ENGR 301 *Project Management*

Lecture 8 — git II

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Basic git

Today's lecture continues our discussion of basic usage of git. References you may find useful are:

- Pro Git `https://git-scm.com/book/en/v2`
- Git: Mastering Version Control `https://learning.oreilly.com/library/view/git-mastering-version/9781787123205/`
- Version Control (Git) `https://missing.csail.mit.edu/2020/version-control/`

git's Workflow

Basic concepts

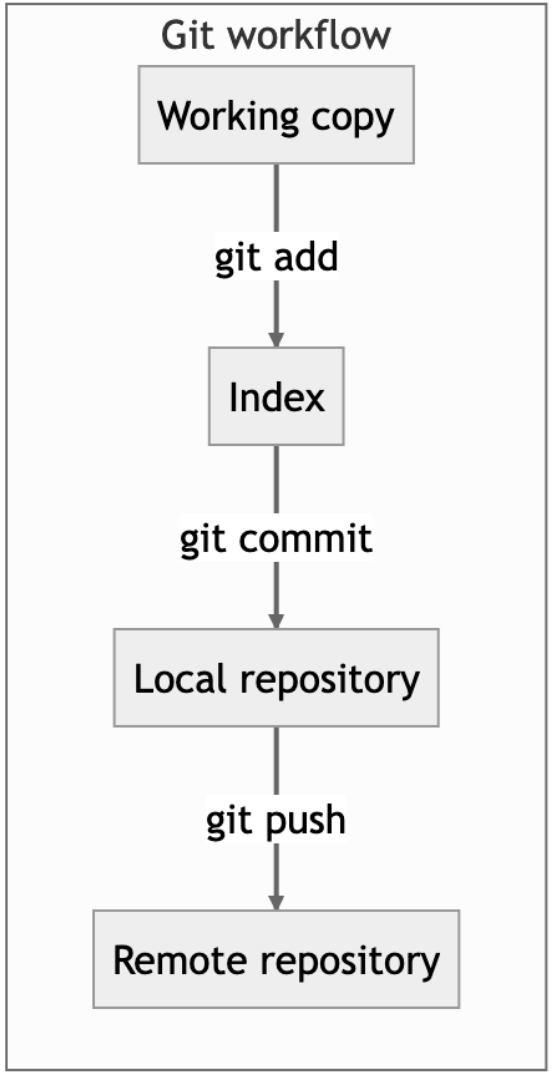
Working copy: the files you see and edit

Index: a.k.a. the "staging area"

Local repo: your clone of the remote repo

Remote repo: the *Single Source of Truth*

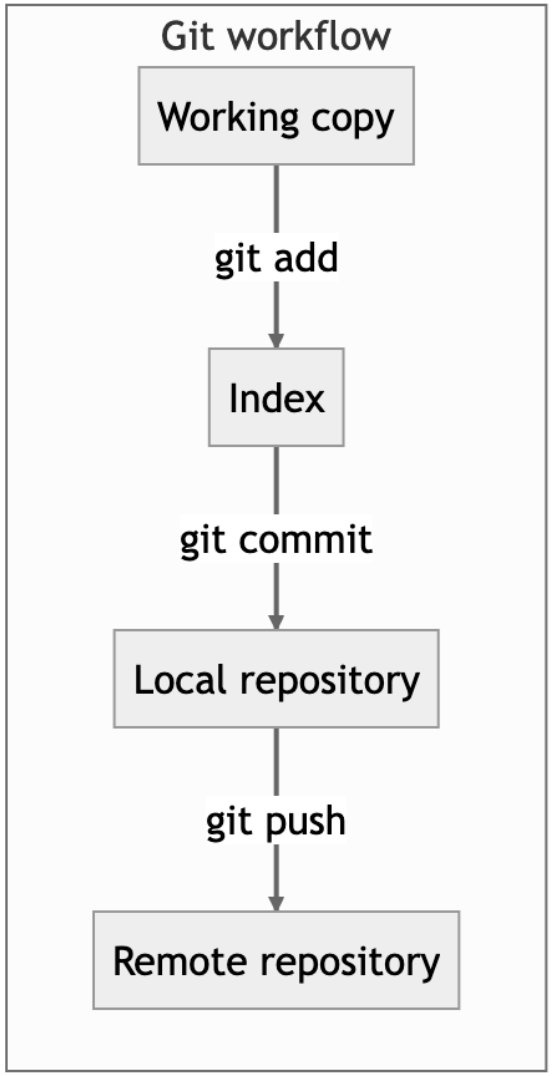
Typically centrally served, e.g. GitLab, GitHub, Bitbucket, *etc.*



Using git's workflow Effectively

Guidelines

- Greatest freedom at the start, least freedom at the end
- Use staging to collect changes for a commit *while working*
- Local commits are easy to change, both content and order
- Remote is *shared* and commits should be changed *with caution*



Working with the Index (staging)

Basic concepts:

- Files are *untracked* until *tracked* using `git add`
- Untrack files with `git rm` *but* will also remove from working copy
- Remove files from staging with `git restore --cached`
- Add changed files with `git add` and piece-by-piece with `git add --patch`

Finding what's changed

Two main commands:

- `git status` shows what git knows about changes
- By default, ignored files are not shown by `git status`
- `git diff` shows the changes between the working copy and staging
- `git diff --cached` shows the changes between staging and local

Restoring changes

Can restore (undo) changes in the Working Copy and Index (staging area) [see also GitKraken]:

- `git restore` will undo changes in the Working Copy tree or a specific file
- `git restore --cached` will undo changes added to the staging area, i.e. undo the `git add`
- `git reset` is an older and *far more dangerous* command for undoing changes
- `git reset` flags: `--soft`, `--mixed` and `--hard`
- `git reset` will also operate on *commits*

Committing to Local

The basic command is `git commit`

- `git commit [--message] [--message]`
- `git commit --amend` will merge changes in the index with the most recent commit
- `git commit --amend --no-edit` will do the same but not ask for an update to the commit summary/title

Pushing and Pulling

- `git push` merges your commits from *local* to *remote*
- `git pull --rebase` merges commits from *remote* to your *working copy*

A common situation on pull is to receive an error message like:

```
$ git pull –rebase
error: cannot pull with rebase: You have unstaged changes.
error: please commit or stash them.
```

What is “stashing“?

Pushing and Pulling

A common situation on push is to receive an error message like:

```
$ git push
To gitlab.ecs.vuw.ac.nz:Courses/SWEN326/SWEN326.git
 ! [rejected]        41-... -> 41-... (fetch first)
error: failed to push some refs to '<path-to-repo>'
hint: Updates were rejected because the remote
hint: contains work that you do not have locally.
hint: This is usually caused by another repository
hint: pushing to the same ref. You may want to first
hint: integrate the remote changes (e.g., 'git pull ...')
hint: before pushing again. See the 'Note about
hint: fast-forwards' in 'git push --help' for details.
```

Need to pull before pushing. Always use the `rebase` merge strategy!

Stashing changes

Basic concepts:

- The stash is a queue, thus: `git stash [push]` and `git stash pop`
- `git stash list` shows the list of stashes;
  select a stash with `git stash pop stash@{<number>}`
- Show the contents of a stash with
  `git stash show [stash@{<number>}]`
- Apply the contents of a stash without removing it with
  `git stash apply [stash@{<number>}]`
- Give stashes better messages with
  `git stash --message "..."`

Pushing and Pulling

A common situation when changes have been made “outside” git:

```
$ git pull –rebase
...
error: The following untracked working tree files would be overwritten
by merge:
<some files>
Please move or remove them before you merge.
Aborting
```

git hooks

`git` hooks execute scripts on specific events.

pre-commit `https://pre-commit.com/`

> *"A framework for managing and maintaining multi-language pre-commit hooks."*

> *"...we recognised that sharing our pre-commit hooks across projects is painful."*

- pre-commit not limited to one hook only
- Incorporated in the data-recorder repository