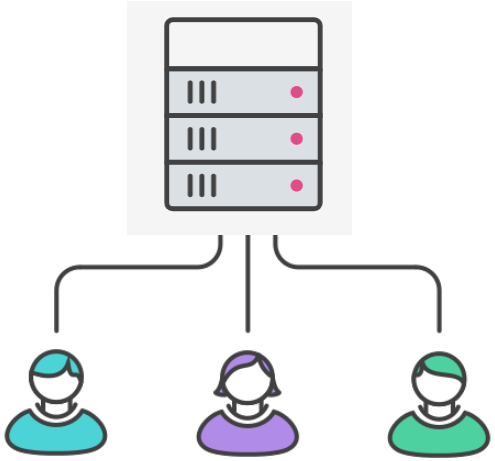
Centralized/Local workflow



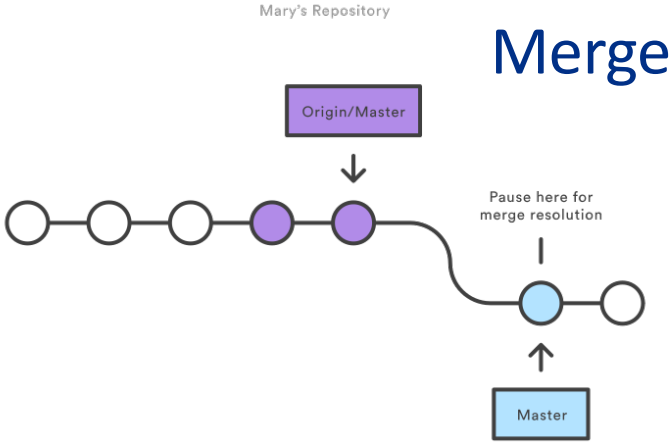


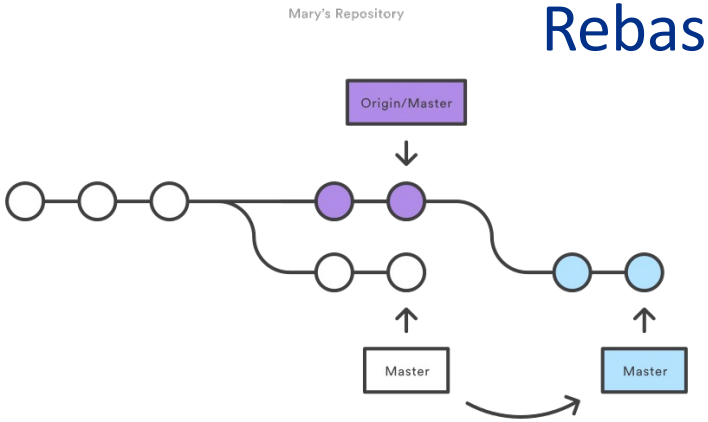
- Single (remote) repo
- Single ordered flow

- Conflicts solved one at the time by the developer



Conflicts resolution

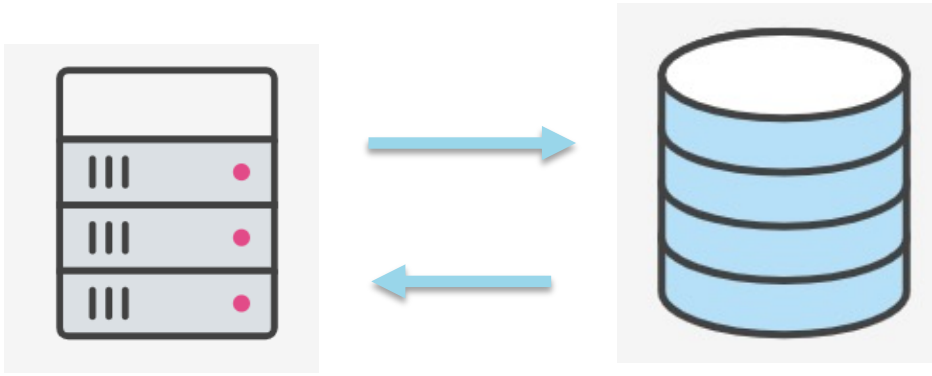




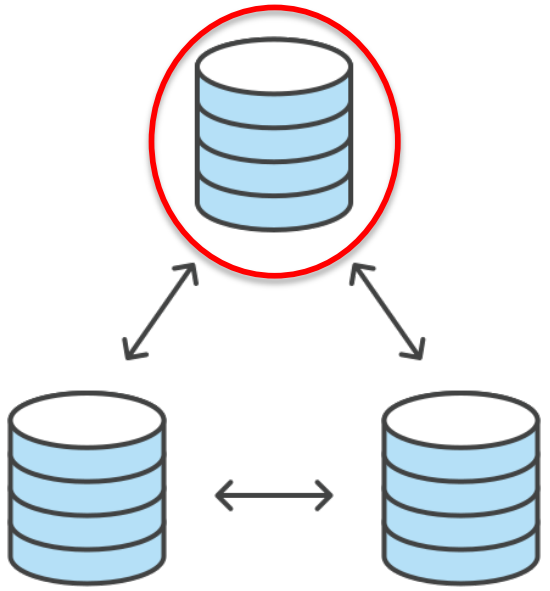
Images credit: https://www.atlassian.com/git/tutorials/comparing-workflows

Git remotes – Remote repositories

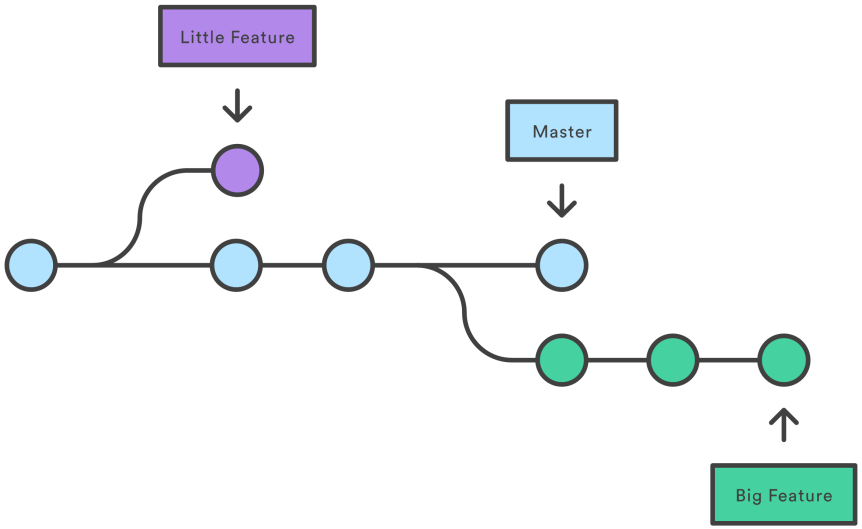
- Remote
  - clone
  - remote add
  - push
  - fetch (pull)
  - Local branches track remote ones (`branch -u`)

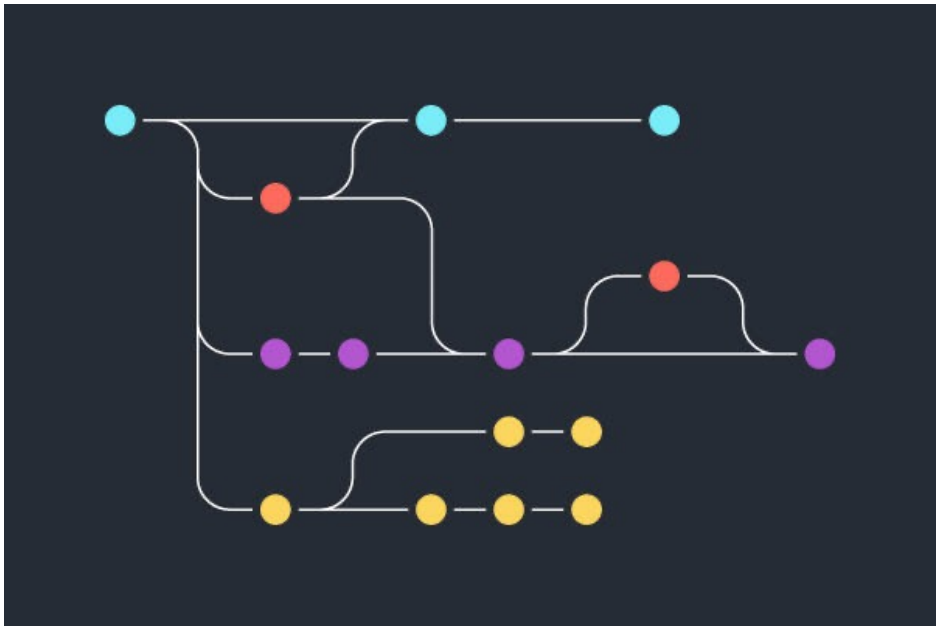


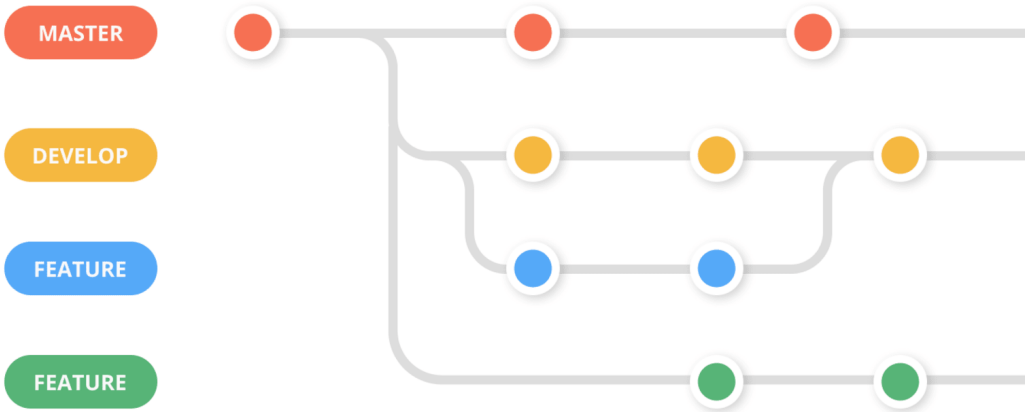
- Define a main repository!



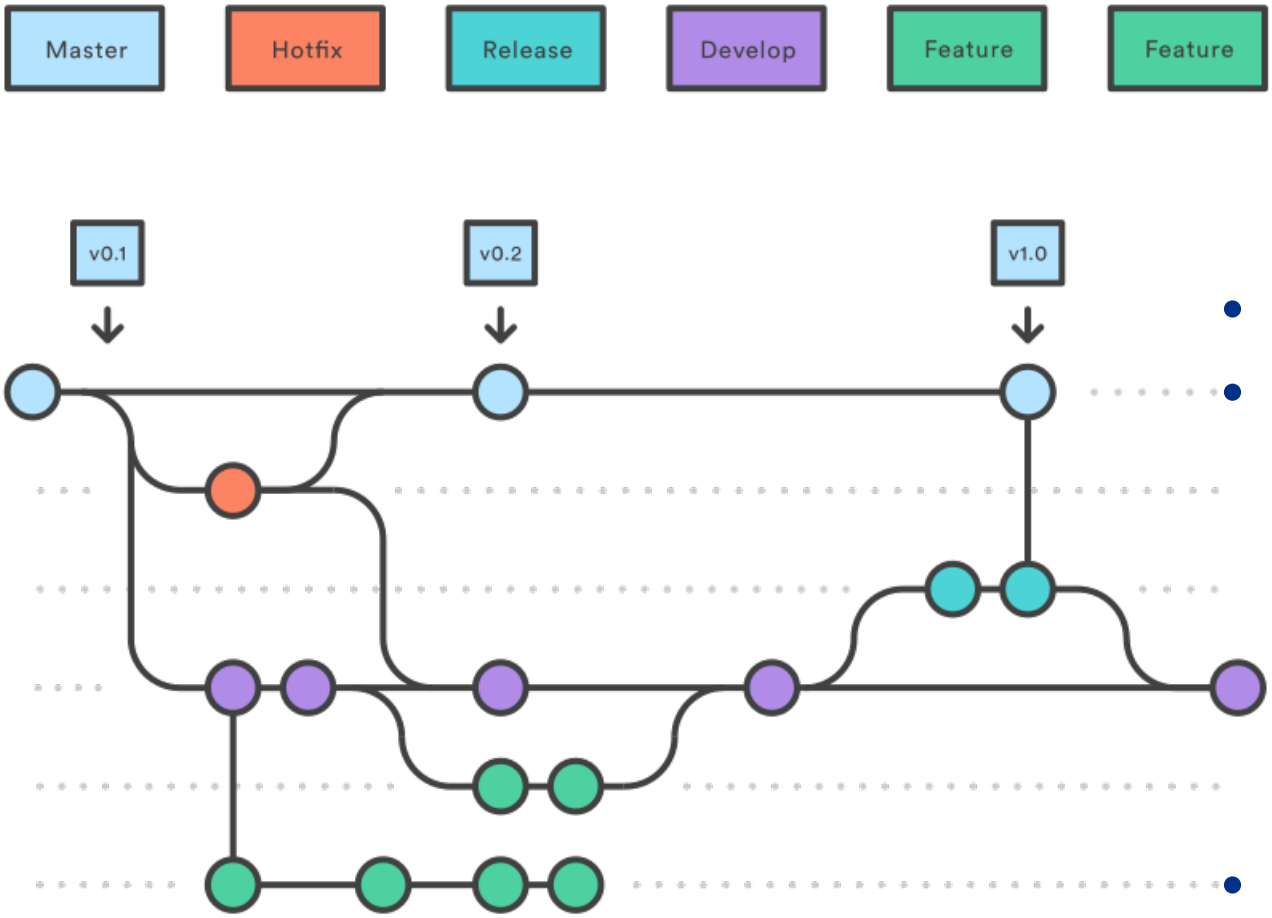
Branches

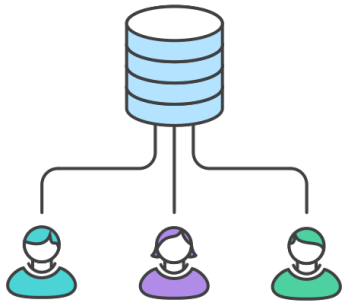

Little Feature
Master
Big Feature




MASTER
DEVELOP
FEATURE
FEATURE

Feature branching workflow



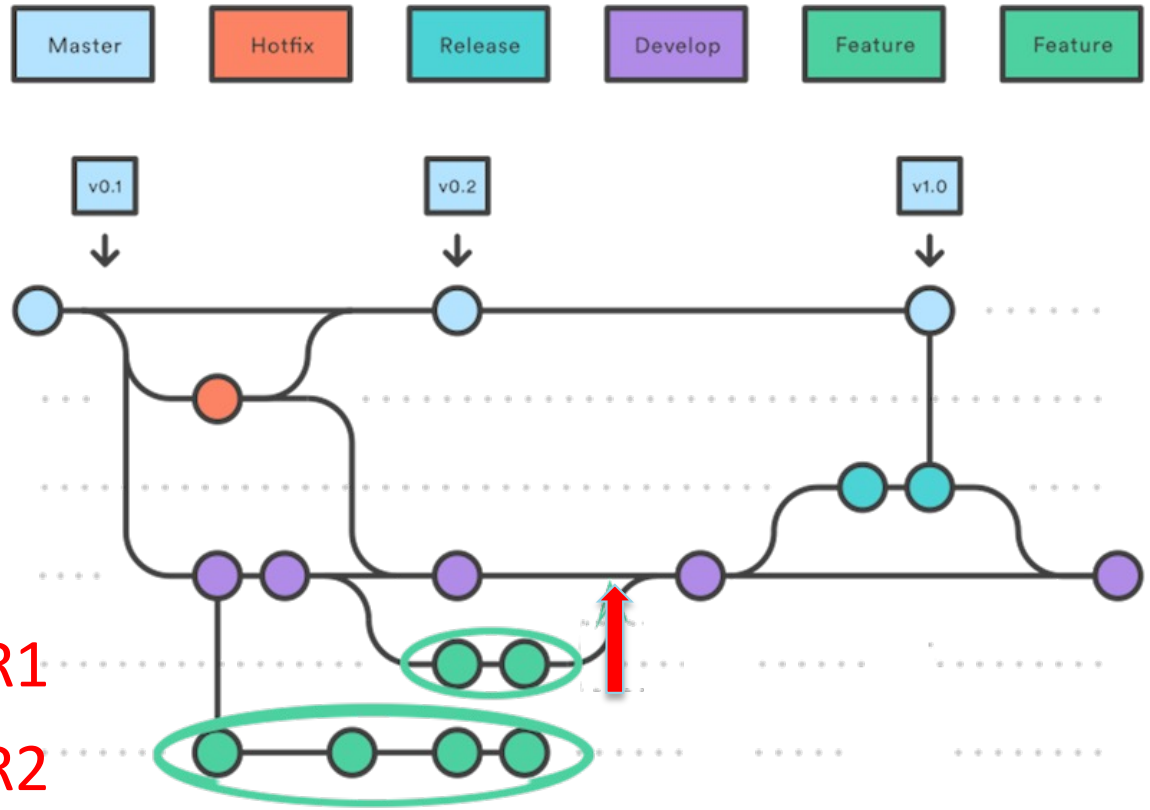


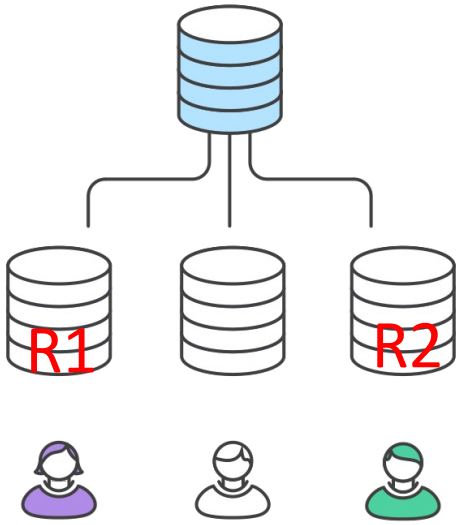
- Single (remote) repo
- Leverage branches:
  - master (releases)
  - Development
  - Features
  - Hotfixes
- Easier to enforce policies

https://nvie.com/posts/a-successful-git-branching-model/

Images credit: https://www.atlassian.com/git/tutorials/comparing-workflows

Fork and branch workflow





- Multiple forked repos
- Leverage branches
- Feature branches in forked repos
  - Squash
  - Rebase
- Pull requests
- Even easier to enforce policies
- Restricted access

Images credit: https://www.atlassian.com/git/tutorials/comparing-workflows

GitHub in brief

- Git repository hosting service https://github.com
- Numbers
  - over 40 million users
  - > 100 million repositories (> 28 million public)
  - GitHub, Inc. subsidiary of Microsoft
- Main services
  - Web interface
  - Wiki
  - Github Pages, websites https://*username*.github.io
  - Github Actions https://pages.github.com/
  - Pull requests w/ review and comments

https://help.github.com/en/github/managing-your-work-on-github/about-issues

  - Integrations

GitHub Desktop and CLI

- GitHub Desktop is a convenient GUI for GitHub
  - https://docs.github.com/en/desktop
- GitHub Command Line Interface (CLI) adds GitHub specific functionalities to the command line
  - Easy token authentication w/ “gh login”
  - https://docs.github.com/en/github-cli
  - https://docs.github.com/en/github-cli/github-cli/quickstart
  - https://github.com/cli/cli

Sources and references

- Google Colab and GitHub
  - https://colab.research.google.com/github/googlecolab/colabtools/blob/master/notebooks/colab-github-demo.ipynb
  - https://colab.research.google.com/github/googlecolab/colabtools/blob/master/notebooks/colab-github-demo.ipynb
  - https://towardsdatascience.com/google-drive-google-colab-github-dont-just-read-do-it-5554d5824228
- Git documents and tutorials
  - https://help.github.com/
  - https://www.atlassian.com/git/tutorials/
  - https://git-scm.com/
  - https://swcarpentry.github.io/git-novice/
  - https://education.github.com/git-cheat-sheet-education.pdf

Important Git recommendations

- One concept, one commit
- Write meaningful commit messages
  - First line is the summary
  - Enough detail to understand the changes
- Is OK to use a GUI
- No PASSWORDS (or keys, PII, …) in your repo!
- Public software should have a license
  - LICENSE (text file in the root of the repository)
  - BSD 3-clause, Apache 2.0, GitHub has examples
- A DOI, Digital Object Identifier, can facilitate citations
  - https://about.zenodo.org/