# Simple Software Development

Dec 17, 2020

# Topics:

CHAPTER 1

# Simple Sphinx

Sphinx generates project documentation, which can be hosted easily at readthedocs.

Your project should be in a github repository. Then, sign up for a readthedocs account with your github account.

## 1.1 Setup new project

1. Install sphinx with pip:

```
$ pip install sphinx
```

2. As best practice, use a separate `docs` folder. From your project folder:

```
$ mkdir docs
$ cd docs
```

3. Use the sphinx quickstart and follow the prompts:

```
$ sphinx-quickstart
```

4. From your readthedocs dashboard, import your github project repository.

5. You can soon access the documentation online, either from your dashboard or the provided URL.

## 1.2 Develop documentation

We create and edit documentation in .rst files, written in restructuredText (quickstart).

To make a header, insert a row of special characters underneath, which cannot be shorter than the header:

```
My Header
---------
```

To make a sub-header, use a different special character:

```
My Header
----------

My Sub-header
*************
```

To make a link, follow this syntax:

```
`My Link <http://www.cutestpaw.com/tag/cats/>`_
```

**Warning:** Note the space before < and the _ after the `.

To show code, one way is to use literal blocks:

```
::

    print('hello world!')

Or with text before the code::

    for i in range(5):
        print(i)
```

**Warning:** Note the empty line after ::.

To make a list:

```
1. Python
2. Javascript
3. C#
```

To format text:

```
**Bold**, *italics*, ``code``.
```

To insert an image:

```
.. image:: https://picsum.photos/200/300
    :width: 200px
    :height: 100px
    :align: center
    :alt: alternate text
```

**Note:** This is a note box.

To insert a note box:

```
.. note::  This is a note box.
```

**Warning:** This is a warning box.

To insert a warning box:

```
.. warning:: This is a warning box.
```

## 1.3 Preview documentation

Use vscode and install the reStructuredText extension. The extension allows you to preview your documentation with *Open Locked Preview to the Side* (find it with *Ctrl/Cmd+Shift+P*.)

You can view the HTML locally. Within your `docs` folder:

```
$ make html
$ open _build/html/index.html
```

## 1.4 Deploy documentation

If your github project was imported into readthedocs, your documentation will be automatically built and deployed when a changed version is pushed to github. Find the URL from your readthedocs dashboard.

## 1.5 *(Optional)* Setup RTD Theme

This page uses the RTD theme .

```
$ pip install sphinx_rtd_theme
```

In your conf.py file, set `html_theme`:

```
html_theme = "sphinx_rtd_theme"
```

CHAPTER 2

# Simple Git

## 2.1 Overview

Git (install) is a *version control system* found everywhere in software development. It is often used from the command line.

Software often lives in multiple *versions* at once. At least one stable version and a version for each new feature or bug fix.

Versions are also called **branches**. Changes to branches are saved as **commits**, which are like checkpoints, and the entire project folder is a **repository/repo**. Repos on your computer are **local**. Repos living on github are **remote**. The initial (and usually main) branch of a repo is often called **master**.

Git allows us to:

- make a local copy of a remote repo
- sync the local repo with the remote repo
- merge branches
- create new branches from existing branches
- switch quickly between branches
- store branches together in one folder
- view commit history
- compare two commits

Git repositories are most often uploaded to Github where they can be public or private.

Github is a place where a lot of software is hosted. Many developers make their source code publicly visible, which allows anybody to write edits and requests for their edits to be accepted, which are called **pull requests**.

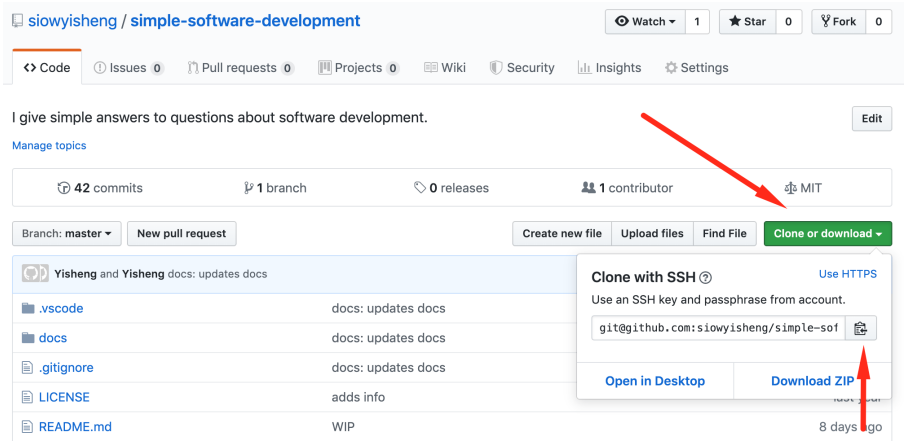
## 2.2 Basic usage

### 2.2.1 Create a repo

Create your new repository on *github*.

### 2.2.2 Make a local copy of a github repo

Find the address to clone here.




Then do:

```
$ git clone git@github.com:siowyisheng/simple-software-development.git
```

A folder will then be created in the folder where you did the command.

### 2.2.3 Check the status of your local repo

```
$ git status
```

This shows useful information, including changes which have not been *added* and changes which have not been committed, as well as the status of the commits of the local repo versus the commits of the local copy of the remote repo.

### 2.2.4 Make a commit

First, we **add** the files that we want to commit:

```
# this adds all changed files
$ git add .

# this adds one changed file
$ git add my_file.py

# this adds all changed files within a folder
$ git add my_folder
```

Then:

```
$ git commit -m 'feat: adds commenting feature'
```

**Note:** The part within the quotes is the **commit message**, which is important for logging. One best practice is to use semantic commits.

For a longer commit message:

```
$ git commit
```

This brings you to a text editor within your shell to input your commit message. End the commit message with `esc, Z, Z`.

### 2.2.5 Push local changes to a remote repo

To update the remote repo with your local commits:

```
$ git push
```

This could fail if the remote repo has extra commits compared to your local repo, which could be caused by (A) your teammates pushing changes, or (B) if you intentionally removed some commits on your local repo.

In situation (A), we need to *pull the changes from remote*.

In situation (B), we can use:

```
$ git push --force-with-lease
```

**Warning:** It could also fail if you don't have push permission, in which case you should make a pull request.

### 2.2.6 Pull changes from remote

To update the local repo with changes from the remote:

```
$ git pull
```

You may need to *resolve merge conflicts*.

### 2.2.7 Create a branch

To create a new branch, first *switch to the branch* that you want base off of, then:

```
$ git checkout -b my_branch_name
```

### 2.2.8 Switch to a branch

```
$ git checkout my_target_branch
```

### 2.2.9 Merge a branch into master

First *switch to the master branch*:

```
$ git merge my_branch_to_merge
```

### 2.2.10 Resolve merge conflicts

Merge conflicts can happen when updating the local repo, either through `git pull` or `git stash pop`. This happens when multiple commits touch the same lines of code and git does not know which commit to follow.

When git notifies you of a merge conflict, you can open the file with the merge conflict in vscode and look for something like:

```
<<<<<<< Updated upstream
some code edited to A
=======
some code edited to B
>>>>>>> Stashed/Incoming changes
```

Then analyse the code and delete the unwanted code. Back in the command line:

```
$ git add file_with_merge_conflict
```

### 2.2.11 View commit history

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

Or with more details:

```
$ git log
```

### 2.2.12 Compare two commits

```
git diff base_commit_reference new_commit_reference
```

A commit reference can be:

- a partial commit hash like `1fc2cd7`, which you can find from the *commit history*,
- `HEAD`, which is a reference to the last commit in the current branch
- a branch name like `master`, which points to the latest commit in that branch

---

**Note:** A commit ref can also have a suffix like `~1`, which means 1 commit *before* that commit.

---

Example to compare the second last commit with the latest commit:

```
$ git diff HEAD~1 HEAD
```

## 2.3 More usage

TODO:

## 2.4 Best practices

Make focused commits and include the commit type in the commit message:

```
feat: adds some new feature
fix: fixes some bug
content: changes some values/strings/content only (no actual code change)
test: adds tests
refactor: refactors some section
docs: changes some documentation
chore: updates build (no code change)
perf: improves performance of some section (by refactoring)
style: formats some section
```

## How do remotes repositories work?

A remote repository first exists at a remote location; often, a github repo. When you *git clone* the repo, you create a **local copy** of the repo and the branches which **track** the remote repo's branches. You also create a **reference** to the remote repo and its branches.

## What is the difference between *git fetch* and *git pull*?

*git fetch* accesses the remote repo and updates your **reference** to the remote repo. *git pull* does a *git fetch* and also does a *git merge* to merge your reference to the remote branch with your local copy of the remote branch.

See [above](#how-do-remotes-repositories-work) to understand how remote repositories work.

## What are some common commands?

*git diff HEAD~1 HEAD* - View differences between this commit and the previous.

## How do I track the history of a file?

*gitk (filename)* or *git log -p (filename)*.

## How do I overwrite the remote after making a mistake?

*git push –force*

## How do I reset my local branch to copy the remote?

*git reset –hard origin/(your_branch_name)*

## How do I find a commit by the message?

*git log –all –grep='your search string'*

## How do I delete a local branch?

*git branch -D branch_name*

## How do I remove references to branches on the remote?

*git fetch –prune*

## How do I move recent commits to a new branch?

Scenario: You made 5 commits to *master* although you were supposed to work on a new branch.

`bash git branch newbranch git reset --hard HEAD~5 git checkout newbranch `

## How do I check which files were edited between two commits?

*git diff –name-only HEAD~1 HEAD*

## How do I stash just one or a few files?

`bash git stash save -p `

From there, use:

- *a* to add the file to the stash
- *d* to ignore the file
- *q* to ignore the rest of the files

## How do I see changes of all recent commits?

`bash git log -p `

## How do I see an overview of what recent commits touched?

`bash git log --stat `

## How do I amend my last commit message?

`bash git commit --amend `

## How do I add a file to a commit?

`bash git commit -m 'initial commit' git add forgotten_file git commit --amend
`

## How do I find all commits that added or removed a certain string?

`bash git log -S "dude, where's my car?" --source --all git log -G
"^(\s)*function foo[(][)](\s)*{$" --source --all `

## How do I list all files which were changed between two commits?

`bash git log --name-only --pretty=oneline --full-index 0be8c001..HEAD | grep
-vE '^[0-9a-f]{40} ' | sort | uniq `

## How do I checkout just one file from a previous commit?

`bash git checkout c5f567 -- file1/to/restore `

git blame