CS35L – Winter 19

Slide set:	9.1
Slide topics:	Source control, Git
Assignment:	9

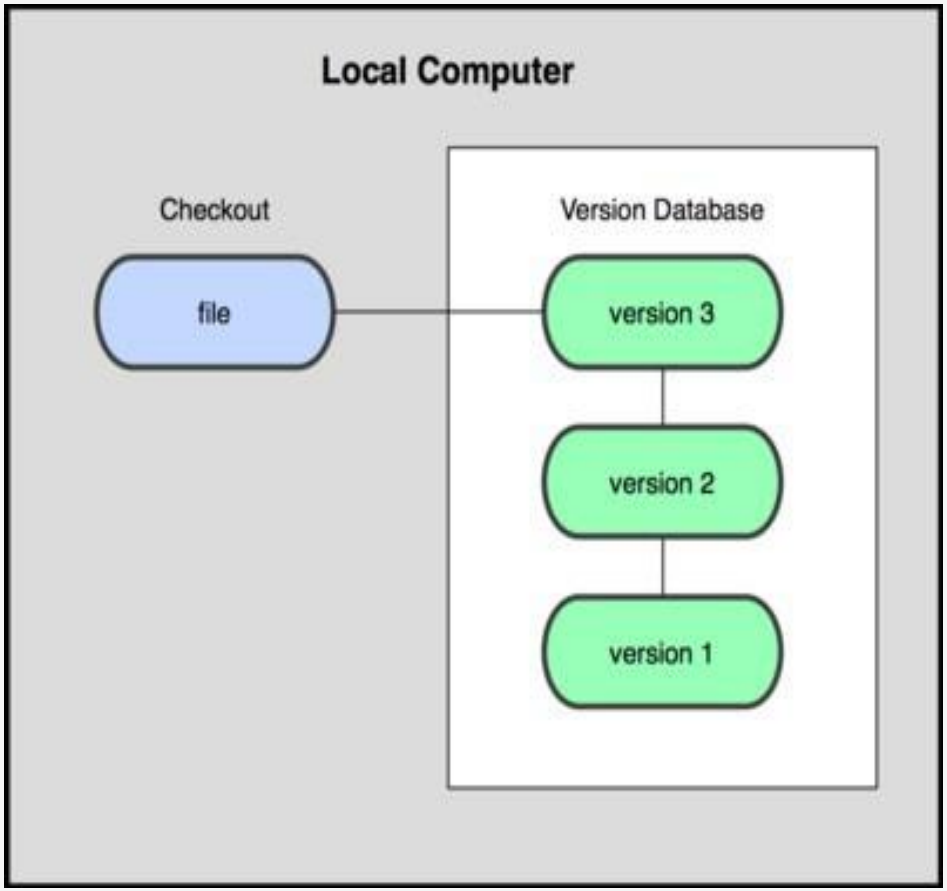
Software development process

- Involves making a lot of changes to code
  - New features added
  - Bugs fixed
  - Performance enhancements
- Software team has many people working on the same/different parts of code
- Many versions of software released
  - Ubuntu 10, Ubuntu 12, etc
  - Need to be able to fix bugs for Ubuntu 10 for customers using it, even though you have shipped Ubuntu 12.

Source / Version Control

- Track changes to code and other files related to the software
  - What new files were added?
  - What changes made to files?
  - Which version had what changes?
  - Which user made the changes?
- Track entire history of the software
- Version control software
  - GIT, Subversion, Perforce

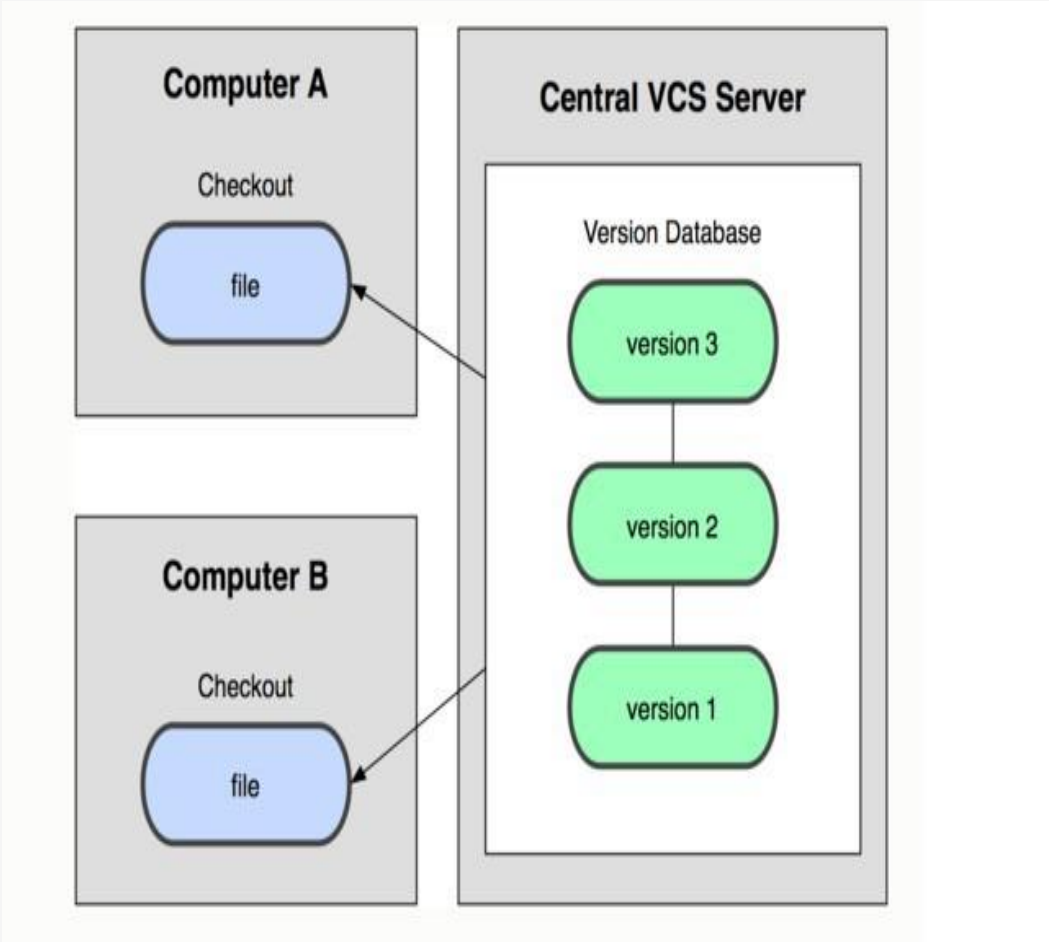
Local VCS



- Organize different versions as folders on the local machine
- No server involved
- Other users should copy it via disk/network

Image Source: git-scm.com

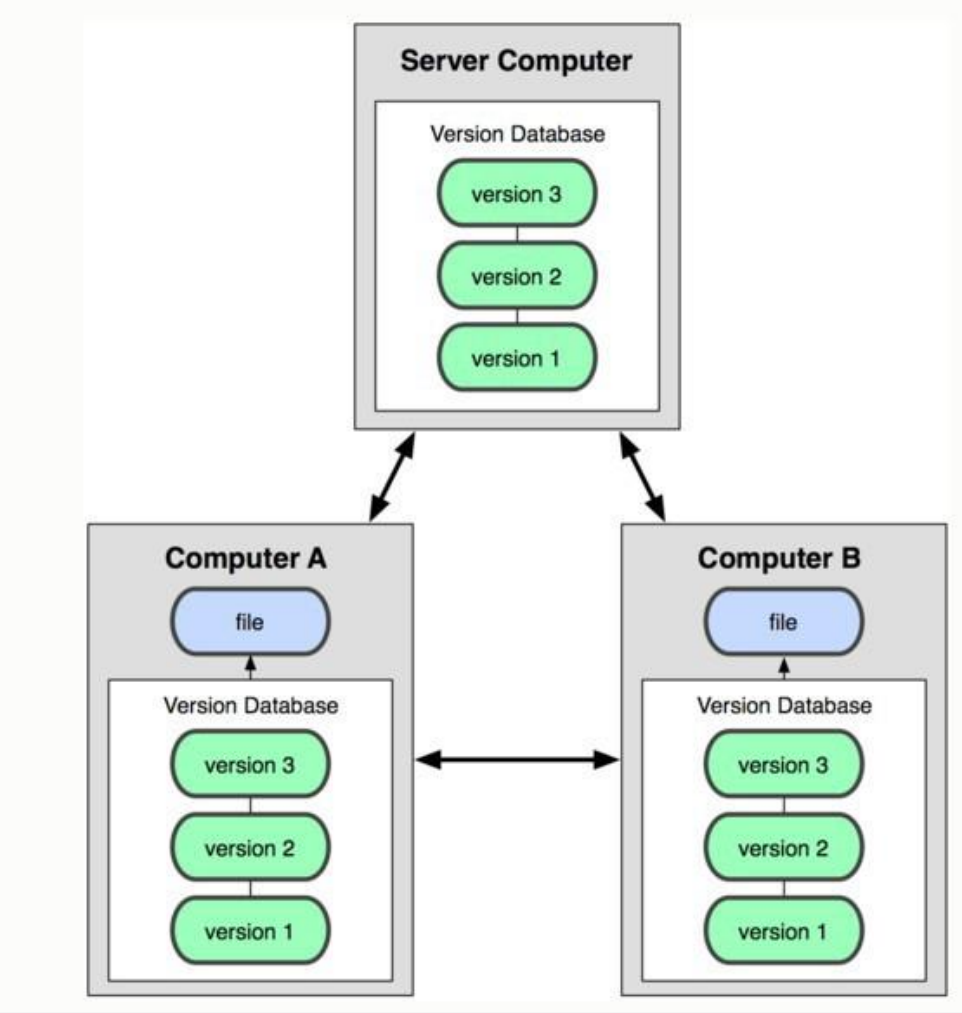
Centralized VCS



- Version history sits on a central server
- Users will get a working copy of the files
- Changes have to be committed to the server
- All users can get the changes

Image Source: git-scm.com

Distributed VCS



- Version history is replicated at every user's machine
- Users have version control all the time
- Changes can be communicated between users
- Git is distributed

Terms used

- **Repository**
  - Files and folder related to the software code
  - Full History of the software
- **Working copy**
  - Copy of software's files in the repository
- **Check-out**
  - To create a working copy of the repository
- **Check-in / Commit**
  - Write the changes made in the working copy to the repository
  - Commits are recorded by the VCS

GIT SOURCE CONTROL

Git States

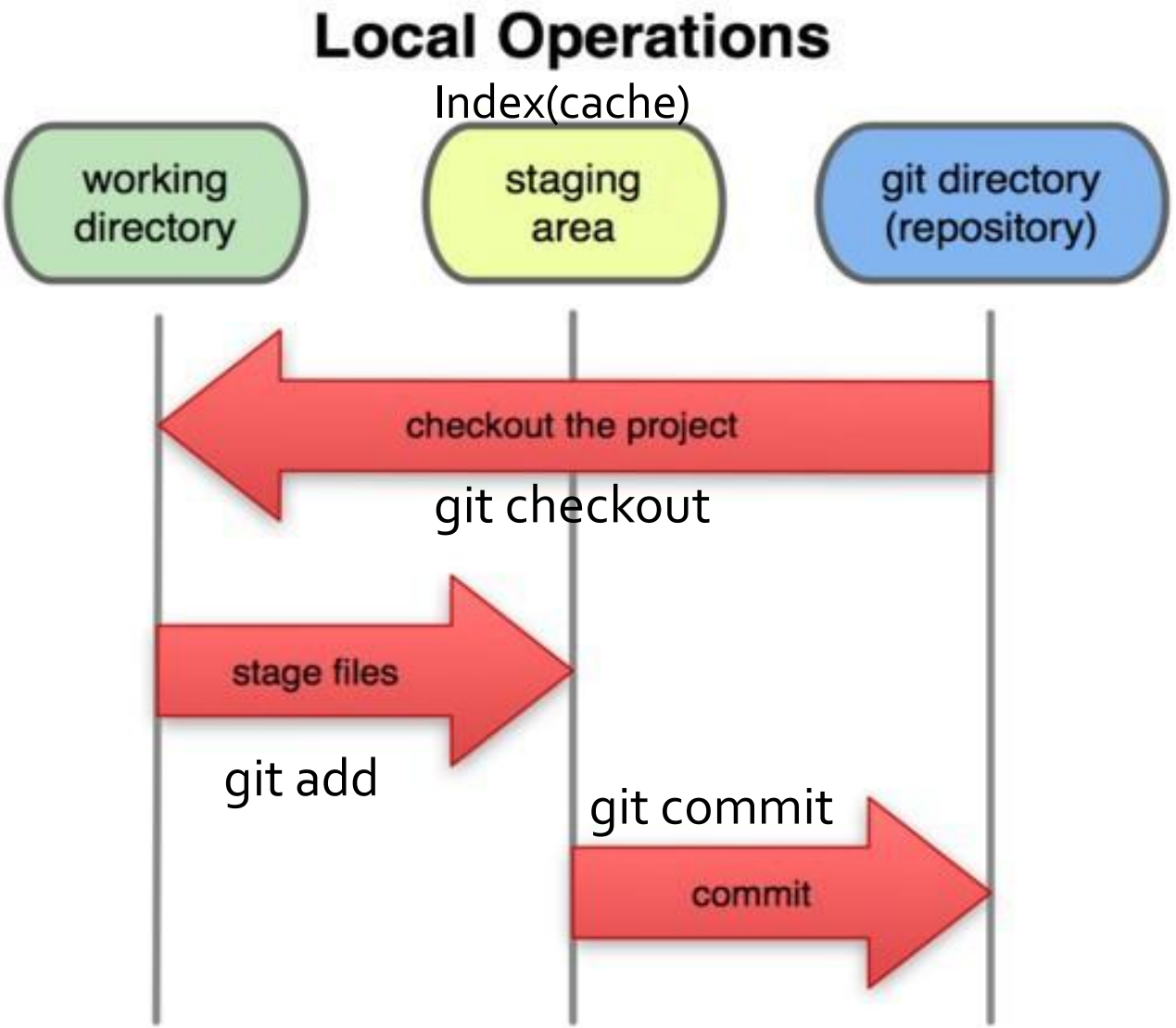


Image Source: git-scm.com

Terms used

- HEAD
  - Refers to the currently active head
  - Refers to a commit object
- Branch
  - Refers to a head and its entire set of ancestor commits
- Master
  - Default branch

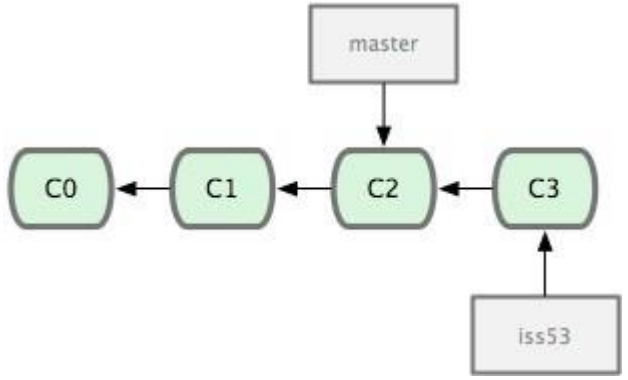


Image Source: git-scm.com

Git commands

- Repository creation
  - $ git init (Start a new repository)
  - $ git clone (Create a copy of an exisiting repository)
- Branching
  - $ git branch <new_branch_name>
  - $ git checkout <tag/commit> -b <new_branch_name> (creates a new branch)
- Commits
  - $ git add (Stage modified/new files)
  - $ git commit (check-in the changes to the repository)
- Getting info
  - $ git status (Shows modified files, new files, etc)
  - $ git diff (compares working copy with staged files)
  - $ git log (Shows history of commits)
  - $ git show (Show a certain object in the repository)
- Getting help
  - $ git help

First Git Repository

- `$mkdir gittest`
- `$cd gittest`
- `$git init`
  - creates an empty git repo (.git directory with all necessary subdirectories)
- `$echo "Hello World" > hello.txt`
- `$git add .`
  - Adds content to the index
  - Must be run prior to a commit
- `$git commit –m "Check in number 1"`

Working With Git

- `$ echo "I love Git" >> hello.txt`

- `$ git status`
  - Shows list of modified files
  - hello.txt

- `$ git diff`
  - Shows changes we made compared to index

- `$ git add hello.txt`

`$ git diff`

No changes shown as diff compares to the index

`$ git diff HEAD`

Now we can see changes in working version

`$ git commit -m "Second commit"`

Working With Branches

- `$ git branch test`
  - Create new branch
- `$ git branch`
  - Lists all branches
- `$ git checkout test`
  - Switch to test branch

- `$ echo "hello world!" > hw`
- `$` Commit the change in new branch

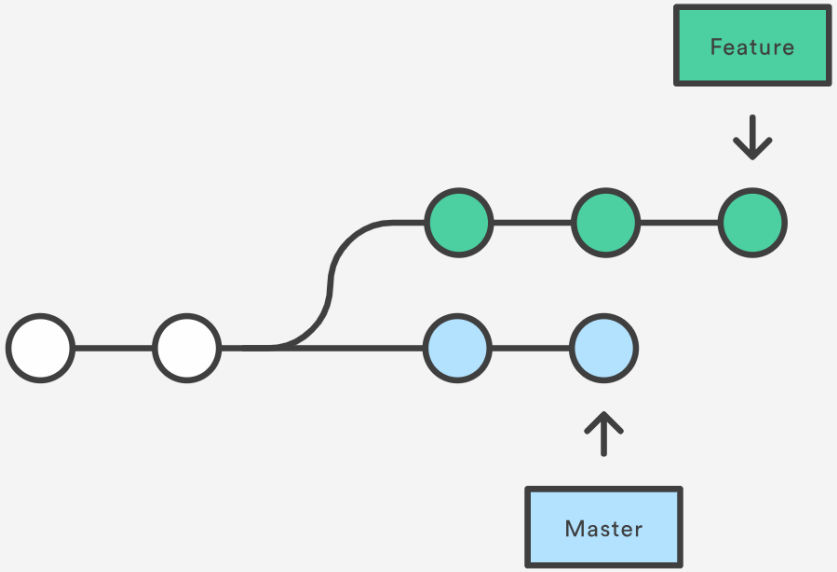
- `$ git checkout master`
  - Back to master branch
- `$ git log`
- `$ git merge test`
  - Merges commits from test branch to current branch (here master)

Git integrating changes

- Required when there are changes in multiple branches
- Two main ways to integrate changes from one branch to another – merge and rebase
- Merge is simple and straightforward
- Rebase is much cleaner, but you lose context!

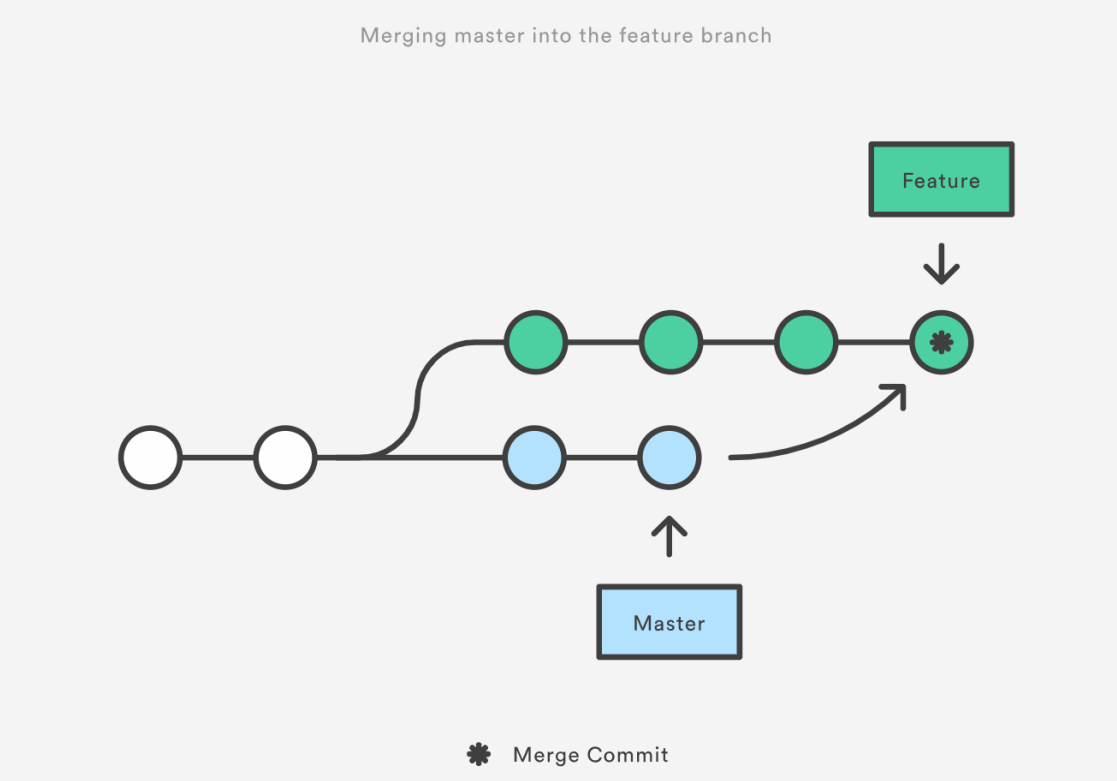
Merge & Rebase

A forked commit history



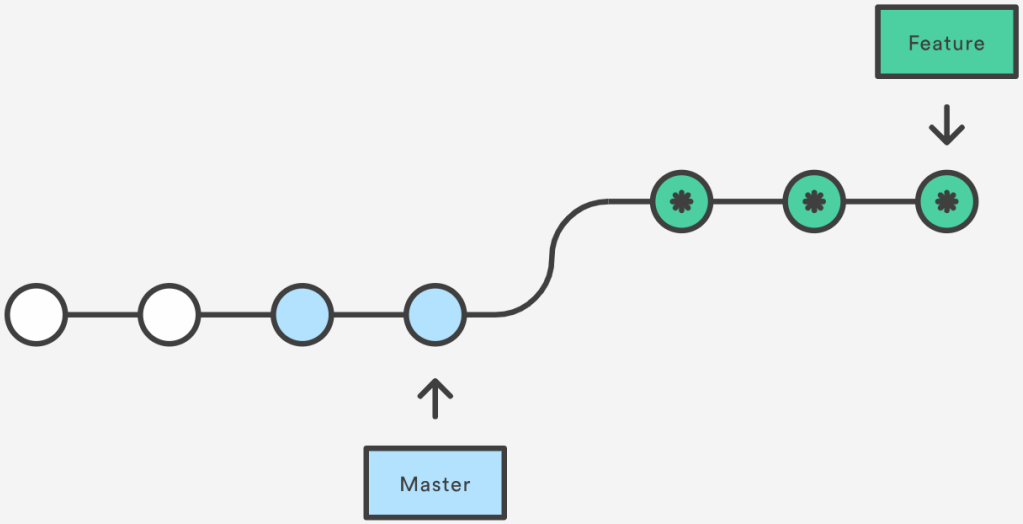
- Feature and Master need to be integrated now
- Two options – merge or rebase

GIT MERGE


Merging master into the feature branch
Feature
Master
Merge Commit

GIT REBASE

Rebasing the feature branch onto master



Brand New Commit

Merge Conflicts

Usually git will do merge automatically

Conflict arises when you changed the same part of the same file differently in the two branches you're merging together

The new commit object will not be created

You need to resolve conflicts manually by selecting which parts of the file you want to keep

More Git Commands

- Reverting
  - `$ git checkout HEAD main.cpp`
    - Gets the HEAD revision for the working copy
  - `$ git checkout -- main.cpp`
    - Reverts changes in the working directory
  - `$ git revert`
    - Reverting commits (this creates new commits)
- Cleaning up untracked files
  - `$ git clean`
- Tagging
  - Human readable pointers to specific commits
  - `$ git tag  -a v1.0 –m 'Version 1.0'`
    - This will name the HEAD commit "v1.0", with the description "Version 1.0"

Assignment 9

Deadline (No late Submission!)

Saturday March 16th, 11:55 PM

Lab 9

Fix an issue with diff diagnostic - apply a patch to a previous version

Installing Git

- Ubuntu: `$ sudo apt-get install git`
- SEASnet
  - Git is installed in /usr/local/cs/bin
  - Add it to PATH variable or use whole path
    - `$ export PATH=/usr/local/cs/bin:$PATH`

Make a directory 'gitroot' and get a copy of the Diffutils Git repository

- `$ mkdir gitroot`
- `$ cd gitroot`
- `$ git clone <URL>`
- Follow steps in lab and use man git to find commands

Hints

1. `git clone`
2. `git log`
3. `git tag`
4. `git show <hash>`
5. `git checkout v3.0 -b <branchname>`