Development with Git

“Digging in your eye-sockets with a fondue fork is strictly considered to be bad for your health, and seven out of nine optometrists are dead set against the practice.”

- Linus Torvalds, on Git mailing list


Censored!
Every time you don't use version control, Linus Torvalds get's a little angrier!

Outline

- Version control software
- Git for software development
- A few words on packaging in Python

Version control

To 0'th order

- Development history for your source code

Version control

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- Development history for your source code
- Collaboration with other developers

Version control

To 0'th order

- Development history for your source code
- Collaboration with other developers
- Allows experimentation without breaking existing code

Version control

To 0'th order

- Development history for your source code
- Collaboration with other developers
- Allows experimentation without breaking existing code
- Might take a little time to learn, but well worth it!

Version control

The generics

- Files and development history stored in repositories
- Check out files to a working directory
- Commit changes back to repository
- Update your working directory with commits from other developers
- Centralized vs. decentralized

Version control

Centralized

- Everyone commits to a server
- Does not encourage offline development
- Single point of failure
- 90's: CVS
- 00's: Subversion
- Now?

Version control

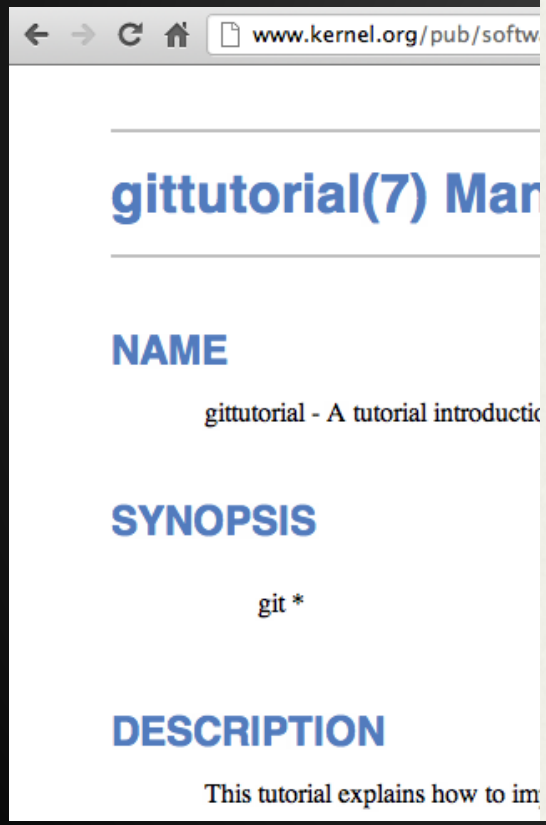
Decentralized

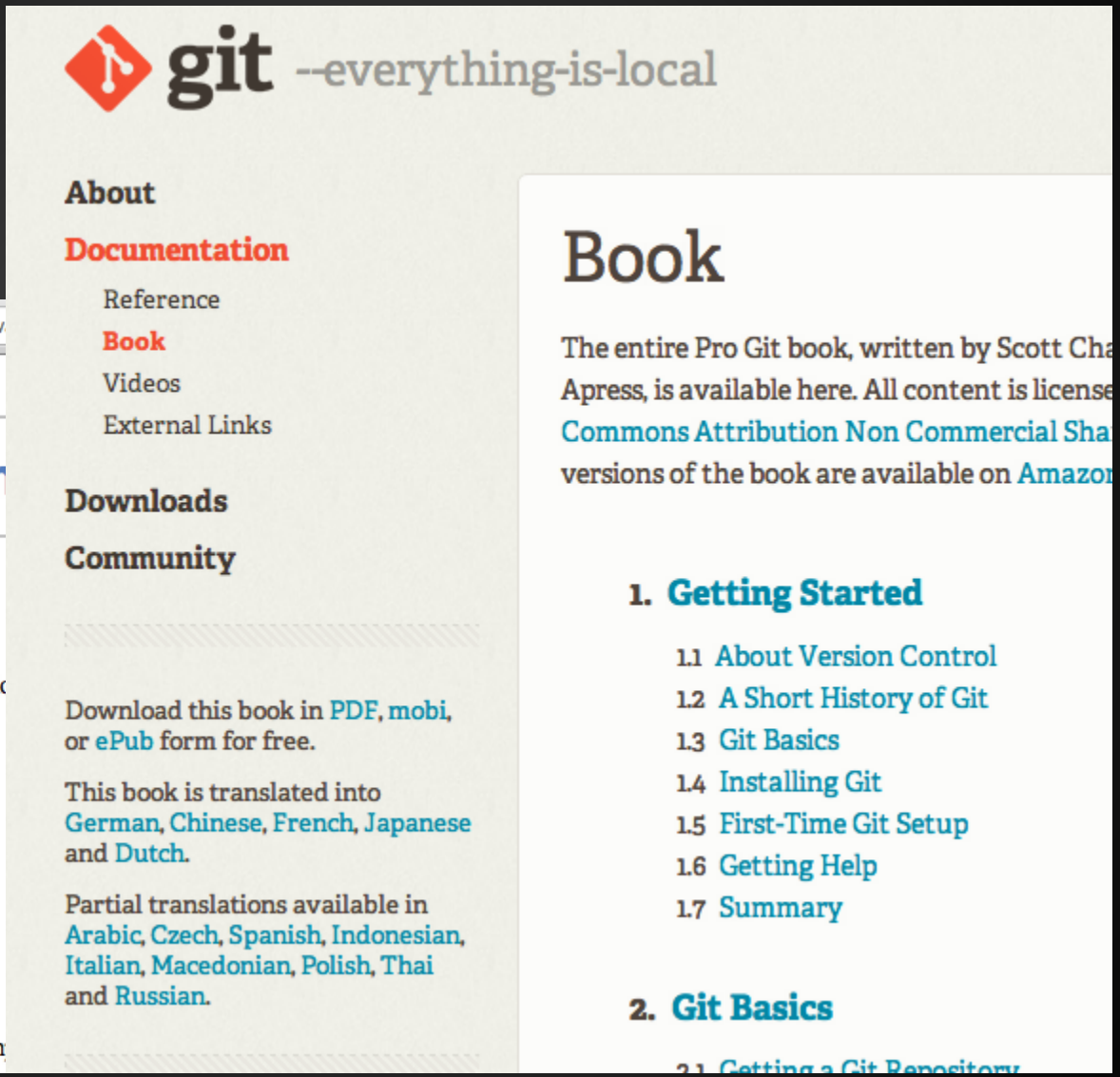
- Everyone has a copy
- Local commits
- Push to and pull from shared copy
- Encourages experimentation
- Many contenders
  - Mercurial
  - Bazaar
  - ....
  - Git

http://git-scm.com

Git

Git basics





Git

Getting started

```
$ mkdir myawesomesoftware
$ cd myawesomesoftware
$ git init
```

Git

Getting started

```
$ mkdir myawesomesoftware
$ cd myawesomesoftware
$ git init
Initialized empty Git repository in [path]
```

```
$ git status
# On branch master
#
# Initial commit
#
nothing to commit
(create/copy files and use
"git add" to track)
```

Git

Getting started

```
$ mkdir myawesomesoftware
$ cd myawesomesoftware
$ git init
Initialized empty Git repository in [path]
$ ls -a
. .. .git
```

```
$ git status
# On branch master
#
# Initial commit
#
nothing to commit
(create/copy files and use
"git add" to track)
```

Git

Getting started

```
$ mkdir myawesomesoftware
$ cd myawesomesoftware
$ git init
Initialized empty Git repository in [path]
$ ls -a
. .. .git
$ echo "My awesome software" > README
```

```
$ git status
# On branch master
#
# Initial commit
#
# Untracked files:
#   (use "git add <file>..." to include in what will be committed)
#
#   README
nothing added to commit but untracked files present (use "git add" to track)
```

Git

Getting started

```
$ mkdir myawesomesoftware
$ cd myawesomesoftware
$ git init
Initialized empty Git repository in [path]
$ ls -a
. .. .git
$ echo "My awesome software" > README
$ git add README
```

```
$ git status
# On branch master
#
# Initial commit
#
# Changes to be committed:
#   (use "git rm --cached
<file>..." to unstage)
#
#   new file:   README
#
```

Git

Getting started

```
$ mkdir myawesomesoftware
$ cd myawesomesoftware
$ git init
Initialized empty Git repository in [path]
$ ls -a
. .. .git
$ echo "My awesome software" > README
$ git add README
$ git commit -m "Initial commit with README file."
```

```
$ git status
# On branch master
nothing to commit (working directory clean)
```

Git

Getting started

```
$ mkdir myawesomesoftware
$ cd myawesomesoftware
$ git init
Initialized empty Git repository in [path]
$ ls -a
. .. .git
$ echo "My awesome software" > README
$ git add README
$ git commit -m "Initial commit with README file."
[master (root-commit) 421659d] Bla bla
 1 files changed, 1 insertions(+), 0 deletions(-)
 create mode 100644 README
```

```
$ git status
# On branch master
nothing to commit (working directory clean)
```

Git

Getting started

```
$ mkdir myawesomesoftware
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$ git init
Initialized empty Git repository in [path]
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$ git add README
$ git commit -m "Initial commit with README file."
[master (root-commit) 421659d] Bla bla
 1 files changed, 1 insertions(+), 0 deletions(-)
 create mode 100644 README

$ git help
```

Git

Under the hood

- Git keeps track of a database of commits.
- Every directory under version control has .git/
- A commit consists of [tree, author, timestamp, log message, parent commit(s)]
- Commits are named with hashes, eg. 0d30e664c0839392a0ec8c7c266e9e194b8bb7f6
- Formally a directed acyclic graph

Git

Working and staging

```
$ git status
# On branch master
# Changes to be committed:
#   (use "git reset HEAD <file>..." to unstage)
#
#   new file:   another.txt
#
# 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:   README
#
# Untracked files:
#   (use "git add <file>..." to include in what will be committed)
#
#   athird.txt
```

Git

Local workflow

```
$ echo "Hope you like it" >> README
```

Git

Local workflow

```
$ echo "Hope you like it" >> README
$ git status
```

Git

Local workflow

```
$ echo "Hope you like it" >> README
$ git status
[...]
modified:   README
[...]
```

Git

Local workflow

```
$ echo "Hope you like it" >> README
$ git status
[...]
modified:   README
[...]
$ git diff
```

Git

Local workflow

```
$ echo "Hope you like it" >> README
$ git status
[...]
modified:   README
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[...]
 My awesome software
+Hope you like it
```

Git

Local workflow

```
$ echo "Hope you like it" >> README
$ git status
[...]
modified:   README
[...]
$ git diff
[...]
 My awesome software
+Hope you like it
$ git commit -a -m "Added more info to the README."
```

Git

Local workflow

```
$ echo "Hope you like it" >> README
$ git status
[...]
modified:   README
[...]
$ git diff
[...]
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$ git commit -a -m "Added more info to the README."
$ git status
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Git

Local workflow

```
$ echo "Hope you like it" >> README
$ git status
[...]
modified:   README
[...]
$ git diff
[...]
 My awesome software
+Hope you like it
$ git commit -a -m "Added more info to the README."
$ git status
$ git log
```

Git

Local workflow

```
$ git log
commit 7351b6521b72745cc2ca523413b2e1f124bab570
Author: Henrik Brink <henrikbrink@gmail.com>
Date:   Sun Aug 19 18:31:00 2012 -0700

    Updated the README file with even more info

commit 16dbb3f18cbe62385b330423685e526cad6ea5c0
Author: Henrik Brink <henrikbrink@gmail.com>
Date:   Sun Aug 19 16:36:37 2012 -0700

    Updated the README file

[...]
```

Git

There and back again

- Different levels of undo
- If committed, you can (almost) never lose it!

Amend the previous commit

```
$ git commit --amend
```

Git

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Discarding changes to files

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Unstaging changes

```
$ git reset HEAD <file>
```

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Create a new commit that removes some old commits

```
$ git revert
```

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Unstaging changes

```
$ git reset HEAD <file>
```

Create a new commit that removes some old commits

```
$ git revert
```

Rewinding commits. Only if they have not been pushed!

```
$ git reset --hard
```

Git

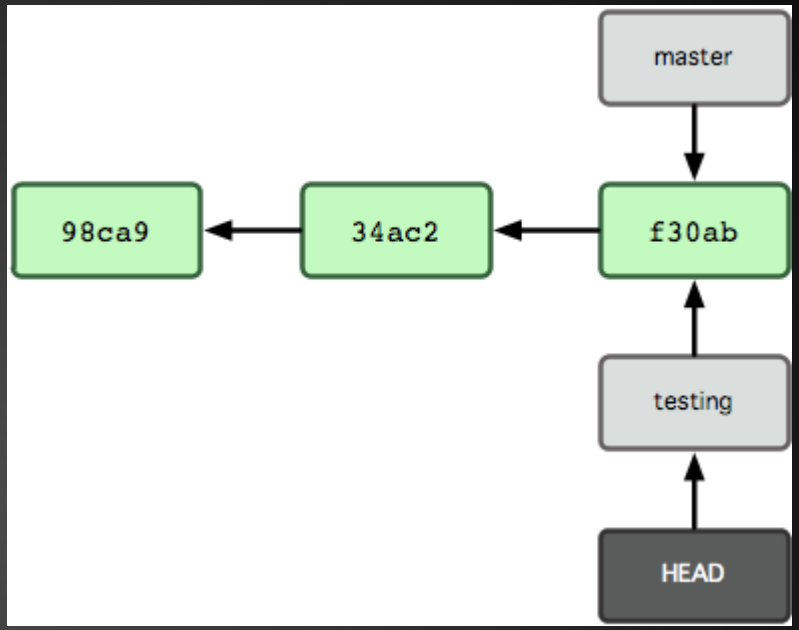
Branches

```
$ git branch -a
* master
```

Git

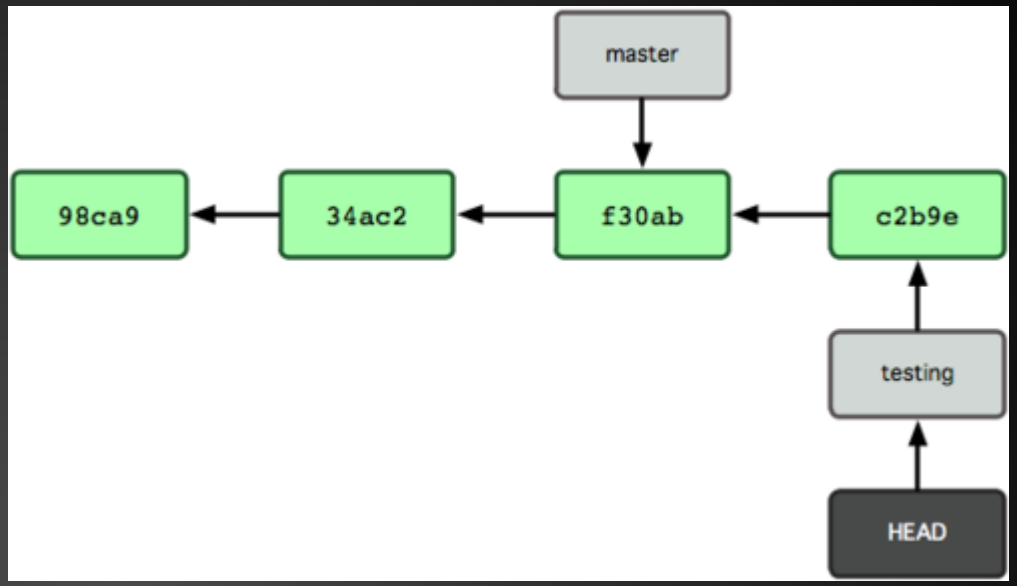
Branches

```
$ git branch -a
* master
$ git branch a_new_hope
$ git checkout a_new_hope
Switched to branch 'a_new_hope'
```



Git

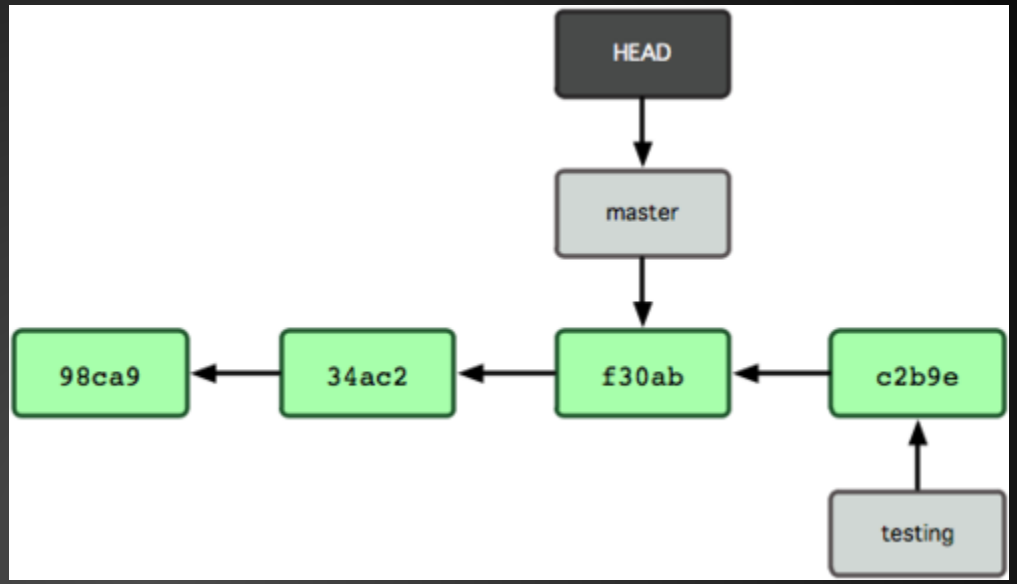
Branches




```
$ git branch -a
* master
$ git branch a_new_hope
$ git checkout a_new_hope
Switched to branch 'a_new_hope'
$ echo "CHANGES ARE COMING" >> README
$ git commit -a -m "Put changes warning in README"
```

Git

Branches




```
$ git branch -a
* master
$ git branch a_new_hope
$ git checkout a_new_hope
Switched to branch 'a_new_hope'
$ echo "CHANGES ARE COMING" >> README
$ git commit -a -m "Put changes warning in README"
$ git checkout master
$ git merge a_new_hope
Updating 16dbb3f..7351b65
Fast-forward
 README |    1 +
 1 files changed, 1 insertions(+), 0 deletions(-)
```

Git

Collaboration

```
$ git clone /path/on/shared/disk
$ git clone git://git-server.com/...
$ git clone user@host:path/to/repo
$ git clone http://host/repo.git
```

Git

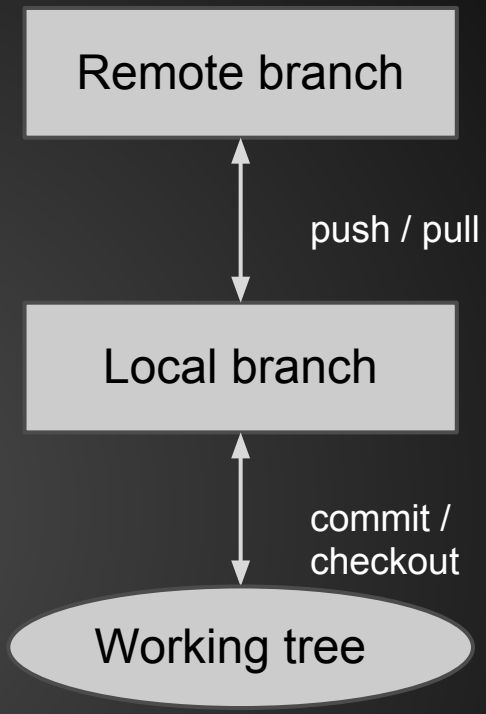
Collaboration

```
$ git clone /path/on/shared/disk
$ git clone git://git-server.com/...
$ git clone user@host:path/to/repo
$ git clone http://host/repo.git

$ echo "My 5 cents" >> README
$ git diff
$ git commit -a -m "Changed README to include my 5 cents."
```

Git

Collaboration




```
$ git clone /path/on/shared/disk
$ git clone git://git-server.com/...
$ git clone user@host:path/to/repo
$ git clone http://host/repo.git

$ echo "My 5 cents" >> README
$ git diff
$ git commit -a -m "Changed README to include my 5 cents."
$ git pull
$ git push
```

Git

Setting up a shared repo

```
$ ssh myserver

$ cd /path/to/repos
$ mkdir myrepo.git
$ cd myrepo.git
$ git init --bare --shared
$ exit
```

Git

Setting up a shared repo

```
$ ssh myserver

$ cd /path/to/repos
$ mkdir myrepo.git
$ cd myrepo.git
$ git init --bare --shared
$ exit

$ cd /path/to/code
$ git remote add origin ssh://myserver/path/git/repos
$ git push -u origin master
```

Git

Resolving conflicts

```
$ git pull
CONFLICT (content): Merge conflict in file.txt
```

Git

Resolving conflicts

```
$ git pull
CONFLICT (content): Merge conflict in file.txt
$ cat file.txt
<<<<<<< HEAD:file.txt
Hello world
=======
Goodbye
>>>>>>> 77976da35a11db4580b80ae27e8d65caf5208086:file.txt
```

Git

Resolving conflicts

```
$ git pull
CONFLICT (content): Merge conflict in file.txt
$ cat file.txt
<<<<<<< HEAD:file.txt
Hello world
=======
Goodbye
>>>>>>> 77976da35a11db4580b80ae27e8d65caf5208086:file.txt
$ vim file.txt
Hello world
Goodbye
```

Git

Resolving conflicts

```
$ git pull
CONFLICT (content): Merge conflict in file.txt
$ cat file.txt
<<<<<<< HEAD:file.txt
Hello world
=======
Goodbye
>>>>>>> 77976da35a11db4580b80ae27e8d65caf5208086:file.txt
$ vim file.txt
Hello world
Goodbye
$ git add file.txt
$ git commit -m "Merged conflicts in file.txt"
```

Git

Blaming people

```
$ git blame README
^421659d (Henrik Brink 2012-08-19 16:27:25 -0700 1) My awesome
software
16dbb3f1 (Henrik Brink 2012-08-19 16:36:37 -0700 2) Hope you like it
7351b652 (Henrik Brink 2012-08-19 18:31:00 -0700 3) Bla
```

- Use for good
- Come up with good excuses
- Another reason for local branch for experimentation

Git

"Github" flow

```
$ git clone ...
$ git checkout -b my_new_feature
```

Git

"Github" flow

```
$ git clone ...
$ git checkout -b my_new_feature
$ vim crazy_feature.py
$ git commit ...
$ git rebase master
$ git push -u origin my_new_feature
```

Tell someone about your new branch and get feedback!

Git

"Github" flow

```
$ git clone ...
$ git checkout -b my_new_feature
$ vim crazy_feature.py
$ git commit ...
$ git rebase master
$ git push -u origin my_new_feature
```

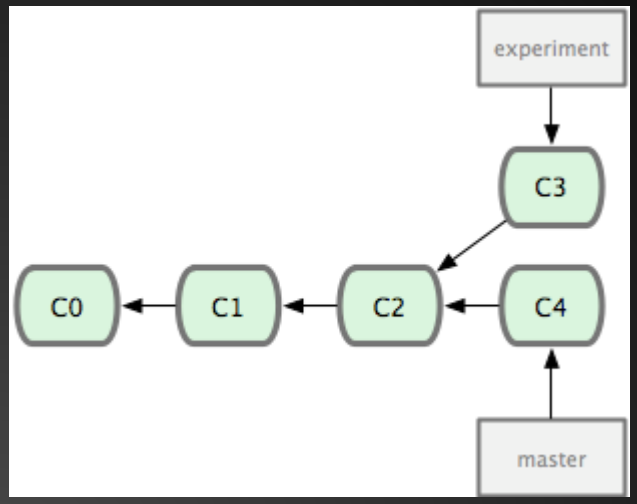
Tell someone about your new branch and iterate... until:

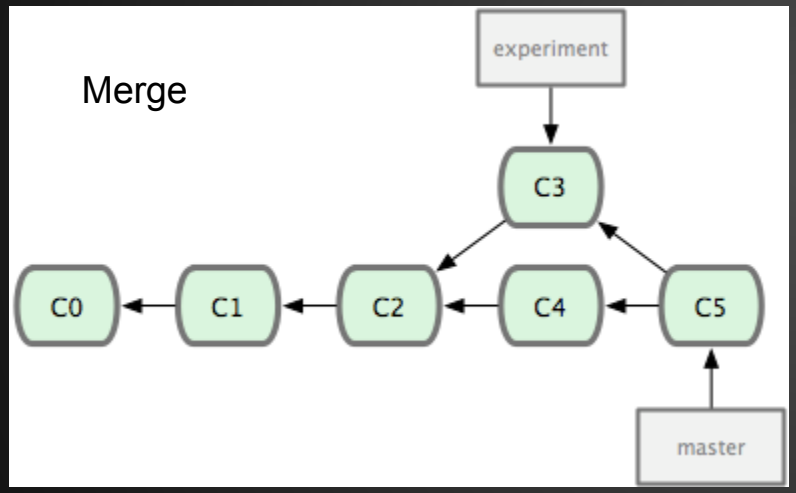
```
On branch master
$ git merge my_new_feature
$ git pull
$ git push
```

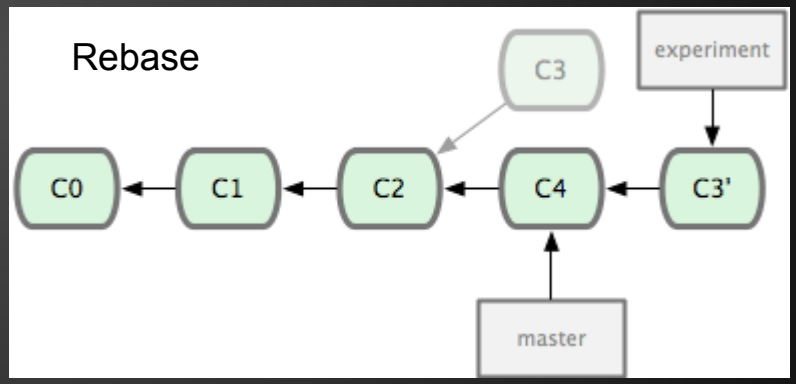
Anything in master is deployable.

Git

Merge vs Rebase







- Interactive rebase - powerful commit management.
- "Do not rebase commits that you have pushed to a public repository!!"

Git

Tagging

```
$ git tag
v1.0
$ git show v1.0
[...]
```

Git

Tagging

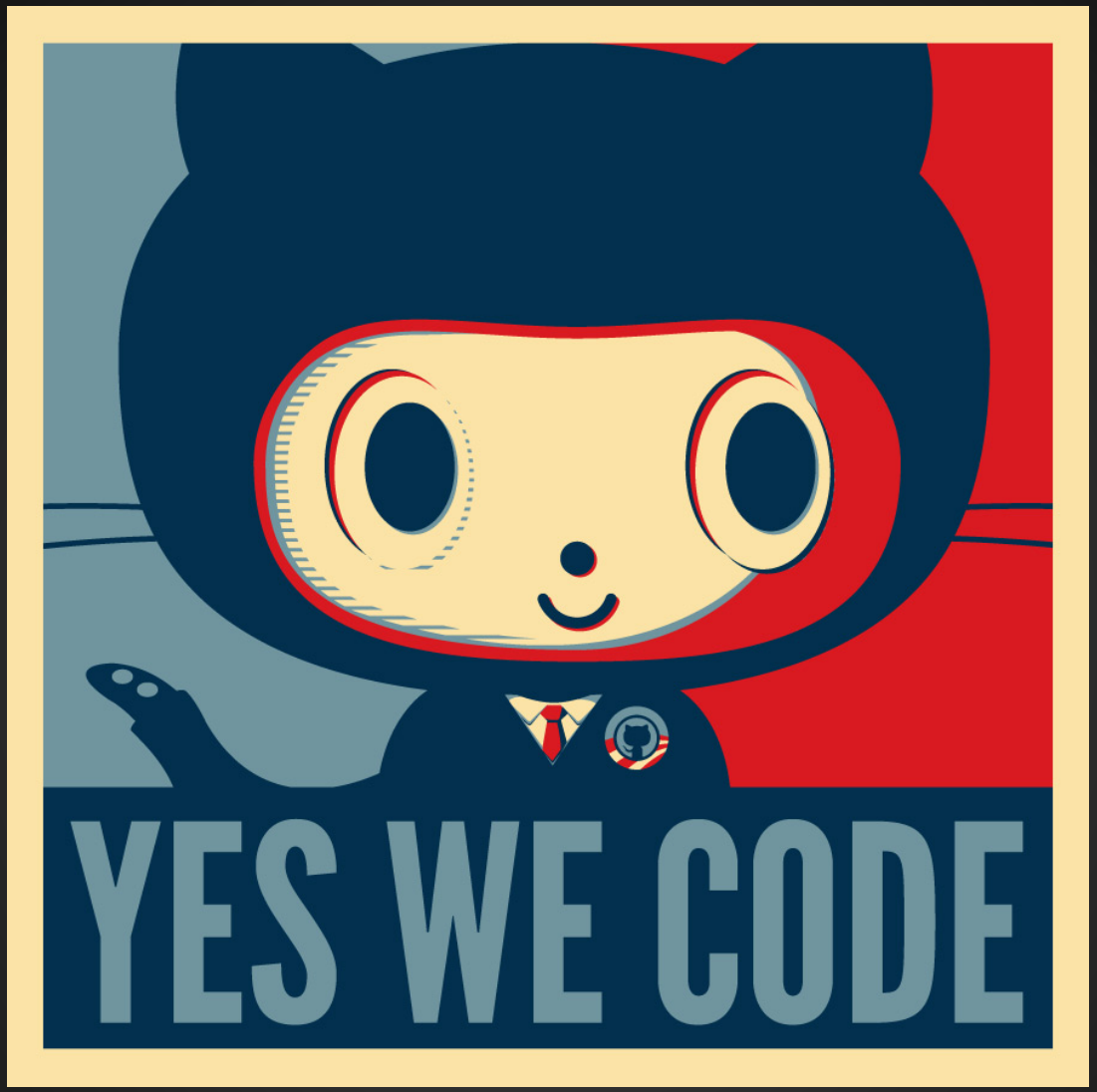
```
$ git tag
v1.0
$ git show v1.0
[...]
$ git tag -a v2.0 -m "2.0 release."
$ git show v2.0
```

Git

Tagging

```
$ git tag
v1.0
$ git show v1.0
[...]
$ git tag -a v2.0 -m "2.0 release."
$ git show v2.0

$ git push origin v2.0
```



http://github.com

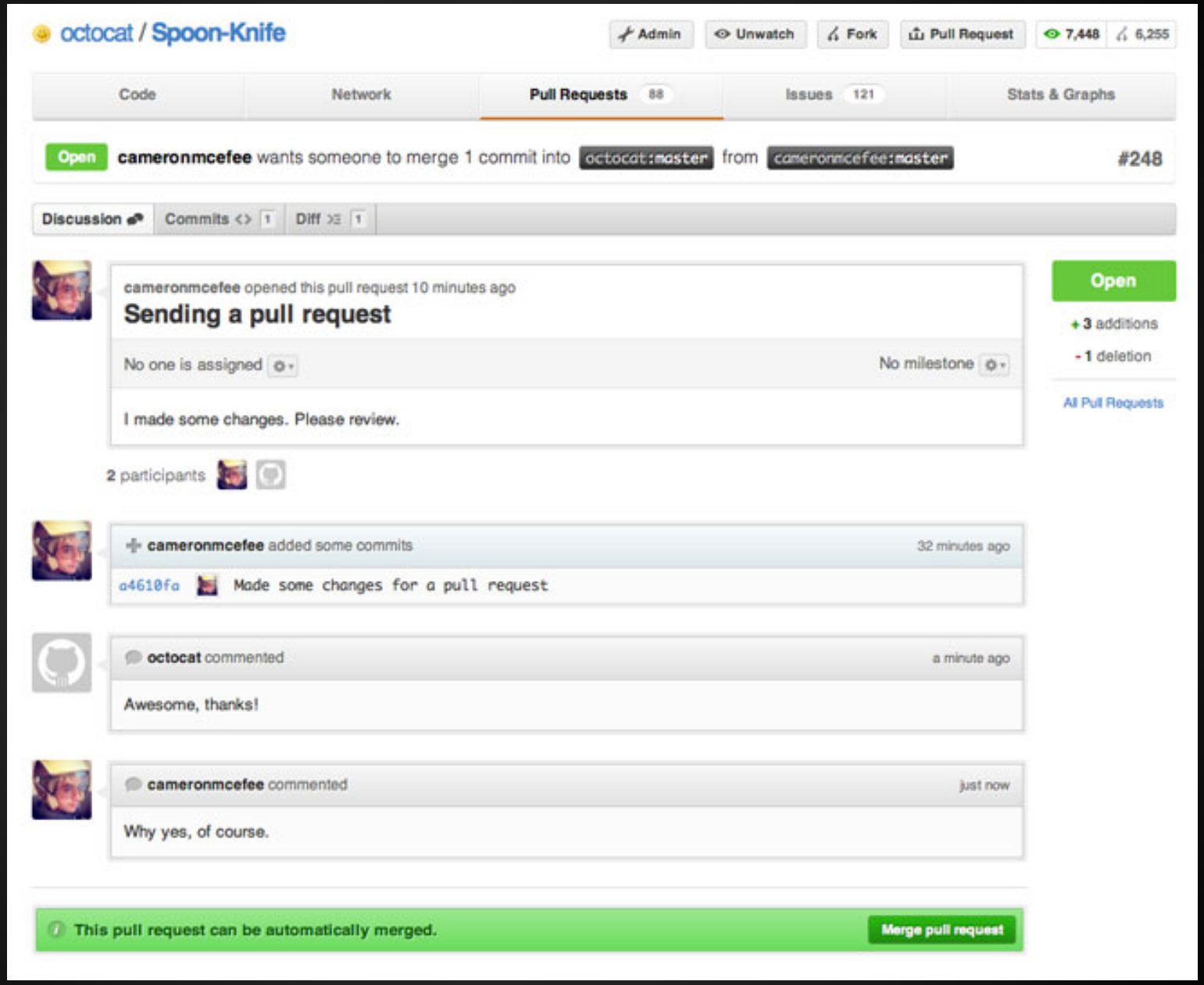
Git

Github?

- Your code in the cloud
- Handles all the plumbing of code collaboration
- Adds project management and social components
- Free for open source
- Revolutionizing software development!

Git

Github pull requests



Git

Github alternatives

- https://bitbucket.org/
  - Unlimited free private repos
  - A step behind Github
- http://gitlabhq.com/
  - Self-hosted Github-like
  - Only basics


The Hitchhiker's Guide to Packaging
http://guide.python-distribute.org

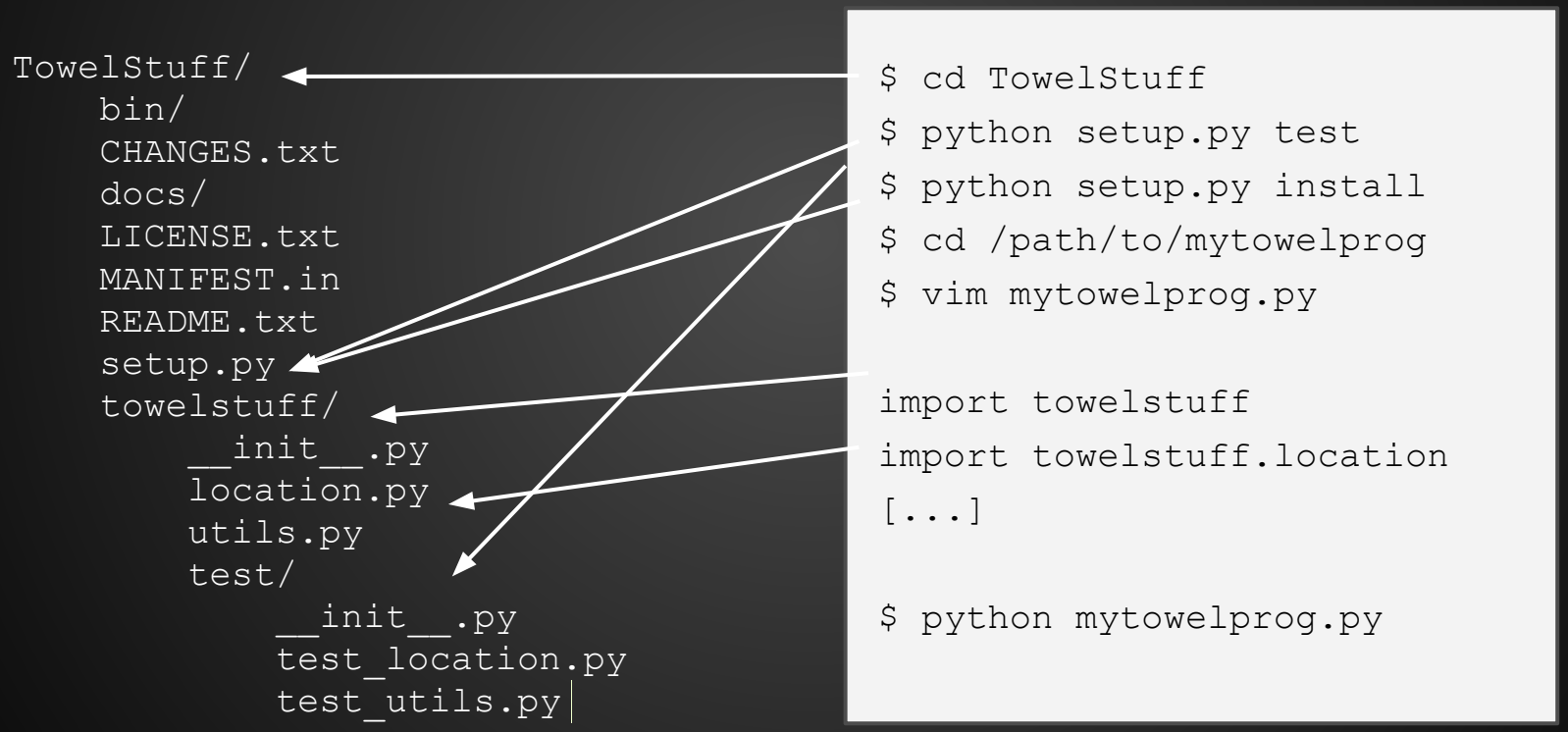
Python packaging

Directory structure

```
TowelStuff/
    bin/
    CHANGES.txt
    docs/
    LICENSE.txt
    MANIFEST.in
    README.txt
    setup.py
    towelstuff/
        __init__.py
        location.py
        utils.py
        test/
            __init__.py
            test_location.py
            test_utils.py
```

Python packaging

Directory structure



Python packaging

setup.py

```
from distutils.core import setup

setup(
    name='TowelStuff',
    version='0.1.0',
    author='J. Random Hacker',
    author_email='jrh@example.com',
    packages=['towelstuff', 'towelstuff.test'],
    scripts=['bin/stowe-towels.py','bin/wash-towels.py'],
    url='http://pypi.python.org/pypi/TowelStuff/',
    license='LICENSE.txt',
    description='Useful towel-related stuff.',
    long_description=open('README.txt').read(),
    install_requires=[
        "Django >= 1.1.1",
        "caldav == 0.1.4",
    ],
)
```

Python packaging

Publishing

- Create repository on Github (or other)
- Then it's just a matter of...

```
$ cd TowelStuff
$ git init
$ git add .  ## Bad practice!
$ git commit -m "Imported TowelStuff package into Git."
$ git remote add origin https://github.com/<username>/TowelStuff.git
```

Python packaging

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- Create repository on Github (or other)
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```
$ cd TowelStuff
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$ git remote add origin https://github.com/<username>/TowelStuff.git
$ git push -u origin master
```

Breakout session

```
$ git clone git://github.com/brinkar/bloomdemo.git
$ cd bloomdemo
$ less INSTRUCTIONS
```