

# GIT

THIS IS GIT. IT TRACKS COLLABORATIVE WORK ON PROJECTS THROUGH A BEAUTIFUL DISTRIBUTED GRAPH THEORY TREE MODEL.

COOL. HOW DO WE USE IT?

NO IDEA. JUST MEMORIZE THESE SHELL COMMANDS AND TYPE THEM TO SYNC UP. IF YOU GET ERRORS, SAVE YOUR WORK ELSEWHERE, DELETE THE PROJECT, AND DOWNLOAD A FRESH COPY.



# VCS -> CVCS -> DVCS

advantages/differences of git

- decentralized
- snapshots, not differences
- operations are local
  - entire history is local, working on trains/airplanes -> off the grid
- integrity through hashing
  - stores everything by hash not filename
- hard to loose data

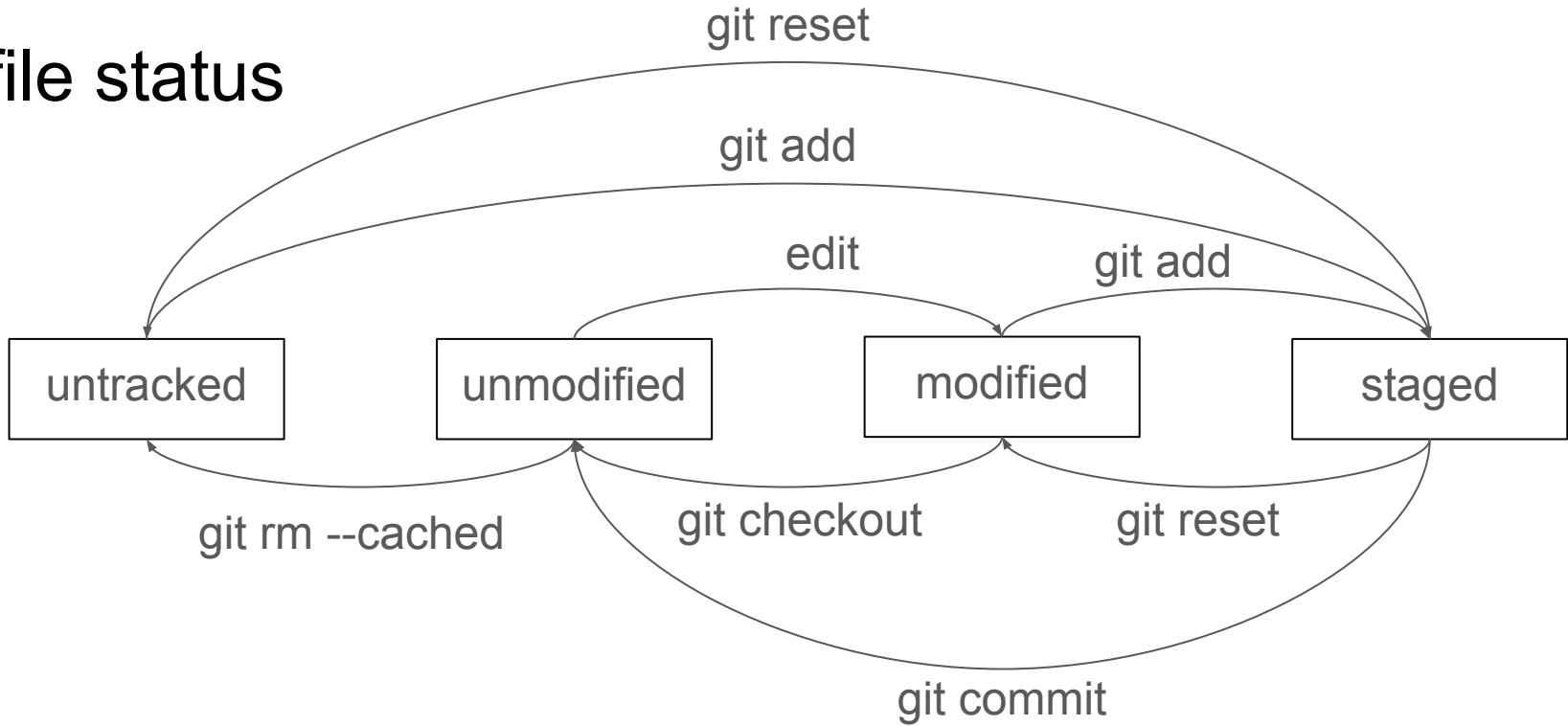
# configuration

git config (--global | --system) user.name "Flo Sattler"

- /etc/gitconfig | system wide
- ~/.gitconfig | user wide
- .git/config | project wide
  
- user.name
- user.email
- core.editor vim
- commit.template
- core.excludesfile ~/.gitignore\_global
- alias.fancyLog "!tig"

git config --list

# file status



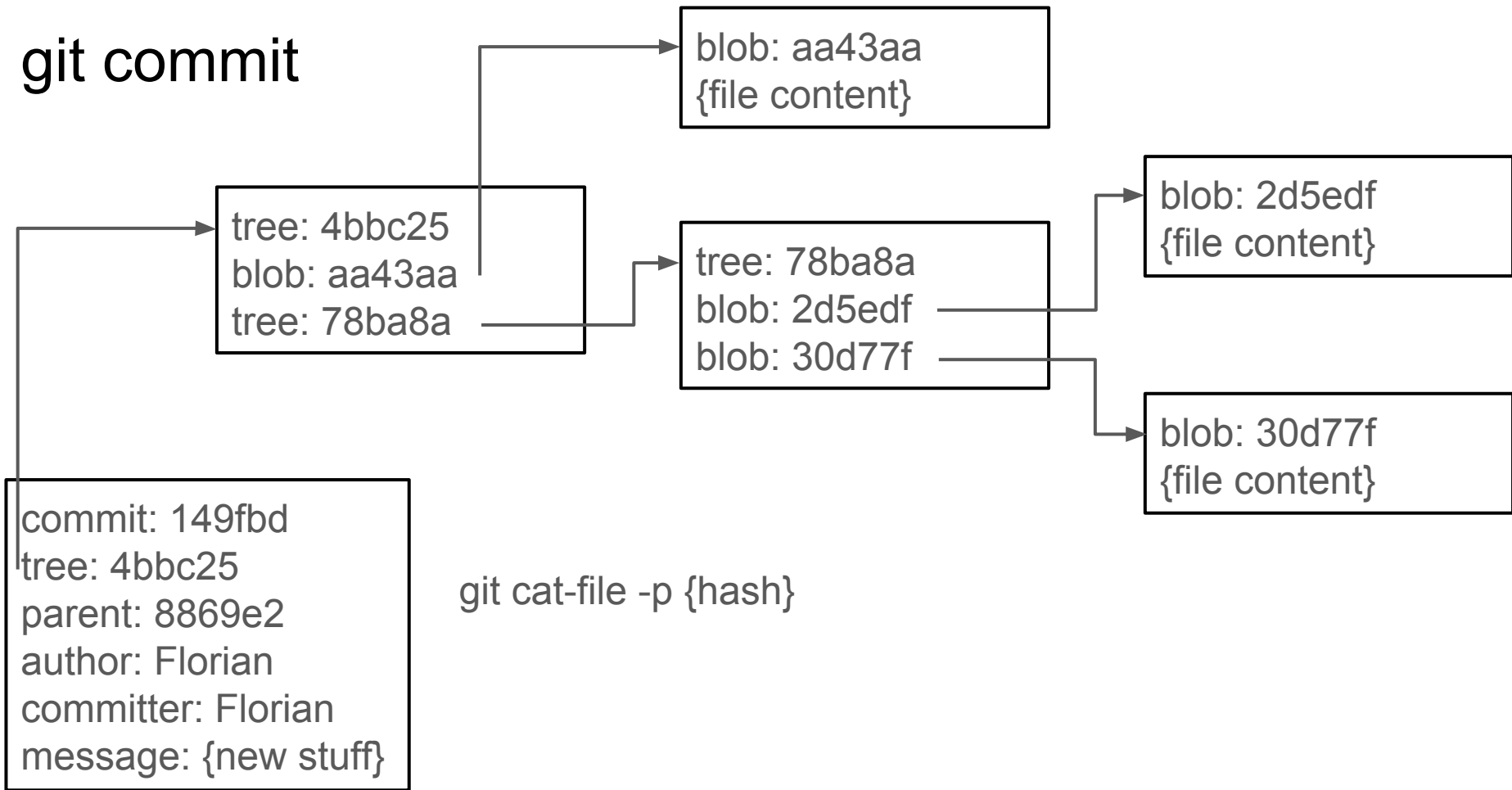
git diff | changed and not staged

git diff --staged | compares staged with last commit

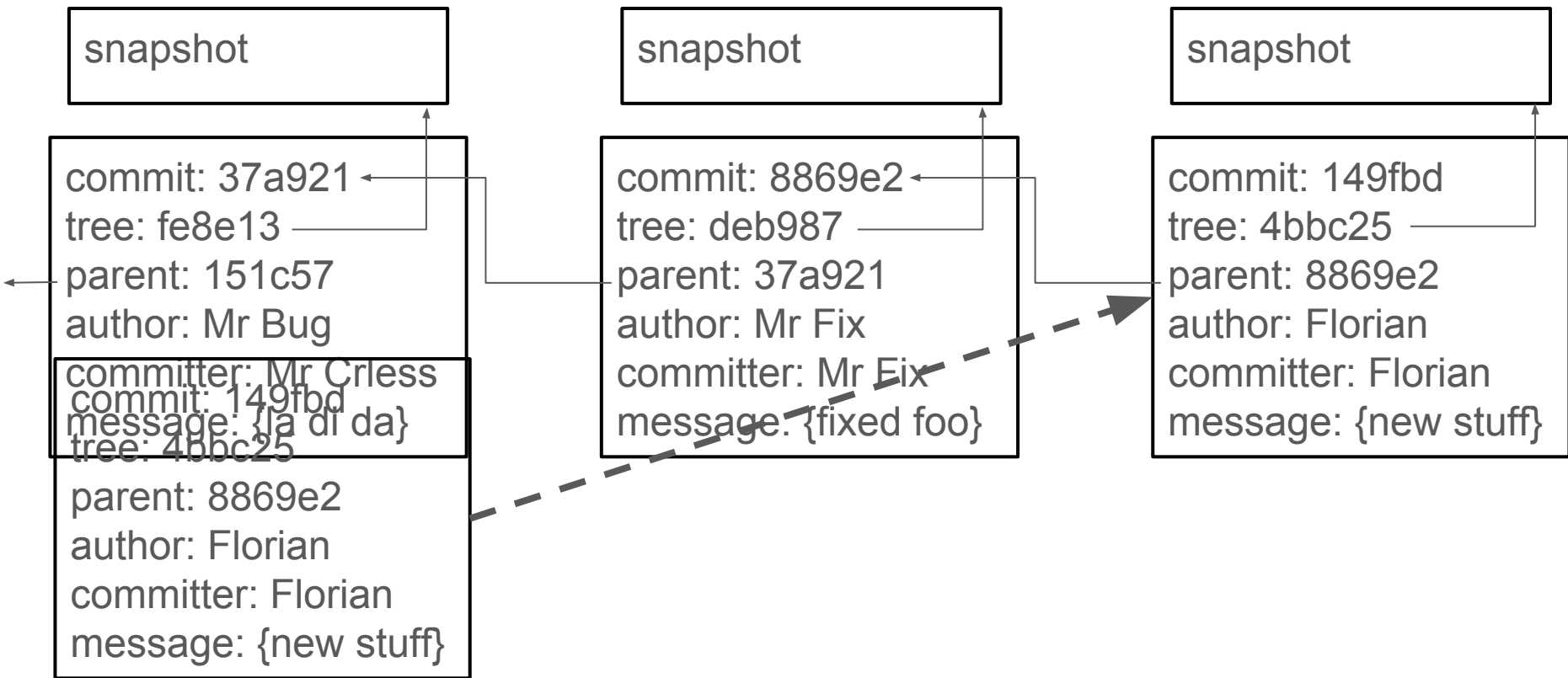
# basic commands

- `git init` | `git clone <URL>`
- `git status`
- `git add` | start tracking/stage file
  - `-p` | patch mode, select specific hunks to add
- `git commit` | commit staged files
  - `-v` | show diff
  - `-m` | message
  - `-a` | stage all
- `git rm <file>` | remove file from tracking
  - `--cached` | keep file
- `git mv <file> <file>` | mv/rename file (mv,git rm, git add)
- `git reset [--hard] HEAD` | reset HEAD to different state

# git commit



# The history





### [mips][microMIPS] Add CodeGen support for ADD, ADDIU\*, ADDU\* and DADD...

...

Zlatko Buljan committed 8 days ago

...\* instructions

Differential Revision: <http://reviews.llvm.org/D16454>

git-svn-id: <https://llvm.org/svn/llvm-project/llvm/trunk@265772> 91177308-0d34-0410-b5e6-96231b3b80d8



bd8d19a



### Use std::fill to simplify some code. NFC ...

Craig Topper committed 8 days ago

git-svn-id: <https://llvm.org/svn/llvm-project/llvm/trunk@265771> 91177308-0d34-0410-b5e6-96231b3b80d8



b033fbe



### [IFUNC] Fix ifunc-asm.ll test ...

Dmitry Polukhin committed 8 days ago

It seems that llc cannot be called used in assembler tests so test that checks asm for particular target needs to be moved to codegen.

git-svn-id: <https://llvm.org/svn/llvm-project/llvm/trunk@265770> 91177308-0d34-0410-b5e6-96231b3b80d8



b34a81f





# The history (git log)

- `-p` | show diff
- `-<n>` | last n entries
- `--stat` | states, like insertions/deletions
- `--pretty=` | formating
  - oneline
  - short
  - fuller
  - `format:""`
- `--graph`
- `--since/until=3.weeks` | time range
- `-S<string>` | shows commits that add/delete the string

# Branches

HEAD

current branch

master

branch pointer

commit: 149fbd

commit: 8869e2

commit: 37a921

testing

commit: 809d82

HEAD

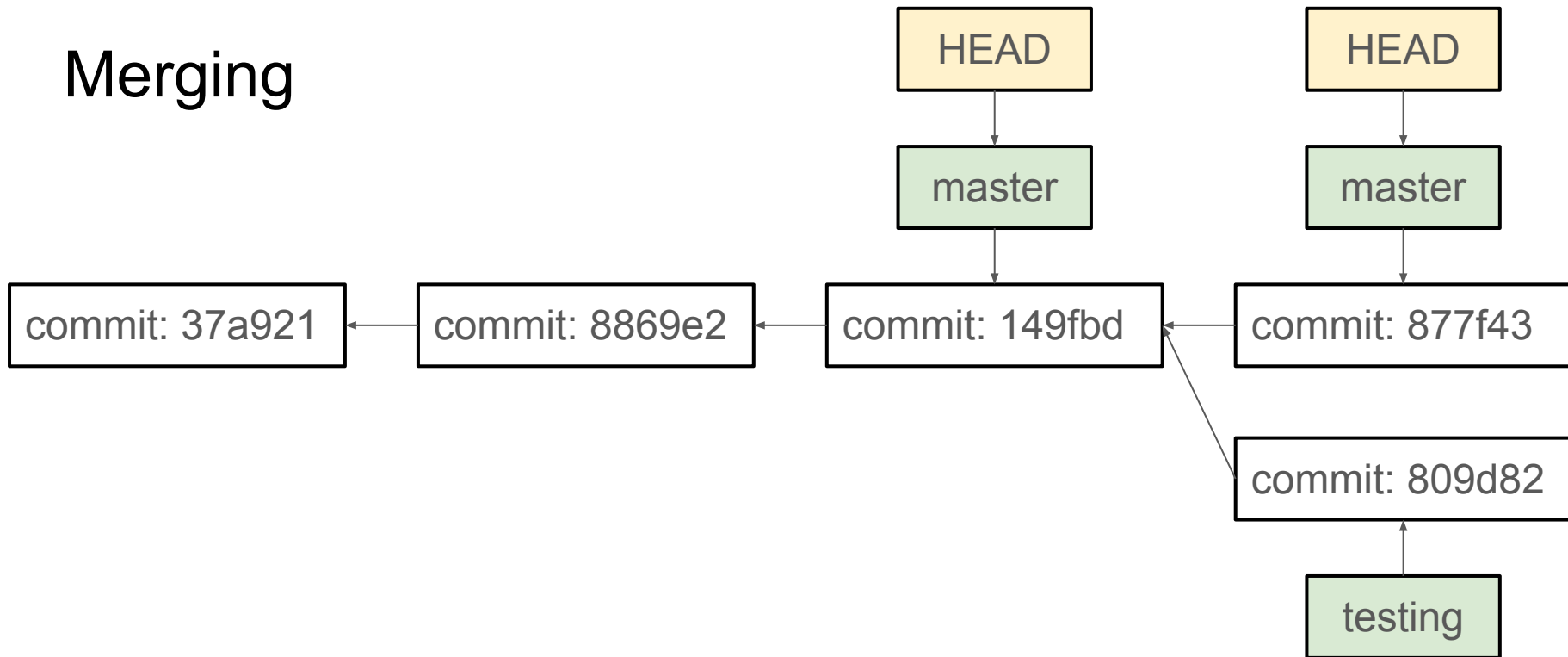
testing

HEAD

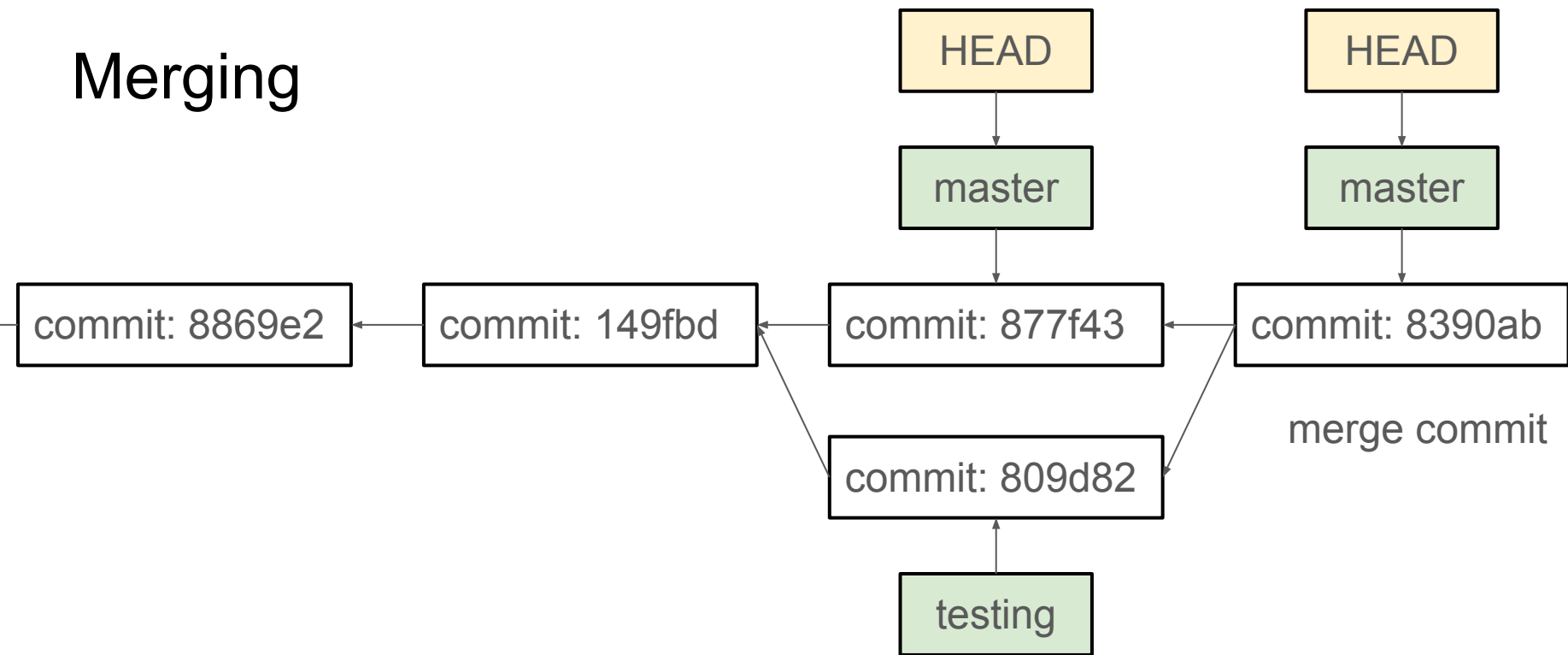
git branch testing  
git checkout testing

| create branch named testing  
| switch HEAD to testing

# Merging



# Merging



merge commit

git merge testing

| merge branch testing into master

# remote interaction

- git remote
  - -v | show URLs
  - add [r-name] [url] | add new remote
  - show [r-name] | shows infos of remote
  - rm [r-name] | remove remote
  - rename [r-old] [r-new] | local rename name of the remote
- git fetch [r-name] | gets objects/refs from remote
- git pull | gets o/r from remote and merges them into own
- git push [r-name] [branch] | pushes local o/r to remote

origin ssh://gitblit/~vulder/foo.git (fetch)

origin ssh://gitblit/~vulder/foo.git (push)

github git@github.com:vulder/foo.git (fetch)

github git@github.com:vulder/foo.git (push)

# remote interaction

cloning/push/pull:

- https with logging
  - git config credential.helper 'cache [opts]'

```
git config credential.helper cache --timeout=300
git credential-cache exit
```

```
github https://github.com/vulder/foo.git (fetch)
github https://github.com/vulder/foo.git (push)
```

- ssh with key auth
  - add pub key to server
  - .ssh/config +priv key

```
Host github.com
IdentityFile ~/.ssh/id_rsa
```

```
github git@github.com:vulder/foo.git (fetch)
github git@github.com:vulder/foo.git (push)
```

# remote branches

## client

origin git@github.com:vulder/foo.git

branches: (git branch -a)

- master
- remotes/origin/HEAD -> origin/master
- remotes/origin/master
- remotes/origin/testing

git branch testing origin/testing

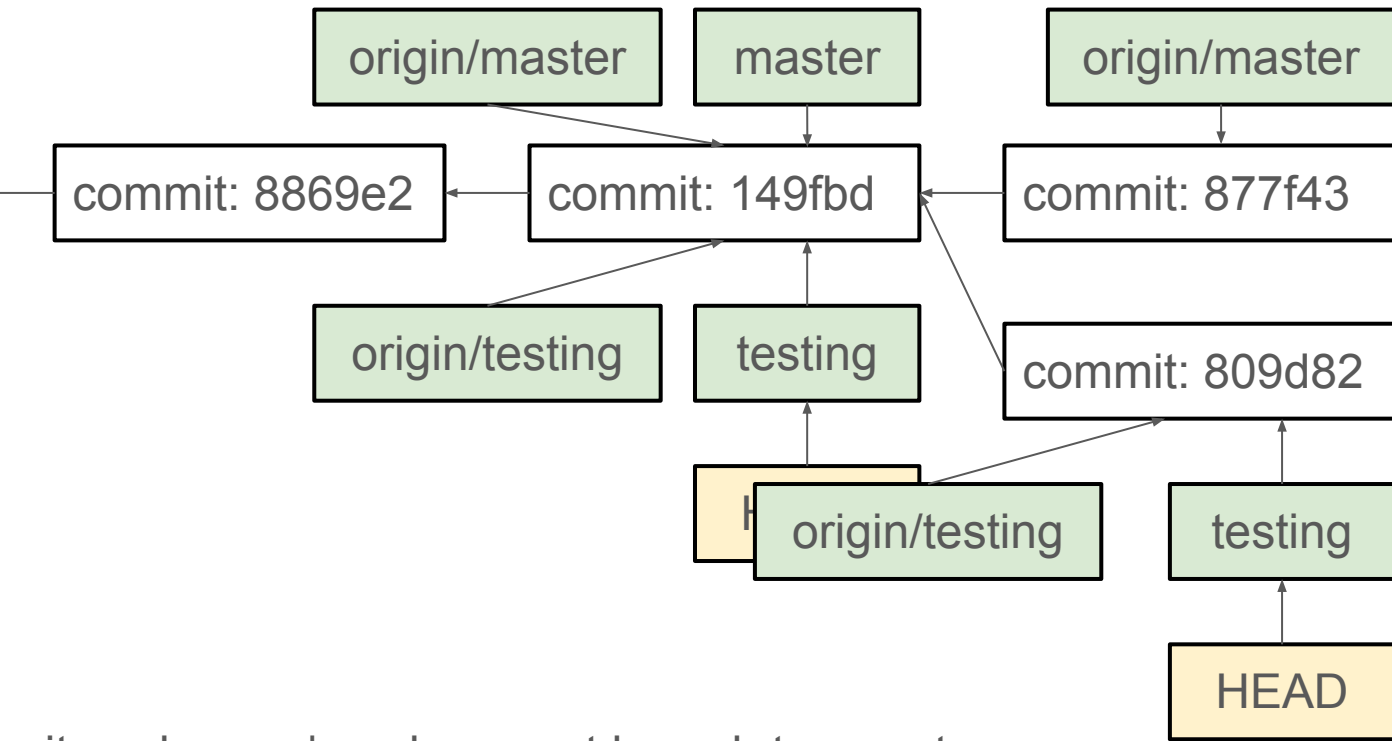
branches: (git branch -vv)

- master 149fbd [origin/master] {cmessage}
- testing 149fbd [origin/testing] {cmessage}

## github.com

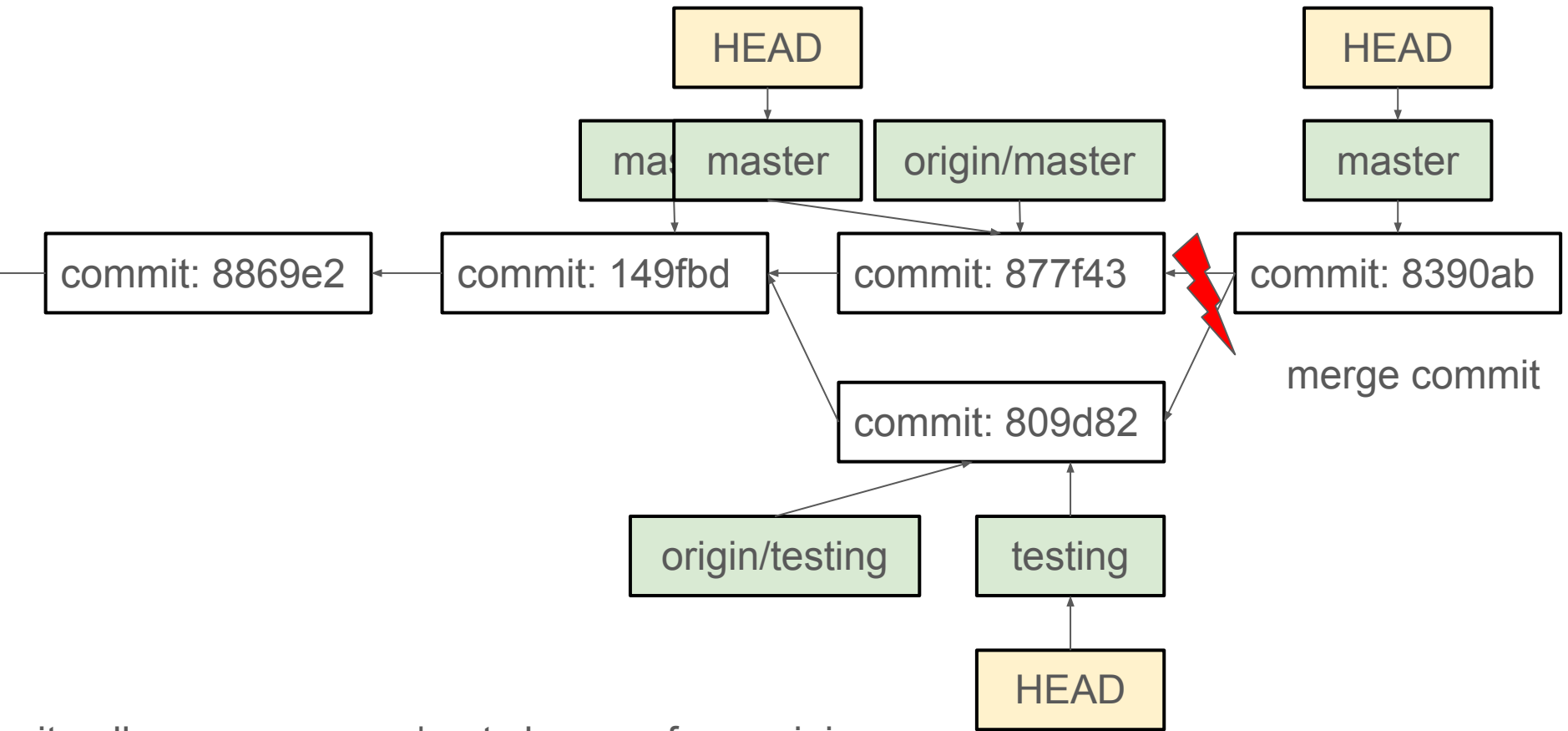
branches:

- master
- testing



git push | push current branch to remote





merge commit

git pull  
 git checkout master  
 git merge testing

| get changes from origin  
 | switch to brache master  
 | merge testing into master

**MERGE CONFLICT?**



**WHY SHOULD THAT  
MATTER?**

# resolving conflicts (git merge testing)

git mergetool -t diffuse

```
foo... foo_master.c foo_test.c buffers
1 void functo(int a) {
2 <<<<<< HEAD
3   std::cout << "print some numbers" << a << std::endl;
4 =====
5   std::cout << "awesome stuff" << std::endl;
6 >>>>>> test
7 }
```

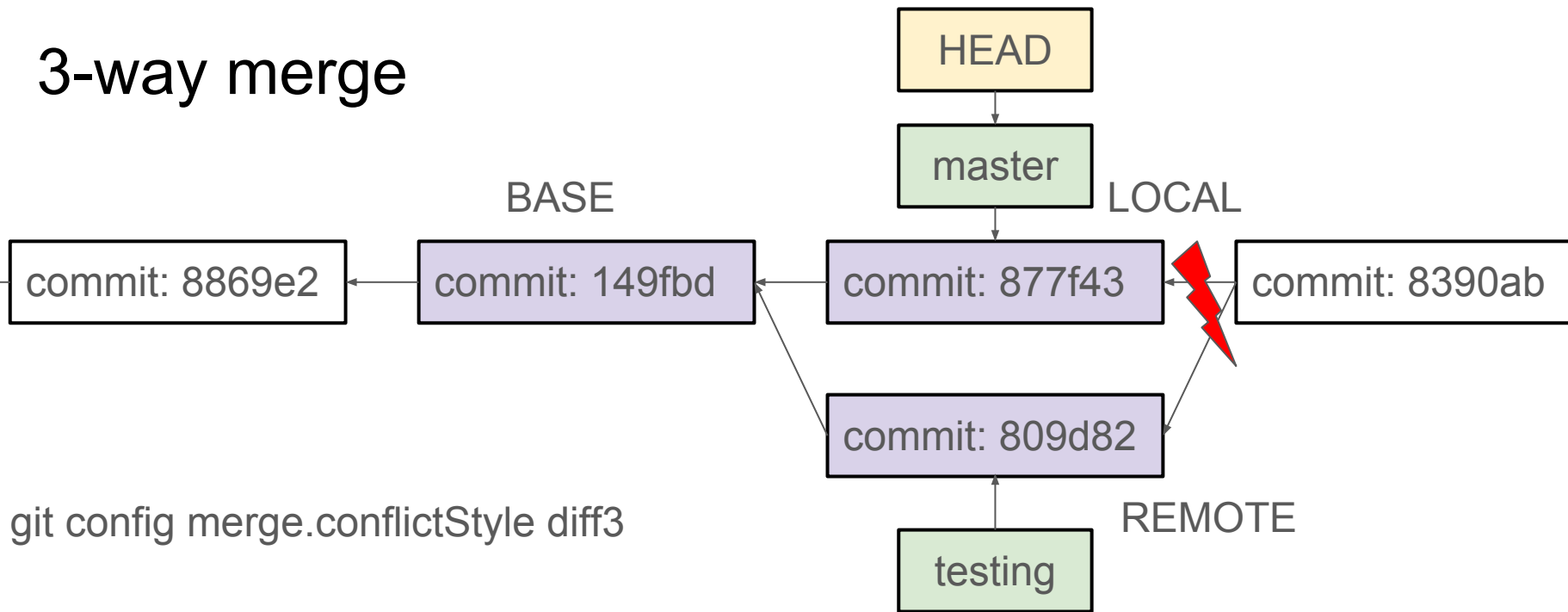
./foo_LOCAL_11635.c	foo.c*	./foo_REMOTE_11635.c
<pre>1 void functo(int a) { 2   std::cout &lt;&lt; "print some numbers" &lt;&lt; a &lt;&lt; 3 }</pre>	<pre>1 void functo(int a) { 2 3   std::cout &lt;&lt; "print some numbers" &lt;&lt; a &lt;&lt; 4 5 6 7 }</pre>	<pre>1 void functo(int a) { 2   std::cout &lt;&lt; "awesome stuff" &lt;&lt; std::endl; 3 }</pre>

master

git commit

testing

# 3-way merge



git config merge.conflictStyle diff3

```
./foo_LOCAL_12818.c      foo.c      ./foo_REMOTE_12818.c      ./foo_BASE_12818.c
1 void functo(int a) {
2     std::cout << "print some numbers" << a <<
3 }
1 void functo(int a) {
2     <<<<<< HEAD
3     std::cout << "print some numbers" << a <<
4     =====
5     std::cout << "awesome stuff" << std::endl
6     >>>>>> test
7 }
1 void functo(int a) {
2     std::cout << "awesome stuff" << std::endl
3 }
1 void functo(int a) {
2
3 }
```

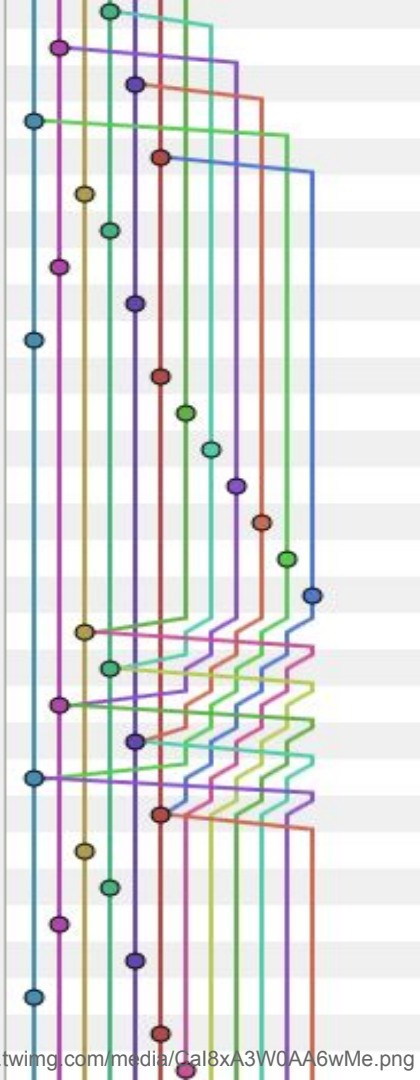
# git merge

- `-no-commit` | merge but not autocommit
- `--ff-only` | only merge if fast forward or HEAD up to date
- `--no-ff` | create merge commit
- `-S` | GPG sign
- `--squash` | merge, create working tree and update state, but don't commit

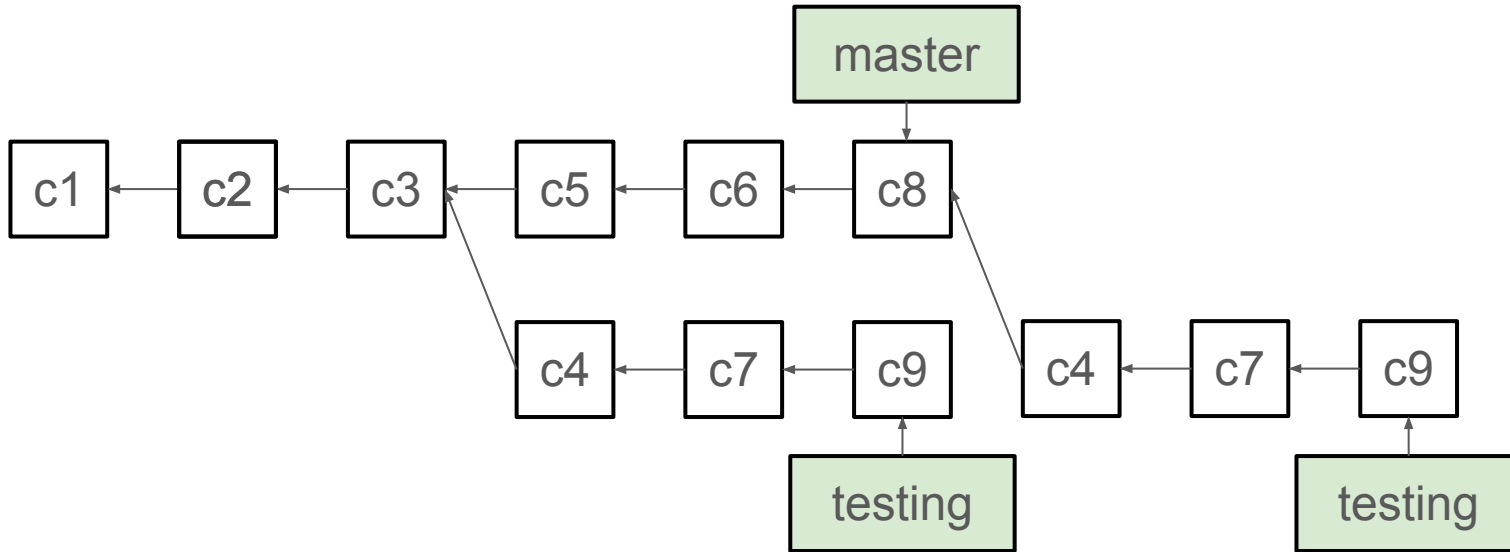
when git turns into guitar hero



ns  
ionWIP

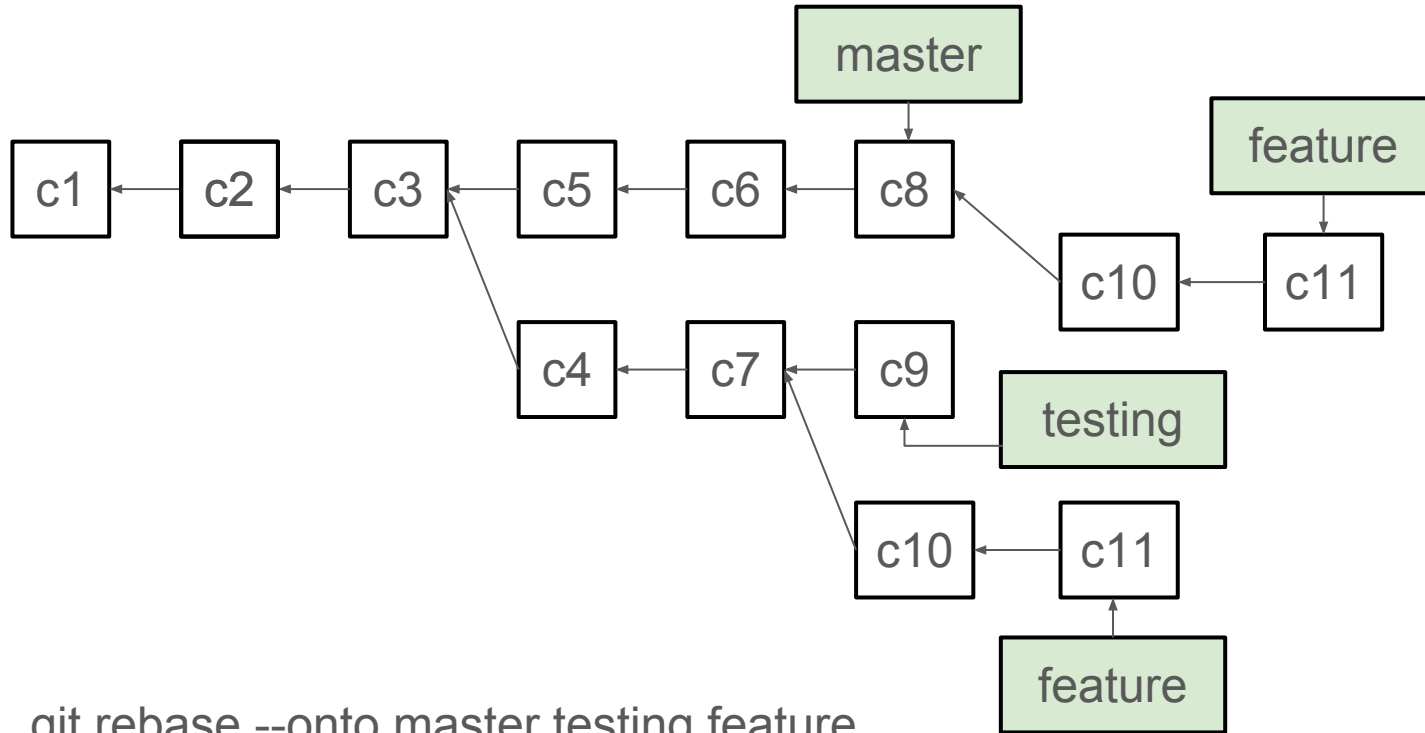


# rebase



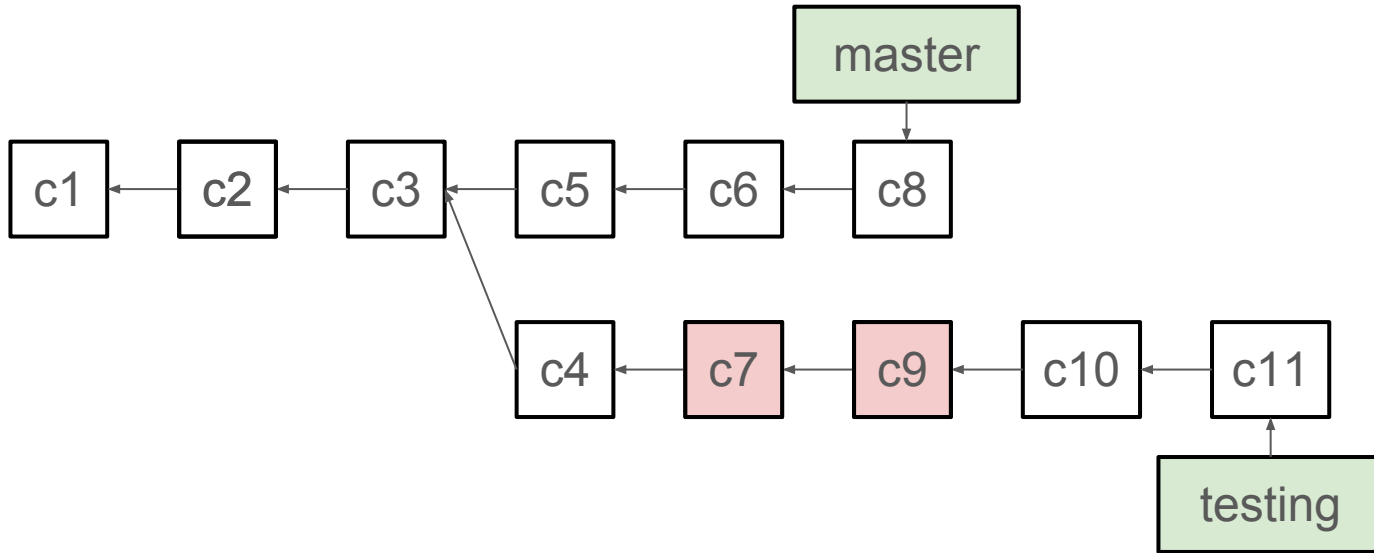
git rebase master

# rebase II





# rebase III



```
git rebase --onto testing~4 testing~2 testing
```

# specifying revisions

<rev>: sha1-hash

ec8723a2ff88bdabc8312c2250444fd5afc2e569

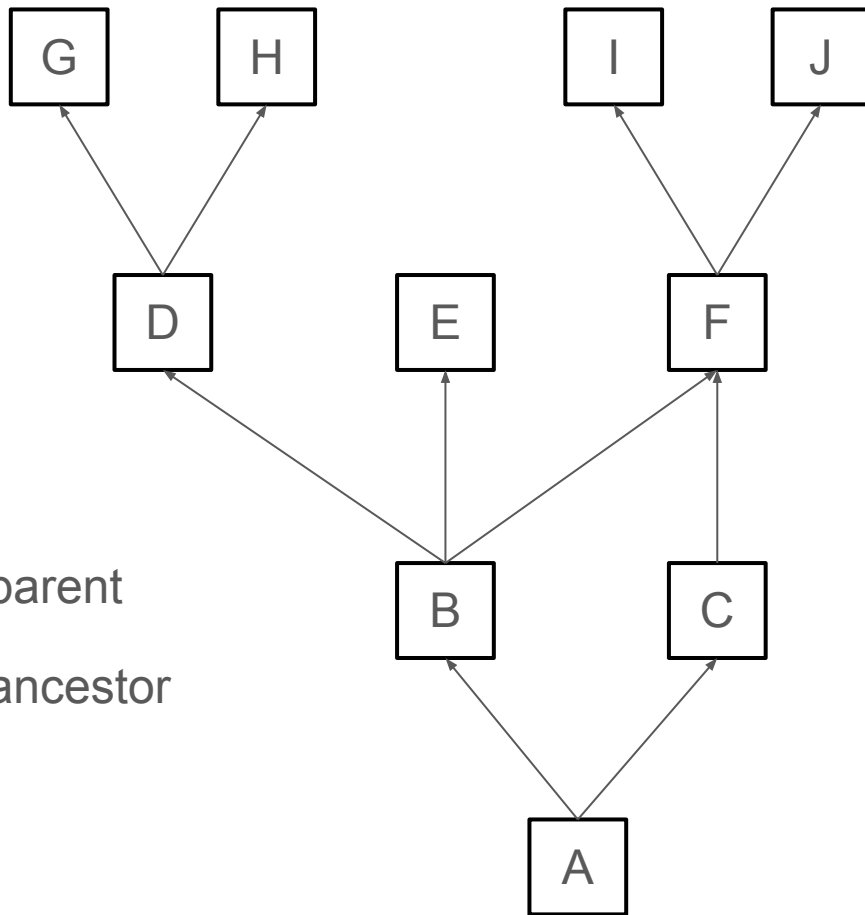
<refname>:

master, heads/master

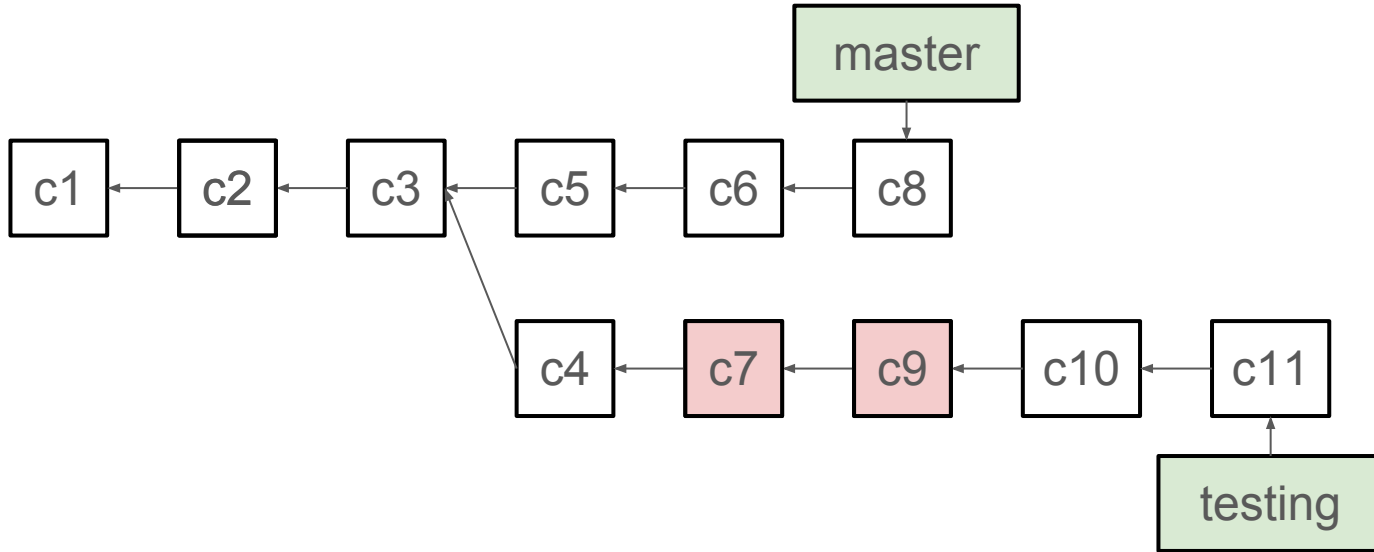
A	A^0		
B	A^	A^1	A~1
F	B^3	A^^3	
G	A^^^	A~3	

$\wedge\langle n \rangle$  n'th parent

$\sim\langle n \rangle$  n'th ancestor

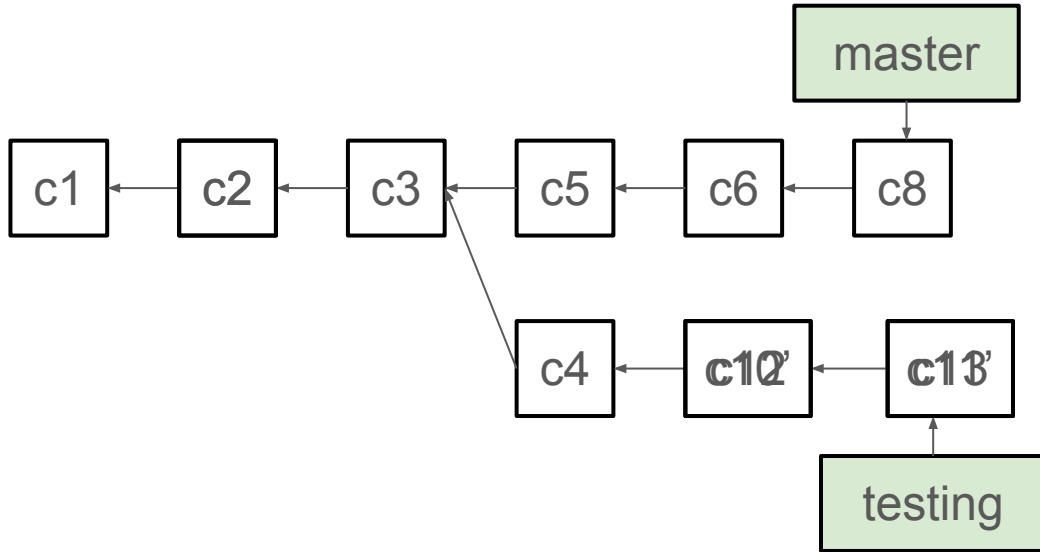


# rebase



```
git rebase --onto testing~4 testing~2 testing
```

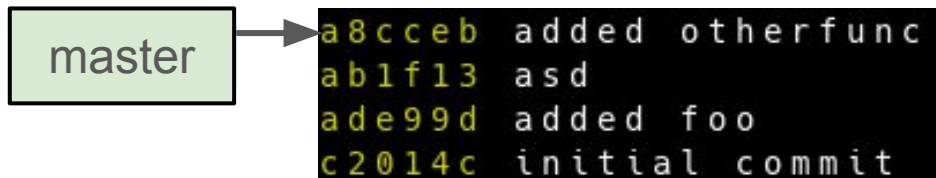
# rebase



```
git rebase --onto testing~4 testing~2 testing
```

# rebase interactive

git rebase -i master~3



```
.g/r/git-rebase-todo buffers
1 pick 1efb7f6 added foo
2 reword 5b3571c asd
3 pick ef48348 added otherfunc
4
5 # Rebase 4b1280e..ef48348 onto 4b1280e (3 command(s))
6 #
7 # Commands:
8 # p, pick = use commit
9 # r, reword = use commit, but edit the commit message
10 # e, edit = use commit, but stop for amending
11 # s, squash = use commit, but meld into previous commit
12 # f, fixup = like "squash", but discard this commit's log message
13 # x, exec = run command (the rest of the line) using shell
14 # d, drop = remove commit
15 #
NORMAL </rebase-merge/git-rebase-todo gitrebase 4% 1: 1
```

# rebase

`git rebase add`

`git rebase --continue`

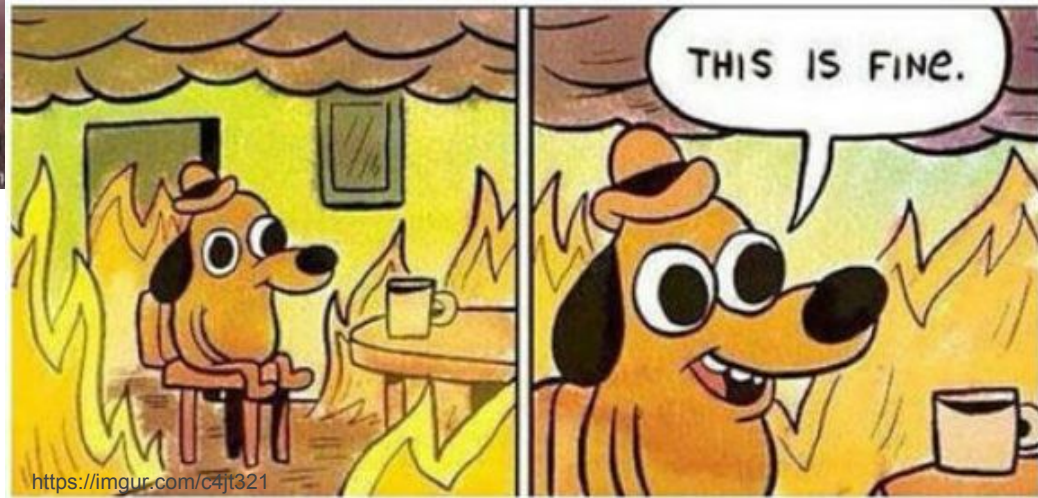
`git rebase --abort`

**PUSH REJECTED, REBASE OR  
MERGE**



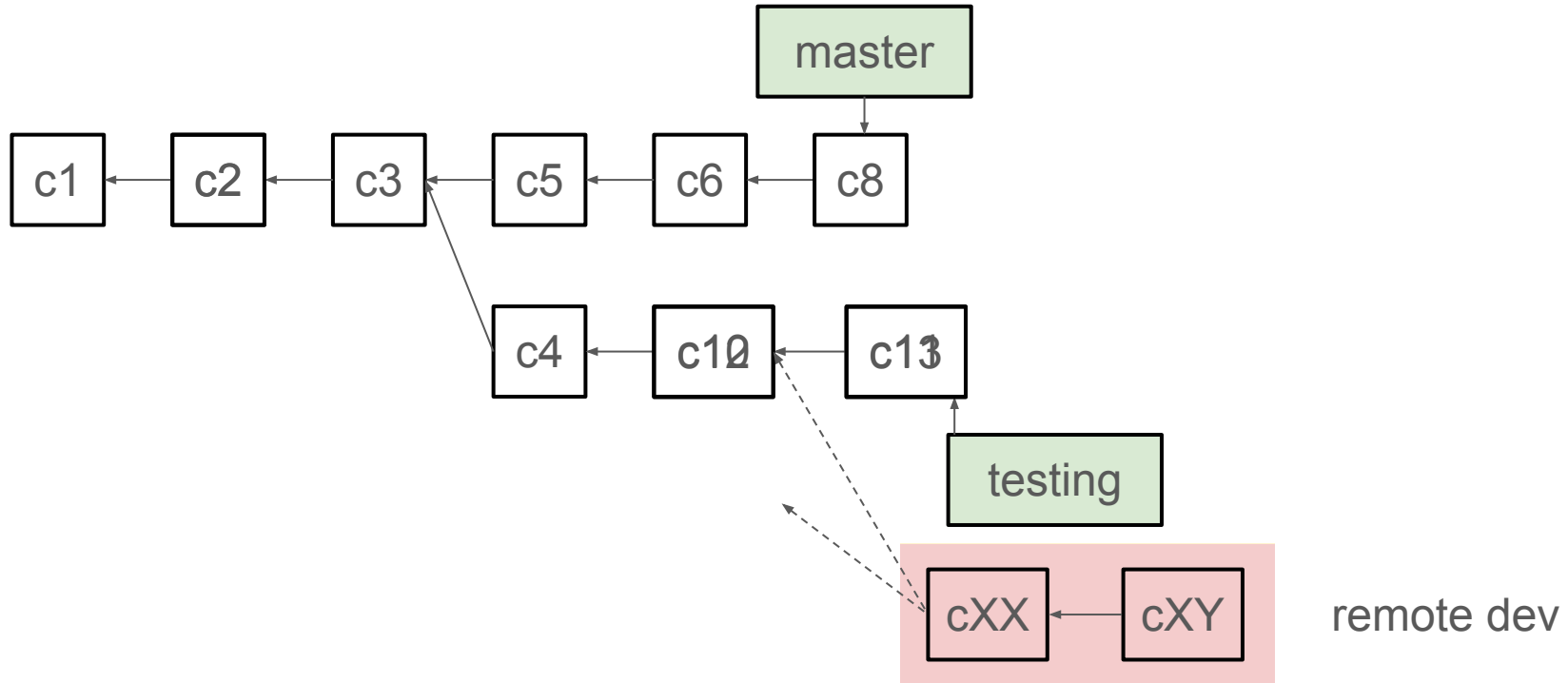
**GIT PUSH --FORCE**

<https://imgur.com/XFQLB>



<https://imgur.com/c4jt321>

# rebase problem



git config pull.rebase true



**YOU SHALL NOT**

**REBASE PUSHED COMMITS**

# git relog

logs the states where branches/HEAD was before a change occurred

```
f0c4558 HEAD@{0}: reset: moving to HEAD~  
c38d994 HEAD@{1}: checkout: moving from foo to master  
aea74ad HEAD@{2}: checkout: moving from master to foo
```

git reset --hard c38d994

repo state before “reset --hard HEAD~”

```
45c38e7 refs/heads/pp@{0}: commit: function  
d47bdcd refs/heads/pp@{1}: commit: fxxxx  
02b3d9c refs/stash@{0}: WIP on master: f0c4558 foo bar  
09046c5 refs/stash@{1}: WIP on master: f0c4558 foo bar  
f0c4558 refs/heads/master@{0}: reset: moving to HEAD~  
c38d994 refs/heads/master@{1}: reset: moving to c38d994
```

# tags (git tag)

lightweight tag: `git tag [new tag name]`

annotated tag: `git tag -a [tag] -m [message]`

+ sign tag with `-s`

default email key

Conf: `user.signingKey = [keyid]`

`git push [remote] [tag-name]`


`git push [remote] --tags`

# github - GPG support

**GPG keys** New GPG key

This is a list of GPG keys associated with your account. Remove any keys that you do not recognize.

**Email addresses:** sattlerf@fim.uni-passau.de, stwac@web.de, vuld3r@gmail.com

 **Key ID:** 19C5BC55CADE871A Delete


Commits on Apr 16, 2016


 **added wellsokai colorscheme** Verified 20b0c09 <>  
vulder committed a minute ago

 **added plumbum docs to setup help** 69 <>  
vulder committed 2 minutes ago

Commits on Apr 8, 2016

 **removed old functions** a6 <>  
vulder committed 8 days ago

 This commit was signed with a **verified signature**.

 **vulder**  
Florian Sattler

GPG key ID: 19C5BC55CADE871A  
[Learn about signing commits](#)

# Comparing changes

Merged **lins05** merged 2 commits into `haiwen:master` from `unknown repository` on May 6, 2015

Choose two branches to see what's changed or to start a pull request

Conversation 3

Commits 2

Files changed 1



base fork: `llvm-mirror/llvm`

base: `release_3`

**X Can't automatically merge.** Don't worry, you can



**vulder** commented on May 5, 2015



Closes #545.

Create pull request

Discuss and review the changes

Commits 3,739

Files changed 5,044

This comparison

Commits on Apr 04, 2016

- rotateright** fix document
- Teresa Johnson** [ThinLT0] Au
- Teresa Johnson** [ThinLT0] Ac
- MatzeB** ARM, AArch64
- Betul Buyukkurt** [PG0] Avoid
- chandlerc** Revert r2634



**Chilledheart** commented on May 6, 2015



LGTM



**lins05** merged commit **095d236** into `haiwen:master` on May 6, 2015

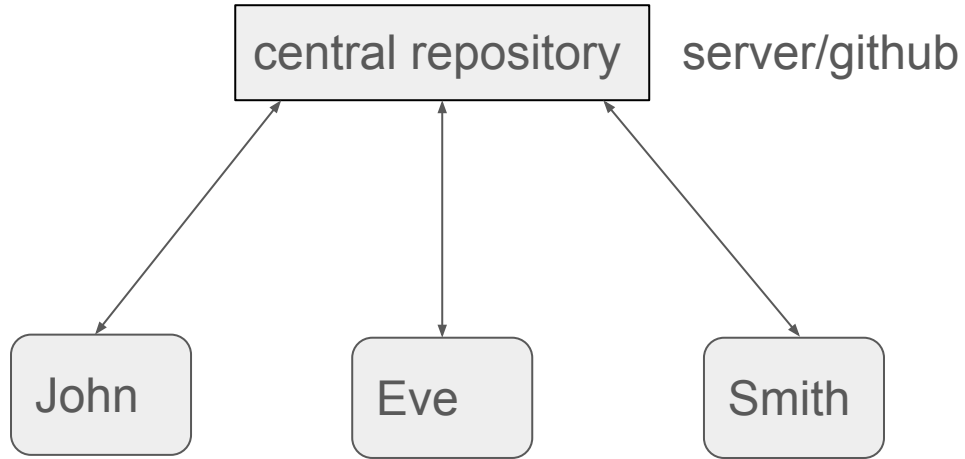
[Hide details](#)

1 check passed

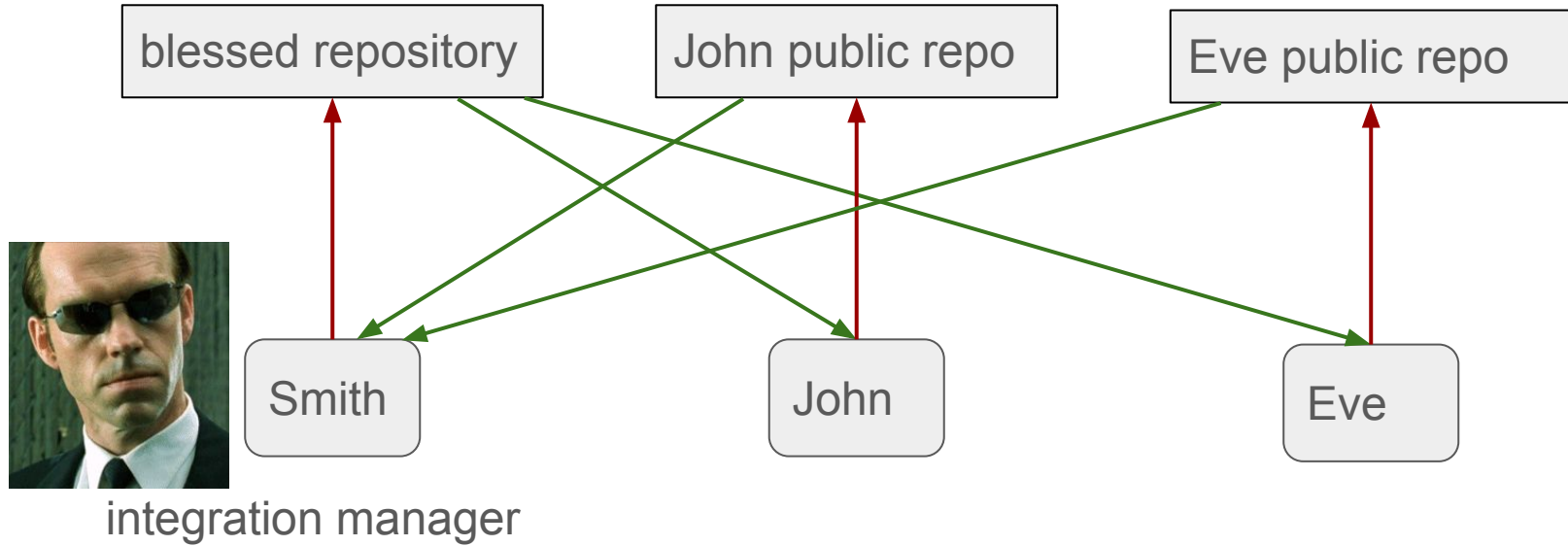
**continuous-integration/travis-ci/pr** The Travis CI build passed

[Details](#)

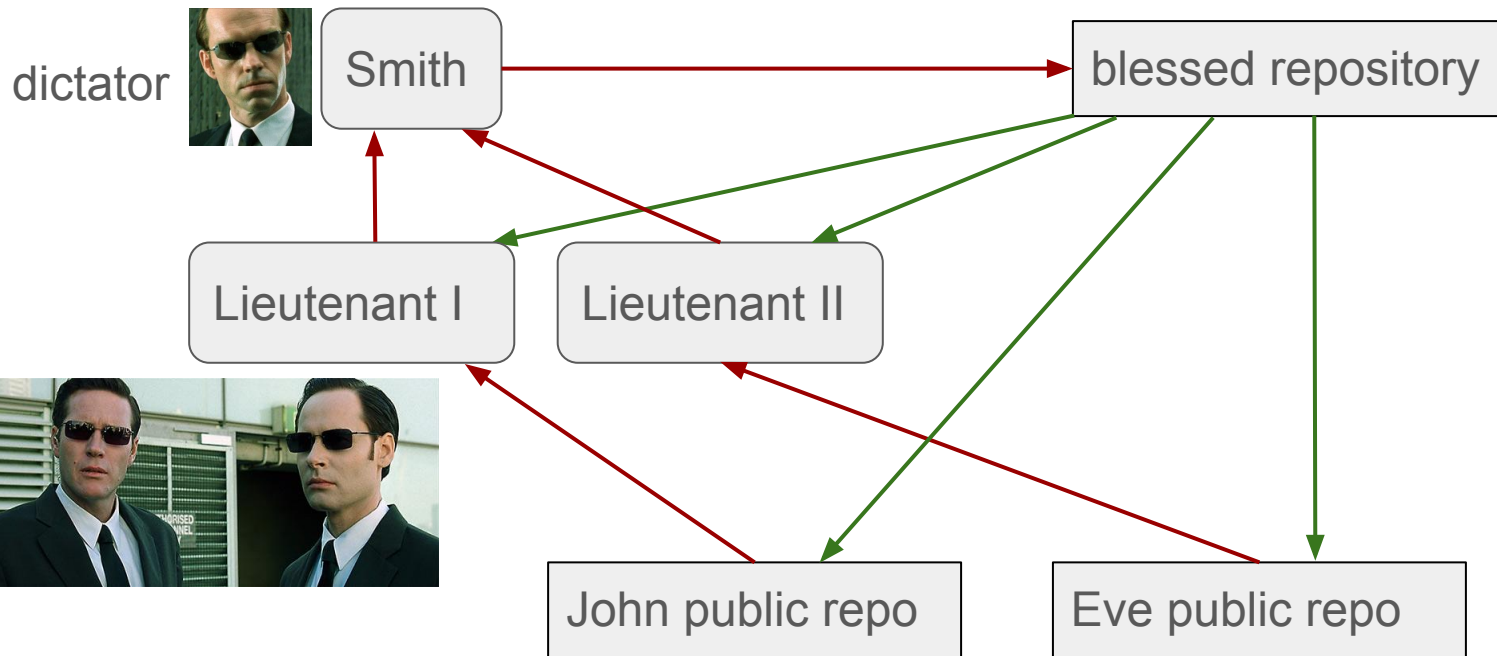
# centralized workflow



# integration-manager workflow



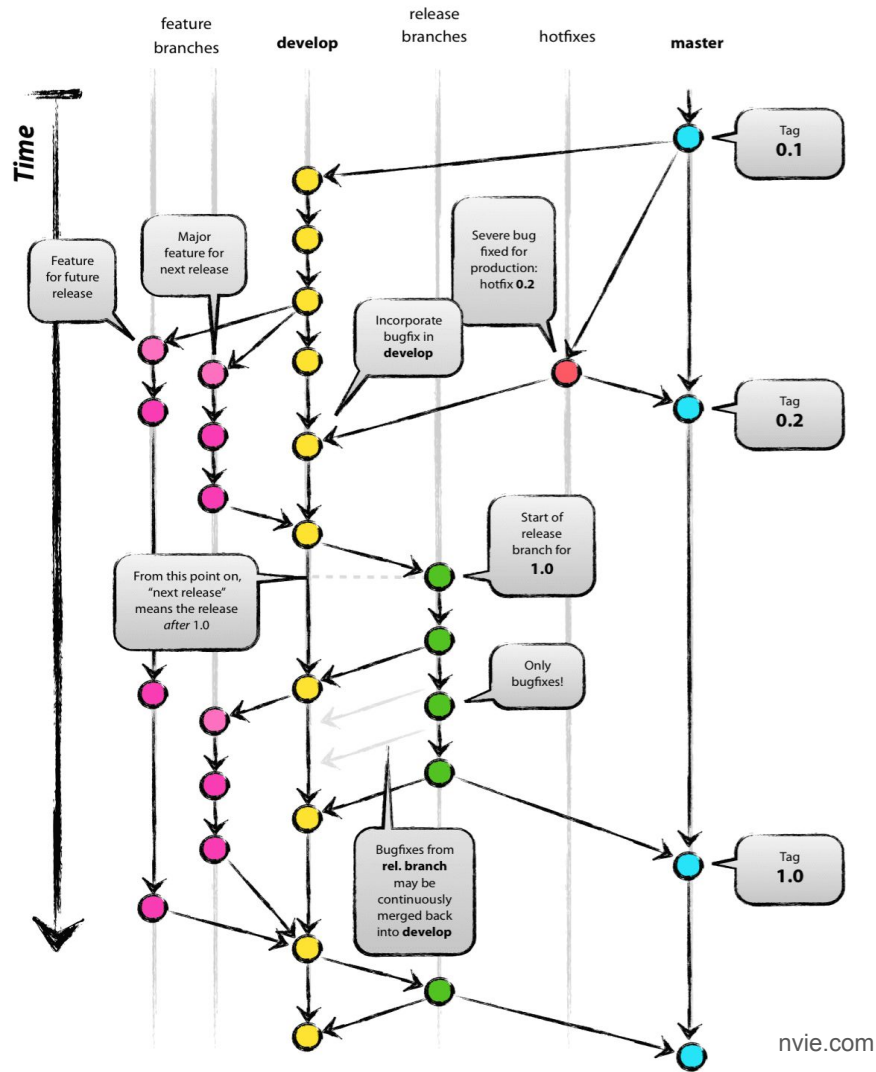
# dictator and lieutenants workflow





# git flow (<https://github.com/nvie/gitflow>)

- master
- develop
- feature
- release
- hotfix

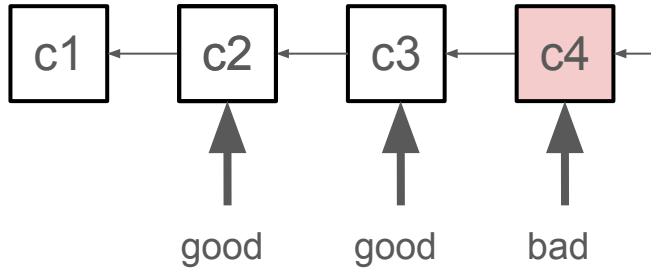


# git stash `stash@{0}`

- `list` | list all stashed states
- `show <stash>` | show state of stash
- `pop/apply` | `{remove}` state and apply it to workdir
- `branch <stash>` | create branch where stash was recorded + apply
- `drop <stash>` | drop state from stash
  
- `-u` | include untracked files
- `-p` | patch

`git stash show -p stash@{0} | git apply -R`

git bisect



# git bisect

- start | start git bisect
- good | mark commit as good
- bad | mark commit as bad
- skip | skip commit
- reset | end git bisect
- visualize | show remaining commits
- log | show bisect log
- replay (log -> reset -> replay) | replay bisect log
- run {script} | run script to check if commit is good/bad

# git blame {file}

```
2015-06-19 23:20 Sanjoy Das lib/Analysis/IPA/CallGraph.cpp 152f3b5
2015-06-19 23:20 Sanjoy Das lib/Analysis/IPA/CallGraph.cpp 152f3b5
2015-06-19 23:20 Sanjoy Das lib/Analysis/IPA/CallGraph.cpp 152f3b5
2015-06-19 23:20 Sanjoy Das lib/Analysis/IPA/CallGraph.cpp 152f3b5
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2015-06-19 23:20 Sanjoy Das lib/Analysis/IPA/CallGraph.cpp 152f3b5
2015-06-19 23:20 Sanjoy Das lib/Analysis/IPA/CallGraph.cpp 152f3b5
2004-08-08 03:27 Chris Lattner lib/Analysis/IPA/CallGraph.cpp af8a424
2013-11-26 04:19 Chandler Carruth lib/Analysis/IPA/CallGraph.cpp 54fec07
2015-11-23 02:58 Davide Italiano lib/Analysis/CallGraph.cpp a7e61b0
2013-11-26 04:19 Chandler Carruth lib/Analysis/IPA/CallGraph.cpp 54fec07
2004-08-08 03:27 Chris Lattner lib/Analysis/IPA/CallGraph.cpp af8a424
2002-07-18 04:43 Chris Lattner lib/Analysis/IPA/CallGraph.cpp d99d4d7
2002-07-18 04:43 Chris Lattner lib/Analysis/IPA/CallGraph.cpp d99d4d7
2002-07-18 04:43 Chris Lattner lib/Analysis/IPA/CallGraph.cpp d99d4d7
2002-07-18 04:43 Chris Lattner lib/Analysis/IPA/CallGraph.cpp d99d4d7
2001-11-26 18:51 Chris Lattner lib/Analysis/IPA/CallGraph.cpp 25e9cad
2001-11-26 18:51 Chris Lattner lib/Analysis/IPA/CallGraph.cpp 25e9cad
2002-07-18 04:43 Chris Lattner lib/Analysis/IPA/CallGraph.cpp d99d4d7
2009-08-31 02:24 Chris Lattner lib/Analysis/IPA/CallGraph.cpp 2adb830
2002-07-18 04:43 Chris Lattner lib/Analysis/IPA/CallGraph.cpp d99d4d7
2003-08-31 20:36 Chris Lattner lib/Analysis/IPA/CallGraph.cpp 5714c97
2003-08-31 20:36 Chris Lattner lib/Analysis/IPA/CallGraph.cpp 5714c97
2001-11-26 18:51 Chris Lattner lib/Analysis/IPA/CallGraph.cpp 25e9cad
2013-11-26 04:19 Chandler Carruth lib/Analysis/IPA/CallGraph.cpp 54fec07
2003-08-31 20:36 Chris Lattner lib/Analysis/IPA/CallGraph.cpp 5714c97
2001-11-26 18:51 Chris Lattner lib/Analysis/IPA/CallGraph.cpp 25e9cad
2001-11-26 18:51 Chris Lattner lib/Analysis/IPA/CallGraph.cpp 25e9cad
```

```
commit 54fec07ec00b4449393a66e8e2e62fd241781f80
```

```
Author: Chandler Carruth <chandlerc@gmail.com>
AuthorDate: Tue Nov 26 04:19:30 2013 +0000
Commit: Chandler Carruth <chandlerc@gmail.com>
CommitDate: Tue Nov 26 04:19:30 2013 +0000
```

```
[PM] Split the CallGraph out from the ModulePass which creates the CallGraph.
```

This makes the CallGraph a totally generic analysis object that is the container for the graph data structure and the primary interface for querying and manipulating it. The pass logic is separated into its own class. For compatibility reasons, the pass provides wrapper methods for most of the methods on CallGraph -- they all just forward.

This will allow the new pass manager infrastructure to provide its own analysis pass that constructs the same CallGraph object and makes it available. The idea is that in the new pass manager, the analysis pass's 'run' method returns a concrete analysis 'result'. Here, that result is a 'CallGraph'. The 'run' method will typically do only minimal work, deferring much of the work into the implementation of the result object in order to be lazy about computing things, but when (like DomTree) there is \*some\* up-front computation, the analysis does it prior to handing the result back to the querying pass.

I know some of this is fairly ugly. I'm happy to change it around if folks can suggest a cleaner interim state, but there is going to be some amount of unavoidable ugliness during the transition period. The good thing is that this is very limited and will naturally go away when the old pass infrastructure goes away. It won't hang around to bother us

tool: tig

**YOU SAID IT WASN'T YOUR  
FAULT**

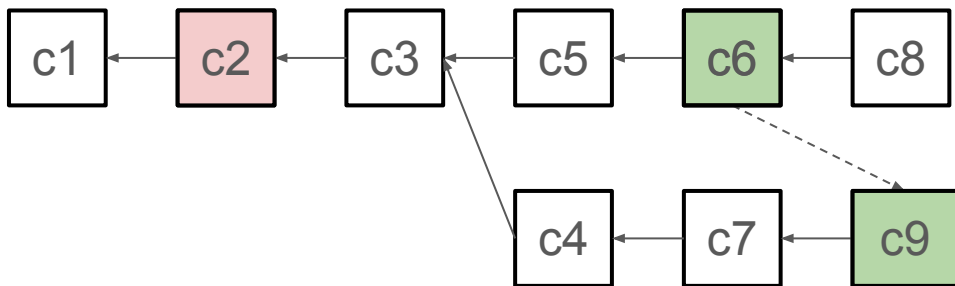
**GIT BLAME DETERMINED THAT  
WAS A LIE**

# git apply / format-patch

1. create branch
2. fix bug
3. git format-patch master | creates patch file
  - a. git format-patch master --stdout
  - b. git format-patch master -o FOLDER
4. git send-mail FOLDER/\* --to=foo@bar.org
5. git apply \*.patch
  - a. --stat | info about patch
  - b. --check | check if patches applies cleanly
6. git am --signoff < 0001-foo.patch | apply patch

# git cherry-pick

apply changes from existing commit



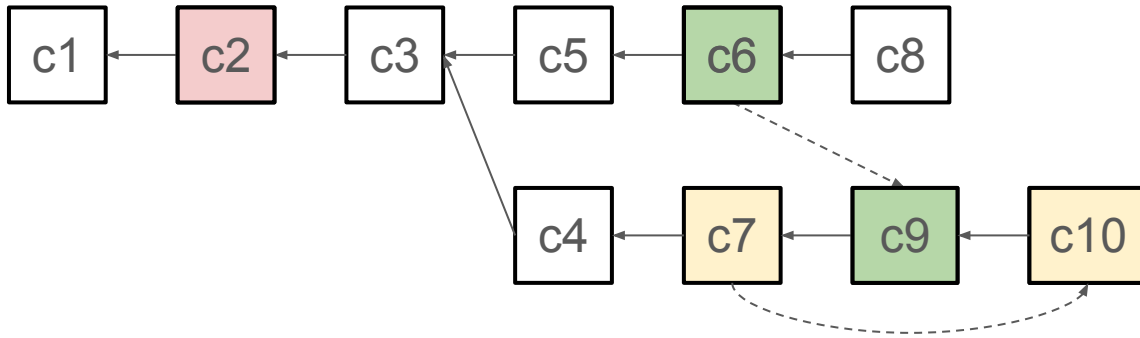
git cherry-pick c6

- -n | no commit
- -e | edit
- -x | add from line



# git revert

reverte existing commit



git revert c7

git revert -n master~5..master~2

- -n | no commit
- -e | edit

# git filter-branch

- `git filter-branch --tree-filter 'rm -rf FILE' master`
- `git filter-branch --msg-filter 'sed -e "/BADWORD/d"'`
- `git filter-branch --env-filter '`

```
if test "$GIT_AUTHOR_EMAIL" = "bar@foo.org"
```

```
then ...'
```

old commits saved to `refs/original/*`

`-f` | overwrite saved commits

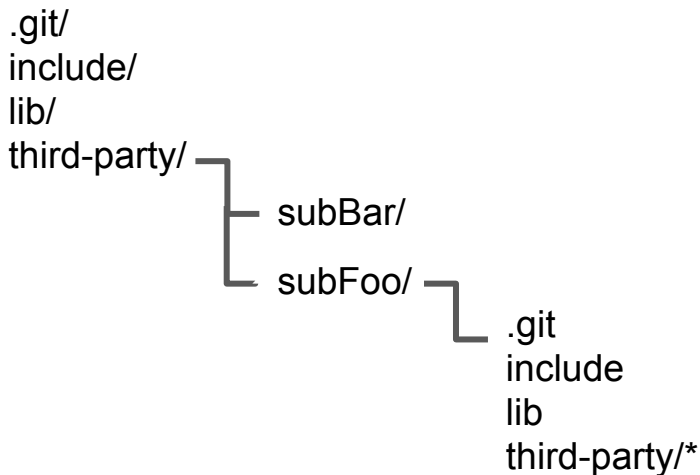
```
git update-ref -d refs/original/refs/heads/master
```

# BFG Repo-Cleaner (<https://rtyley.github.io/bfg-repo-cleaner/>)

```
alias java -jar bfg.jar = bfg
```

- `bfg --delete-files id_{rsa,dsa} repo.git` | delete key files
- `bfg --strip-blobs-bigger-than 50M repo.git` | remove big files
  - `--protect-blobs-from master, next` | restrict commands
- `bfg --replace-text password.txt repo.git` | remove all on pw list

# git submodule



- add <repo> | add new sub repo
- status | status of submodule
- init/deinit | initialize the submodule (register/deregister)
- update | update registered submodule
- foreach <cmd> | exec cmd in all submodules
  - --recursive | traverse recursively into sub...submodules

# git-large file storage

- `git lfs track <file type>`
  - '\*.pdf'
  - 'bigStuff/'
- `git lfs track`
- `git lfs ls-files`

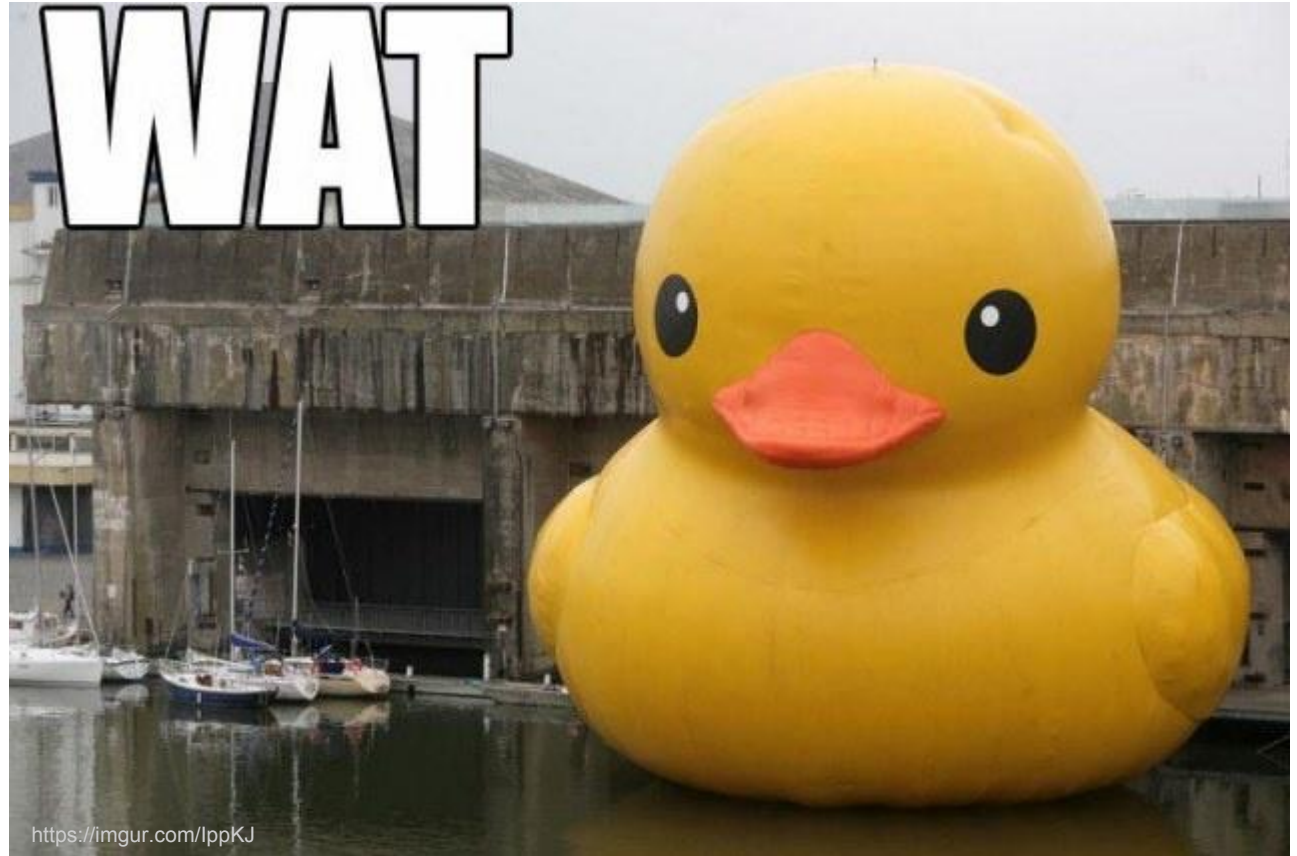
`git add {file}` | file replaced by pointer

# .git folder

- ❖ config | local configurations
- ❖ FETCH\_HEAD | head updated by last fetch
- ❖ HEAD | current ref
- ❖ index | staging area, with meta info
- ❖ hooks | hooks
  - pre-commit
  - commit-msg
- ❖ logs
- ❖ objects | location to store all blobs
- ❖ refs | all refs of the repo
  - heads
  - remotes
  - stash
  - tags

digging deeper `.git/objects/`

- ❖ 02
- ❖ 9a
- ❖ d4
- ❖ f7
- ❖ ec



## ❖ ec

➤ 8723a2ff88bdabc8312c2250444fd5afc2e569

ec8723a2ff88bdabc8312c2250444fd5afc2e569

git cat-file -p ec8723a2ff88bdabc8312c2250444fd5afc2e569

```
$ git cat-file -p ec8723a2ff88bdabc8312c2250444fd5afc2e569
tree a91db712b2ea26b56b4ae9eccc26727f85c6098c
parent 9a514740e112067f96b73cd83e7ccba5d0bb9254
author Florian Sattler <vuld3r@gmail.com> 1460968371 +0200
committer Florian Sattler <vuld3r@gmail.com> 1460968371 +0200

added bar
```

git gc

| clean and optimize local repo

## ❖ info

## ❖ pack

- pack-6d505071a5d9cfe8cae32a8b90057c16c4a378ef.idx | offsets
- pack-6d505071a5d9cfe8cae32a8b90057c16c4a378ef.pack | objects



# hooks (.git/hooks)

- pre-commit
- commit-msg
- pre-push
- pre-receive/up

h/pre-push.sample

```

22 remote="$1"
23 url="$2"
24
25 z40=0000000000000000000000000000000000000000000000000000000000000000
26
27 IFS=' '
28 while read local_ref local_sha remote_ref remote_sha
29 do
30     if [ "$local_sha" = $z40 ]
31     then
32         # Handle delete
33         :
34     else
35         if [ "$remote_sha" = $z40 ]
36         then
37             # New branch, examine all commits
38             range="$local_sha"
39         else
40             # Update to existing branch, examine new commits
41             range="$remote_sha..$local_sha"
42         fi
43
44         # Check for WIP commit
45         commit=`git rev-list -n 1 --grep '^WIP' "$range"`
46         if [ -n "$commit" ]
47         then
48             echo "Found WIP commit in $local_ref, not pushing"
49             exit 1
50         fi
51     fi
52 done
53
54 exit 0

```

NORMAL

+0 ~0 -0 ↩ master

hooks/pre-push.sample

sh

utf-8[unix]

40%

22: 1

h/commit-msg

```

1 #!/usr/bin/env python
2 import sys, os
3
4 print(sys.argv[1])
5 with open(sys.argv[1], 'w') as f:
6     for line in f.readlines():
7         print(line)
8         if "foo" in line:
9             f.write("bar\n")
10        sys.exit(1)
11 sys.exit(1)

```

NORMAL &gt; &lt;/commit-msg



# git hosting

provided:


- [github.com](https://github.com)
- [bitbucket.org](https://bitbucket.org)




self hosted:



- [gogs.io](https://gogs.io)
- [gitlab.com](https://gitlab.com)
- [gitblit.com](https://gitblit.com)
- [phabricator.org](https://phabricator.org)

  **vulder** created this revision. Dec 4 2015, 6:16 PM

 **vulder** added a reviewer: **simbuerg**.

 **vulder** added a subscriber: **vulder**.

   **simbuerg** awarded a token. Dec 4 2015, 6:52 PM

  **simbuerg** accepted this revision. Dec 4 2015, 6:58 PM

LGTM.

 **pprof/projects/gentoo/gentoo.py**



 45

Long line (ursprgl.) ? Das sieht komisch aus. Aber egal, pylint wirds schon wissen

View Options ▾

the portage tree.

oup:

  This revision is now accepted and ready to land. Dec 4 2015, 6:58 PM

  Closed by commit **rPPROF3c9442840b16: added class documentation** (authored by **vulder**). · Explain Why

Dec 4 2015, 7:00 PM

Show All 12 Lines

25

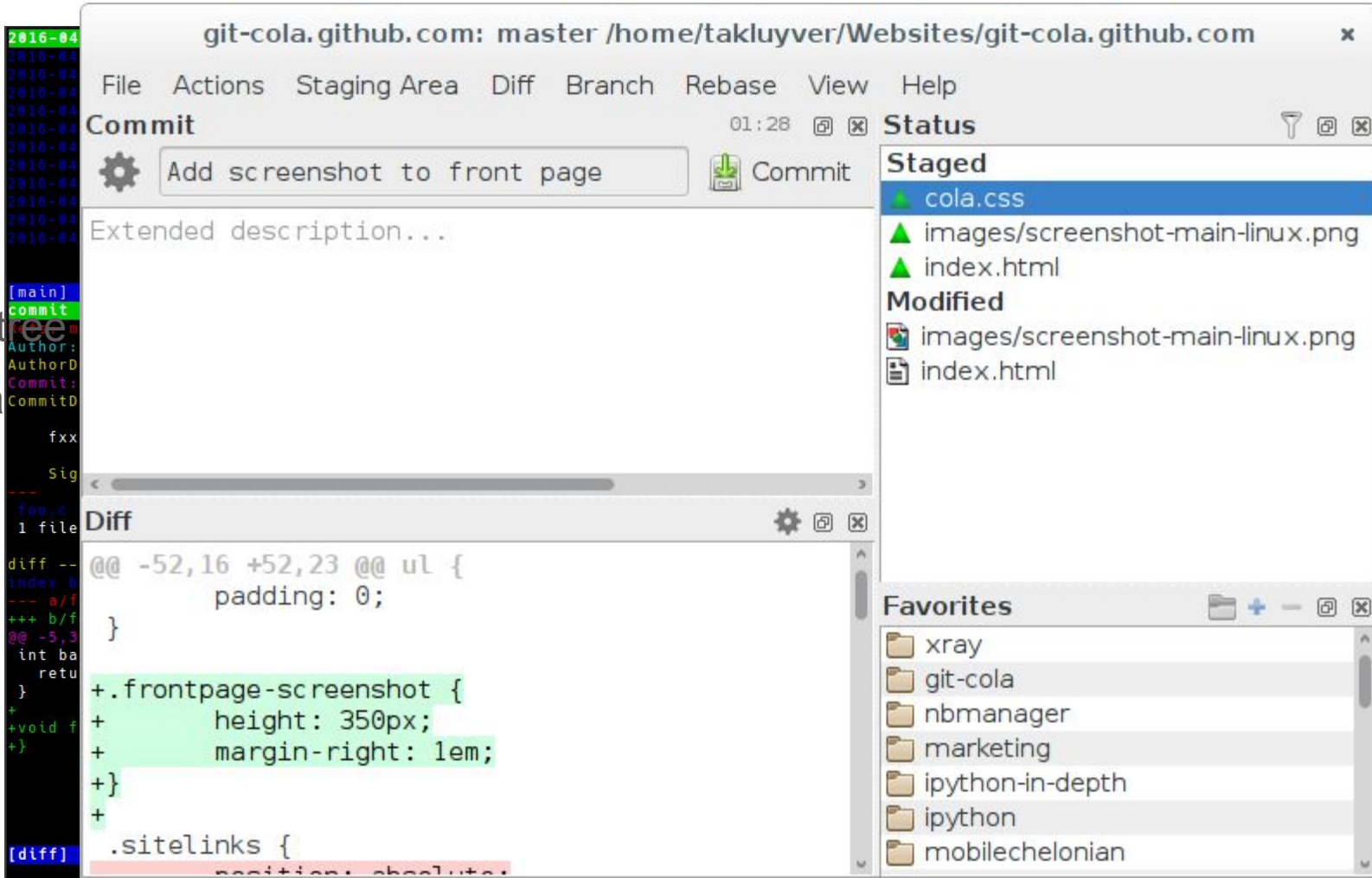
```
24     src_uri = (curl[latest_txt] | tail["-n", "+3"]
25               | cut["-f1", "-d "]()).strip()
26 except ProcessExecutionError as proc_ex:
27     src_uri = "NOT-FOUND"
28     error("Could not determine latest stage3 src uri: {0}",
```

try:

```
26     src_uri = (curl[latest_txt] | tail["-n", "+3"]
27               | cut["-f1", "-d "]()).strip()
28 except ProcessExecutionError as proc_ex:
29     src_uri = "NOT-FOUND"
30     error("Could not determine latest stage3 src uri: {0}",
```

# tooling

- gitk
- tig
- sourceTree
- git-cola



# tooling

- gitk
- tig
- sourcetree
- git-cola
- docx to text

## gitattributes

.git/info/attributes

| path/file spec settings

```
*.docx diff=word
```

| word filter

```
1. #!/bin/bash  
2. docx2txt.pl $1 -
```

| script to call docx converter

git config diff.word.textconv docx2txt

## infos

@ <https://git-scm.com/book/uz/v2/Customizing-Git-Git-Attributes>

@ <http://docx2txt.sourceforge.net/>

# other stuff

- git clean
- git grep
- read-tree + subtree
- git replace
- git fsck
- git bundle
- git log -L
- git describe
- git archive
- git rerere

...

**WOW, SUCH AUDIENCE**



**MUCH QUESTIONS, VERY RELEVANT**



**GIT'EM ALL**