Fundamentals of Git

Deakin Software Engineering Club (DSEC)

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Welcome 

The first DSEC event of 2021!

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Agenda

1. Overview
2. Installation & configuration
3. Repositories & commits
4. Branching, merging & conflict resolution
5. Collaboration

Git

Version Control System (VCS)—keeps track of changes made to files over time.

Widely used, free & open-source!

https://git-scm.com

Installing Git

Windows https://git-scm.com/download/win

Download & run the installer

macOS https://git-scm.com/download/mac

```
$ brew install git
```

Linux https://git-scm.com/download/linux

```
$ apt install git # Debian (e.g., Ubuntu)
$ dnf install git # Fedora
```

Configuring Git

Specify your name & email address

```
$ git config --global user.name "Your Name"
$ git config --global user.email "your.email@deakin.edu.au"
```

Specify a default branch name

```
$ git config --global init.defaultBranch main
```

(Optionally) Specify which text editor you'd like to use

```
$ git config --global core.editor "code -n -w" # Visual Studio Code
```

Terminology

Repository = folder in which Git tracks changes.

Committing = saving changes to the repo, making a “checkpoint” in its timeline.

Creating a Repo

Create an empty folder for your project

```
$ mkdir my-project
$ cd my-project
```

“Initialize” the folder as a repository

```
my-project$ git init
Initialized empty Git repository in my-project/.git/
```

Commits

Stage changes

Marks changes to be included
in the next commit.

```
$ git add <files>
```

Commit staged changes

```
$ git commit -m <commit message>
```

Commit Logs

View the commit log

```
$ git log
```

View changes of a commit

```
$ git show <hash> [<files>]
```

Commit Messages

Keep commits focused, and their changes cohesive.

Commit messages describe the effect of the commit. Prefer imperative mood.

```
$ git commit -m <para1> -m <para2>
```

```
$ git commit -e
```

View single-line logs

```
$ git log --oneline
```

Staging & Diffs

Stage specific changes of files

```
$ git add -e [<files>]
```

View staged changes

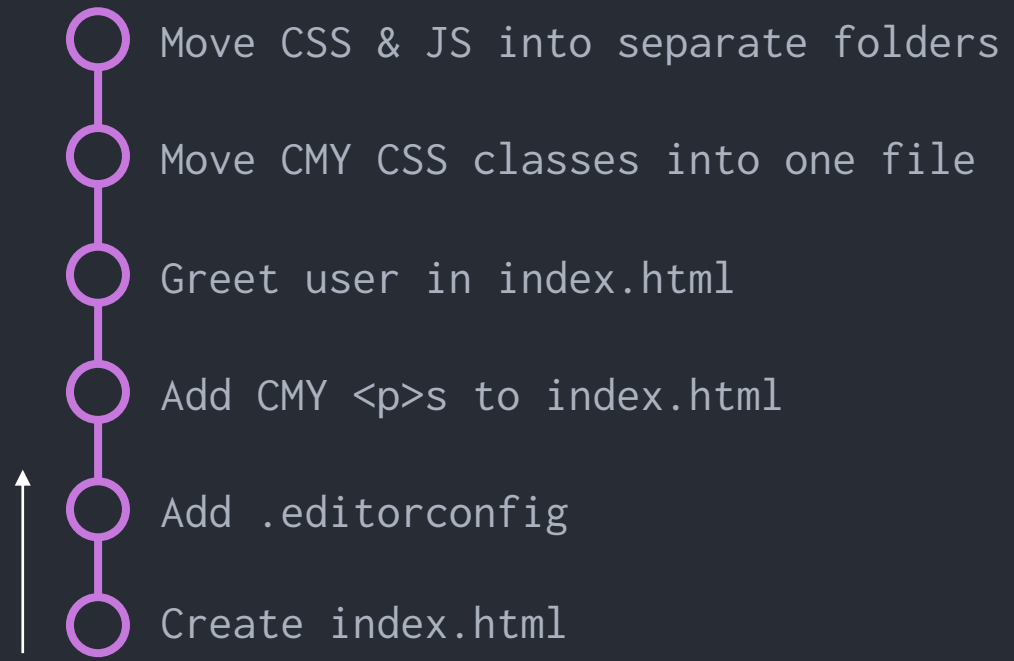
```
$ git diff --cached [<files>]
```

View unstaged changes of tracked files

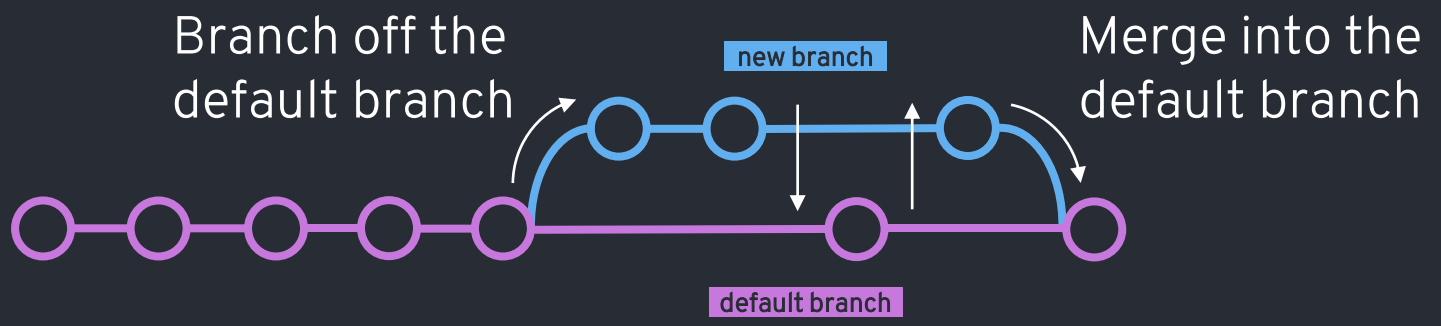
```
$ git diff [<files>]
```

Commit Graph

Chronological representation of commits in a repo.



Branches


Branch off the
default branch
new branch
Merge into the
default branch
default branch

Branches

Create a branch

```
$ git branch <name>
```

List branches

```
$ git branch
```

Switch to (checkout) a branch

```
$ git checkout <name>
```

Create & checkout a branch

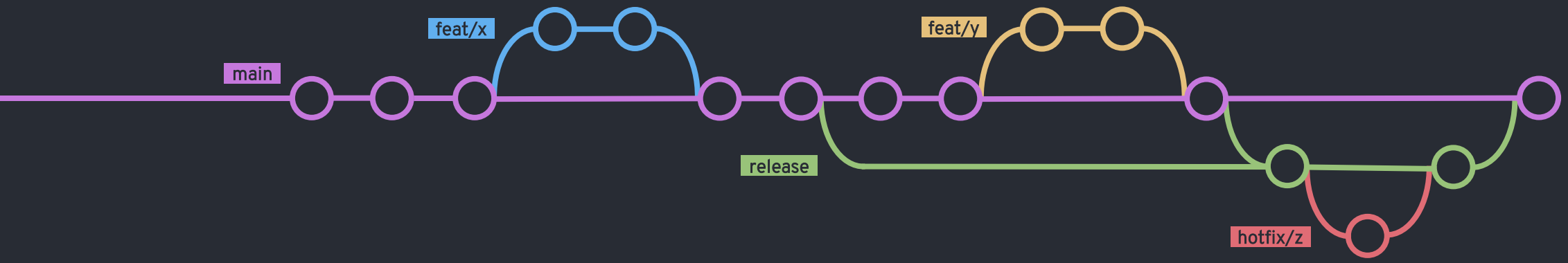
```
$ git checkout -b <name>
```

Merging

Merge a branch into the current branch

```
$ git merge <name>
```

Branching Convention



main	Development branch.
release	Stable versions (“releases”) of the project.
feat/xyz	Features added to the project. Replace “xyz” with a feature ID. Branch off main.
hotfix/xyz	Fixes for bugs found in releases. Replace “xyz” with a fix ID. Branch off release. Merge into main.

Branches

Rename the current branch

```
$ git branch -m <name>
```

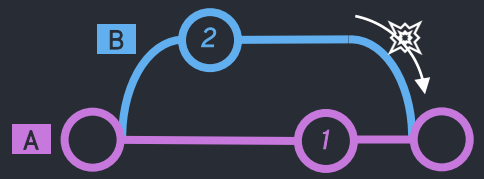
Delete a branch

```
$ git branch -D <name>
```

Conflict Resolution

💥 Merge conflicts occur when,

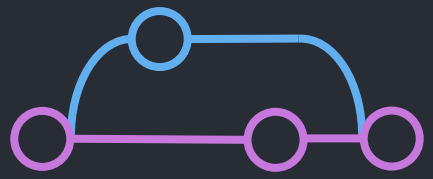
- Different changes are made to the same line(s) on both branches.
- A file deleted in one branch has changed in the other.



🤔 Git doesn't understand what changes to retain/discard,

- Keep changes from *1*?
- Keep changes from *2*?
- Some combination of these?

Conflict Resolution

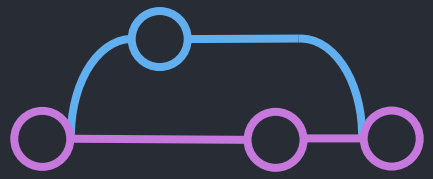


Running `git merge`,

- Merges as much as possible.
- Stages files that are successfully merged.
- Markers conflicting lines of code with merge conflict markers.

```
<<<<<<< HEAD
changes on current branch
=======
incoming branches
>>>>>>> branch/being/merged
```

Conflict Resolution



Merge commit

Fix the conflicts, stage changes & commit.

```
$ git commit
```

Abort a merge

```
$ git merge --abort
```

Terminal Interface

Scrollable commit logs

`j` & `k` to scroll down & up

`Ctrl` `d` & `Ctrl` `u` to page down & up

`q` to exit

Check the status often!

```
$ git status
```

Use git help for reference docs

```
$ git help <command>
```

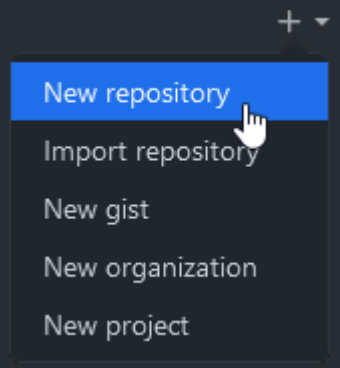
Collaboration

Host your Git repositories on a hosting service such as,

- GitHub
- GitLab
- Bitbucket

Collaboration

Create a GitHub repo



Specify the repo name (unique within your account) & privacy settings.

Collaboration

Add a remote to your local repo

```
$ git remote add <name> <url>
```

Push a new branch to the remote

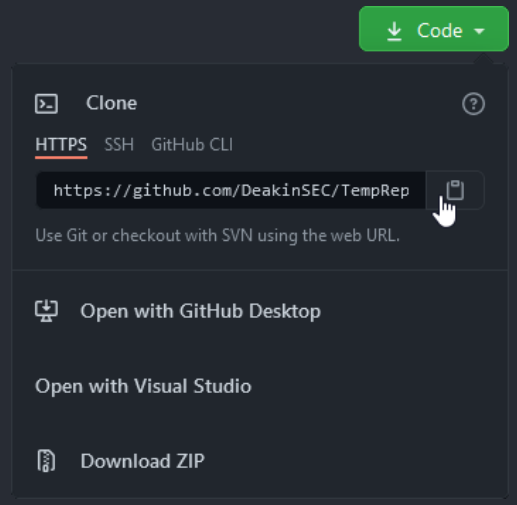
```
$ git push -u <remote name> <branch name>
```

Your project should now be hosted online 

Collaboration

Clone a repo

```
$ git clone <url>
```



Collaboration

Push the current branch to the remote

```
$ git push
```

⚠ committing != pushing

Collaboration

Pull changes the current branch from the remote

```
$ git pull
```

✔ Branch often to avoid conflicts

Git Projects

Specify files that must be ignored by Git (e.g. autogenerated files/build artefacts) via a `.gitignore` file.

- https://github.com/github/gitignore contains common `.gitignore`s.

Recommended documentation at the root of your repo,

1. `README.md` describes the project.
2. `CONTRIBUTING.md` describes how contributors would get started.
3. `LICENSE` contains the project license. https://choosealicense.com.
4. `CODE_OF_CONDUCT.md` https://docs.github.com/github/building-a-strong-community/adding-a-code-of-conduct-to-your-project

GitHub-flavoured Markdown: https://github.github.com/gfm

Graphical Clients

Terminals

+ Fast, lightweight, complete
+ Allows scripting, automation

Graphical Clients

+ Better visualisation of diffs & repo
- Not universal, possibly functionally limited

✔ Know the underlying Git concepts & terminal commands even if you're using a GUI!

Graphical Git Client

 SourceTree *Free [WM]*

 GitHub Desktop *Free [WM]*

 GitKraken *Free for non-commercial [WML]*

 Fork *[WM]*

 Tower *[WM]*

 Sublime Merge *[WML]*

https://git-scm.com/downloads/guis

Review

✓Installed & configured Git

✓Created a repo
✓Created commits
✓Created & merged branches
✓Resolved merge conflicts

✓Published the repo to GitHub
✓Collaborated with contributors

Thank you!

We'd appreciate your feedback!

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