

hackerschool

by NUS Hackers

Introduction to Git

Time to Git Gud

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Where are we?

Introduction

Version Control and Git

Getting Started

Setting up a repo

How does git work

Saving Changes

Collaborating

Branching

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Advanced Features

Rebasing

Reset, Checkout, Revert

Cherry Picking

Conclusion

Quality of Life Improvements

NUS Hackers



<http://nushackers.org>

Hackerschool
Friday Hacks
Hack & Roll
NUS Hackerspace

About Me

Hi! I am Raynold. My github is

<https://github.com/raynoldng>

A Year 3 Computer Science Undergraduate who loves building stuff.

Have been doing web development for the past 2 years.

Interests: algorithms and math

About This Workshop

- Beginner level workshop
- No prior knowledge assumed
- Basic and advanced features of Git
- Better manage your code base and collaborate with others

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Required Software

- **git** (<https://git-scm.com/downloads>)
- **VS Code** (<https://code.visualstudio.com/>) or your favorite text editor

Have you ever seen:



Report_draft_1.doc



Report_draft_2.doc



Report_draft.doc



Report_final_1.doc



Report_final_2.doc



Report_final_final_please.doc



Report_final_final.doc



Report_final.doc

What is version control

- Category of software tools that help software team manage checks changes to source code over time
- every modification to code tracked in a special kind of database
- version control software (VSC) essential part of modern software team's professional practices
- Example: `https://github.com/torvalds/linux/commits/master`



What is git?

- Most widely used modern VSC
- Originally developed in 2005 by Linus Torvalds, famous creator of Linux operating system kernel
- Pros: Performance, Security, Flexibility
- Cons: Hard to learn???
- Download it here: <https://git-scm.com/downloads>



```
2. leafgecko@r-31-104-25-172: ~ (zsh)
Last login: Wed Sep  5 13:37:40 on ttys002
➔ ~ git version
git version 2.15.2 (Apple Git-101.1)
➔ ~
```

Setting up git

Set your user name and email. Every git commit uses this information and baked into your commits. --global option so that git will always use that information on that system

```
1 git config --global user.name <your name>
2 git config --global user.email <your email address>
3 git config --global --add color.ui true
```

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Create a local git repo

- When creating a new project on your local machine, you'll first create a new repository
- Enter the following into the terminal

```
1    cd ~/Desktop
2    mkdir my_site
3    cd my_site
4    git init
```

Add a new file to the repo

- We are going to reuse the website created from last week. If you don't have it, get it here
- once you've added or modified files, in the repo folder, git will notice changes made in the repo
- use the `git status` to see which files git knows exist

```
1. leafgecko@r-31-104-25-172: ~/Desktop/my_website
→ my_website git:(master) ✗ git status
On branch master

No commits yet

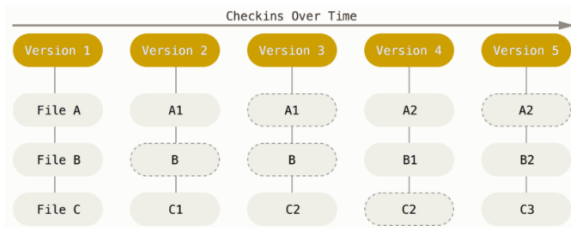
Untracked files:
  (use "git add <file>..." to include in what will be committed)

    index.html

nothing added to commit but untracked files present (use "git add" to track)
```

Git Basics

- git all about snapshots, not deltas
- git thinks of its data as a series of snapshots of a miniature filesystem
- every time you commit, git takes a photo of what your files look like and stores a reference to that object
- git data is a stream of snapshots

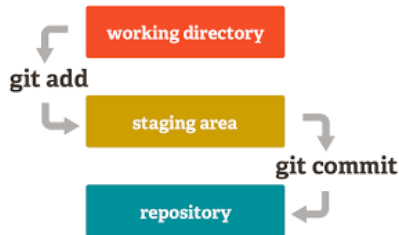
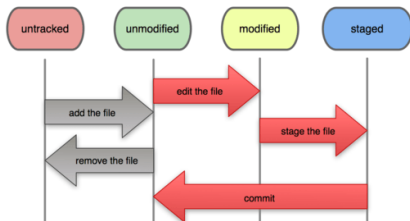


Master the Three States (Elements)

- **commit**: record of what files you have changed since the last commit
- files in your git repository can be in three main states:
 - **untracked**: any files that are not in your last snap shot and not in your staging area
 - **unmodified**: files not modified since last snap shot
 - **committed**: data is stored safely in your local database
 - **modified**: file changed but have not committed to your database yet
 - **staged**: modified file marked in its current version to go into next commit snapshot

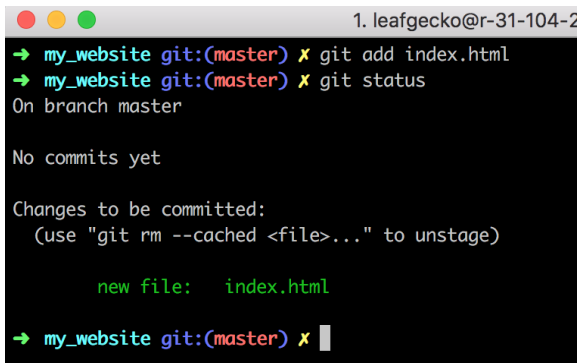
git workflow

File Status Lifecycle



Add a file to staging environment

- add a file to staging with the `git add <file>` command
- the after `git add`, the file has **not** yet been added to a commit



```
1. leafgecko@r-31-104-2
→ my_website git:(master) ✗ git add index.html
→ my_website git:(master) ✗ git status
On branch master

No commits yet

Changes to be committed:
  (use "git rm --cached <file>..." to unstage)

    new file:   index.html

→ my_website git:(master) ✗
```

Create a commit

- Run the command `git commit -m "Your message to commit"`
- The message should be related to the commit

```
1. leafgecko@r-31-104-25-17:  
→ my_website git:(master) ✗ git commit -m "first commit"  
[master (root-commit) dff4c25] first commit  
1 file changed, 46 insertions(+)  
create mode 100644 index.html  
→ my_website git:(master) █
```



Comparing changes with git diff

- Diffing is a function that takes two input data sets and outputs changes between them
- Add/delete/edit some lines in `index.html` and run `git diff` to show any uncommitted since last commit
- `git diff` used to show changes between commits, commit and working tree etc. See <https://git-scm.com/docs/git-diff> documentation

```
diff --git a/index.html b/index.html
index f5a08bd..0c98206 100644
--- a/index.html
+++ b/index.html
@@ -2,6 +2,7 @@
<html lang="en">
<head>
  <!-- Required meta tags -->
+  <!-- random comment -->
  <meta charset="utf-8">
  <meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no">
@@ -19,7 +20,7 @@
  <div class="row">
    <div class="col-4">
      <h2>About me</h2>
-      <p>Proud member of NJS Hackers</p>
+      <p>Proud member of NJS Hackers and Computing</p>
+      <p>I love building and hacking stuffs.</p>
      
    </div>
@@ -27,10 +28,12 @@
    <h2>Interests</h2>
    <p>Computer Science</p>
    <p>Mathematics</p>
+    <p>Good Foods</p>
+    <p>Sleeping</p>
  </div>
  <div class="col-4">
    <h2>Favourite Games</h2>
+    <a href="https://acecombat.com/">Ace Combat</a>
+    <a href="https://www.easports.com/fifa/">Fifa</a>
  </div>
</div>
```

Stashing changes

- stashing is handy if you need to quickly switch context and work on something else
- `git stash` takes your uncommitted changes (both staged and unstaged) and saves them away for later use
- By default, `git stash` will not stash new files and files that are ignored(!), add `-u` or `--include-untracked` to stash untracked files

```
1. leafgecko@r-31-104-25-172: ~/Desktop/my_website (zsh)
→ my_website git:(master) ✗ git stash
Saved working directory and index state WIP on master: dff4c25 first commit
→ my_website git:(master) ✗ git status
On branch master
Untracked files:
  (use "git add <file>..." to include in what will be committed)

    my_photo.png

nothing added to commit but untracked files present (use "git add" to track)
→ my_website git:(master) ✗
```

```
1. leafgecko@r-31-104-25-172: ~/Desktop/my_wet
→ my_website git:(master) ✗ git status
On branch master
Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git checkout -- <file>..." to discard changes in working directory)

    modified:   index.html

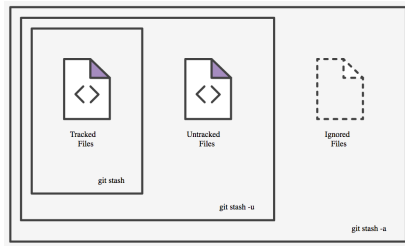
Untracked files:
  (use "git add <file>..." to include in what will be committed)

    my_photo.png

no changes added to commit (use "git add" and/or "git commit -a")
→ my_website git:(master) ✗
```

Stashing untracked or ignored files

- By default, `git stash` will not stash new files and files that are ignored(!), add `-u` or `--include-untracked` to stash untracked files
- annotate your stash with a description: `git stash save "message"`



Applying Stash

- Reapply stashed changes with `git stash pop`
- popping **removes** the changes from your stash and reapplies them to your working copy
- `git stash apply` to reapply changes to your working copy and keep them, useful if want to apply on multiple branches(!)

.gitignore

- Ignored files are usually build artifacts and machine generated files that can be derived from your repository
- common examples:
 - dependency caches like `/node_modules` or `/packages`
 - compiled code, such as `.o`, `.pyc`, and `.class` files
 - build output directories, such as `/bin`, `/out`, or `/target`
 - files generated at runtime, such as `.log`, `.lock`, or `.tmp`
 - personal config files like `.idea/workspace`

Git ignore patterns

- `**/logs`
- `**/logs/debug.log`
- `*.log`
- `/debug.log`
- `debug.log`
- See the full list [here](#)

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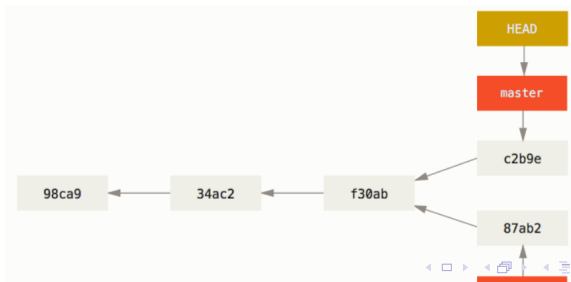
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Branching

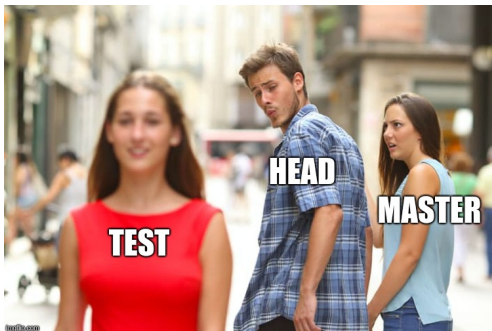
- allow you to diverge from the main line of development and continue work without messing with the main line
- killer feature of git as it is incredibly fast and lightweight
- a branch is a lightweight pointer to a commit, default pointer is `master`
- `HEAD`: special pointer to local branch that you are currently on



Common branch commands

- `git branch`: list all branches
- `git branch <branch>`: create a new branch of given name
- `git branch -d <branch>`: delete specified branch, cannot delete if have unmerged changes
- `git branch -D <branch>`: force delete specified branch
- `git branch -m <branch>`: rename current branch to <branch>
- `git branch -a`: list all remote branches

Git checkout



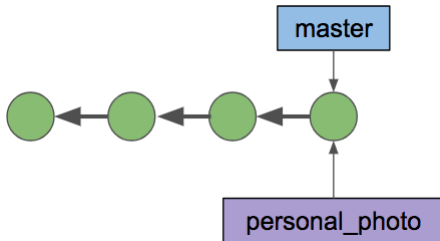
Creating and checking out a branch

- checking out is the act of switching between different versions of a target entity
- entities: files, commits, and branches

```
1 git branch personal_photo  
2 git checkout personal_photo
```

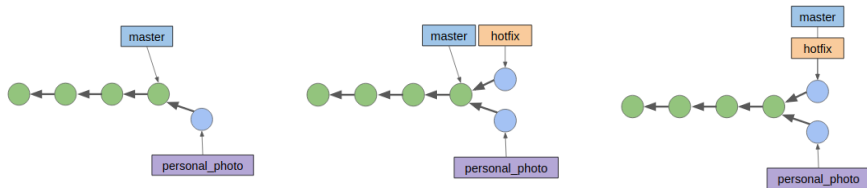
OR:

```
1 git checkout -b personal_photo
```



Branching Workflow

1. add photo to `index.html` and commit it, doing so moves `personal_photo` forward
2. urgent fix: change the name, create a `hot_fix` branch, once done merge it back into `master`
3. switch back to adding your photo and merge it back into `master` when done



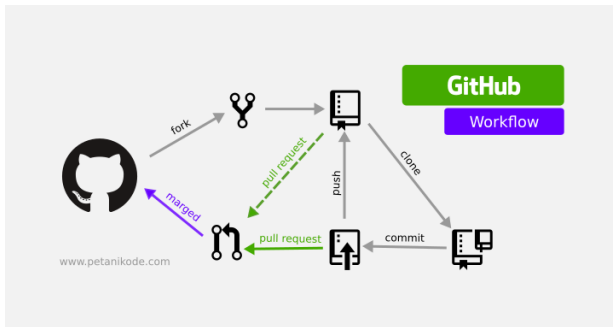
git fast forwarding

- git does a fast forward when you merge a branch that is ahead of your checked out branch (e.g. merge hotfix into master)
- both branches point the same commit and no new commit is made

```
test@julius-ThinkPad-X220: ~/Desktop/my_website$ git checkout master
Switched to branch 'master'
Your branch is up to date with 'origin/master'.
test@julius-ThinkPad-X220:~/Desktop/my_website$ git merge hotfix
Updating dff4c25..c09c6be
Fast-forward
 index.html | 3 ++-
 1 file changed, 2 insertions(+), 1 deletion(-)
```


What is Github?

- code hosting platform for version control and collaboration. It lets you and others work together on projects from anywhere
- alternative: bitbucket



Create your github repo

1. Create a github account if you haven't done so already
2. Create a new repository `my_website` or any name you want
3. Push your code to this repo

Create a new repository

A repository contains all the files for your project, including the revision history.

Owner

 raynoldg

Repository name

/ my_website

Great repository names are short and memorable. Need inspiration? How about [crispy-fiesta](#).

Description (optional)

1

2

```
git remote add origin
↩ <url>

git push -u origin
↩ master
```

Working with remotes

- remote repos are versions of your project that are hosted on the Internet (Github) or somewhere
- collaborating with others involves managing these remote repositories and pushing and pulling data between them

```

1. leafgecko@r-31-104-25-172: ~/E
→ my_website git:(master) X git remote -v
origin https://github.com/raynoldng/my_website.git (fetch)
origin https://github.com/raynoldng/my_website.git (push)
→ my_website git:(master) X git push origin master
Username for 'https://github.com': raynoldng
Password for 'https://raynoldng@github.com':
Counting objects: 3, done.
Delta compression using up to 4 threads.
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 1.11 KiB | 1.11 MiB/s, done.
Total 3 (delta 0), reused 0 (delta 0)
To https://github.com/raynoldng/my_website.git
 * [new branch]      master -> master
→ my_website git:(master) X

```

Fetching, Pushing and Pulling

- `git fetch <remote>`: goes to remote project and pulls down all the data from that remote project that you don't have yet
- `git pull <remote>`: fetch and merge that remote branch into your current branch
- `git push <remote> <branch>`: push branch to remote project, you need write permissions to that remote project

Cloning a repo

- `git clone` target an existing repo and create a clone, or copy of the target repository
- cloning automatically creates a remote connection called `origin` pointing back to the original repository

```
1. leafgecko@r-31-104-25-172: ~/Documents (zsh)
→ Documents git clone https://github.com/raynoldng/raynoldng.github.io.git
Cloning into 'raynoldng.github.io'...
remote: Counting objects: 643, done.
remote: Total 643 (delta 0), reused 0 (delta 0), pack-reused 643
Receiving objects: 100% (643/643), 3.88 MiB | 1.21 MiB/s, done.
Resolving deltas: 100% (182/182), done.
→ Documents
```

Forking a repo

- forking produces a personal copy of someone else's project
- acts as the bridge between original repository and your personal copy
- you can submit pull requests to help make other people's project better



Making a Pull Request

- mechanism for a developer to notify team members that they have completed a feature
- once feature is ready, the dev files a pull request via their Github account
- pull request is more than just a notification—it's a dedicated forum for discussing the proposed feature

The screenshot shows a GitHub Pull Request interface for the repository 'DeveloperLiberationFront / linux.minus.s.sharp'. The pull request is titled 'Add New Features #22' and is in the 'Merged' state. It shows that 'akofink' merged 5 commits into the 'master' branch from the 'JustinAMiddleton-NewFeatures' branch 21 minutes ago. The pull request has 5 commits and 3 files changed, with a net change of +188 lines and -2 lines. A comment by JustinAMiddleton, posted 43 minutes ago, states: 'I added a few new features to the project that were proposed in issue #20. Documentation included.' Below the comment, a list of commits is shown, including 'Add New Features', 'Create codebase2.txt', 'Update README.md', and 'Update codebase.txt'. The right sidebar shows labels (None yet), milestone (No milestone), and assignee (No one assigned).

Pair Activity

1. Learn one interesting fact about the person sitting next to you
2. Fork his/her project and create a branch `fun_facts` and add the fun fact under the About Me section
3. Create a pull request
4. Accept your neighbor's pull request

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Talk to us!

- **Feedback form:** <https://tinyurl.com/hs2018-html>
- **Completed:**
 - HTML/CSS
 - Git
- **Upcoming hackerschool:**
 - HTML/CSS practice
 - Introduction to ES6