git

source/version control with git and github

Outline

- why?
- git basics
- tools
- step-by-step examples
- advanced topics (if time permits)

why source control?

why source control?

- enables team collaboration
- backup
- experiment—unlimited undo
- multiple versions (branches)
- history of changes
- github has a lot of other stuff as well...

why git?

- there are lots of options
 - cvs, svn, mercurial, tfs, etc...
 - they are similar in many ways
- git is fast, free, multi-platform
- git works well if you are on/offline
- github

git basics

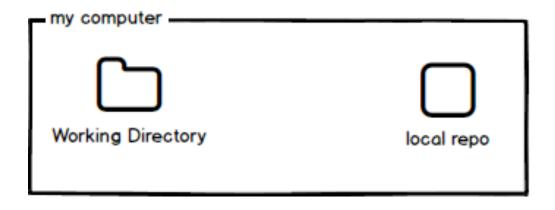
- repository
- local vs. remote
- commit / push / pull
- repo structure

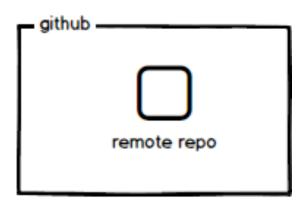
repository

- repository == repo
- the "database" with ALL your project files
 - including all past versions and changes
- multiple copies of "the repo"...

local vs. remote

- everyone on the project has a local repo
- there is 1 remote repo (github)
- and there's the working directory



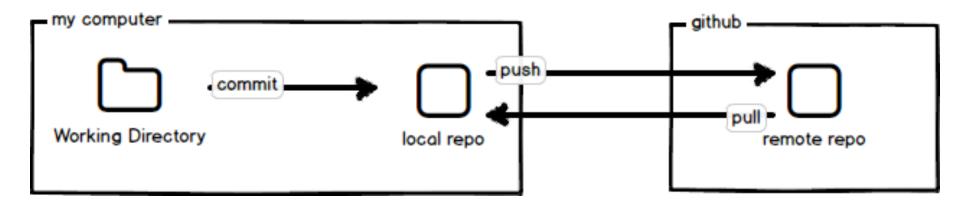


```
14:17:05 shasta:~/dev/src/take2 > ll
total 128
                        staff
                               18436 Sep 14 14:16 .DS Store
-rw-r--r--@
            1 ecrane
                        staff
                                 102 Jul 13 12:51 .bundle/
drwxr-xr-x
             3 ecrane
            19 ecrane
                        staff
                                 646 Sep 11 08:38 .git/
drwxr-xr-x
                                 404 Sep 10 07:09 .gitigh
             1 ecrane
                        staff
-rw-r--r--
                                 198 Apr 24
                                            2013 .project
             1 ecrane
-rw-r--r--
                        staff
                                             2012 .rspec
             1 ecrane
                        staff
                                   8 Oct 12
-rw-r--r--
                                     Jul 23
                                            09:32 .rvmrc
-rw-r--r--
             1 ecrane
                        staff
                                 663
             3 ecrane
                        staff
                                 102 Dec 18
                                             2012 .sass-cache/
drwxr-xr-x
                                            2012 Capfile
-rw-r--r--
             1 ecrane
                        staff
                                 268 Apr 20
             1 ecrane
                        staff
                                1868 Sep
                                          2 09:06 Gemfile
-rw-r--r--
                        staff
                                7028 Sep
                                          2 09:06 Gemfile.lock
-rw-r--r--
             1 ecrane
                                3303
                                     Oct 12
                                             2012 README.md
-rw-r--r--
                        staff
             1 ecrane
                        staff
                                 267 May 18
                                            2011 Rakefile
-rw-r--r--@
             1 ecrane
                                            2014 app/
             9 ecrane
                                 306 Sep 23
drwxr-xr-x
                        staff
                                 544 Sep 11 08:38 config/
drwxr-xr-x
            16 ecrane
                        staff
                                 155 May 18
                                            2011 config.ru
-rw-r--r--@
             1 ecrane
                        staff
drwxr-xr-x
            12 ecrane
                        staff
                                 408 Jun 26
                                             2012 coverage/
             9 ecrane
                        staff
                                 306 Aug 24 12:14 db/
drwxr-xr-x
                                 170
                                     Jul
                                          3
                                             2014 doc/
drwxr-xr-x
             5 ecrane
                        staff
drwxr-xr-x
            10 ecrane
                        staff
                                 340 Sep 25
                                             2014 lib/
             8 ecrane
                        staff
                                 272 Sep  7 06:05 log/
drwxr-xr-x
            18 ecrane
                                 612 Jul 10 10:13 public/
                        staff
drwxr-xr-x
                                             2011 script/
            12 ecrane
                        staff
                                 408 May 18
drwxr-xr-x
drwxr-xr-x
            16 ecrane
                        staff
                                 544 Sep 23
                                            2014 spec/
             8 ecrane
                                 272 Aug 28 2014 tmp/
drwxr-xr-x
                        staff
                                 136 Dec 26
                                             2012 vendor/
                        staff
drwxr-xr-x
             4 ecrane
14:17:86 shasta:~/dev/src/take2
```

```
14:17:86 shasta:~/dev/src/take2 > ll .git
total 1448
                             6148 Mar 27 2014 .DS Store
-rw-r--r--@ 1 ecrane
                     staff
                                8 Sep 11 08:21 COMMIT_EDITMSG
-rw-r--r-- 1 ecrane
                     staff
-rw-r--r-- 1 ecrane staff
                             1836 Sep 14 14:15 FETCH HEAD
-rw-r--r-- 1 ecrane
                     staff
                               28 Sep 11 08:38 HEAD
-rw-r--r-- 1 ecrane staff
                               41 Sep 11 08:20 ORIG HEAD
                               41 May 18 2011 RENAMED-REF
-rw-r--r-- 1 ecrane
                     staff
drwxr-xr-x 2 ecrane staff
                               68 May 18 2011 branches/
                     staff 524 Sep 2 09:38 config
-rw-r--r-- 1 ecrane
                               72 May
-rw-r--r-- 1 ecrane
                     staff
                                       6 07:32 description
-rw-r--r-- 1 ecrane staff 334328 Mar 7 2013 gitk.cache
drwxr-xr-x 12 ecrane staff
                               408 May 18 2011 hooks/
-rw-r--r-- 1 ecrane
                     staff
                           343152 Sep 11 08:38 index
drwxr-xr-x 4 ecrane staff
                              136 Jul 20 07:44 info/
                              136 Jul 20 07:42 logs/
drwxr-xr-x 4 ecrane staff
                             8670 Sep 10 13:14 objects/
drwxr-xr-x 255 ecrane
                     staff
-rw-r--r-- 1 ecrane staff 21164 Sep 10 14:50 packed-refs
                              204 Jul 20 07:42 refs/
drwxr-xr-x 6 ecrane staff
14:18:17 shasta:~/dev/src/take2 > [
```

commit / push / pull

- commit: makes changes to your local repo
- push: move changes from your local repo to the remote repo
- pull: get changes from the remote repo to your local repo (and working directory)



repo structure

- flexible
- you might create a separate repo for each project
 - or folders within one repo for each project
- folders for
 - notes, documentation, pics, links, etc.



Branch: master ▼

devops / +

Create user Doug and add Sudo		
timfox1234 authored on May 6		
in chef/samples	Create user Doug and add Sudo	
doc doc	Starting work on folder structure.	
resources	Adds hosts file sample.	
scripts	Scripts folder	
■ README.md	Starting work on folder structure.	

Merge branch 'master' of github.com:MDeverywhere/status_repo		
ecrane authored on Mar 31, 2014		
agents	Adds hostname.	
config	Adds disk usage agent.	
sample_code	Merge branch 'master' of github.com:MDeverywhere/status	
utilities utilities	Adds hostname.	
gitignore	Adds configuration directory with setting for root directory.	
README.txt	Initial project created.	
initpy	Adding some sample code and starting work on utilities.	

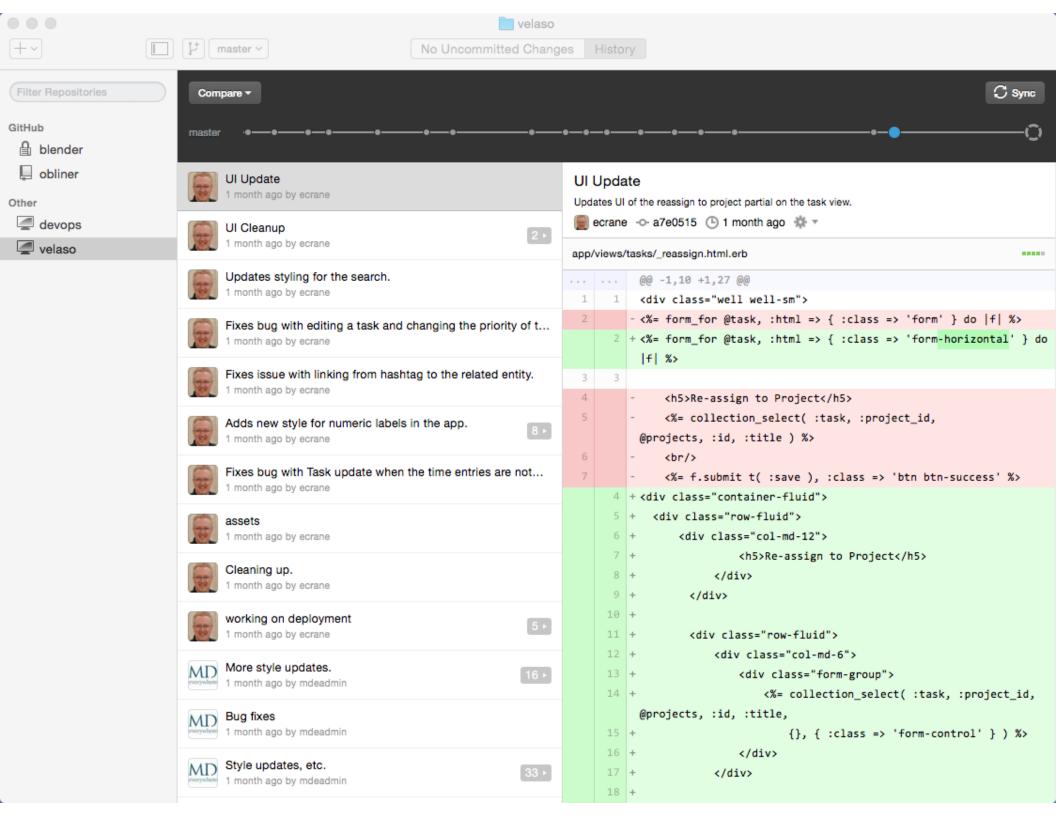
app removed statements with balance menu item config 5.2.0.1 db Merge branch 'staging' of github.com:MDeverywhere/blender into staging doc Main Page adds index link. lib Adds all servers to server list in Diagnostic tool. public added favicon to public folder. script Initial import spec Merge branch 'refs/heads/development' into staging vendor/assets reverted statement transactions refresh back to polling on page load gitignore removed gemfile.lock from gitignore l. rspec Initial rspec work rvmrc Ading ruby 1.9.3-p194 to our project as it has some security fixes Capfile First capistrano files Gemfile Restoring Gemfile and lock from staging.		
■ db Merge branch 'staging' of github.com:MDeverywhere/blender into staging ■ doc Main Page adds index link. ■ lib Adds all servers to server list in Diagnostic tool. ■ public added favicon to public folder. ■ script Initial import ■ spec Merge branch 'refs/heads/development' into staging ■ vendor/assets reverted statement transactions refresh back to polling on page load ■ .gitignore removed gemfile.lock from gitignore ■ .rspec Initial rspec work ■ .rvmrc Ading ruby 1.9.3-p194 to our project as it has some security fixes ■ Capfile First capistrano files ■ Gemfile Restoring Gemfile and lock from staging.	а рр	removed statements with balance menu item
■ doc Main Page adds index link. ■ lib Adds all servers to server list in Diagnostic tool. ■ public added favicon to public folder. ■ script Initial import ■ spec Merge branch 'refs/heads/development' into staging ■ vendor/assets reverted statement transactions refresh back to polling on page load ■ .gitignore removed gemfile.lock from gitignore ■ .rspec Initial rspec work ■ .rvmrc Ading ruby 1.9.3-p194 to our project as it has some security fixes ■ Capfile First capistrano files ■ Gemfile Restoring Gemfile and lock from staging.	config	5.2.0.1
iib Adds all servers to server list in Diagnostic tool. added favicon to public folder. Initial import spec Merge branch 'refs/heads/development' into staging vendor/assets reverted statement transactions refresh back to polling on page load gitignore removed gemfile.lock from gitignore rspec Initial rspec work rvmrc Ading ruby 1.9.3-p194 to our project as it has some security fixes Capfile First capistrano files Restoring Gemfile and lock from staging.	db	Merge branch 'staging' of github.com:MDeverywhere/blender into staging
public added favicon to public folder. Initial import spec Merge branch 'refs/heads/development' into staging vendor/assets reverted statement transactions refresh back to polling on page load gitignore removed gemfile.lock from gitignore rspec Initial rspec work rvmrc Ading ruby 1.9.3-p194 to our project as it has some security fixes Capfile First capistrano files Restoring Gemfile and lock from staging.	doc	Main Page adds index link.
Image: Initial import Initial import Image: Ima	ib lib	Adds all servers to server list in Diagnostic tool.
■ spec Merge branch 'refs/heads/development' into staging ■ vendor/assets reverted statement transactions refresh back to polling on page load ■ .gitignore removed gemfile.lock from gitignore ■ .rspec Initial rspec work ■ .rvmrc Ading ruby 1.9.3-p194 to our project as it has some security fixes ■ Capfile First capistrano files ■ Gemfile Restoring Gemfile and lock from staging.	public	added favicon to public folder.
vendor/assets reverted statement transactions refresh back to polling on page load ightignore removed gemfile.lock from gitignore ightignore removed gemfile.lock from gitignore removed gemfile	script	Initial import
 ☐ .gitignore removed gemfile.lock from gitignore ☐ .rspec Initial rspec work ☐ .rvmrc Ading ruby 1.9.3-p194 to our project as it has some security fixes ☐ Capfile First capistrano files ☐ Gemfile Restoring Gemfile and lock from staging. 	spec	Merge branch 'refs/heads/development' into staging
 ☐ .rspec Initial rspec work ☐ .rvmrc Ading ruby 1.9.3-p194 to our project as it has some security fixes ☐ Capfile First capistrano files ☐ Gemfile Restoring Gemfile and lock from staging. 	vendor/assets	reverted statement transactions refresh back to polling on page load
☐ .rvmrc Ading ruby 1.9.3-p194 to our project as it has some security fixes ☐ Capfile First capistrano files ☐ Gemfile Restoring Gemfile and lock from staging.	gitignore	removed gemfile.lock from gitignore
Capfile First capistrano files Gemfile Restoring Gemfile and lock from staging.	:rspec	Initial rspec work
Gemfile Restoring Gemfile and lock from staging.	.rvmrc	Ading ruby 1.9.3-p194 to our project as it has some security fixes
	Capfile	First capistrano files
Gemfile.lock Restoring Gemfile and lock from staging.	■ Gemfile	Restoring Gemfile and lock from staging.
	■ Gemfile.lock	Restoring Gemfile and lock from staging.
README md readme file update with appropriate attributions	README.md	readme file update with appropriate attributions.

tools

- CLI command line interface
 - Terminal on Mac
- GUI
 - GitHub Desktop
 - there are lots of options
- IDE often have built in tools as well

zsh

```
14:19:18 shasta:~/dev/src/take2 > git help
usage: git [--version] [--help] [-C <path>] [-c name=value]
           [--exec-path[=<path>]] [--html-path] [--man-path] [--info-path]
           [-p|--paginate|--no-pager] [--no-replace-objects] [--bare]
           [--git-dir=<path>] [--work-tree=<path>] [--namespace=<name>]
           <command> [<args>]
The most commonly used git commands are:
              Add file contents to the index
   add
              Find by binary search the change that introduced a bug
   bisect
              List, create, or delete branches
   branch
   checkout
              Checkout a branch or paths to the working tree
   clone
              Clone a repository into a new directory
   commit
              Record changes to the repository
              Show changes between commits, commit and working tree, etc
   diff
              Download objects and refs from another repository
   fetch
              Print lines matching a pattern
   grep
              Create an empty Git repository or reinitialize an existing one
   init
   log
              Show commit logs
              Join two or more development histories together
   merge
              Move or rename a file, a directory, or a symlink
   mΥ
              Fetch from and integrate with another repository or a local branch
   pull
              Update remote refs along with associated objects
   push
              Forward-port local commits to the updated upstream head
   rebase
              Reset current HEAD to the specified state
   reset
              Remove files from the working tree and from the index
   r m
              Show various types of objects
   show
              Show the working tree status
   status
   tag
              Create, list, delete or verify a tag object signed with GPG
'git help -a' and 'git help -g' list available subcommands and some
concept guides. See 'git help <command>' or 'git help <concept>'
to read about a specific subcommand or concept.
14:21:14 shasta:~/dev/src/take2 >
```



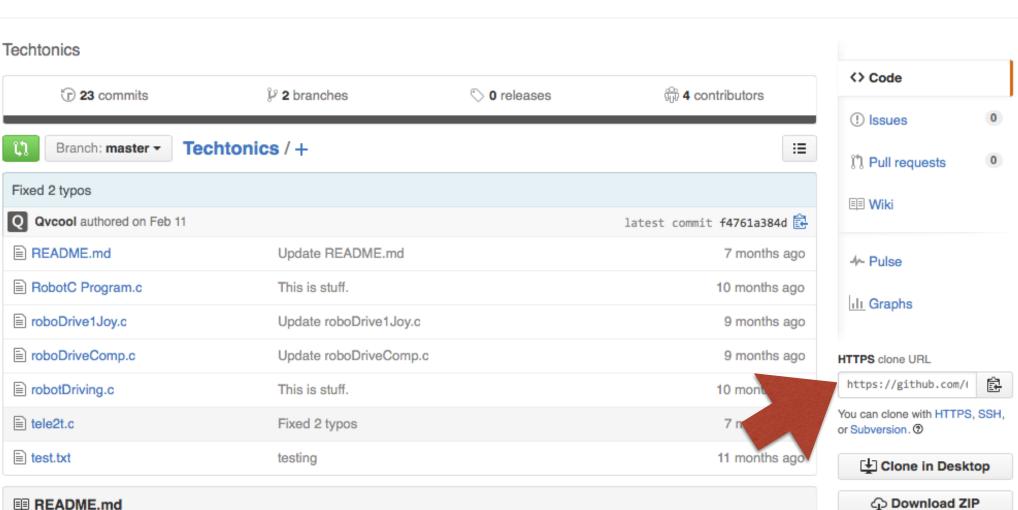
https://desktop.github.com

step-by-step examples

- clone
- status
- add
- commit
- pull
- push
- merge

git clone: get an existing project





★ Star

Watch ▼

Ÿ Fork

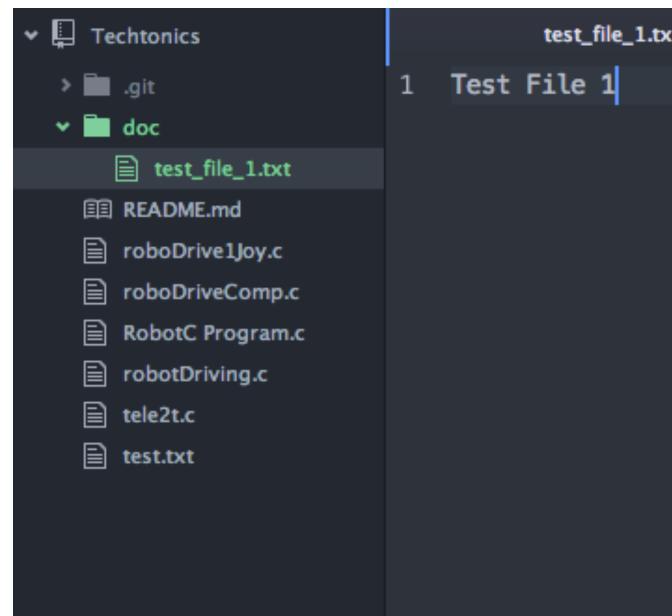
https://github.com/ Techtonics8947/ Techtonics 2015.git

> git clone repo_name

> git clone https://github.com/ Techtonics8947/Techtonics 2015.git

```
14:57:36 shasta:~/Dropbox/edu/git > ll
total 16
-rw-r--r--@ 1 ecrane staff 6148 Sep 14 14:59 .DS Store
drwxr-xr-x@ 5 ecrane staff 170 Sep 14 14:59 2015 Git Demo/
14:59:51 shasta:~/Dropbox/edu/git > git clone https://github.com/6tigersrds/Techtonics.git
Cloning into 'Techtonics'...
remote: Counting objects: 65, done.
remote: Total 65 (delta 0), reused 0 (delta 0)
                                                reused 65
Unpacking objects: 100% (65/65), done.
Checking connectivity... done.
15:00:00 shasta:~/Dropbox/edu/git > ll
total 16
-rw-r--r--@ 1 ecrane staff 6148 Sep 14 14:59 .DS Store
drwxr-xr-x@ 5 ecrane staff 170 Sep 14 14:59 2015 Git Demo/
drwxr-xr-x@ 10 ecrane staff 340 Sep 14 15:00 Techtonics/
15:00:03 shasta:~/Dropbox/edu/git > ll Techtonics
total 56
-rw-r--r--@ 1 ecrane staff 22 Sep 14 15:00 README.md
-rw-r--r--@ 1 ecrane staff 1420 Sep 14 15:00 RobotC Program.c
-rw-r--r--@ 1 ecrane staff 2575 Sep 14 15:00 roboDrive1Joy.c
-rw-r--r-- 1 ecrane staff
                          2917 Sep 14 15:00 roboDriveComp.c
-rw-r--r-- 1 ecrane staff 1745 Sep 14 15:00 robotDriving.c
-rw-r--r-- 1 ecrane staff 6044 Sep 14 15:00 tele2t.c
-rw-r--r-- 1 ecrane staff
                             0 Sep 14 15:00 test.txt
```

git status: check the current status of your working folder



test_file_1.txt

> git status

git add: stage modified (or new) files

> git add.

> git add doc/test_file_1.txt

git commit: move changes from working directory to local repo > git commit -m "what I did"

```
15:28:40 shasta:~/Dropbox/edu/git/Techtonics > git commit -m "adding test files"
[master fe8a41e] adding test files
2 files changed, 1 insertion(+)
create mode 100644 doc/test_file_1.txt
create mode 100644 doc/test_file_2.txt
15:34:17 shasta:~/Dropbox/edu/git/Techtonics > []
```

```
15:34:17 shasta:~/Dropbox/edu/git/Techtonics > git status
On branch master
Your branch is ahead of 'origin/master' by 1 commit.
  (use "git push" to publish your local commits)
nothing to commit, working directory clean
15:51:18 shasta:~/Dropbox/edu/git/Techtonics >
```

git pull: get the latest changes from the remote repo

> git pull origin master

git push: put your changes on the remote repo

> git push origin master

```
7:16:18 shasta:~/Dropbox/edu/git/Techtonics_2015 > git push origin master

Counting objects: 4, done.

Delta compression using up to 4 threads.

Compressing objects: 100% (2/2), done.

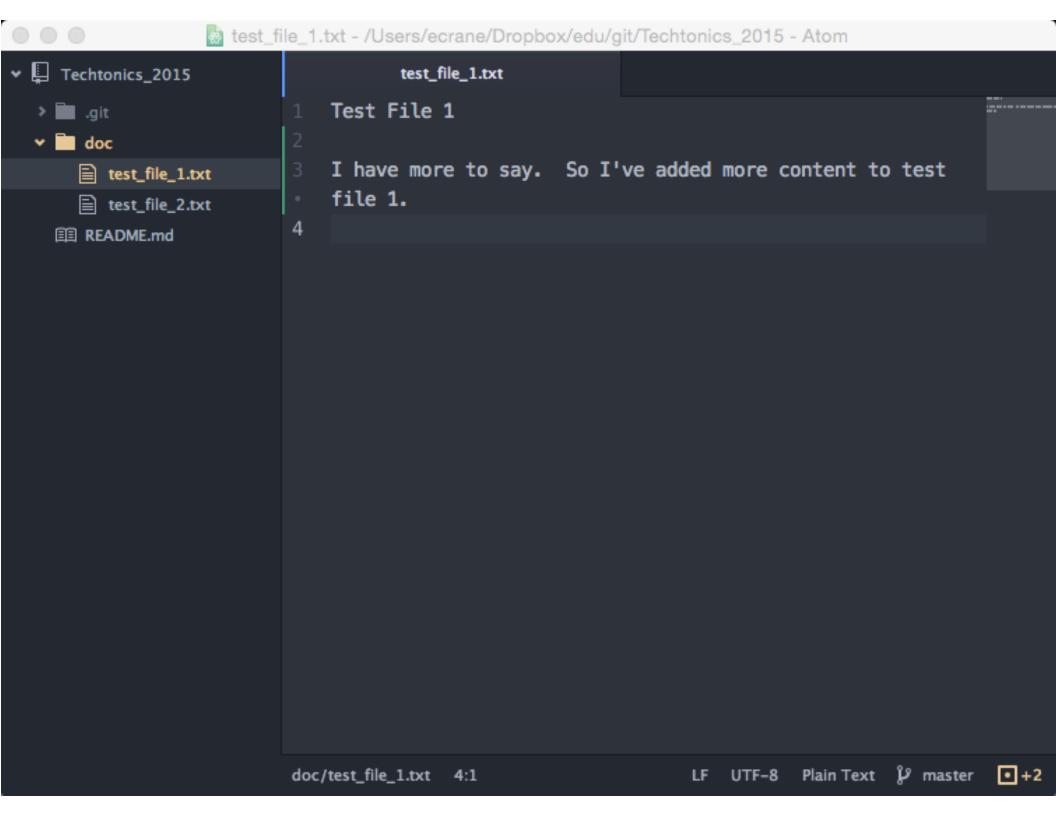
Vriting objects: 100% (4/4), 330 bytes | 0 bytes/s, done.

Total 4 (delta 0), reused 0 (delta 0)

To https://github.com/Techtonics8947/Techtonics_2015.git

724ee0b..99c3f88 master -> master
```

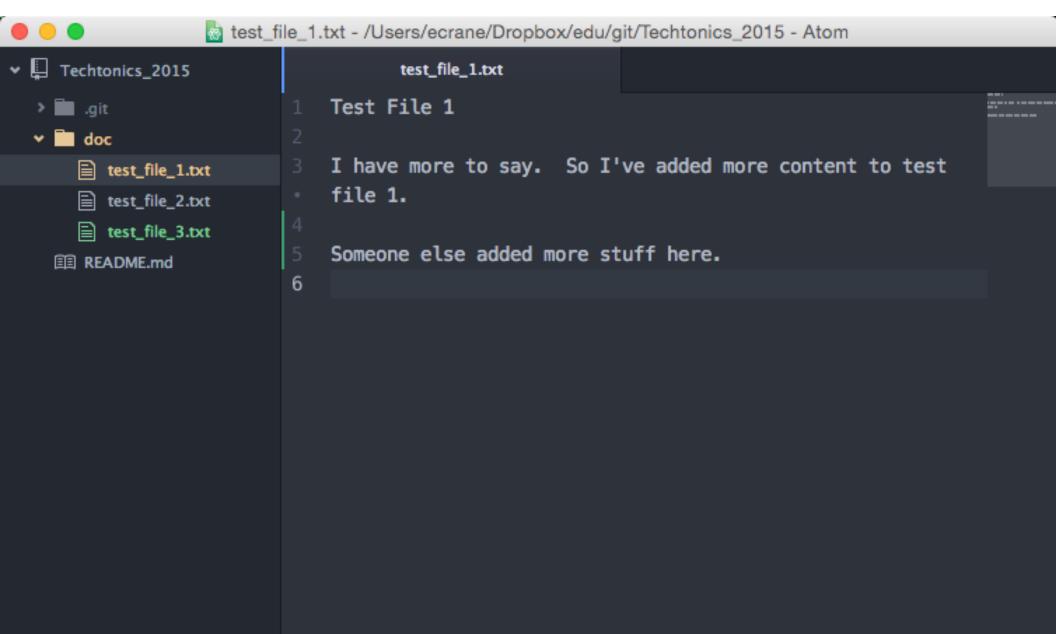
merge: resolve differences



```
7:24:35 shasta:~/Dropbox/edu/git/Techtonics 2015 > git status
On branch master
Your branch is up-to-date with 'origin/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: doc/test file 1.txt
no changes added to commit (use "git add" and/or "git commit -a")
7:28:46 shasta:~/Dropbox/edu/git/Techtonics 2015 > git add doc/test file 1.txt
7:28:54 shasta:~/Dropbox/edu/git/Techtonics 2015 > git status
On branch master
Your branch is up-to-date with 'origin/master'.
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)
        modified: doc/test file 1.txt
7:28:58 shasta:~/Dropbox/edu/git/Techtonics 2015 > git commit -m "saying more things..."
[master 4ef67d1] saying more things...
1 file changed, 2 insertions(+)
7:29:21 shasta:~/Dropbox/edu/git/Techtonics 2015 > git pull origin master
remote: Counting objects: 8, done.
remote: Compressing objects: 100% (6/6), done.
remote: Total 8 (delta 0), reused 8 (delta 0), pack-reused 0
Unpacking objects: 100% (8/8), done.
From https://github.com/Techtonics8947/Techtonics 2015
* branch
                     master -> FETCH HEAD
   383ee4a..51a16ee master -> origin/master
Auto-merging doc/test file 1.txt
CONFLICT (content): Merge conflict in doc/test file 1.txt
Automatic merge failed; fix conflicts and then commit the resu
7:29:27 shasta:~/Dropbox/edu/git/Techtonics 2015 >
```

- ▼ ☐ Techtonics_2015
 - test_file_1.txt
 - test_file_2.txt
 - test_file_3.txt
 - III README.md

- <<<<< HEAD
- I have more to say. So I've added more content to test
- file 1.
- Someone else added more stuff here.
- >>>>> 51a16eeb23c19f2b18514c93327b49f1b24e6112



```
7:29:27 shasta:~/Dropbox/edu/git/Techtonics 2015 > git status
On branch master
Your branch and 'origin/master' have diverged,
and have 1 and 2 different commits each, respectively.
  (use "git pull" to merge the remote branch into yours)
You have unmerged paths.
  (fix conflicts and run "git commit")
Changes to be committed:
        new file: doc/test file 3.txt
Unmerged paths:
  (use "git add <file>..." to mark resolution)
7:33:11 shasta:~/Dropbox/edu/git/Techtonics 2015 > git add .
7:33:13 shasta:~/Dropbox/edu/git/Techtonics 2015 > git status
On branch master
Your branch and 'origin/master' have diverged,
and have 1 and 2 different commits each, respectively.
  (use "git pull" to merge the remote branch into yours)
All conflicts fixed but you are still merging.
  (use "git commit" to conclude merge)
Changes to be committed:
        modified: doc/test file 1.txt
        new file: doc/test file 3.txt
7:33:17 shasta:~/Dropbox/edu/git/Techtonics 2015 > git commit -m "merging changes"
[master dbbb73a] merging changes
7:33:32 shasta:~/Dropbox/edu/git/Techtonics 2015 >
```

```
7:33:32 shasta:~/Dropbox/edu/git/Techtonics_2015 > git push origin master Counting objects: 8, done.
Delta compression using up to 4 threads.
Compressing objects: 100% (8/8), done.
Writing objects: 100% (8/8), 829 bytes | 0 bytes/s, done.
Total 8 (delta 1), reused 0 (delta 0)
To https://github.com/Techtonics8947/Techtonics_2015.git
    51a16ee..dbbb73a master -> master
7:34:18 shasta:~/Dropbox/edu/git/Techtonics_2015 >
```

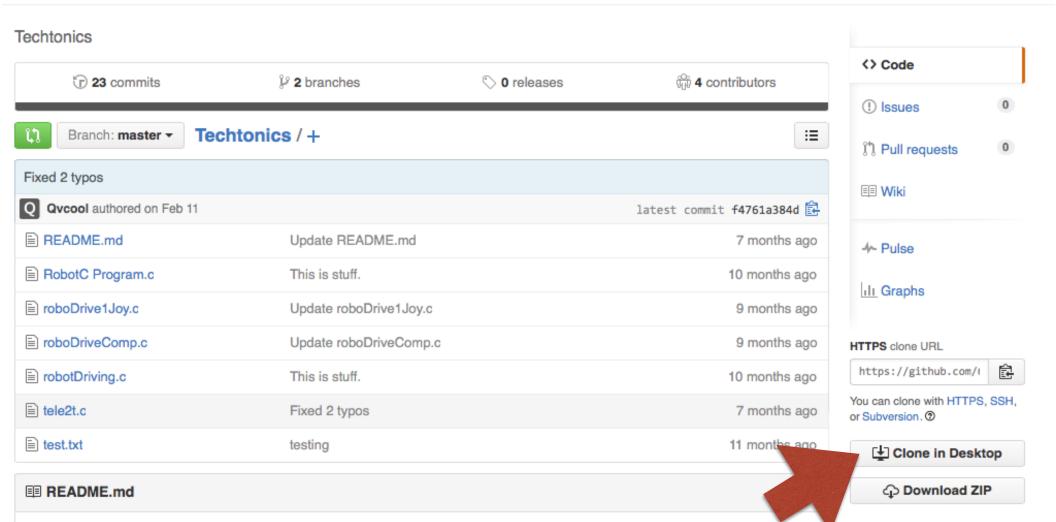
step-by-step examples

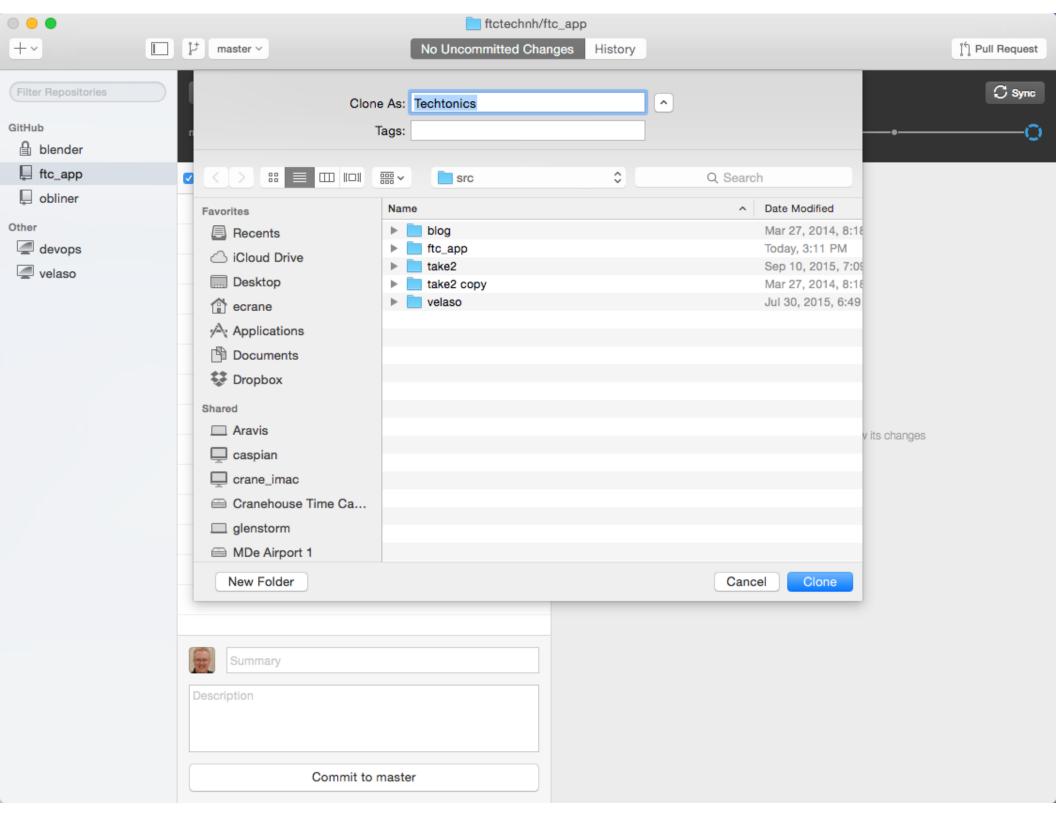
- clone
- status
- add
- commit
- pull
- push
- merge

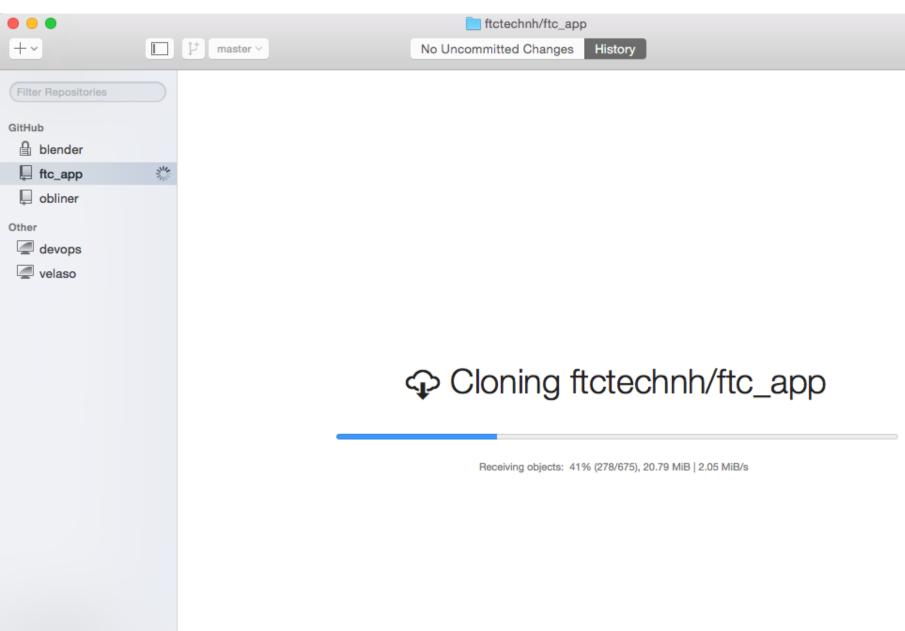
git clone: get an existing project

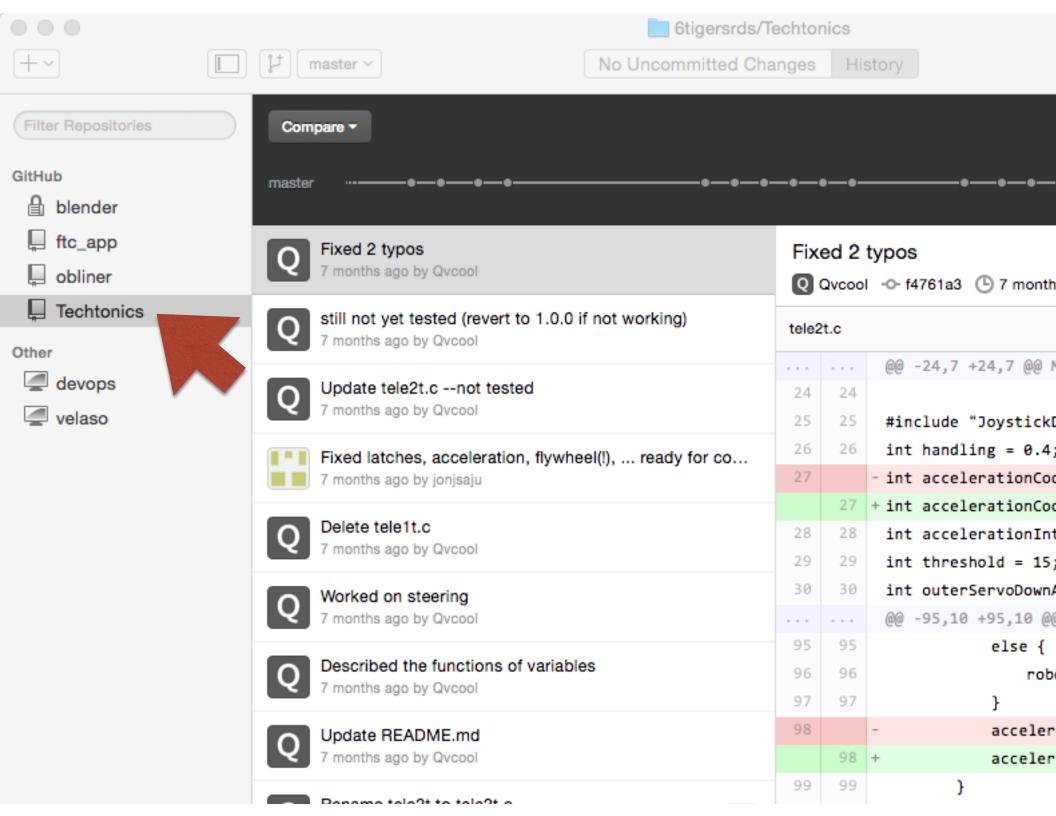


Watch ▼ 5 ★ Star 0 Ÿ Fork 0

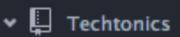








git status: check the current status of your working folder



> **iii** .git

🕶 🛅 doc

test_file_3.txt

III README.md

roboDrive1Joy.c

roboDriveComp.c

RobotC Program.c

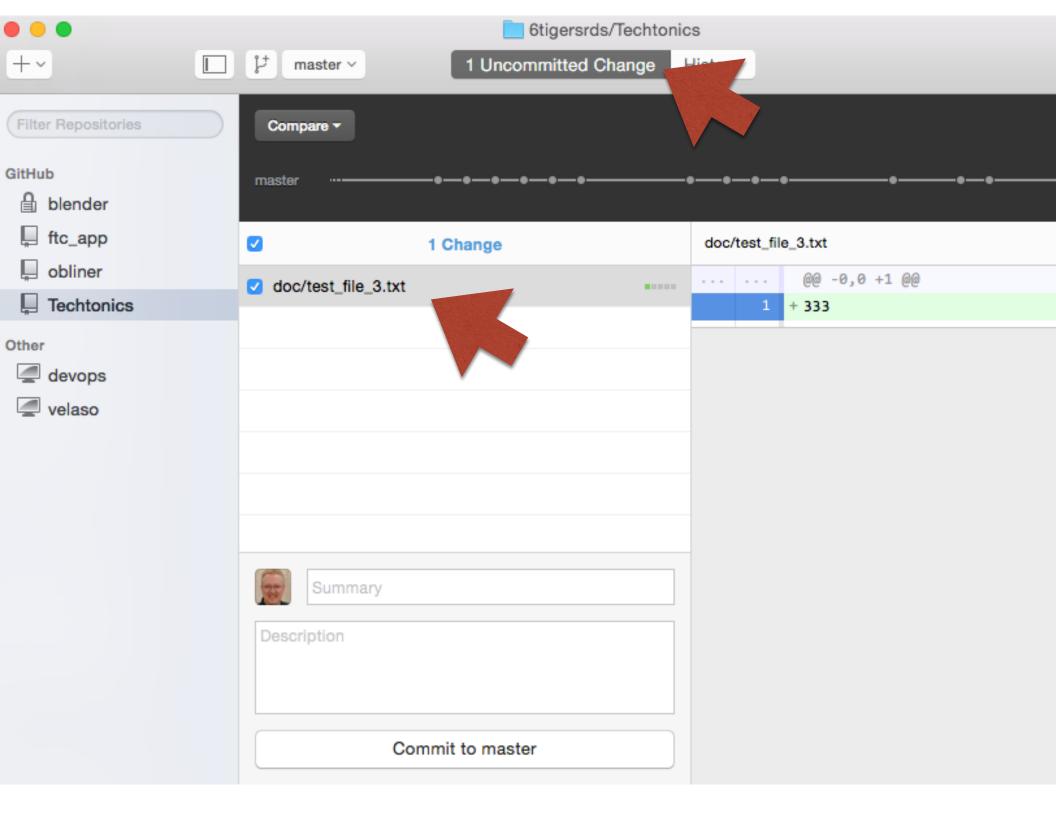
robotDriving.c

tele2t.c

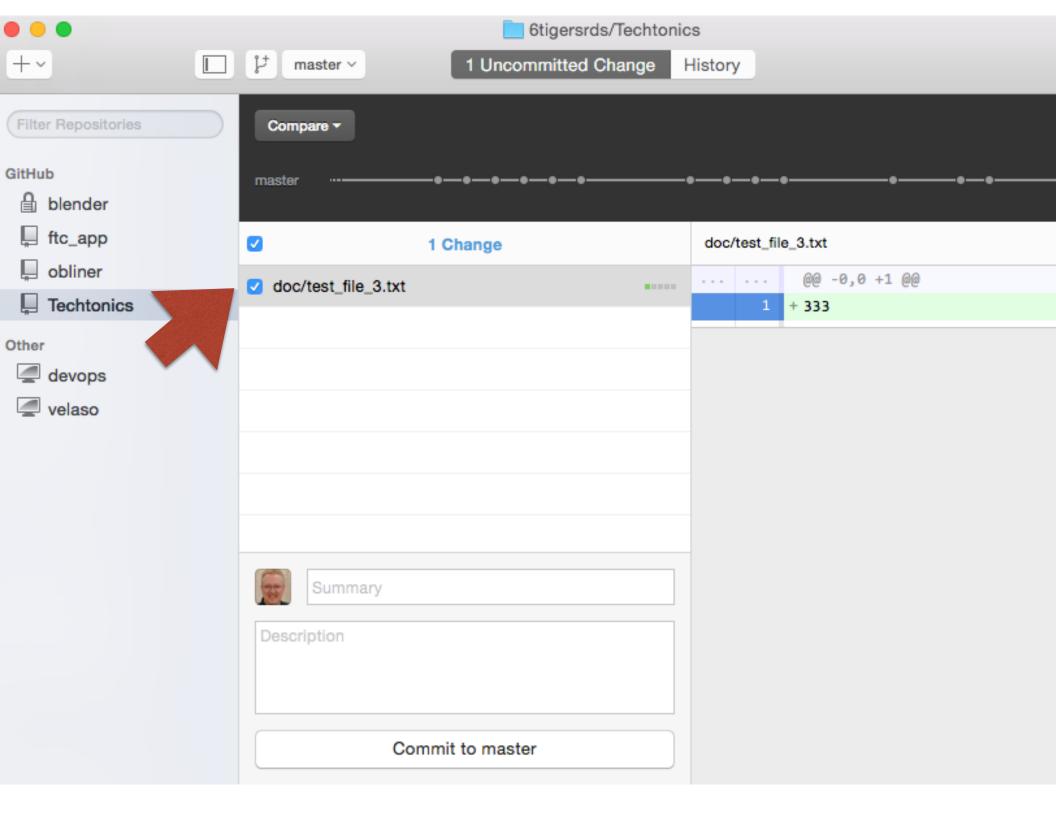
test.txt

test_file_3.txt

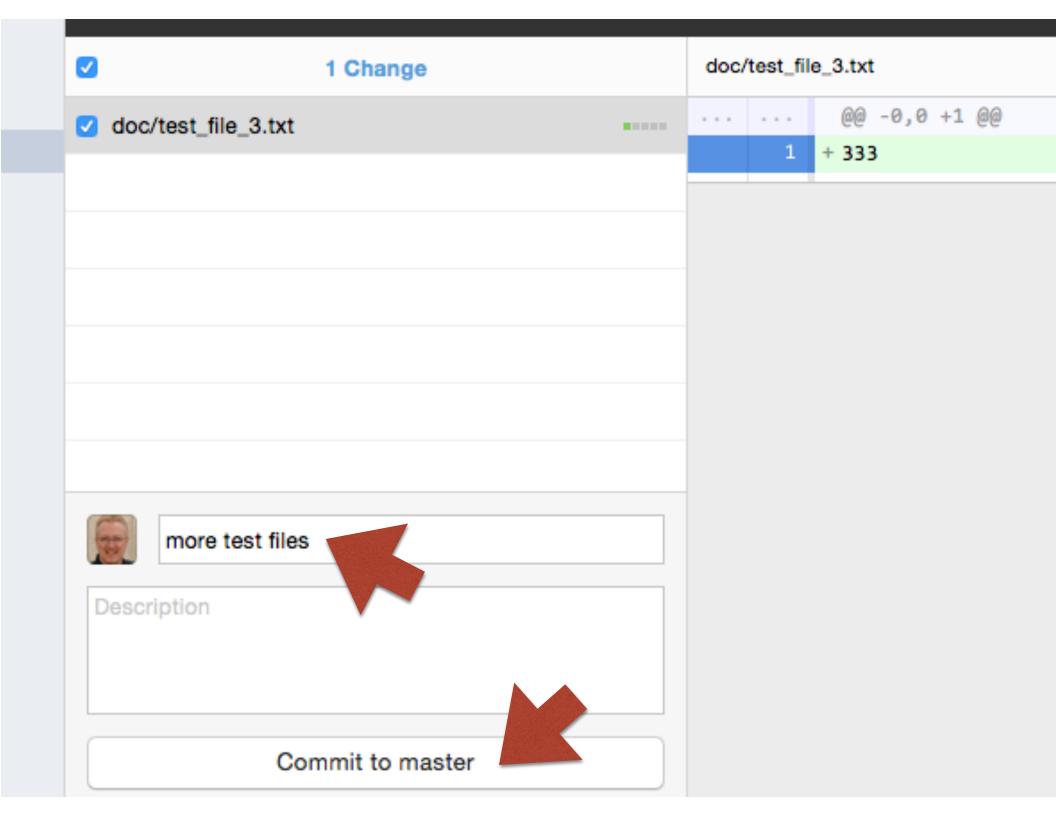
333

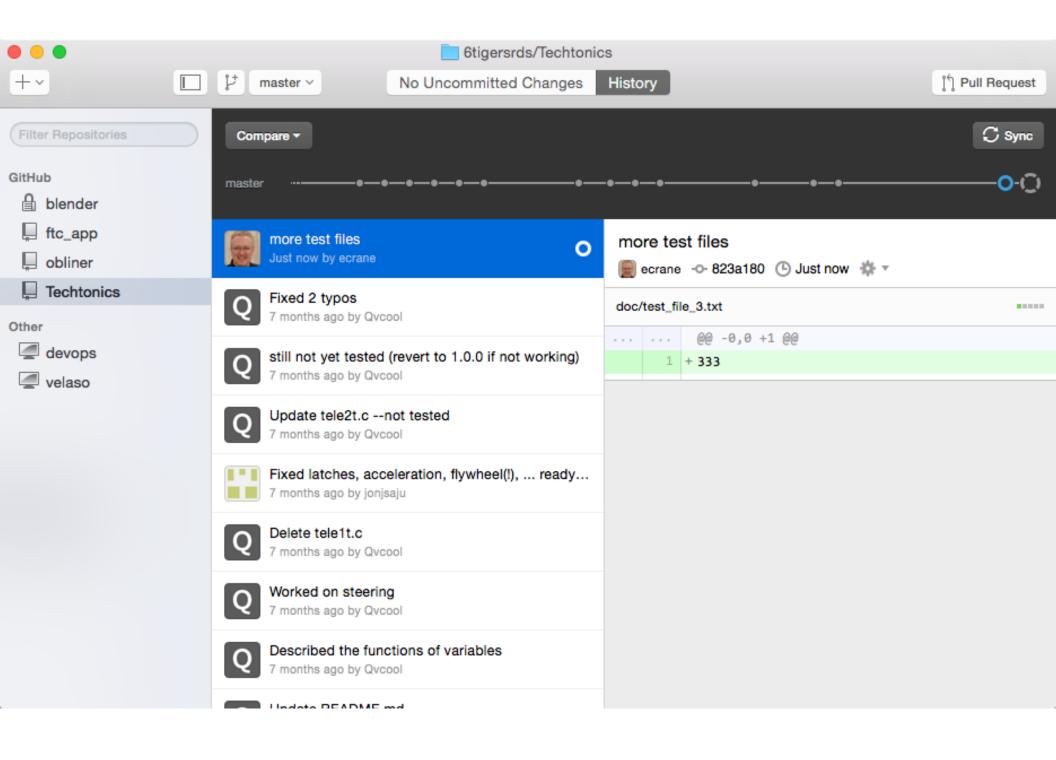


git add: stage modified (or new) files

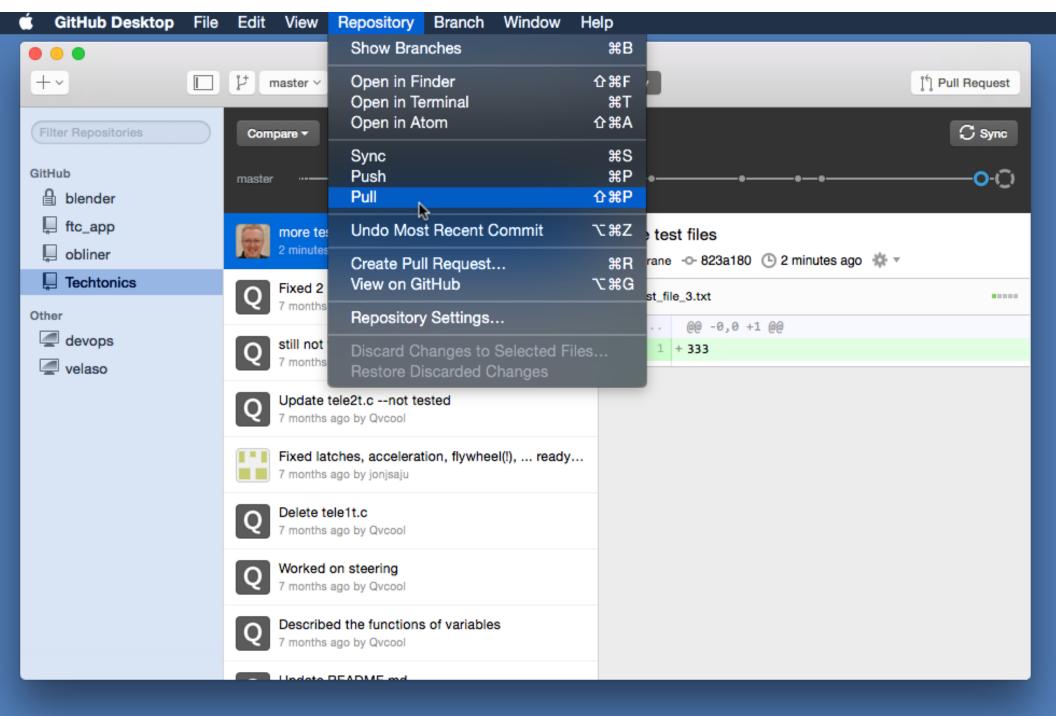


git commit: move changes from working directory to local repo

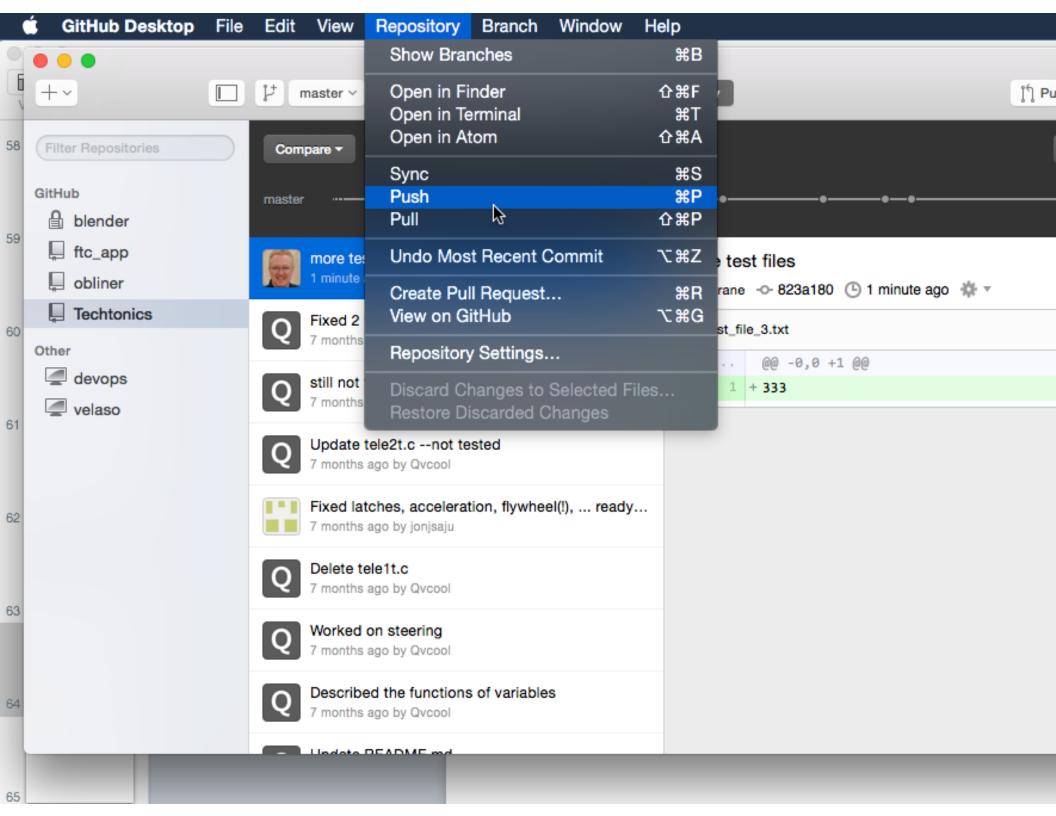


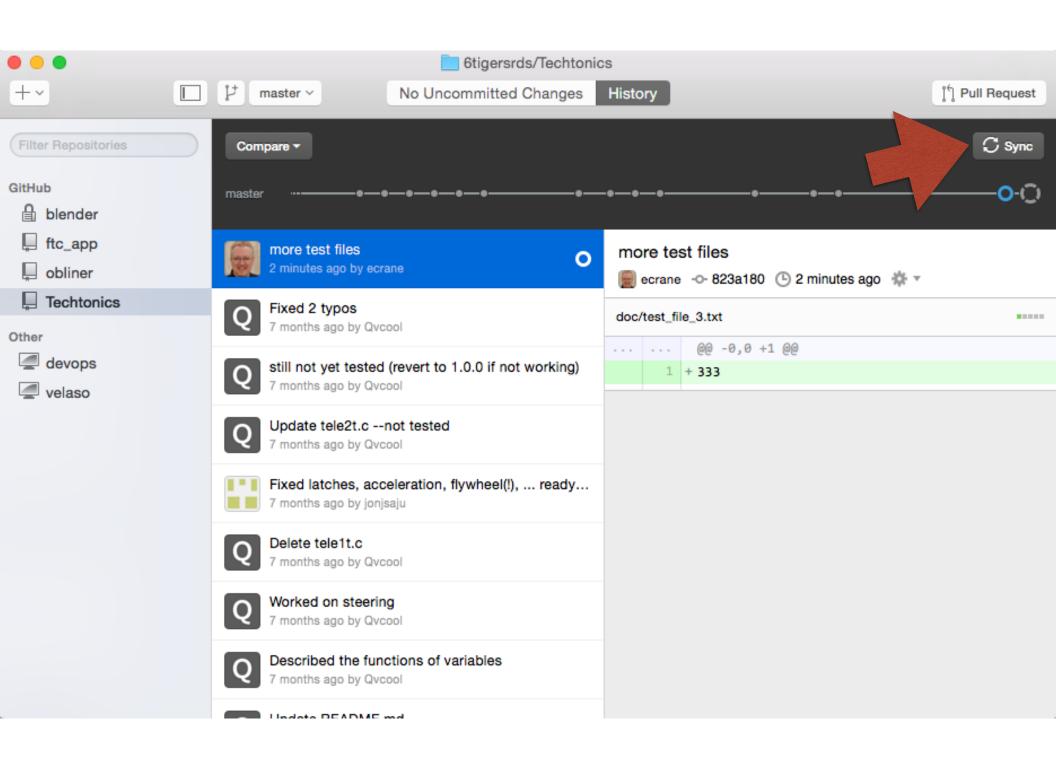


git pull: get the latest changes from the remote repo

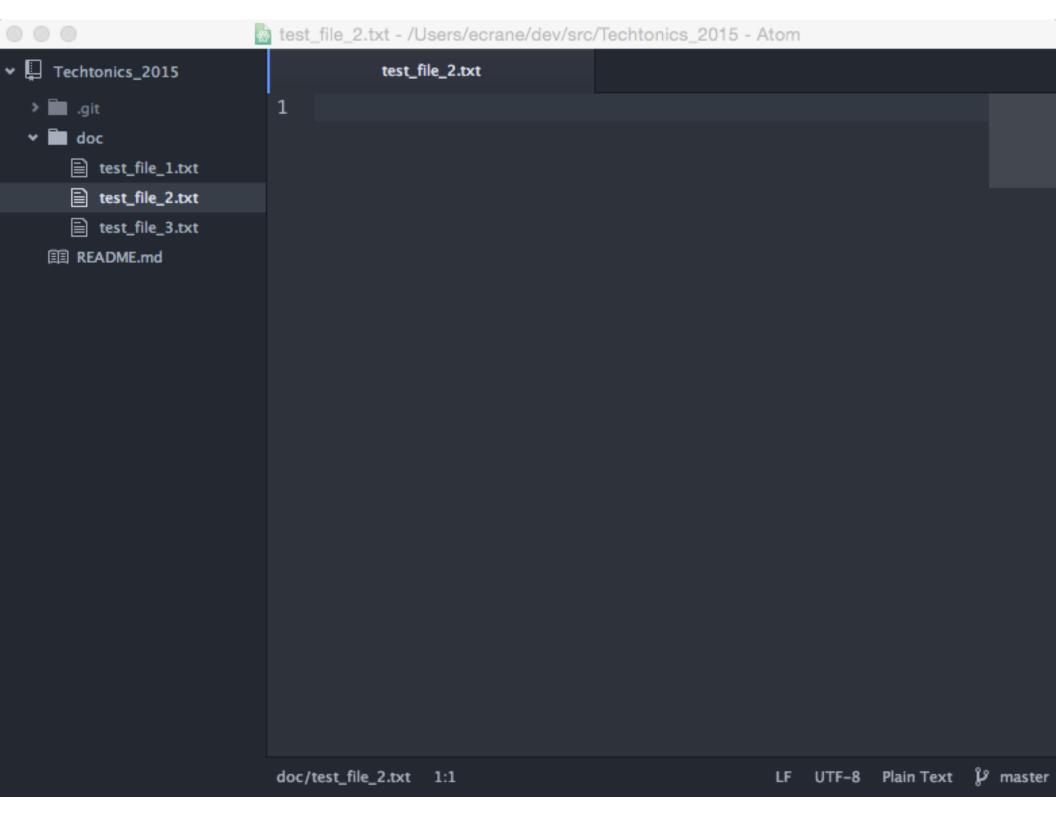


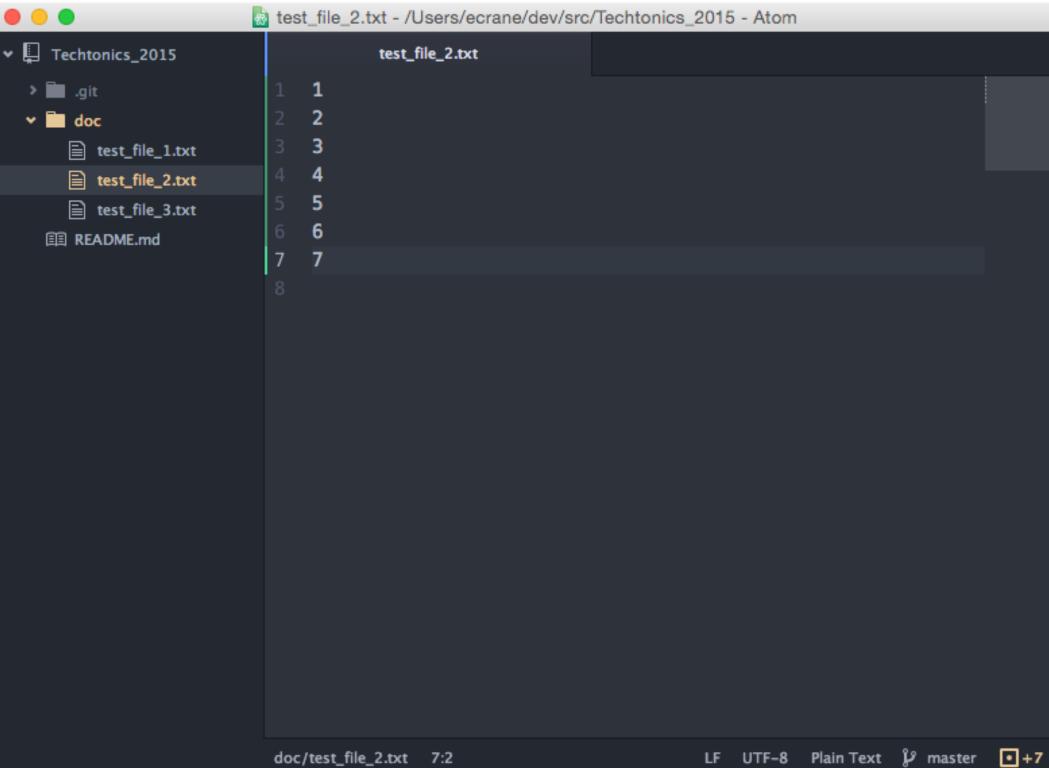
git push: put your changes on the remote repo

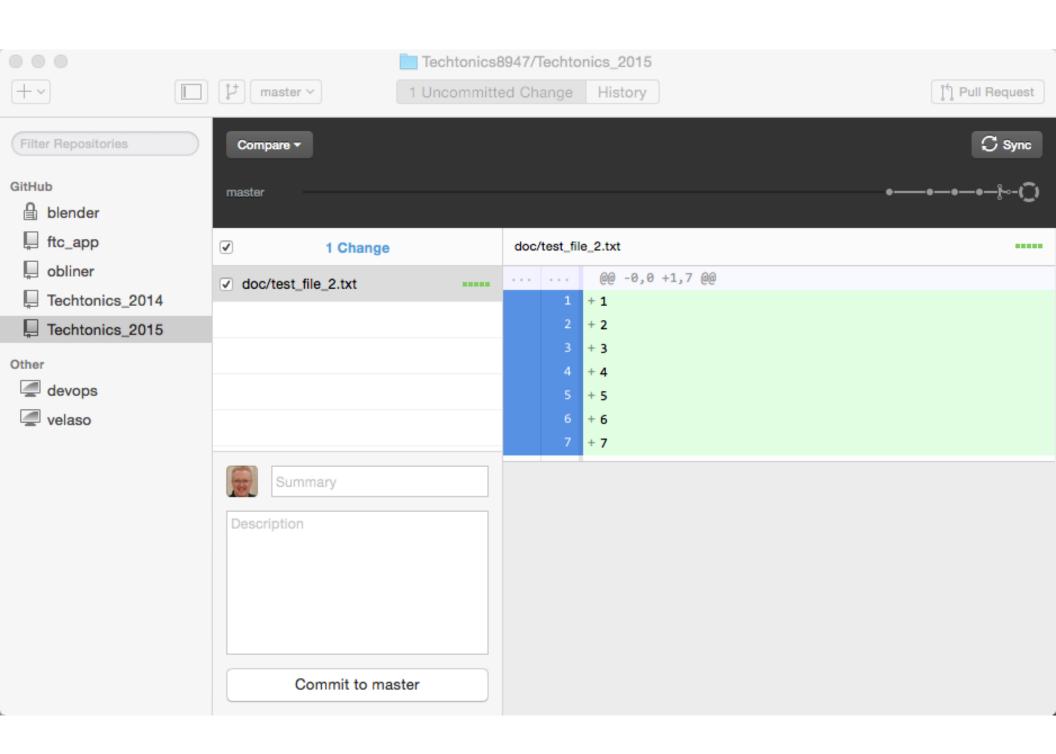


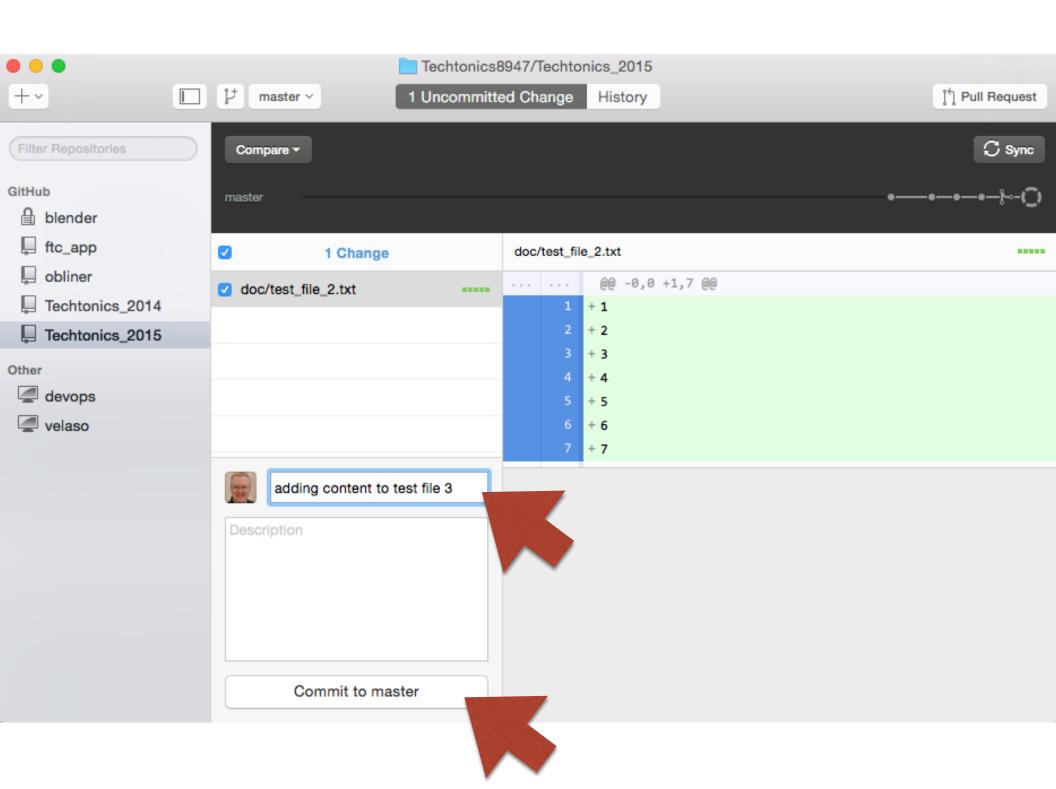


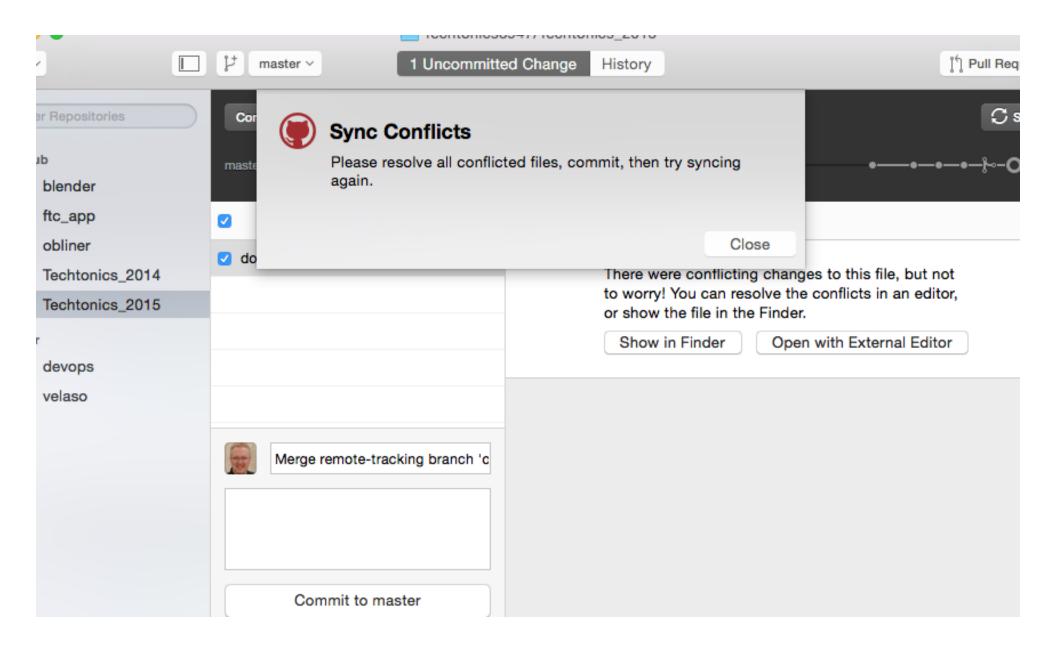
merge: resolve differences

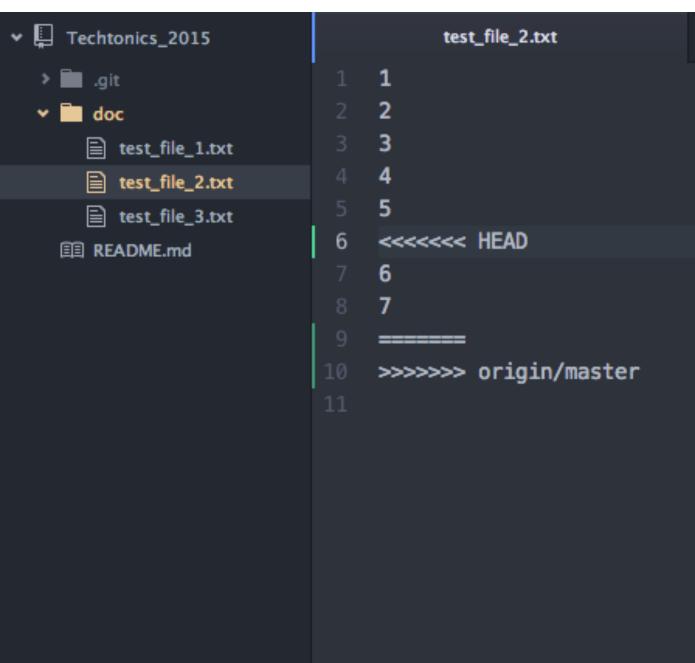


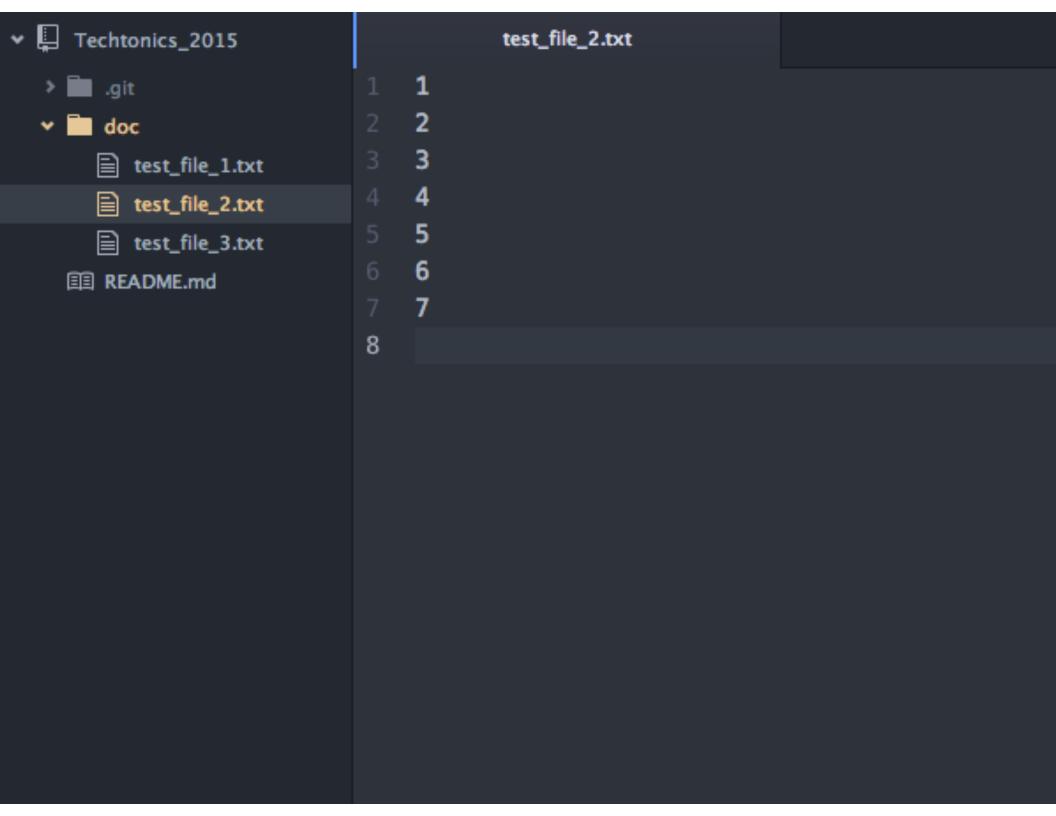


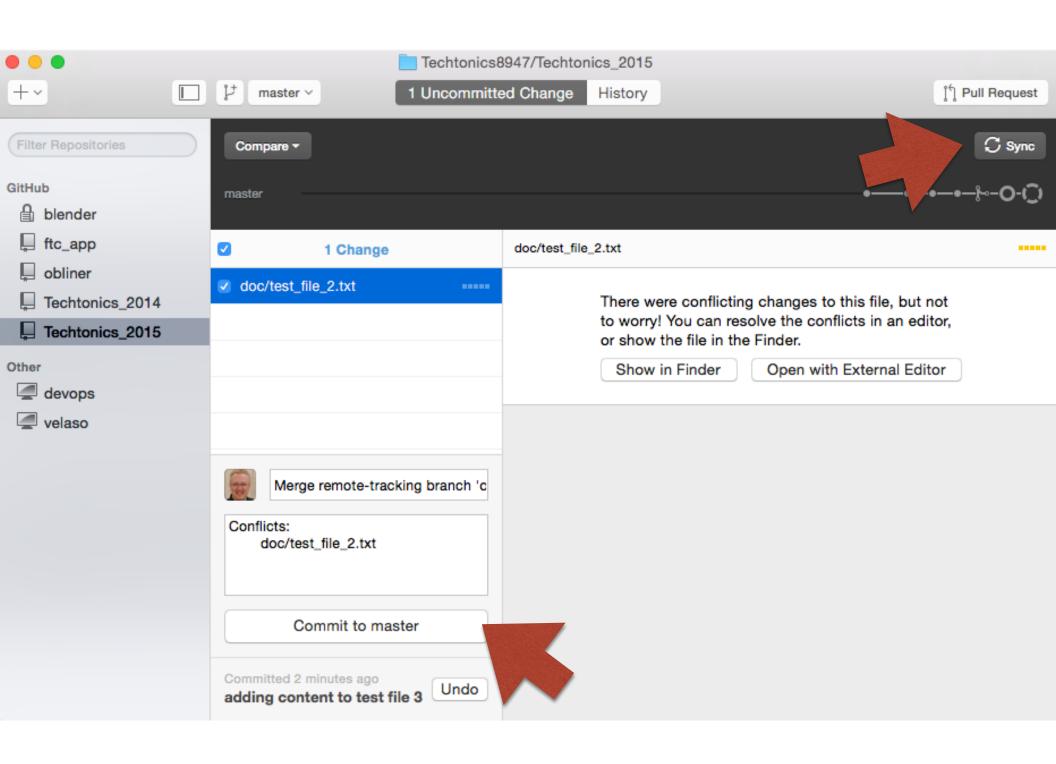


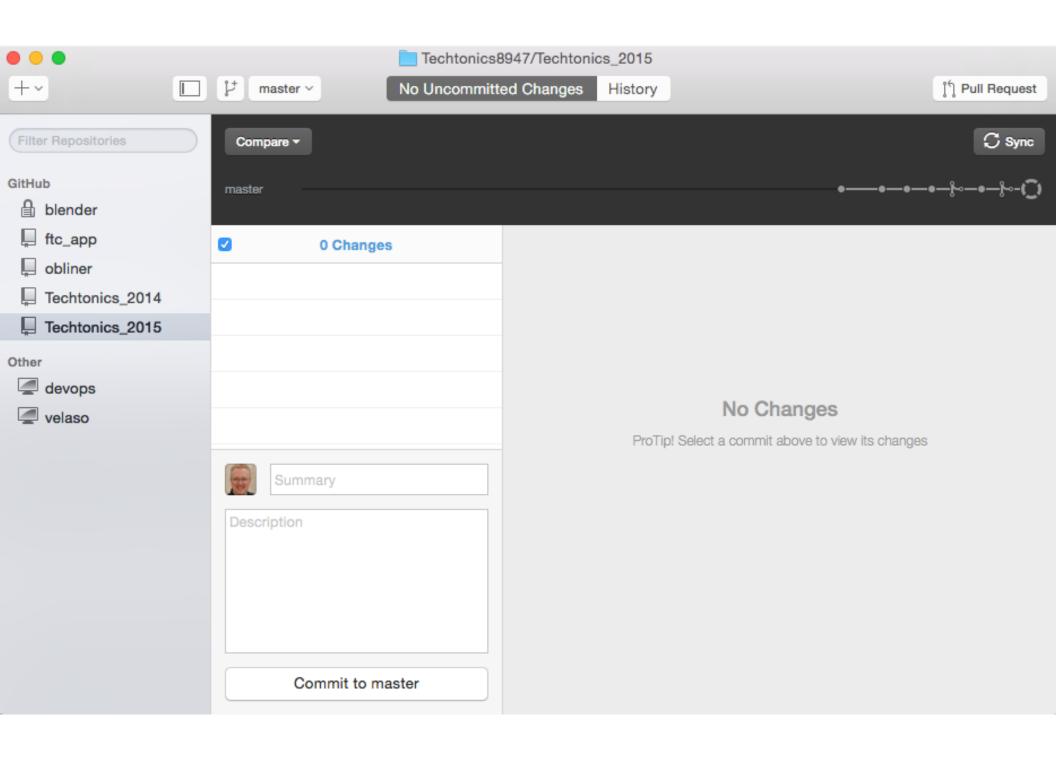












advanced topics

- .gitignore
- stash
- history
- branching

Resources

- https://en.wikipedia.org/wiki/Version_control
- https://bitbucket.org
- http://www.git-scm.com/doc
- https://codewords.recurse.com/issues/two/git-fromthe-inside-out
- https://desktop.github.com