

Git

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<http://bytes.inso.cc/>

Purple Scout presentation (April 17, 2009)



Swiss Federal Institute
of Technology, Lausanne



XMMS2 Music Player



Playlouder MSP

Outline

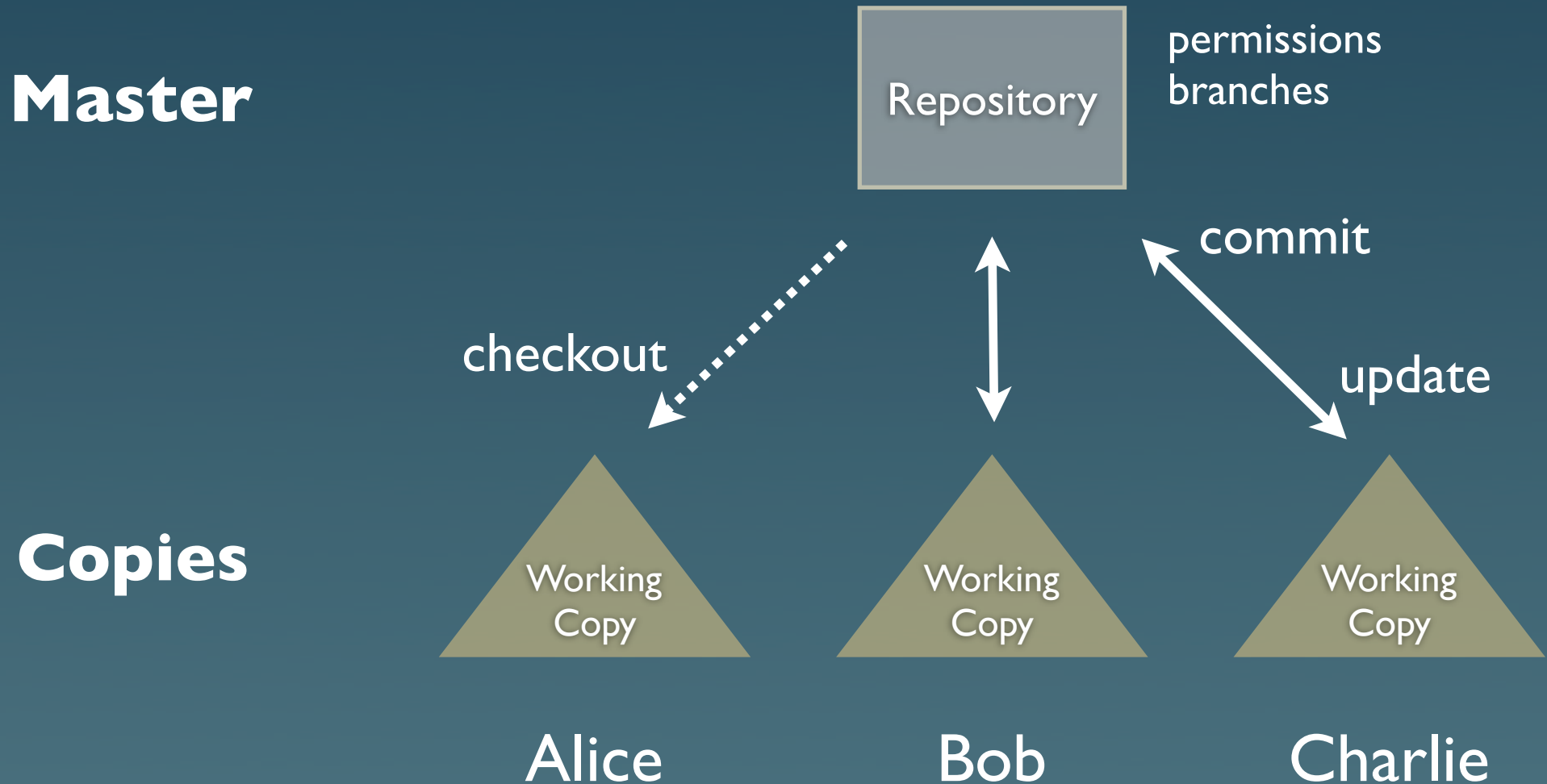
1. Introduction
2. Concepts & Local Workflow
3. Distributed Work
4. Advanced Features
5. Conclusion

I. Introduction

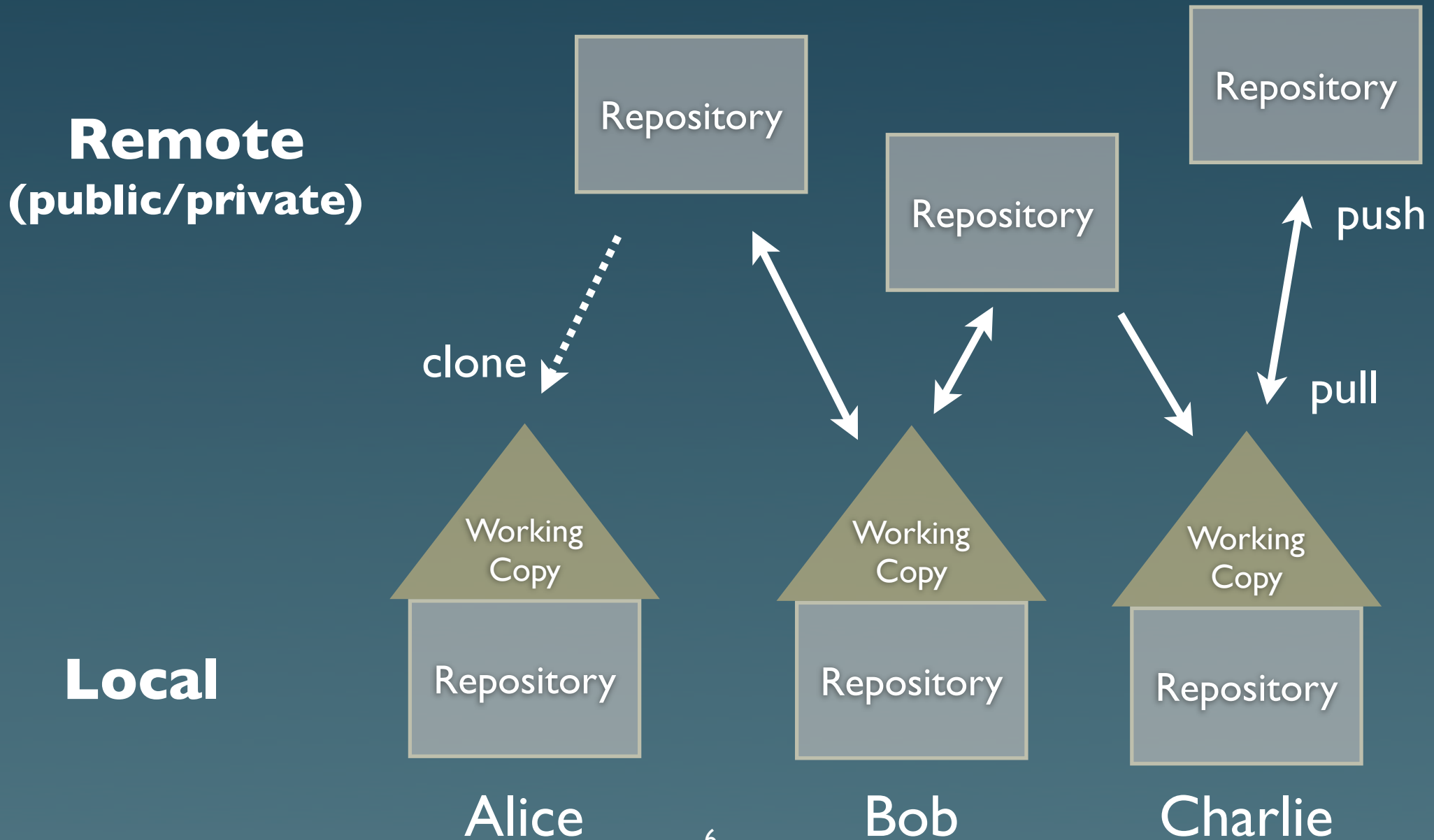
Version Control Systems

- Record history
- Facilitate team work
- Expose source code
- Branch/merge development paths

Centralized VCS



Distributed VCS



Centralized vs Distributed

- synchronous
 - unique reference
 - fixed hierarchy
- centralized access control
- simpler

- asynchronous
 - copy = repository
 - loose hierarchy
- offline:
 - history
 - commit
 - branches
- more powerful

Centralized vs Distributed

- synchronous
 - unique reference
 - fixed hierarchy
- centralized access control
- simpler
- tråkig... ;_;

- asynchronous
 - copy = repository
 - loose hierarchy
- offline:
 - history
 - commit
 - branches
- more powerful
- fun! ^_^

Git History

- Linus Torvalds needed a replacement for BitKeeper to maintain the Linux kernel
- Requirements:
 - Distributed
 - Scalable & Fast
 - Integrity guarantee
 - Non-linear, custom workflows
 - Talk over HTTP, SSH, FTP, rsync, email, etc
- First prototype on April 7, 2005
- Now used by many FOSS projects:
Linux kernel, Freedesktop (X.org), Ruby on Rails, XMMS2, Android, Gnome, GCC, etc.

Why “Git” ?

git (plural *gits*)

2. (*British, slang, pejorative*) A silly, incompetent, stupid, annoying or childish person.

“Jacko is a git.”

Linus Torvalds:

“I'm an egotistical bastard, and I name all my projects after myself. First Linux, now git.”

Alternatively: “Global Information Tracker”

Git vs. other DVCS

(Mercurial, Darcs, Bazaar, Monotone, etc)

- + **Fast**, scalable (execution and setup)
- + Powerful small tools (Unix spirit)
- + Lively development
- + Linus (smart design)

Git vs. other DVCS

(Mercurial, Darcs, Bazaar, Monotone, etc)

- + **Fast**, scalable (execution and setup)
- + Powerful small tools (Unix spirit)
- + Lively development
- + Linus (smart design)
- Learning curve (grasp concepts)
- Imperfect on MS Windows
- Linus (no library)

Why Git is better than X?

- Cheap Local Branching
- Everything is Local
- Git is Fast
- Git is Small
- The Staging Area
- Distributed
- Any Workflow
- Easy to Learn

Source: <http://whygitisbetterthanx.com/>

2. Concepts & Local Workflow

Git Repository

repository = object database



`.git/objects/`

Git Repository

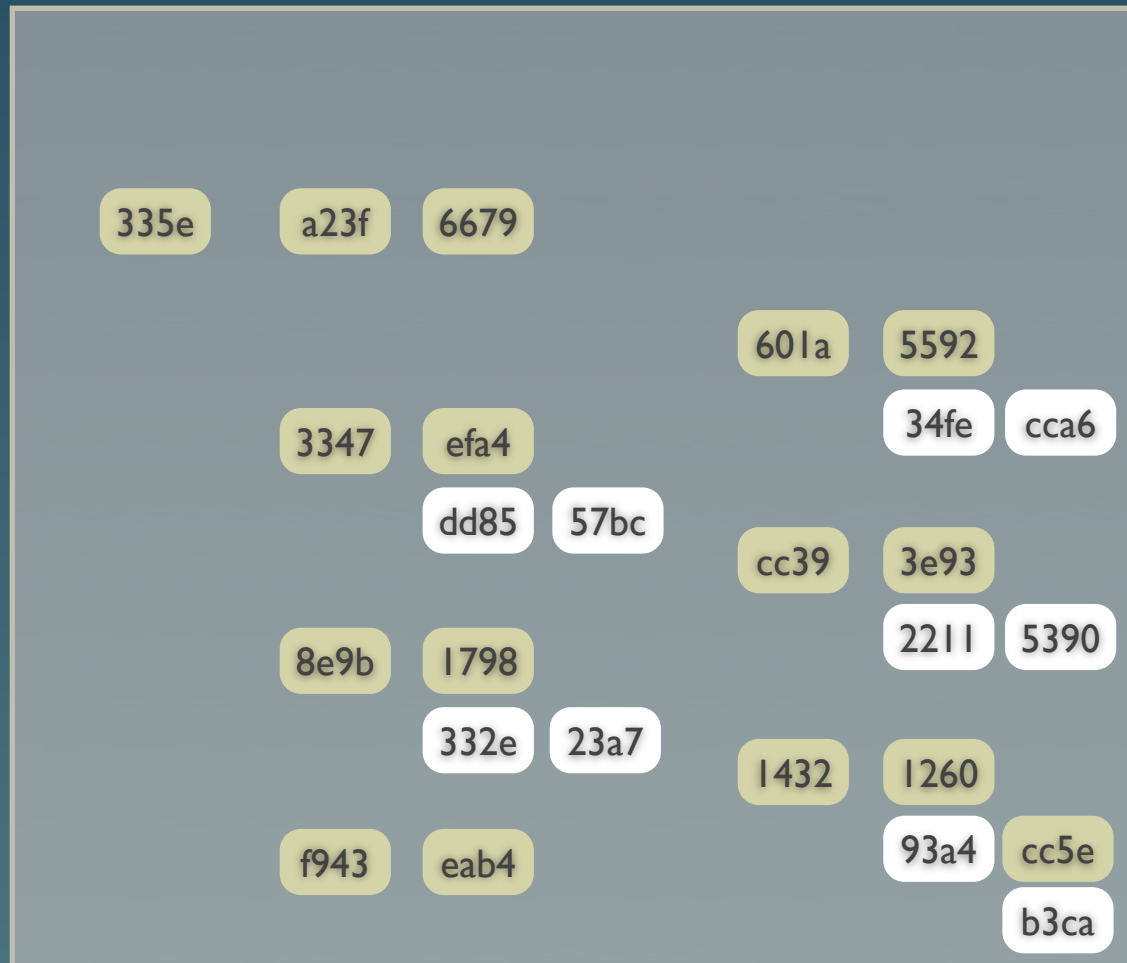
$id(object) = SHA1(object\ content)$



`.git/objects/8e/9b...`

Git Repository

content is stored in **blob** objects
⇒ File



```
#include <stdio.h>

int main ()
{
    printf("Hello World");
    return 0;
}
```

git cat-file -p 93a4

Git Repository

structure is stored in **tree** objects
⇒ Directory



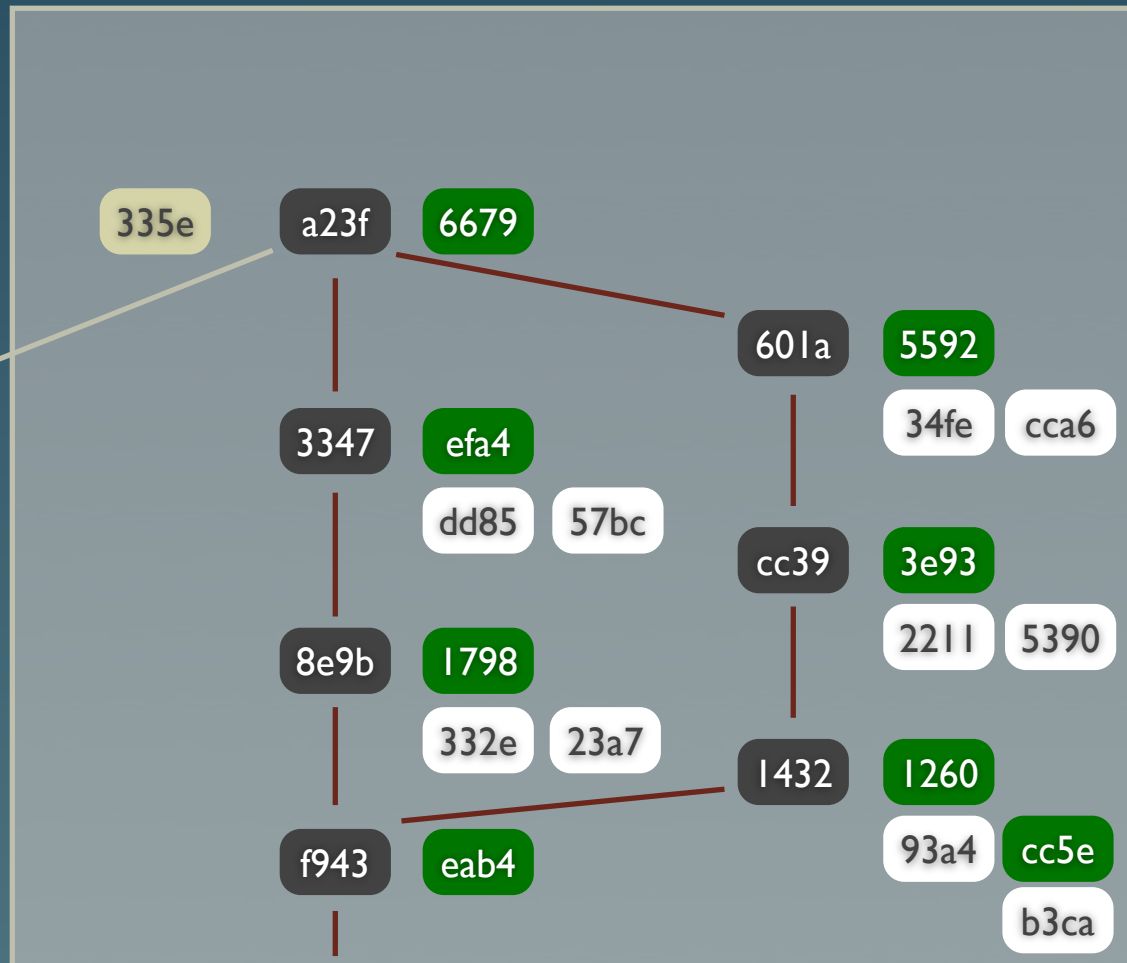
```
040000 tree cc5e src  
100644 blob 93a4 hw.c
```

git cat-file -p 1260

Git Repository

history is stored in **commit** objects
⇒ Authenticated hierarchical snapshots

Note: identity is a function of the whole history!
i.e. build-in integrity check



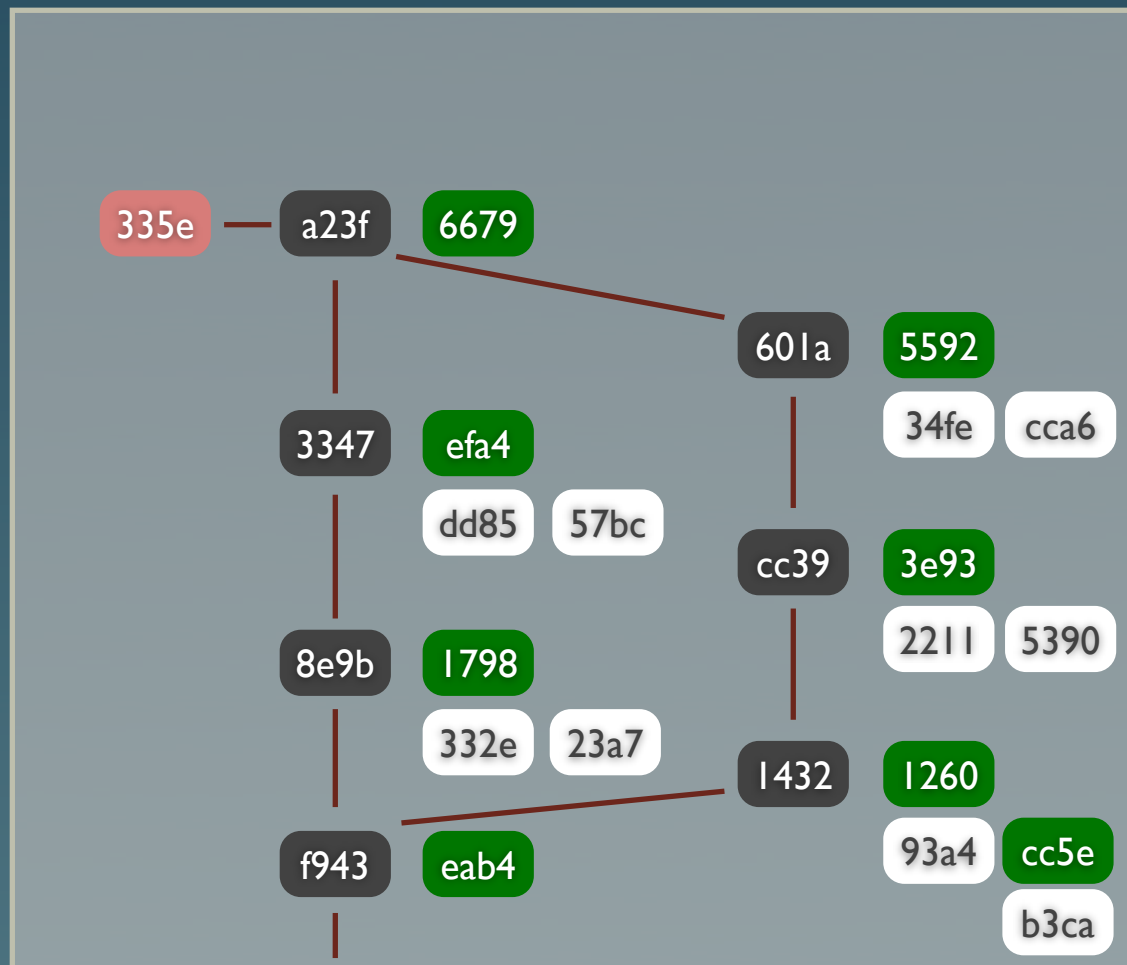
```
tree 1260...
parent f943...
author Tom <tom@...>
 1204666883 +0100
committer Max
 <max@...>
 1204666883 +0100

Fixed a major bug in
Hello World.
```

git cat-file -p 1432

Git Repository

references are stored as **tag** objects
⇒ (Signed) symbolic link



```
object a23f...
type commit
tag v1.0.7
tagger Jack <jack@...>
    1136523576 -0800

GIT 1.0.7
-----BEGIN PGP
SIGNATURE-----
Version: GnuPG v1.4.2
(GNU/Linux)

iD8D...
-----END PGP
SIGNATURE-----
```

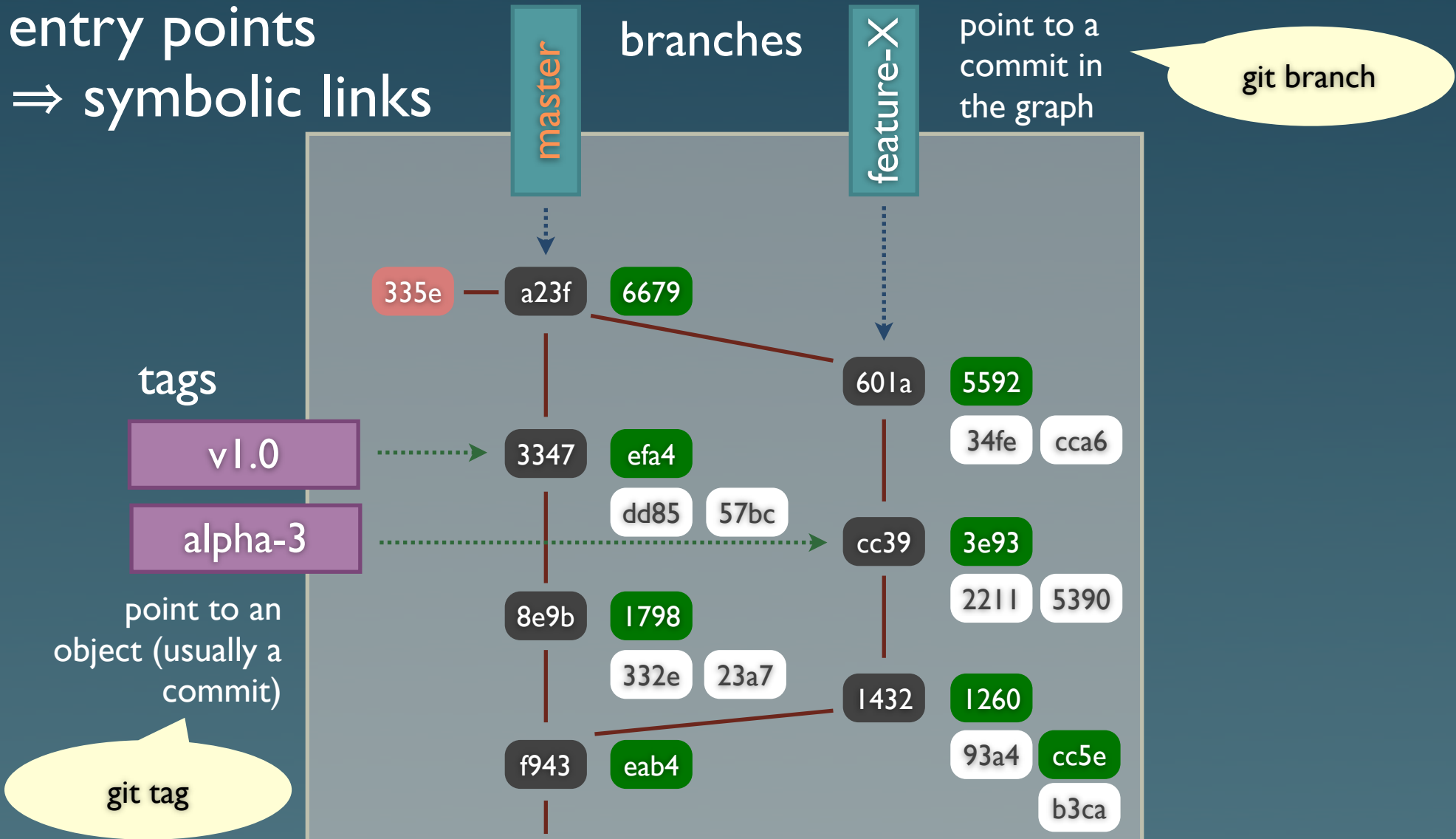
git cat-file -p 335e

Git Repository

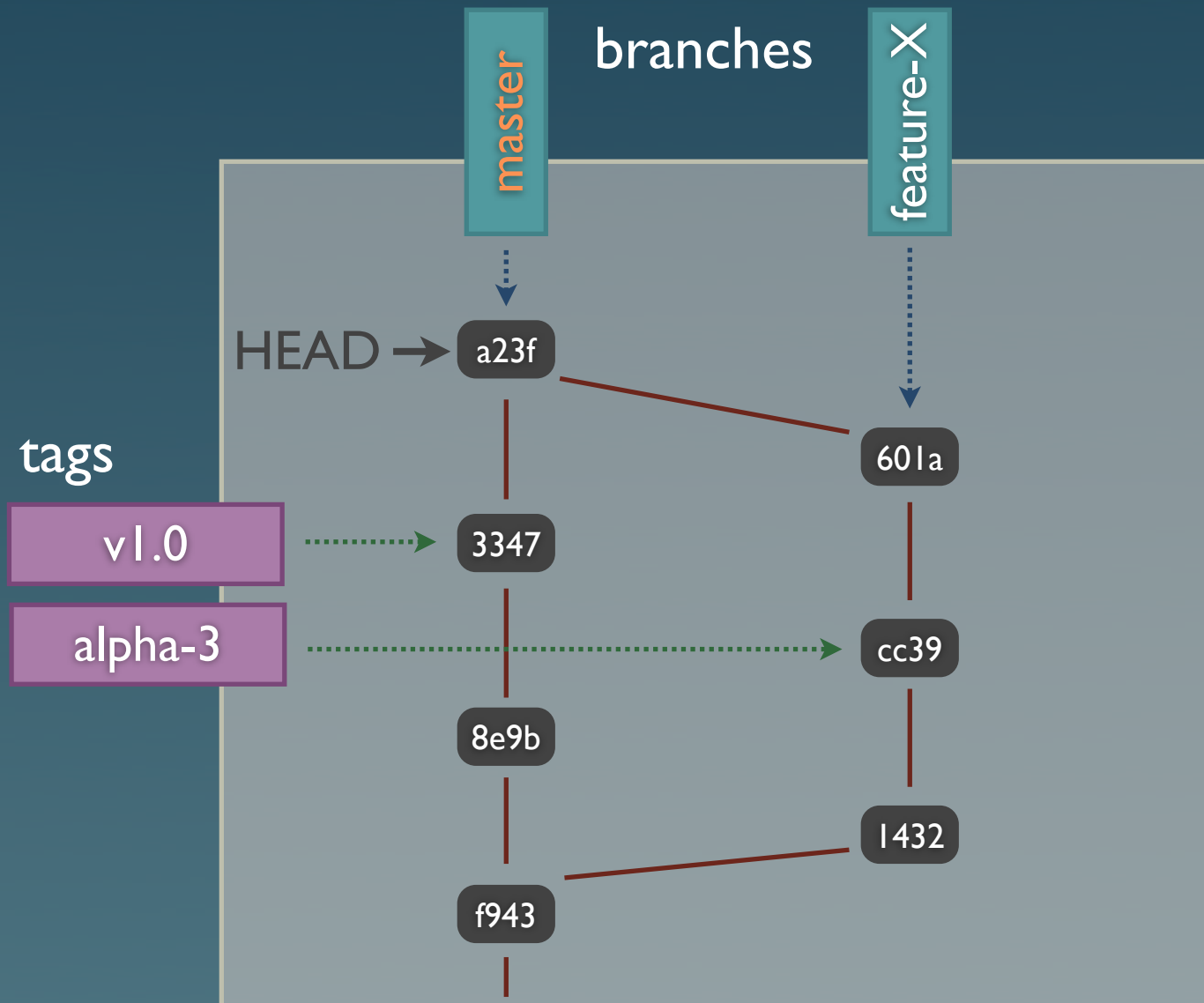
practical repository

entry points

⇒ symbolic links



History Graph



Git workflow

```
$ find
.
./src
./src/Makefile
./src/helloworld.c
./src/helloworld.h
./Makefile
./IDEAS
./README
```

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
```

initialize

```
$ git init
```

```
Initialized empty Git repository in /path/example/.git/
```

```
IDEAS  
Makefile  
README  
src  
|-- Makefile  
|-- helloworld.c  
`-- helloworld.h
```


check status

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

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
```

add files

```
$ git add .
```

```
IDEAS  
Makefile  
README  
src  
|-- Makefile  
|-- helloworld.c  
`-- helloworld.h
```

check status

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

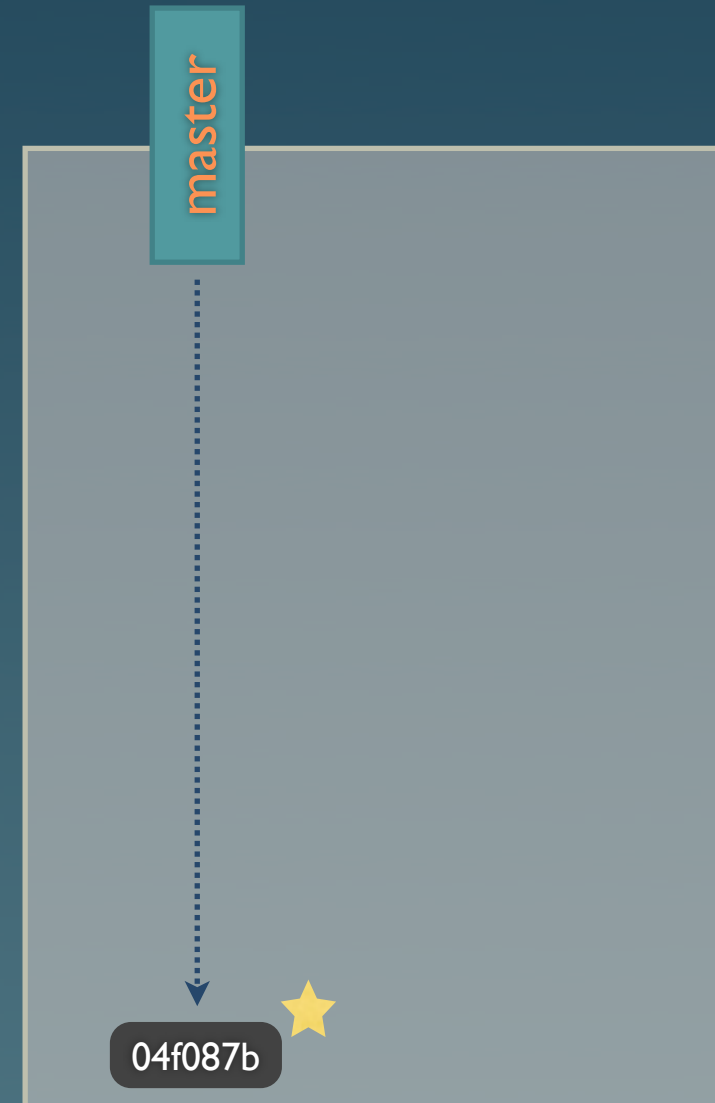
```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
```

commit

```
$ git commit -a -m "First import"
```

```
Created initial commit 04f087b: First import  
0 files changed, 0 insertions(+), 0 deletions(-)  
create mode 100644 IDEAS  
create mode 100644 Makefile  
create mode 100644 README  
create mode 100644 src/Makefile  
create mode 100644 src/helloworld.c  
create mode 100644 src/helloworld.h
```

```
IDEAS  
Makefile  
README  
src  
|-- Makefile  
|-- helloworld.c  
`-- helloworld.h
```

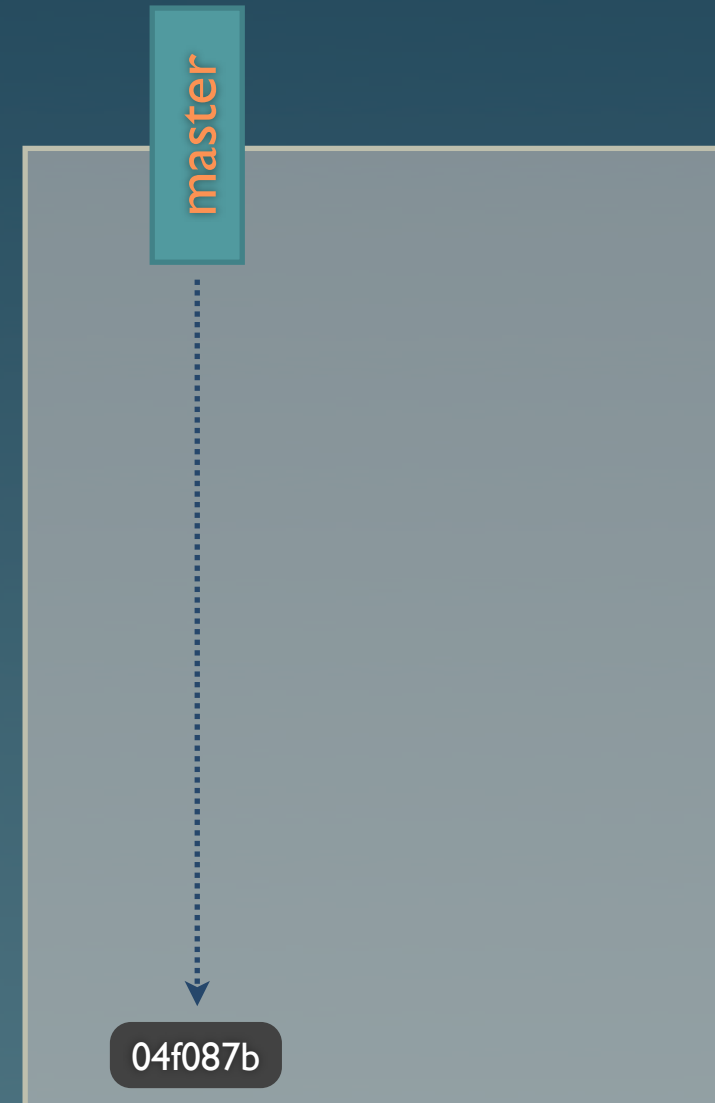


hack

```
$ echo "Blah blah" >> README
```

```
$ rm IDEAS
```

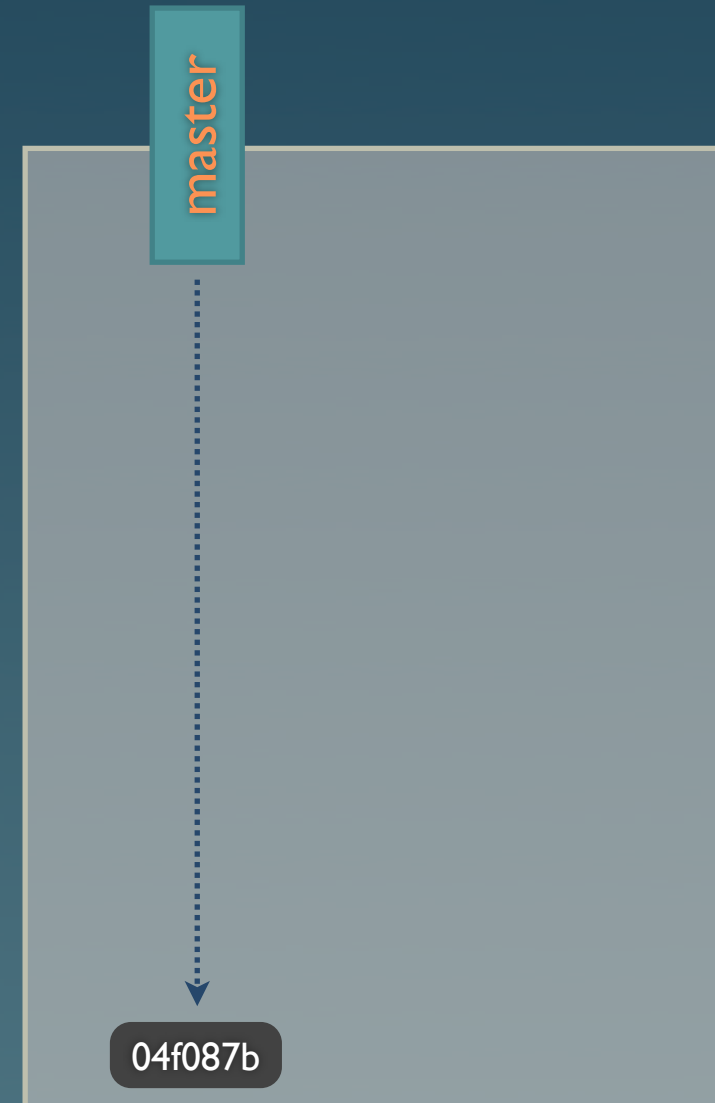
```
Makefile  
README          <- edited ★  
src  
|-- Makefile  
|-- helloworld.c  
`-- helloworld.h
```



check status

```
$ git status
# On branch master
# Changed but not updated:
#   (use "git add/rm <file>..." to update what will be
#   committed)
#
#       deleted:   IDEAS
#       modified:  README
#
no changes added to commit (use "git add" and/or "git
commit -a")
```

```
Makefile
README      <- edited
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
```



commit

```
$ git commit -a -m "More stuff"
```

```
Created commit 54eda77: More stuff
```

```
1 files changed, 1 insertions(+), 0 deletions(-)  
delete mode 100644 IDEAS
```

```
Makefile  
README ★  
src  
|-- Makefile  
|-- helloworld.c  
`-- helloworld.h
```



view commit

```
$ git show
```

```
commit 54eda77a85b0e5d1891653a36ff08faf133df030
```

```
Author: Sebastien Cevey <seb@cine7.net>
```

```
Date: Mon Apr 13 21:23:02 2009 +0200
```

```
More stuff
```

```
diff -git a/IDEAS b/IDEAS
```

```
deleted file mode 100644
```

```
index e69de29..0000000
```

```
diff -git a/README b/README
```

```
index e69de29..579c5b1 100644
```

```
- a/README
```

```
+++ b/README
```

```
@@ -0,0 +1 @@
```

```
+Blah blah
```

```
Makefile
```

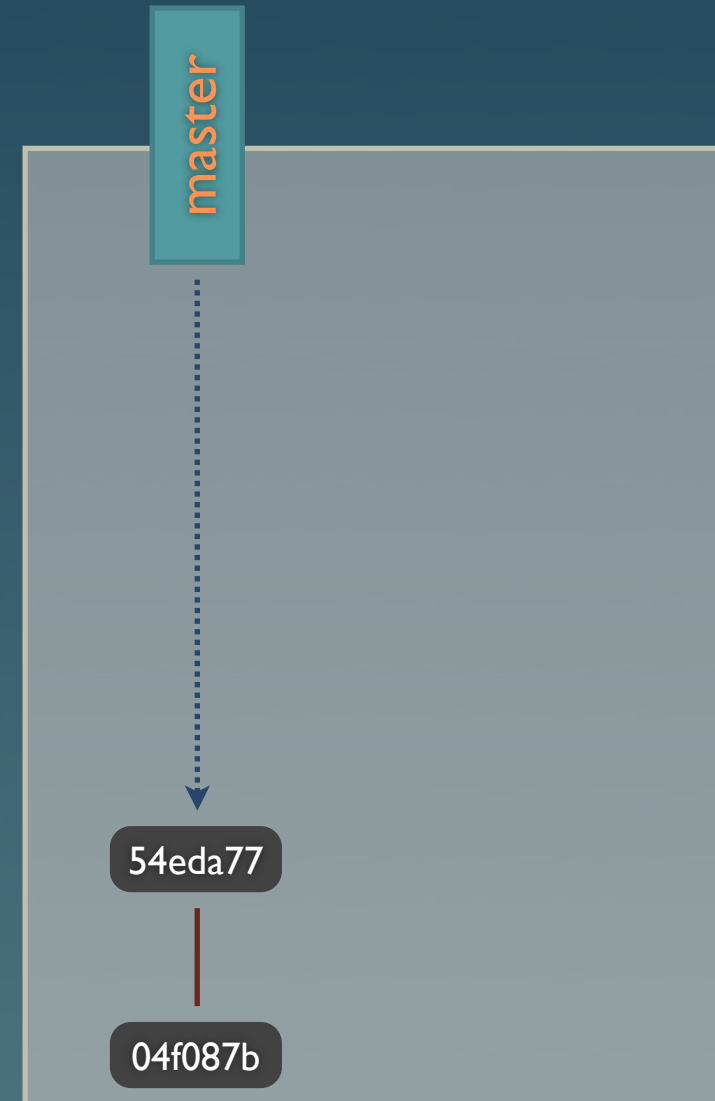
```
README
```

```
src
```

```
|-- Makefile
```

```
|-- helloworld.c
```

```
`-- helloworld.h
```



view commit

```
$ git show --pretty=raw
commit 54eda77a85b0e5d1891653a36ff08faf133df030
tree 524f0cfe293064d18ac0c12a55baaf2b34d42e8d
parent 04f087b23ce96c2b24f9f6b5f7cf437af33e19c6
author Sebastien Cevey <seb@cine7.net> 1239650582
+0200
committer Sebastien Cevey <seb@cine7.net> 1239650582
+0200
```

More stuff

[...]

```
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
```



view history

```
$ git log
```

```
commit 54eda77a85b0e5d1891653a36ff08faf133df030
```

```
Author: Sebastien Cevey <seb@cene7.net>
```

```
Date: Mon Apr 13 21:23:02 2009 +0200
```

More stuff

```
commit 04f087b23ce96c2b24f9f6b5f7cf437af33e19c6
```

```
Author: Sebastien Cevey <seb@cene7.net>
```

```
Date: Mon Apr 13 21:11:58 2009 +0200
```

First import

```
Makefile
```

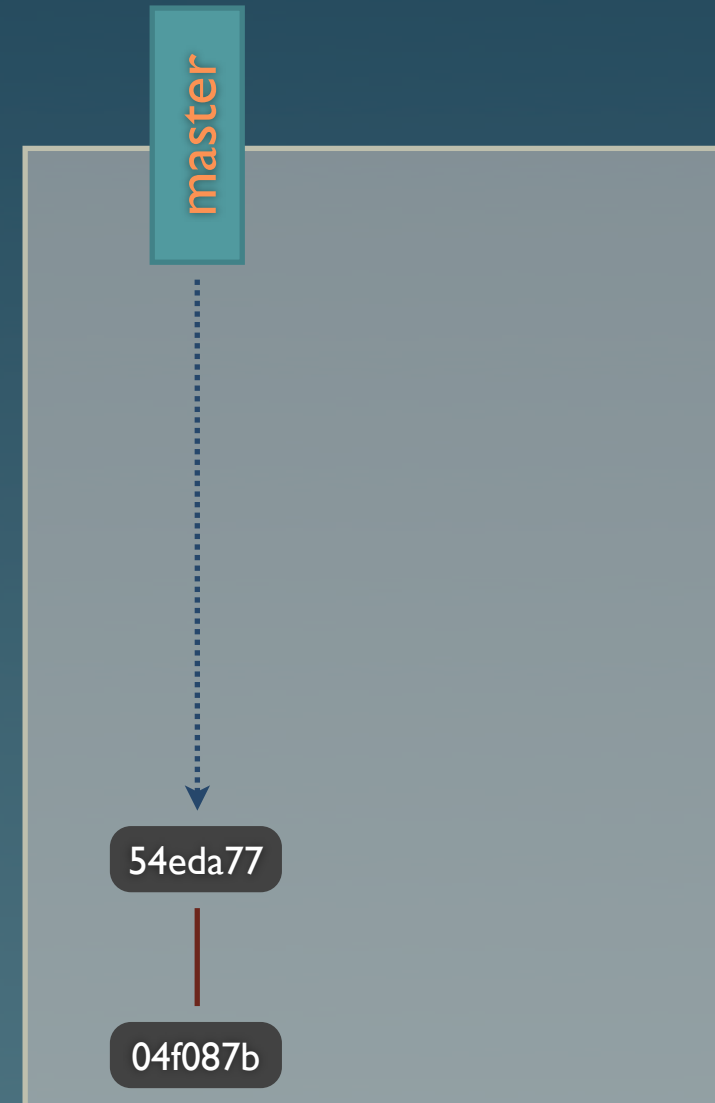
```
README
```

```
src
```

```
|-- Makefile
```

```
|-- helloworld.c
```

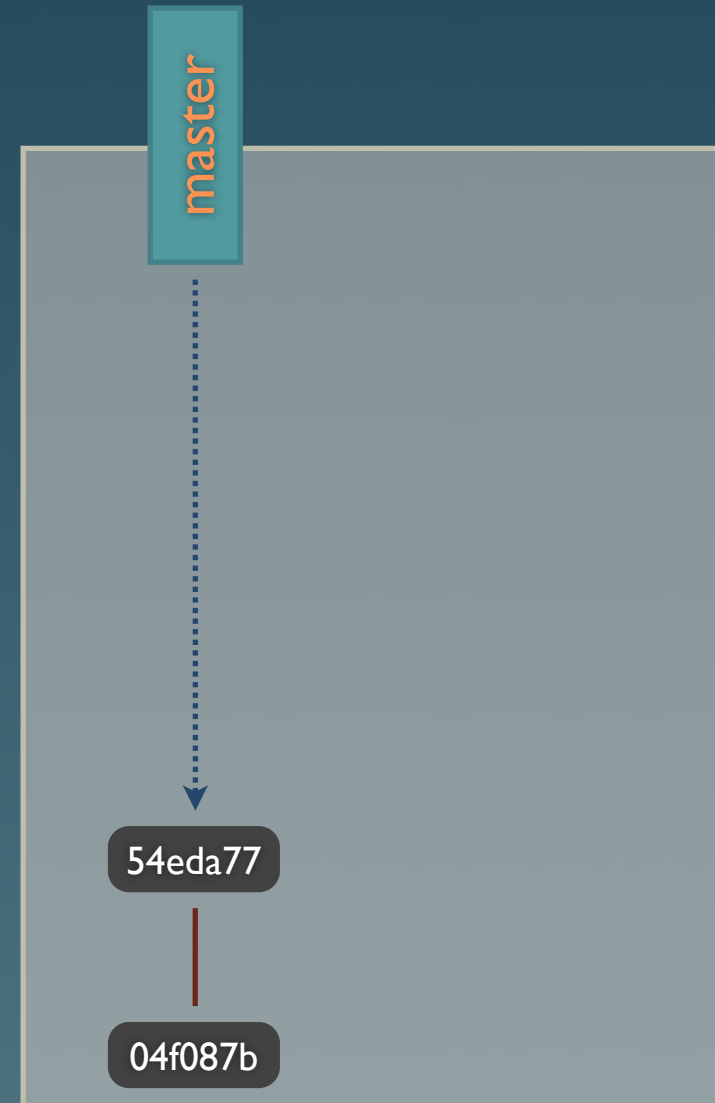
```
`-- helloworld.h
```



hack again

```
$ echo "/* End of fil */" >> src/helloworld.c
```

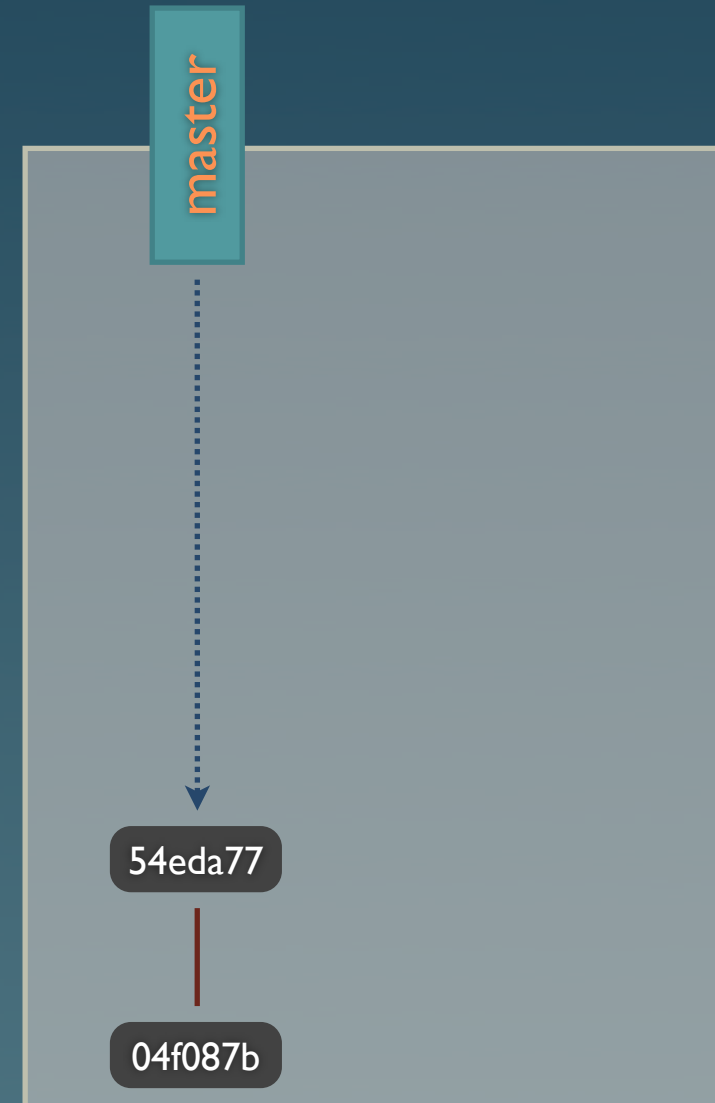
```
Makefile  
README  
src  
|-- Makefile  
|-- helloworld.c      <- edited ★  
`-- helloworld.h
```



diff modifs

```
$ git diff
diff -git a/src/helloworld.c b/src/helloworld.c
index e69de29..54a606d 100644
- a/src/helloworld.c
+++ b/src/helloworld.c
@@ -0,0 +1 @@
+/* End of fil */
```

```
Makefile
README
src
|-- Makefile
|-- helloworld.c      <- edited
`-- helloworld.h
```



commit

```
$ git commit -a -m "Hasty commit"  
Created commit 3b5ba16: Hasty commit  
1 files changed, 1 insertions(+), 0 deletions(-)
```

```
Makefile  
README  
src  
|-- Makefile  
|-- helloworld.c ★  
`-- helloworld.h
```



rewind history

```
$ git reset --hard HEAD^ # parent of HEAD
```

```
HEAD is now at 54eda77 More stuff
```

```
$ git status
```

```
# On branch master
```

```
nothing to commit (working directory clean)
```

```
Makefile
```

```
README
```

```
src
```

```
|-- Makefile
```

```
|-- helloworld.c ★
```

```
`-- helloworld.h
```



rewind history

```
$ git reset HEAD^ # parent of HEAD  
src/helloworld.c: locally modified
```

```
$ git diff
```

```
diff -git a/src/helloworld.c b/src/helloworld.c  
index e69de29..54a606d 100644  
- a/src/helloworld.c  
+++ b/src/helloworld.c  
@@ -0,0 +1 @@  
+/* End of fil */
```

```
Makefile  
README  
src  
|-- Makefile  
|-- helloworld.c      <- edited  
`-- helloworld.h
```



new history

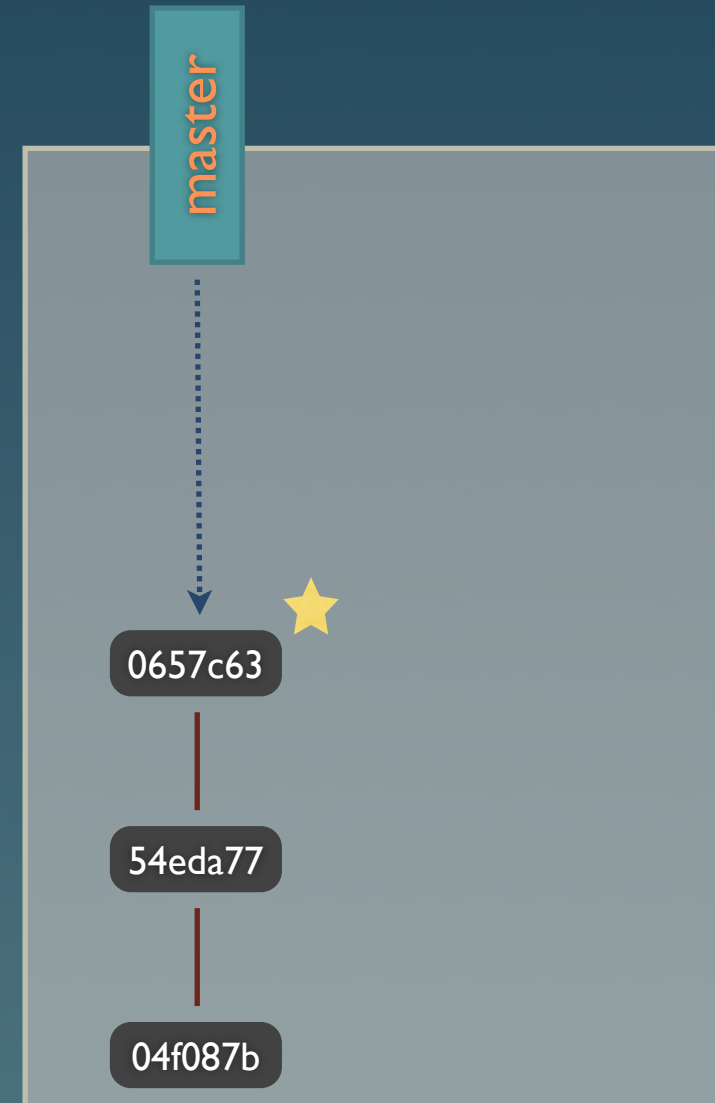
```
$ $EDITOR src/helloworld.c
```

```
$ git commit -a -m "Proper commit"
```

```
Created commit 0657c63: Proper commit
```

```
1 files changed, 1 insertions(+), 0 deletions(-)
```

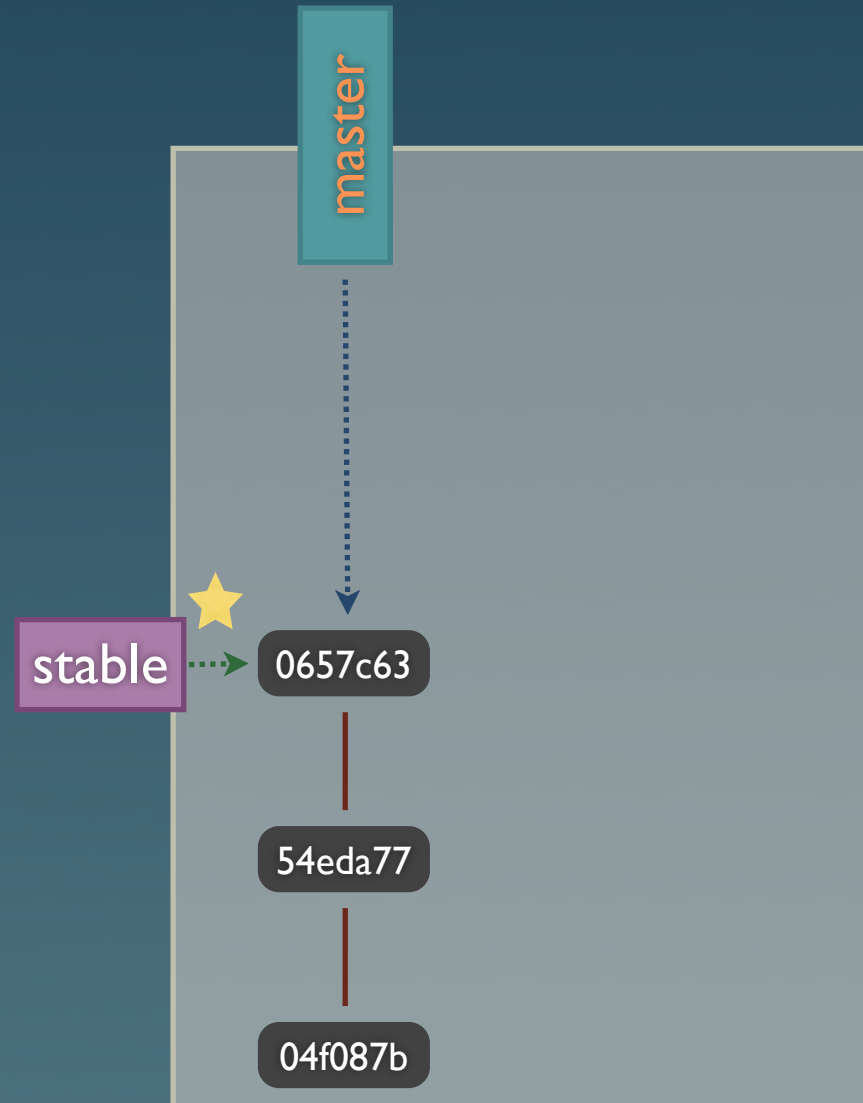
```
Makefile
README
src
|-- Makefile
|-- helloworld.c ★
`-- helloworld.h
```



tag

```
$ git tag stable
```

```
Makefile  
README  
src  
|-- Makefile  
|-- helloworld.c  
`-- helloworld.h
```



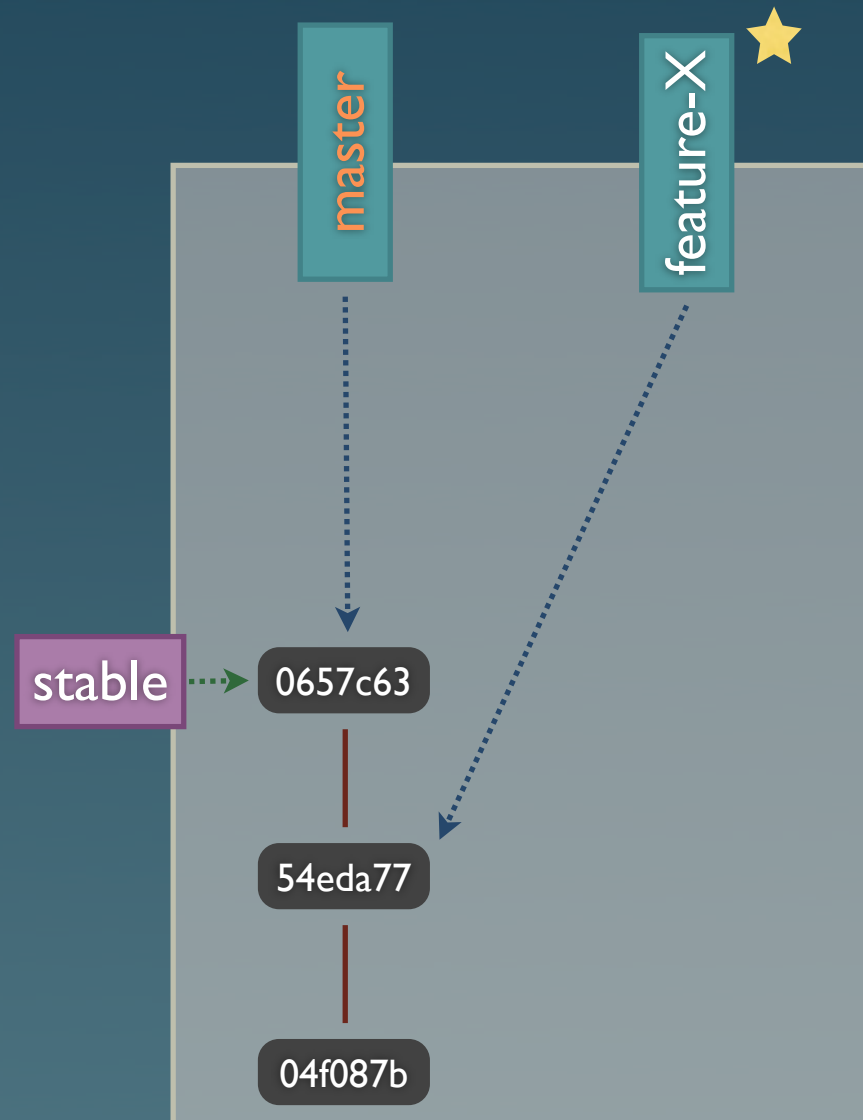
new branch

```
$ git branch feature-X 54eda77
```

```
$ git branch
```

```
feature-X  
* master
```

```
Makefile  
README  
src  
|-- Makefile  
|-- helloworld.c  
`-- helloworld.h
```



switch branch

```
$ git checkout feature-X
```

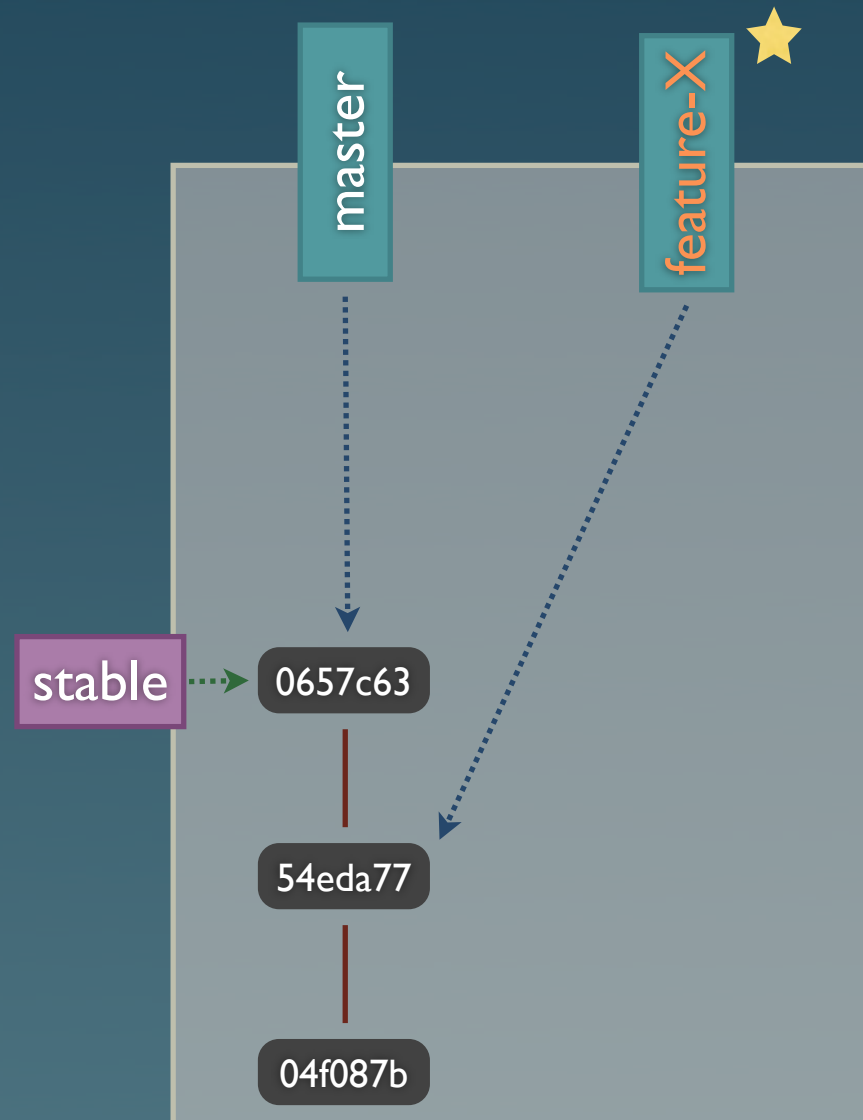
```
Switched to branch "feature-X"
```

```
$ git branch
```

```
* feature-X
```

```
master
```

```
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
```



commit branch

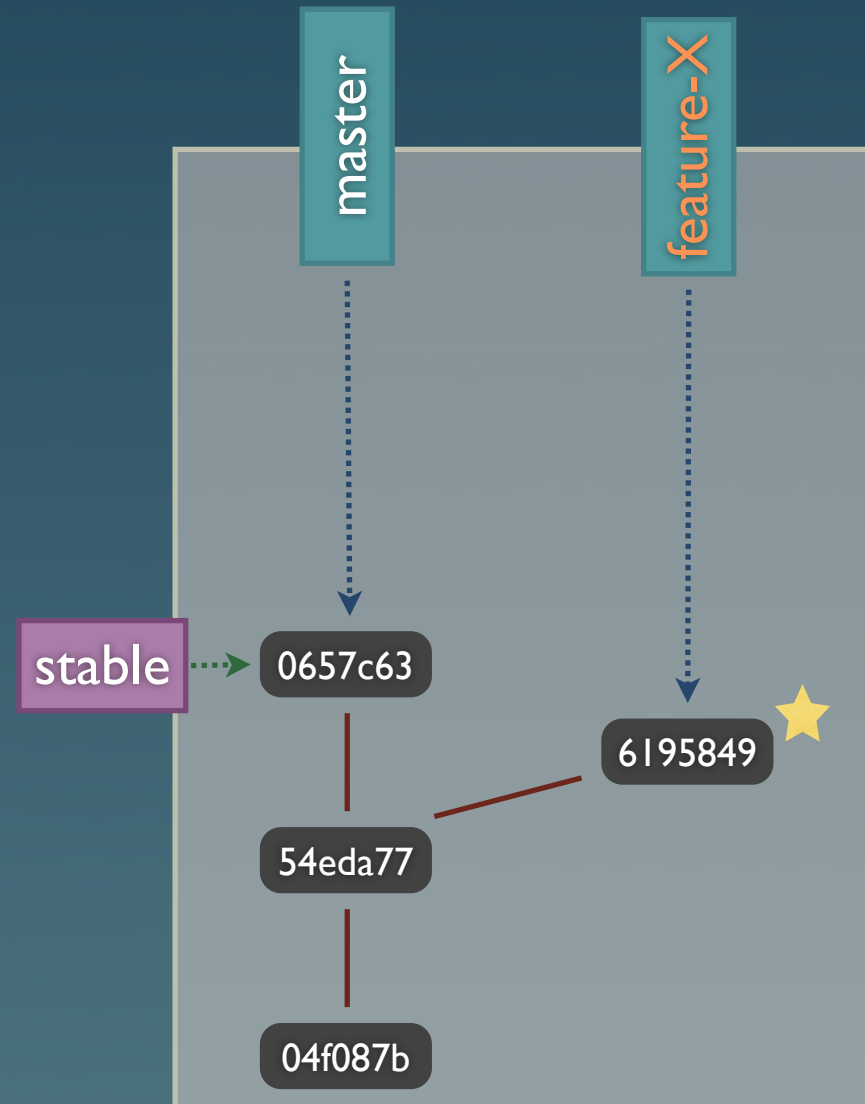
```
$ $EDITOR src/helloworld.c
```

```
$ git commit -a -m "Work on X"
```

```
Created commit 6195849: Work on X
```

```
1 files changed, 1 insertions(+), 0 deletions(-)
```

```
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
```



commit branch

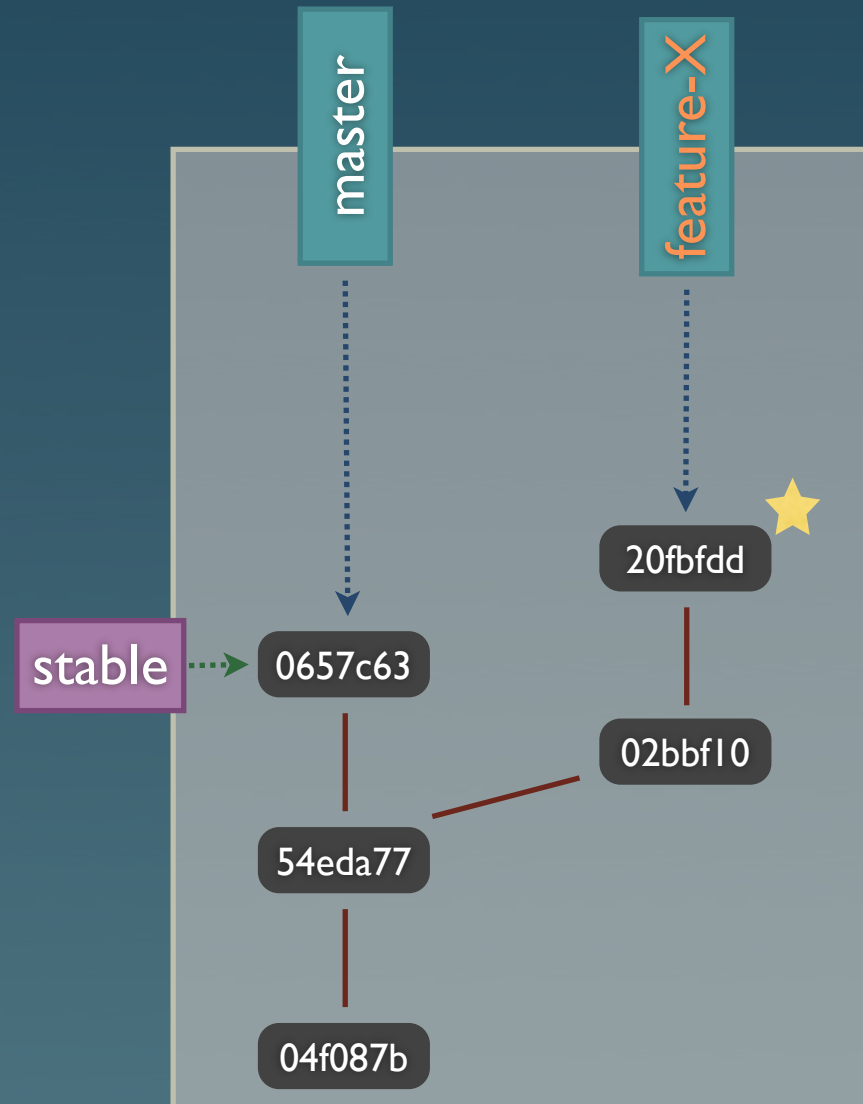
```
$ $EDITOR README
```

```
$ git commit -a -m "Edit README for X"
```

```
Created commit 20bfdd: Edit README for X
```

```
1 files changed, 1 insertions(+), 0 deletions(-)
```

```
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
```

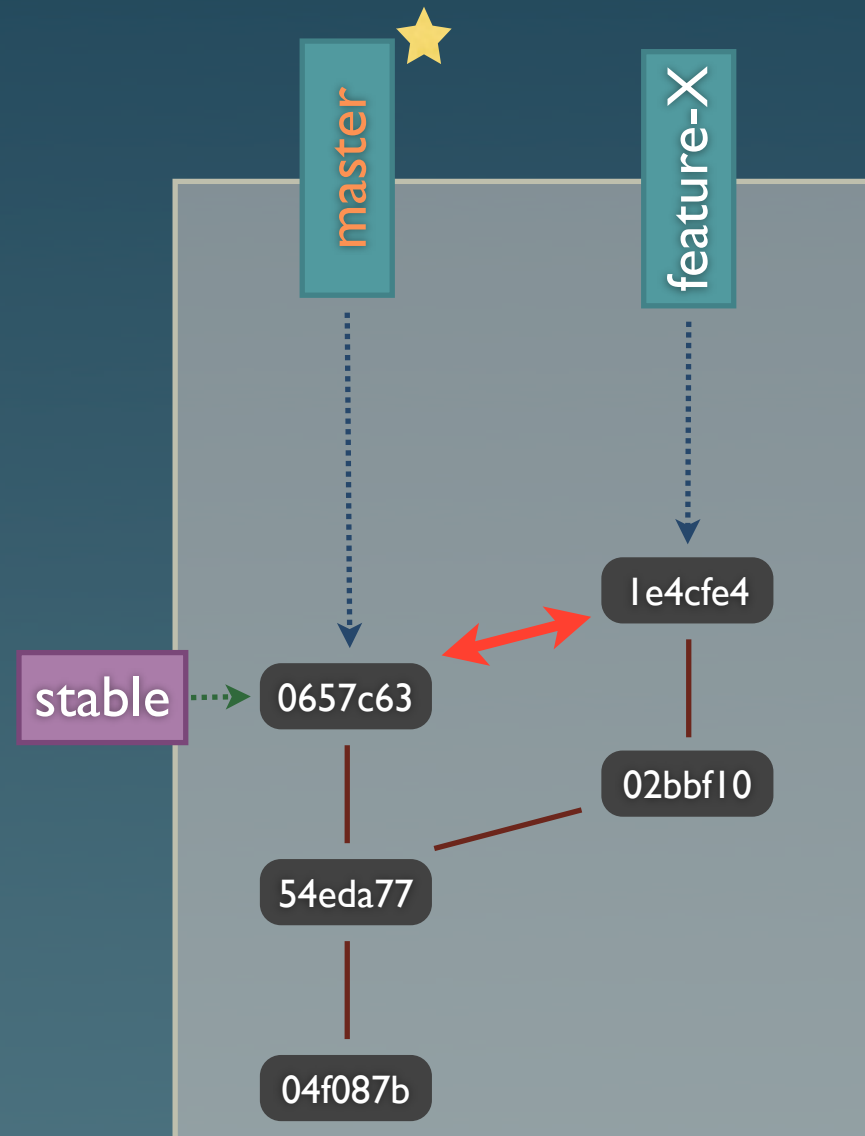


diff branches

```
$ git checkout master  
Switched to branch "master"
```

```
$ git diff feature-X  
diff -git a/README b/README  
index 29a6a68..579c5b1 100644  
- a/README  
+++ b/README  
@@ -1,2 +1 @@  
  Blah blah  
-foo  
[...]
```

```
Makefile  
README  
src  
|-- Makefile  
|-- helloworld.c  
`-- helloworld.h
```



merge

```
$ git merge feature-X
```

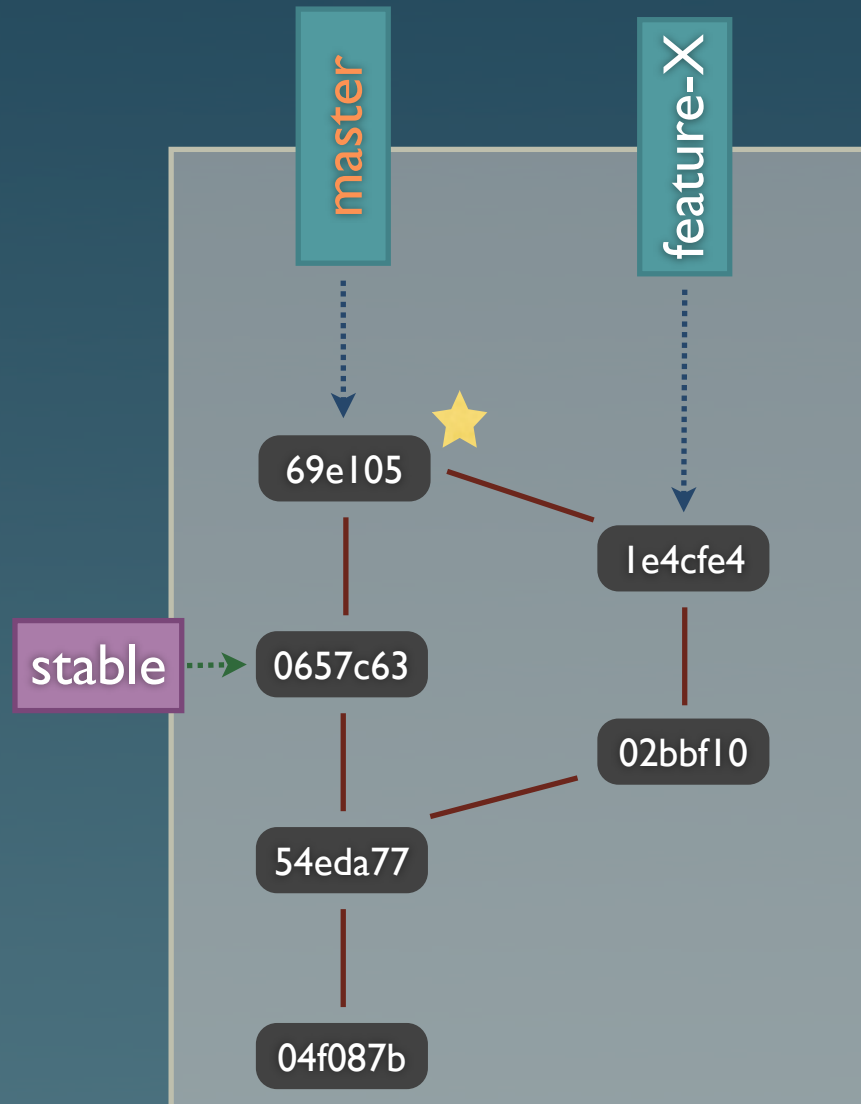
Merge made by recursive.

```
README      | 1 +
```

```
src/helloworld.h | 1 +
```

```
2 files changed, 2 insertions(+), 0 deletions(-)
```

```
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
```



view merge commit

```
$ git show
```

```
commit 69e105f3d1991c34d74d079197d5f1b1917d3120
```

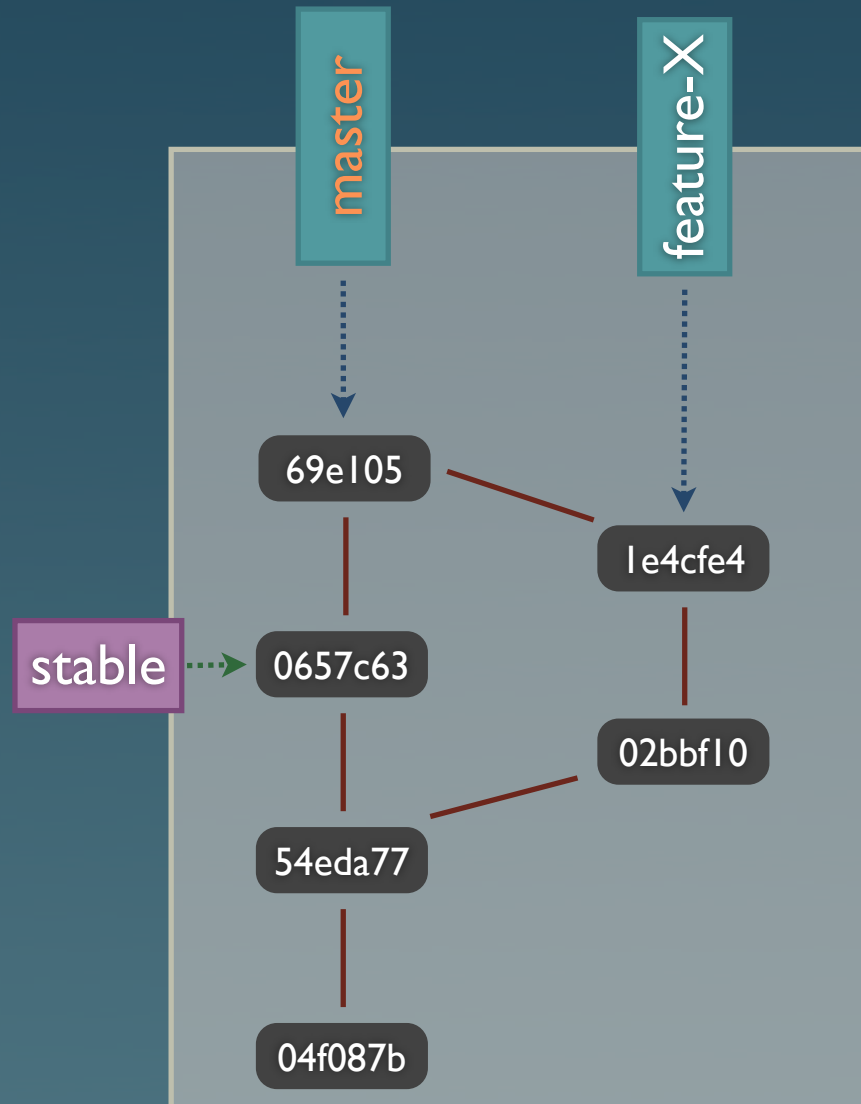
```
Merge: 0657c63... 20fbfdd...
```

```
Author: Sebastien Cevey <seb@cin7.net>
```

```
Date: Mon Apr 13 22:49:16 2009 +0200
```

```
Merge branch 'feature-X'
```

```
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
```

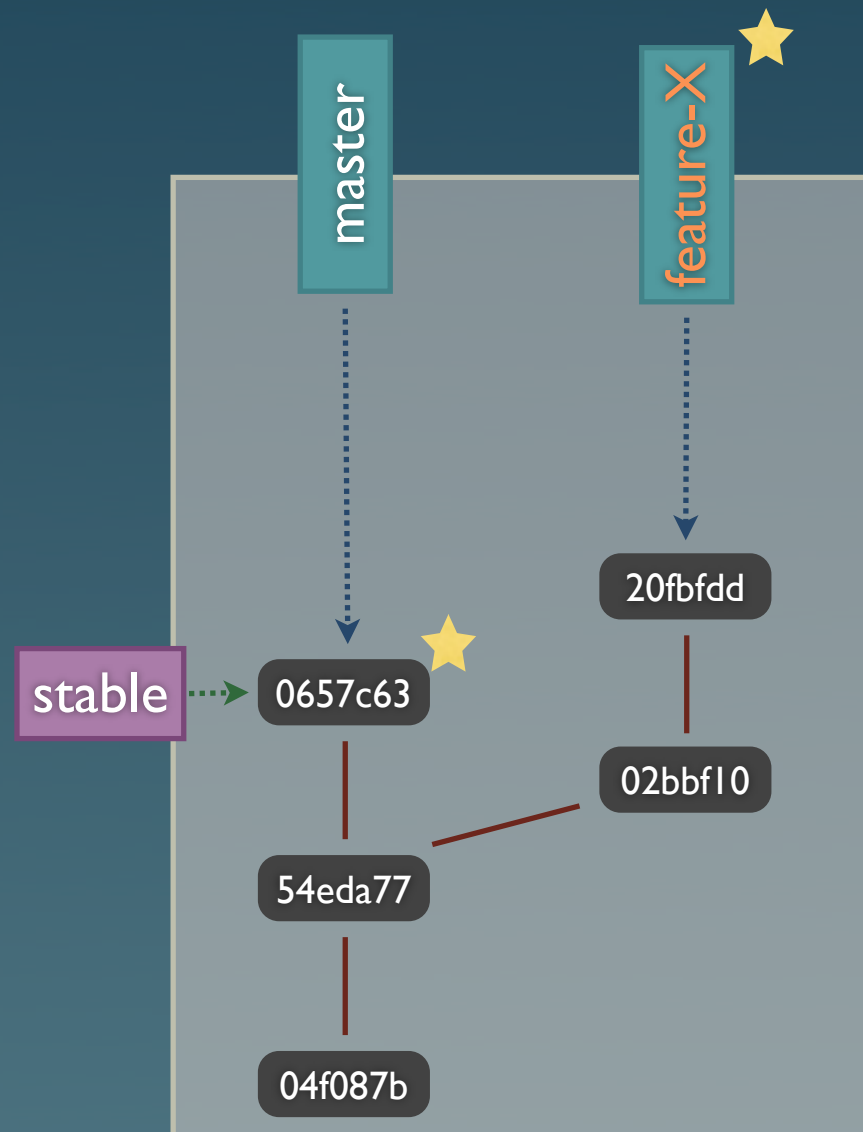


undo

```
$ git reset --hard stable # undo last merge  
HEAD is now at 0657c63 Proper commit
```

```
$ git checkout feature-X  
Switched to branch "feature-X"
```

```
Makefile  
README  
src  
|-- Makefile  
|-- helloworld.c  
`-- helloworld.h
```



rebase

```
$ git rebase master
```

First, rewinding head to replay your work on top of it...

Applying: Work on X

Applying: Edit README for X

```
$ git show-branch
```

```
* [feature-X] Edit README for X
```

```
! [master] Proper commit
```

```
--
```

```
* [feature-X] Edit README for X
```

```
* [feature-X^] Work on X
```

```
*+ [master] Proper commit
```

```
Makefile
```

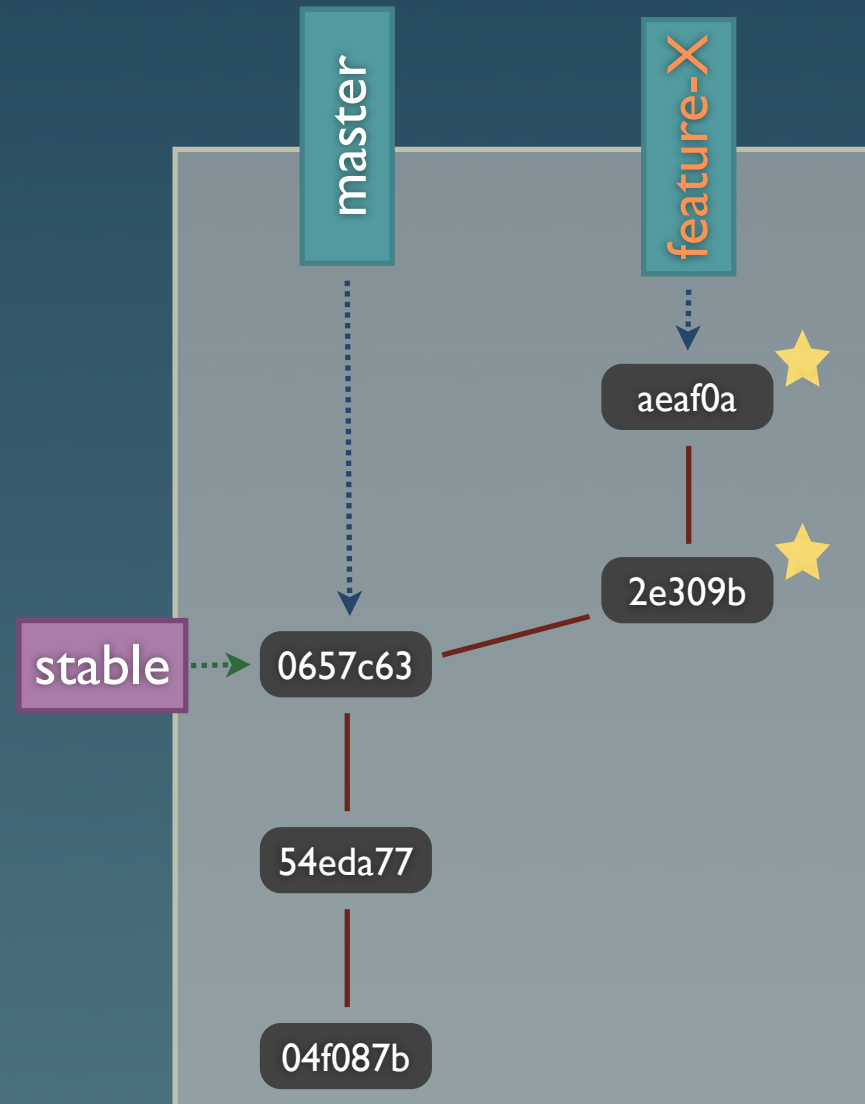
```
README
```

```
src
```

```
|-- Makefile
```

```
|-- helloworld.c
```

```
`-- helloworld.h
```



trivial merge

```
$ git checkout master
```

```
Switched to branch "master"
```

```
$ git merge feature-X
```

```
Updating 0657c63..aeaf0a9
```

```
Fast forward
```

```
README      | 1 +
```

```
src/helloworld.h | 1 +
```

```
2 files changed, 2 insertions(+), 0 deletions(-)
```

```
Makefile
```

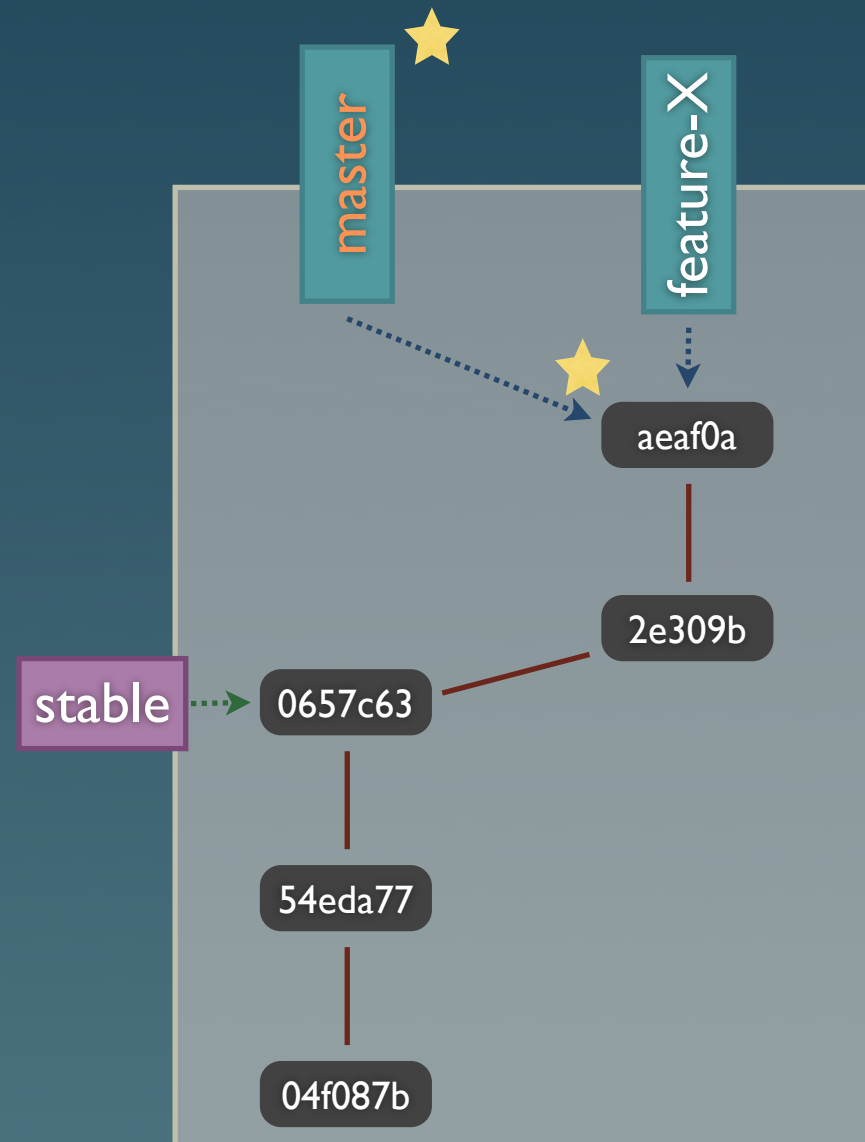
```
README
```

```
src
```

```
|-- Makefile
```

```
|-- helloworld.c
```

```
`-- helloworld.h
```



git show-branch

```
seb@faukes ~/Build/xmms2-devel $ git show-branch service-clients theefer sqlcrap
! [service-clients] PENDING REVIEW, INCOMPLETE
* [theefer] OTHER: Fix leaks with coll_read_collname.
! [sqlcrap] BEWARE! EXPERIMENTAL! Modified database schema to use integers for keys. BACKUP MEDIALIB!
---
* [theefer] OTHER: Fix leaks with coll_read_collname.
* [theefer^] BUG(1907): Allow 'All Media' as pshuffle input.
* [theefer~2] BUG(1095): Make xmms2d handle -h.
* [theefer~3] BUG(1904): Fix crash in volume setting/getting in pulseaudio plugin.
* [theefer~4] OTHER: Added PGP fingerprint for Sebastian Noack (wallunit).
* [theefer~5] OTHER: Updated my PGP key fingerprint
* [theefer~6] OTHER: Another try on implementing perl constant mapping.
* [theefer~7] OTHER: Fix some compilation warnings in the perl bindings.
* [theefer~8] BUG(1896): Made the config object use a BST instead of a hashtable.
+ [sqlcrap] BEWARE! EXPERIMENTAL! Modified database schema to use integers for keys. BACKUP MEDIALIB!
+ [sqlcrap^] OTHER: Make sources two way hashable.
++ [theefer~9] OTHER: Remove old unused visualisation
++ [theefer~10] OTHER: Cache result of "get next medialib id" in xmms_medialib_session_t
++ [theefer~11] FEATURE(1470): Add xmmsc_playlist_add_idlist and make cli's addpls use it.
++ [theefer~12] BUG(1805): Add xform_media_browse_encoded to pythonbindings.
++ [theefer~13] BUG(1822): Properly emit entry_added broadcasts when using the radd command.
++ [theefer~14] BUG(1893): Fix handling of playlists to "xmms2 add" cli command.
++ [theefer~15] BUG(1875): Fix leak in cue plugin.
++ [theefer~16] OTHER: cleanup xmmsclient-glib
++ [theefer~17] BUG(1861): copy startup scripts instead of doing nothing when the os doesn't support symlinks
++ [theefer~18] OTHER: disable ET on win32
++ [theefer~19] BUG(1873): don't try to install objects in pixmaps
++ [theefer~20] OTHER: log error when a script fails to run
+ [service-clients] PENDING REVIEW, INCOMPLETE
+ [service-clients^] OTHER: Add service id to the result of service method changed broadcast.
+ [service-clients~2] OTHER: Add other service broadcasts and related functions in clientlib.
+ [service-clients~3] OTHER: Ignore Emacs temp file.
```

gitk

The screenshot shows the gitk graphical user interface for a repository named 'xms2-devel'. The main window is divided into several sections:

- Commit History (Left):** A tree view showing the commit history. The current commit is highlighted in green. The commit message is: "OTHER: Add service id to the result of service method cha". The commit is linked to the 'remotes/theefer/master' branch.
- Commit Details (Right):** A table showing the commit details for the selected commit. The commit is by Sebastien Cevey on 2008-03-05 at 00:08:13. The commit message is: "OTHER: Add service id to the result of service method cha".
- SHA1 ID:** 931925a66df66ee6ea05be6c388abe5d76564f60
- Highlight:** Commits touching paths: (empty) OR in view: None OR on (empty)
- Search:** A search box with the text "Search".
- Diff View (Bottom):** A diff view showing the changes between the current commit and its parent. The diff is for the file 'src/clients/cli/cmd_coll.c'. The changes are: 'src/clients/cli/cmd_coll.c', 'src/clients/cli/cmd_pls.c', and 'src/clients/cli/common.c'. The diff view is currently showing the 'Patch' view.

gitk

The screenshot shows the gitk interface for a repository named 'xmms2-devel'. The main window displays a commit history graph on the left and a list of commit messages and dates on the right. The graph shows a series of commits, with a merge commit '0.4DrKosmos' into the 'debian' branch. The commit messages include various updates to dependencies, version numbers, and package names. The dates range from 2007-11-13 to 2008-01-27.

Commit Message	Author	Date
DEBIAN: Remove builddir for all pythonversions in clean ta	Anders Waldenborg <anders@debian.org>	2008-01-27 19:43:06
DEBIAN: Change/update some dependencies.	Anders Waldenborg <anders@debian.org>	2008-01-27 19:42:44
DEBIAN: Clean up some rules dependencies.	Florian Ragwitz <rafl@debian.org>	2007-11-16 10:10:34
DEBIAN: Fix the version number.	Florian Ragwitz <rafl@debian.org>	2007-11-16 09:24:25
DEBIAN: Changelogging for DrKosmos.	Florian Ragwitz <rafl@debian.org>	2007-11-16 09:05:12
Merge commit '0.4DrKosmos' into debian	Florian Ragwitz <rafl@debian.org>	2007-11-16 08:58:59
DEBIAN: Update version number.	Florian Ragwitz <rafl@debian.org>	2007-11-15 07:57:28
Merge branch 'master' into debian	Florian Ragwitz <rafl@debian.org>	2007-11-15 07:57:02
DEBIAN: Build the python module for both 2.4 and 2.5	Florian Ragwitz <rafl@debian.org>	2007-11-15 07:51:21
DEBIAN: Don't pass install twice to waf.	Florian Ragwitz <rafl@debian.org>	2007-11-13 15:50:45
Merge branch 'master' into debian	Florian Ragwitz <rafl@debian.org>	2007-11-13 15:23:06
DEBIAN: Package the pulse plugin.	Florian Ragwitz <rafl@debian.org>	2007-11-13 13:43:32
DEBIAN: Adjust debian/rules to the new SONAMEs.	Florian Ragwitz <rafl@debian.org>	2007-11-13 13:29:03
Merge commit 'anders/master' into debian	Florian Ragwitz <rafl@debian.org>	2007-11-13 13:20:46
DEBIAN: changelogging.	Florian Ragwitz <rafl@debian.org>	2007-11-13 13:19:27
DEBIAN: Update package names to reflect SONAMEs.	Florian Ragwitz <rafl@debian.org>	2007-11-13 13:17:16
Merge branch 'master' into debian	Florian Ragwitz <rafl@debian.org>	2007-11-13 12:52:33
DEBIAN: Fix debian/NEWS syntax.	Florian Ragwitz <rafl@debian.org>	2007-11-13 12:19:42
DEBIAN: Add packages for the normalize plugin.	Florian Ragwitz <rafl@debian.org>	2007-11-13 12:17:02
DEBIAN: Add packages for the asf plugin.	Florian Ragwitz <rafl@debian.org>	2007-11-13 12:07:13
DEBIAN: Install the pixmaps into xmms2-core.	Florian Ragwitz <rafl@debian.org>	2007-11-13 12:03:00
DEBIAN: Call waf with --nocache.	Florian Ragwitz <rafl@debian.org>	2007-11-13 11:55:40
DEBIAN: Remove obsolete patches.	Florian Ragwitz <rafl@debian.org>	2007-11-13 11:51:34

SHA1 ID: 931925a66df66ee6ea05be6c388abe5d76564f60

Highlight: Commits touching paths: OR in view None OR on

Search Patch Tree

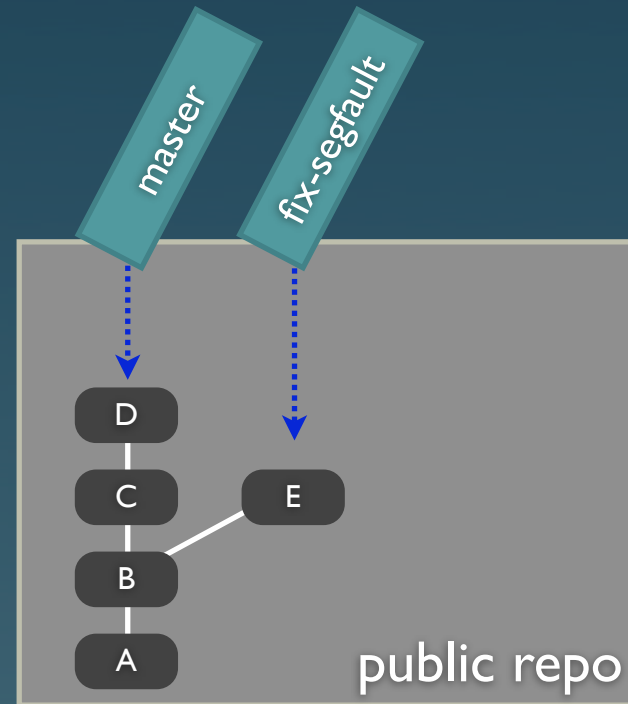
Diff Old version New version lines of content

Author: Sebastien Cevey <seb@cine7.org>
Committer: Sebastien Cevey <seb@cine7.org>
Parent: 9cf45f636caa89591ded058544
Child: 00000000000000000000000000000000
Branches: remotes/theefer/master,
Follows: 0.4DrKosmos
Precedes:

Comments
src/clients/cli/cmd_coll.c
src/clients/cli/cmd_pls.c
src/clients/cli/common.c

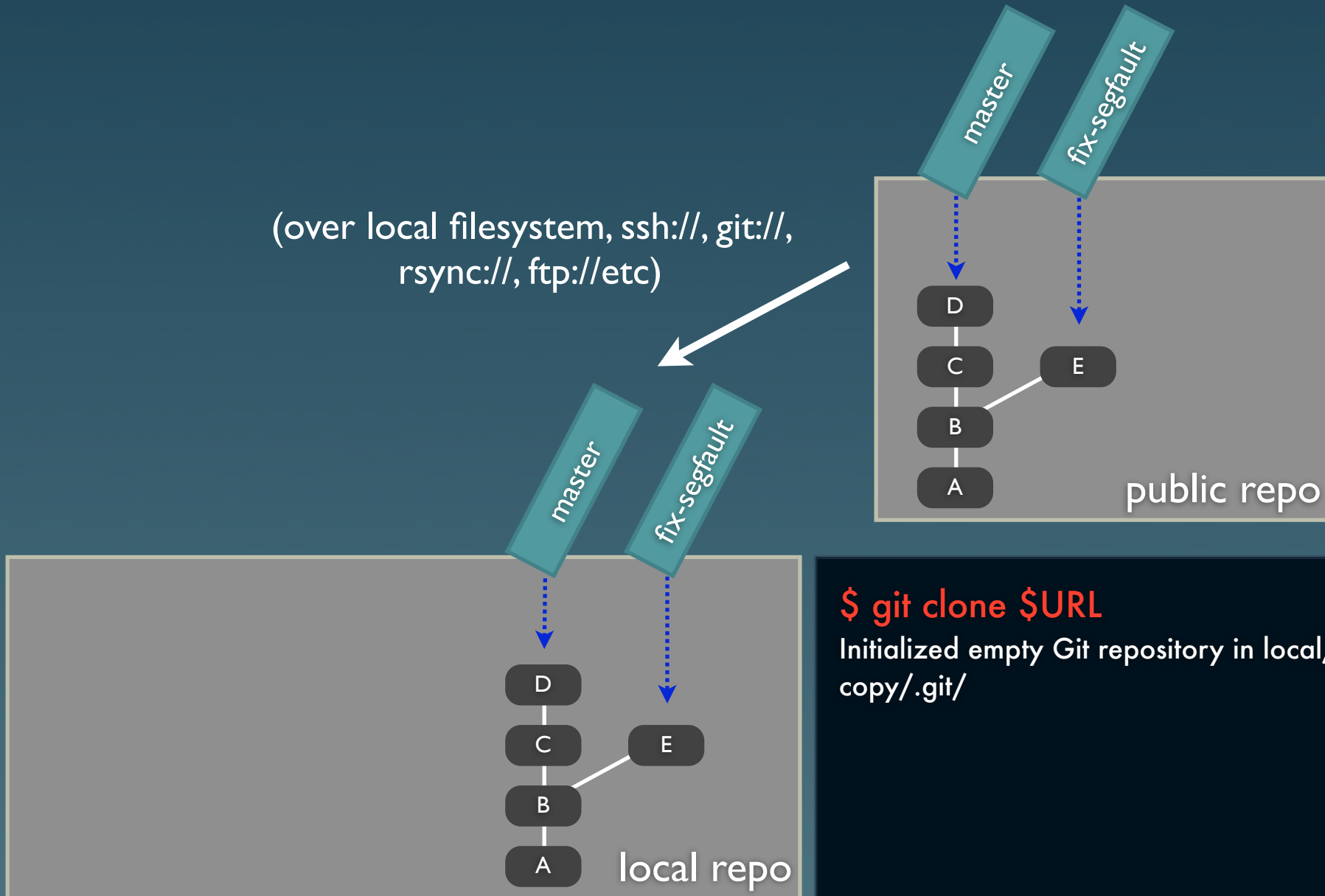
3. Distributed Work

public repository



clone

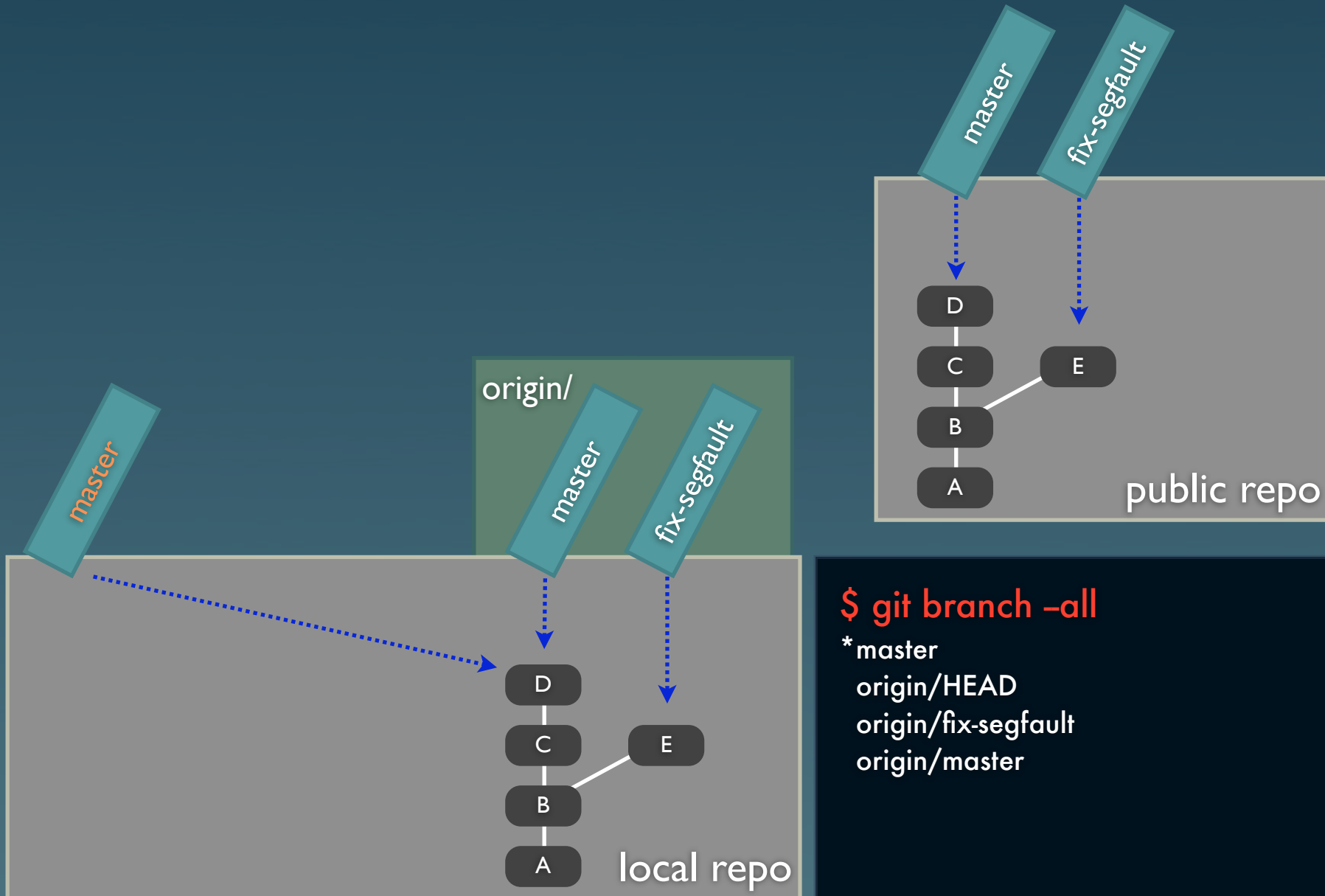
(over local filesystem, ssh://, git://, rsync://, ftp://etc)



\$ git clone \$URL

Initialized empty Git repository in local/
copy/.git/

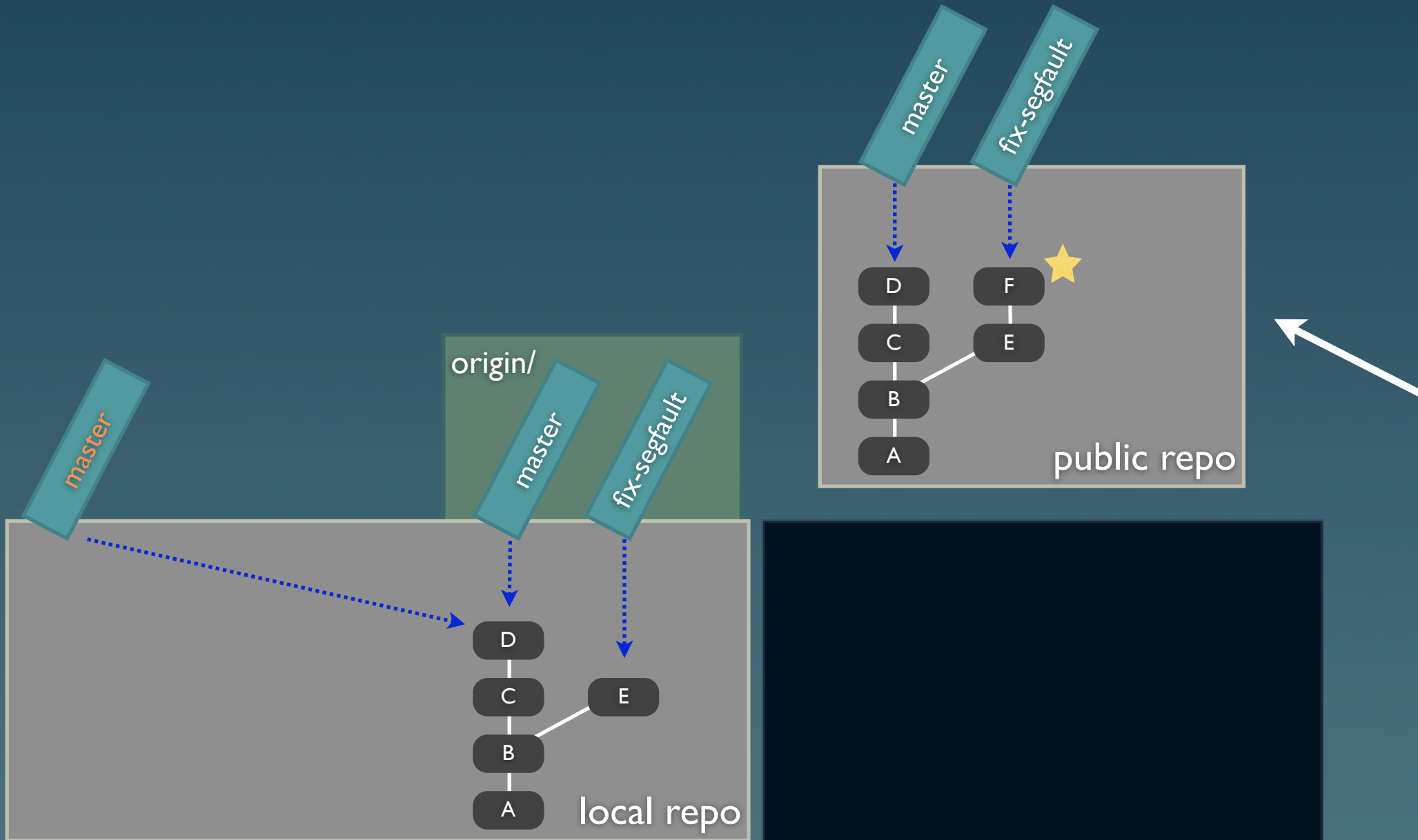
branch namespace



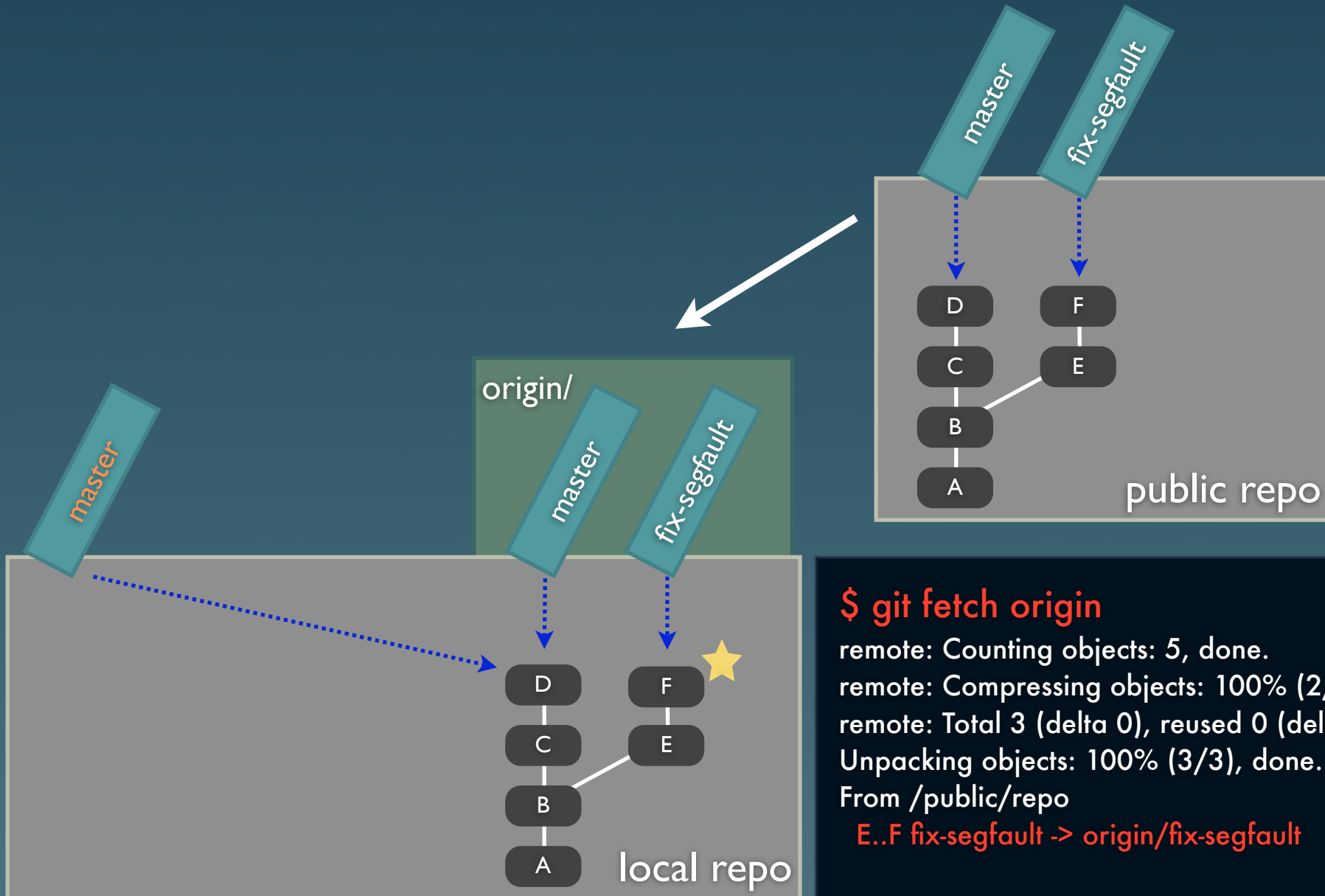
```
$ git branch -all
```

```
* master  
origin/HEAD  
origin/fix-segfault  
origin/master
```

public repository updated



fetch update



\$ git fetch origin

remote: Counting objects: 5, done.

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

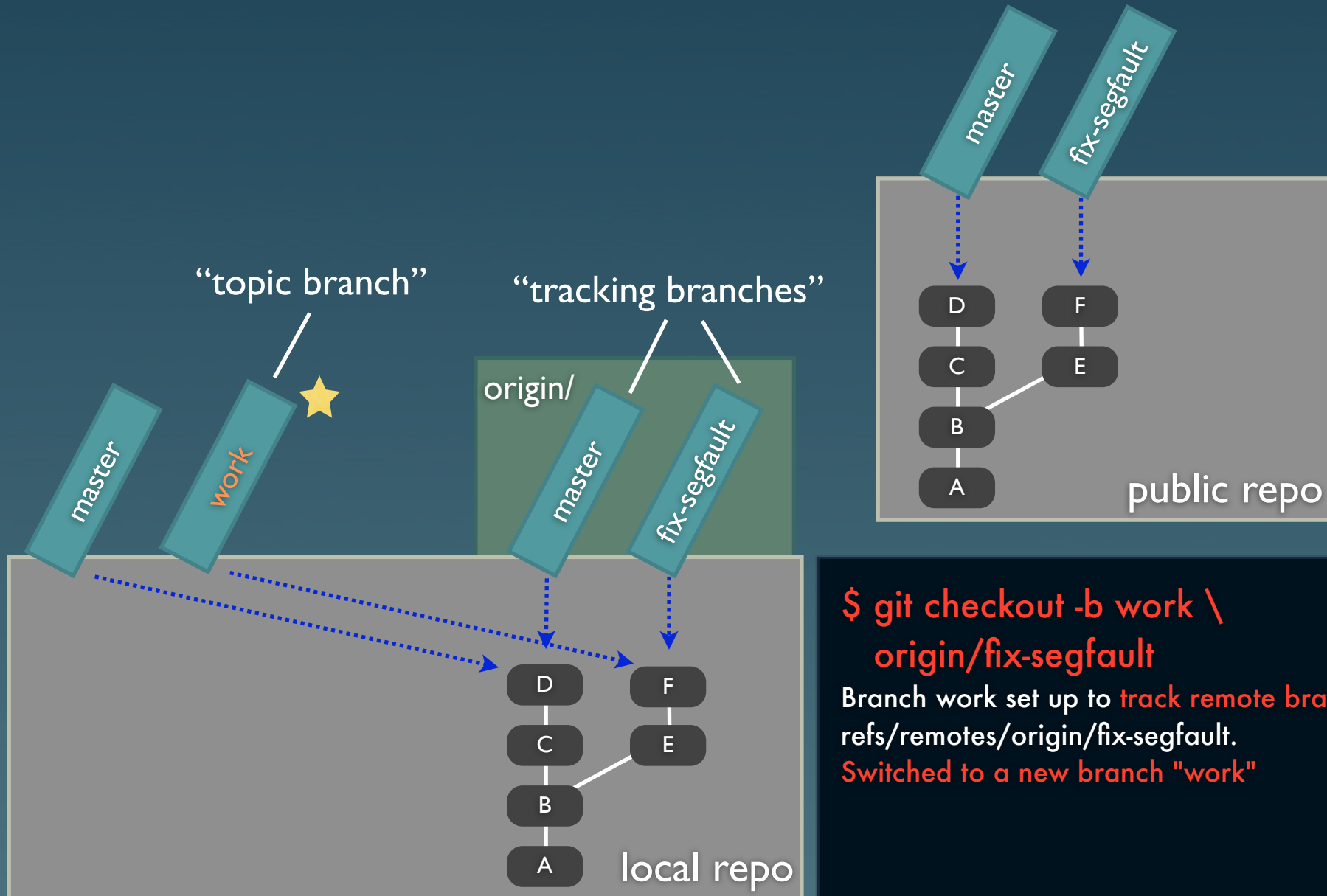
remote: Total 3 (delta 0), reused 0 (delta 0)

Unpacking objects: 100% (3/3), done.

From /public/repo

E..F fix-segfault -> origin/fix-segfault

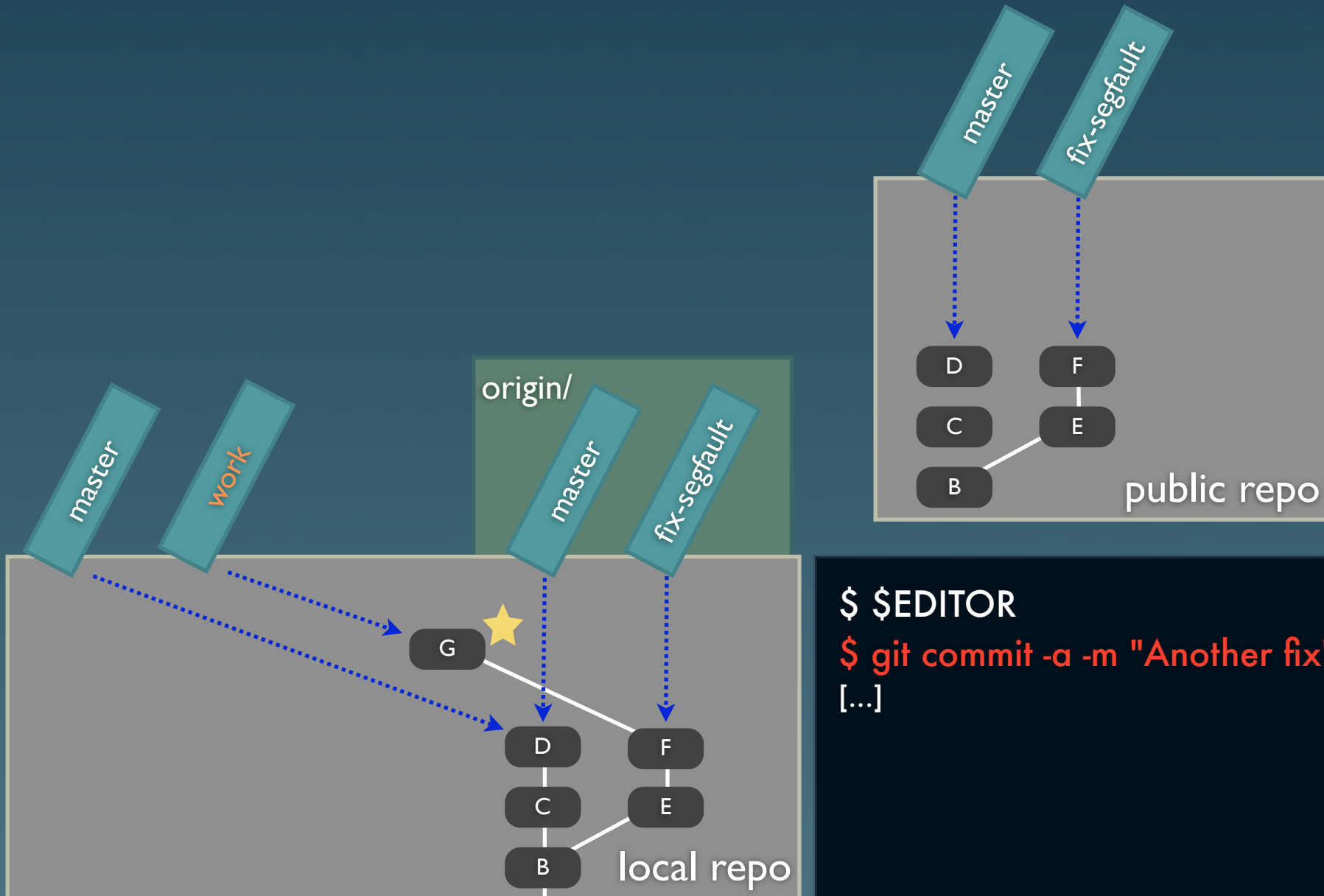
checkout tracking branch



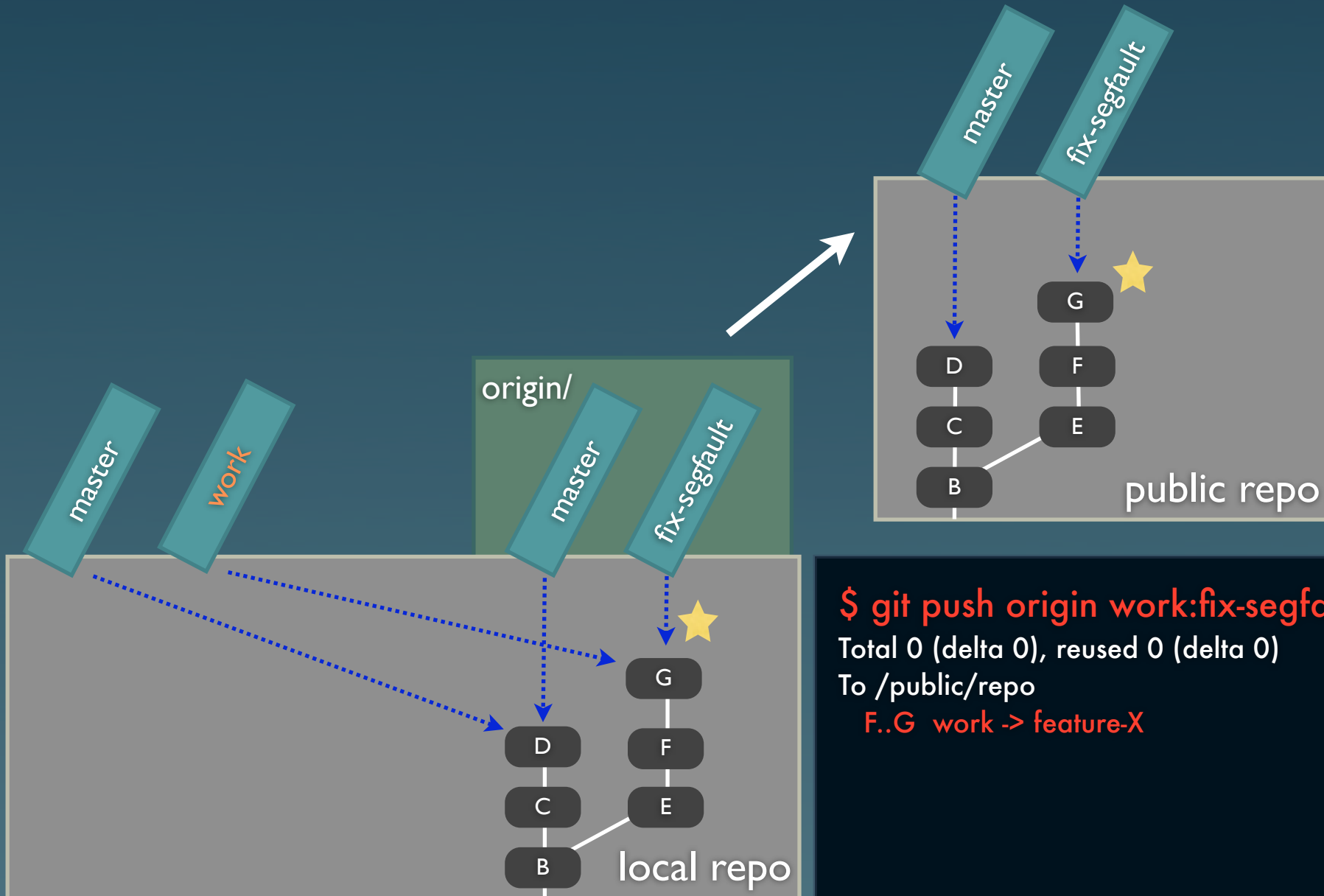
```
$ git checkout -b work \
origin/fix-segfault
```

Branch `work` set up to track remote branch refs/remotes/origin/fix-segfault. Switched to a new branch "work"

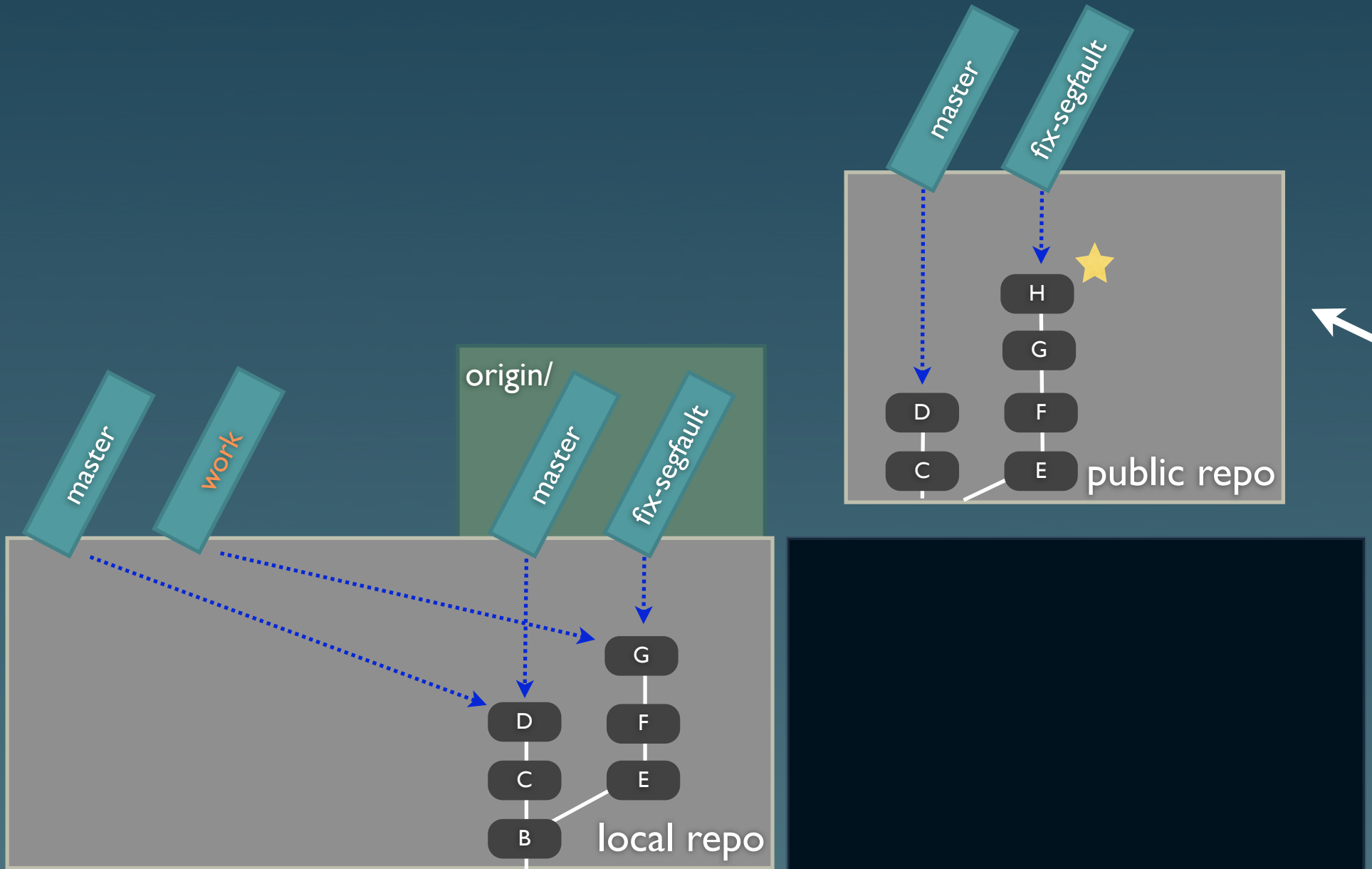
commit topic branch



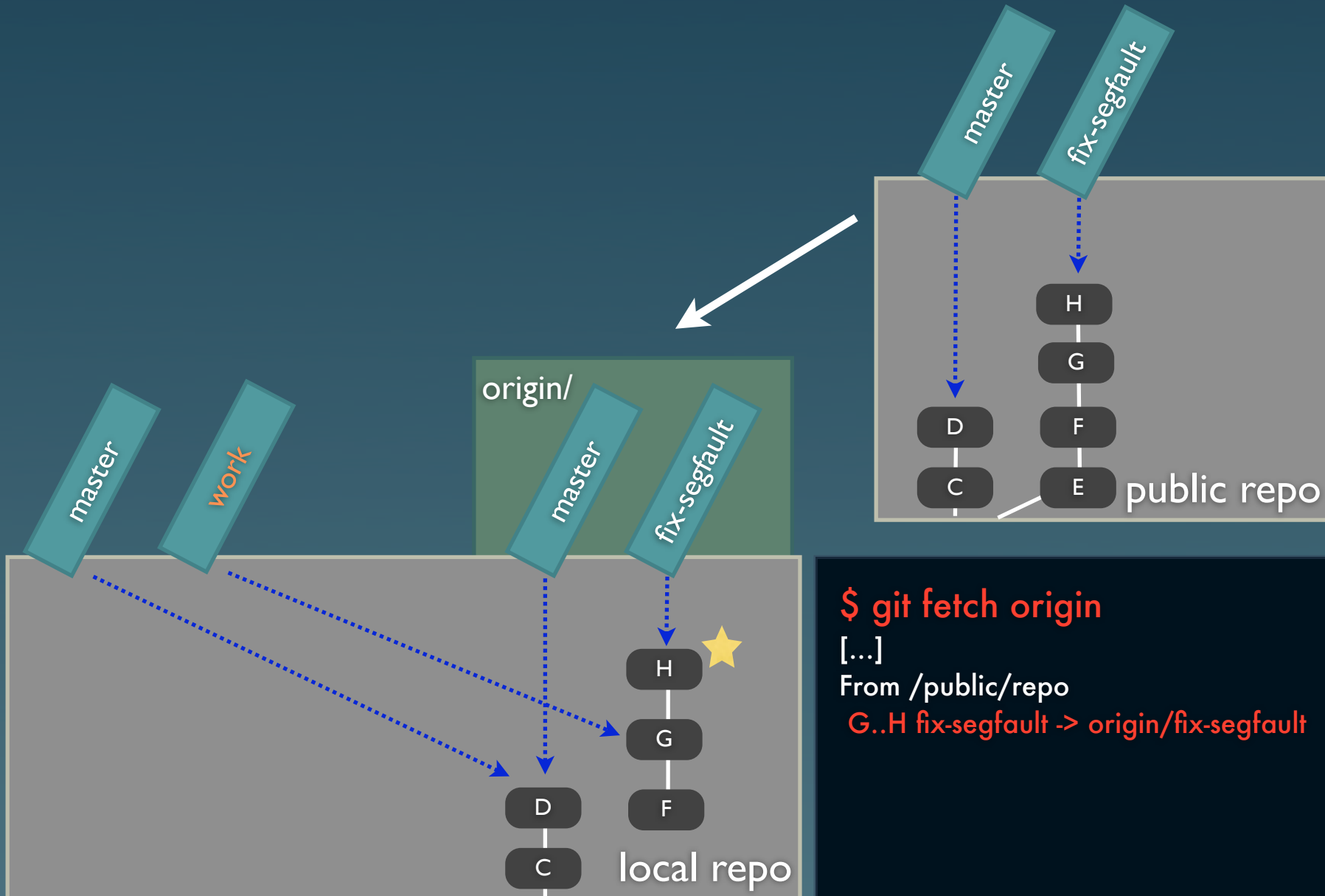
push new commit



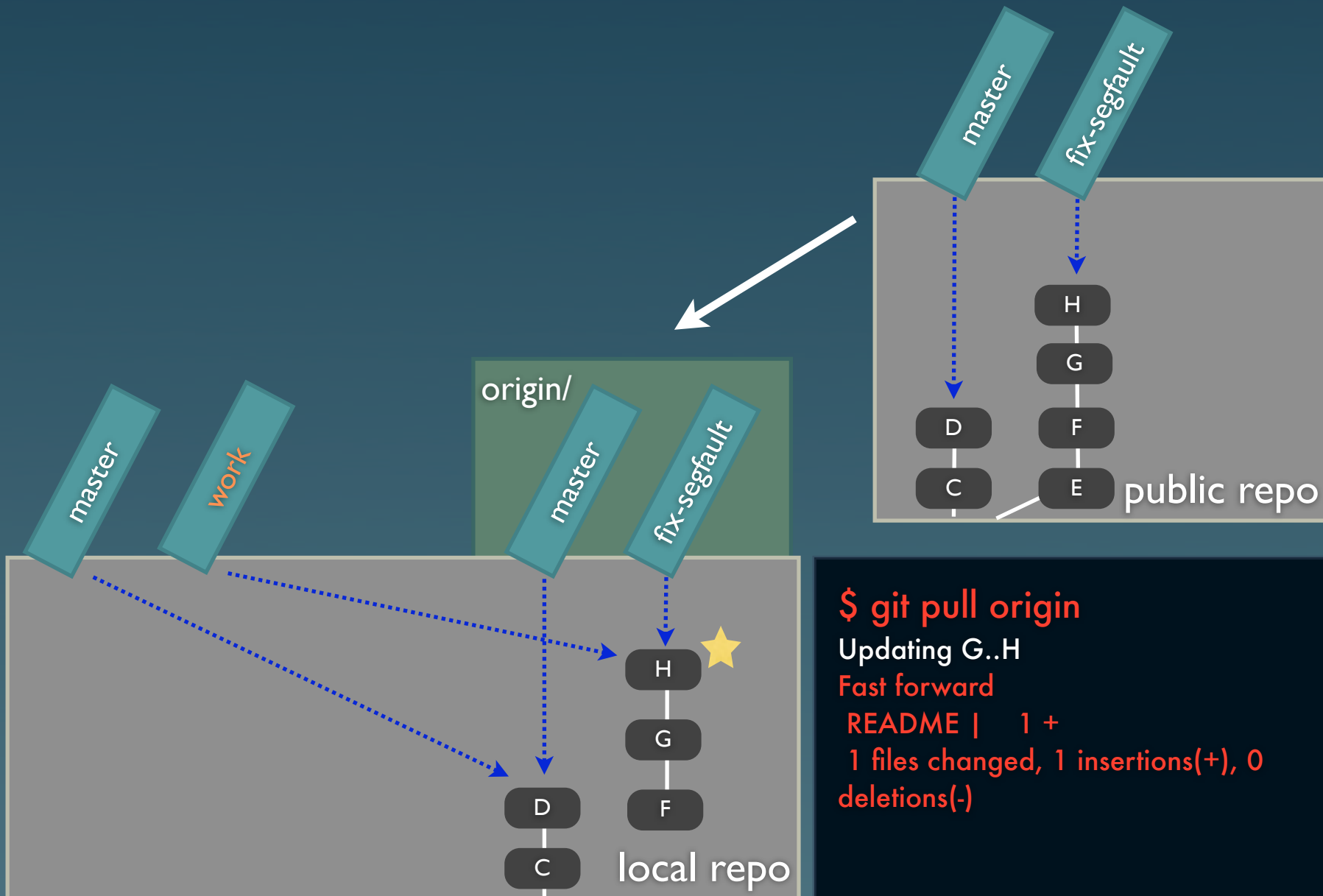
public repository updated



fetch update



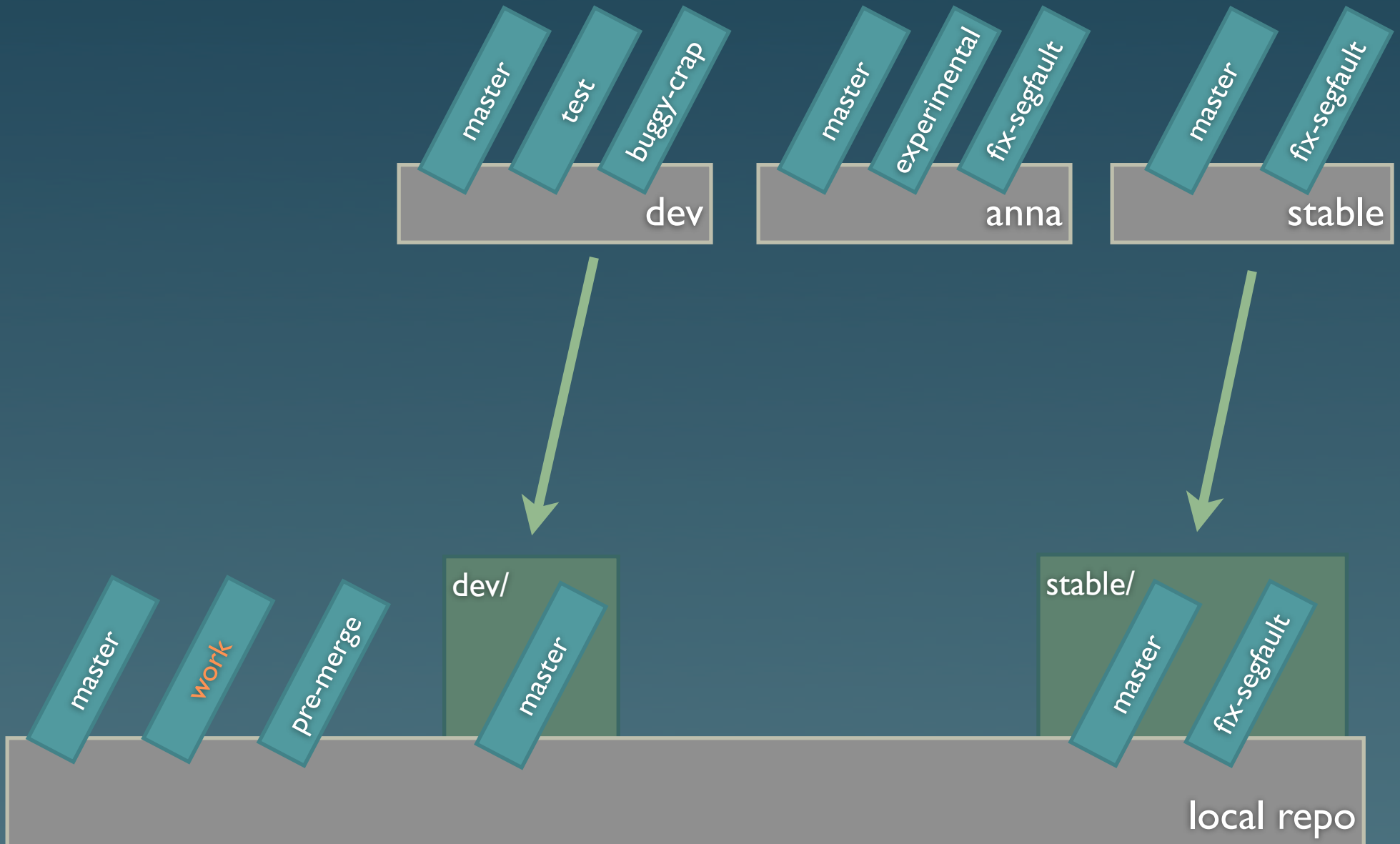
pull to merge update



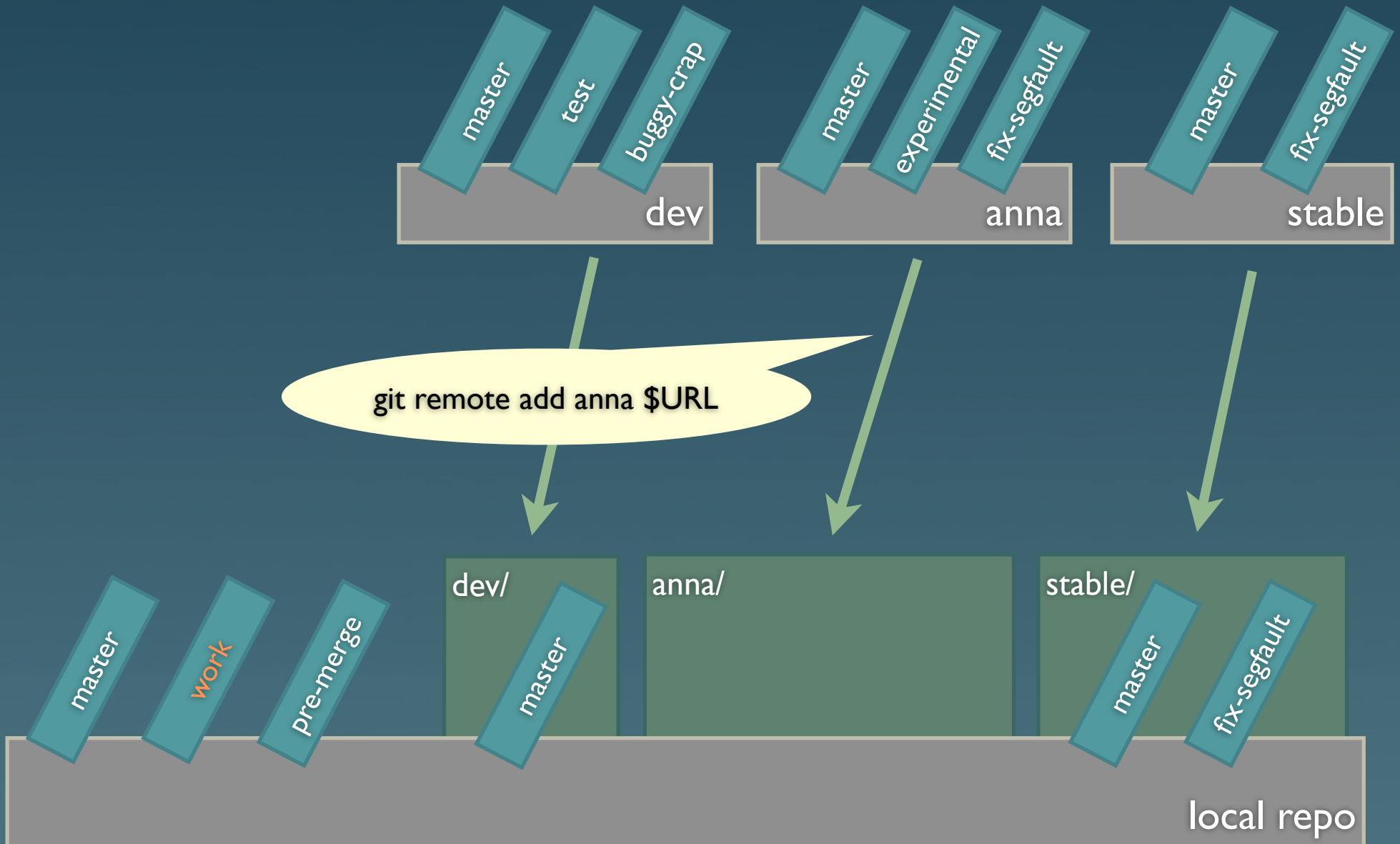
Basic multi-repo commands

- **git clone**: init a copy of a repository
- **git fetch**: sync remote repo R with local branches R/*
- **git pull**: fetch + merge
- `git push <repo> [<local-branch>:<remote-branch>]`

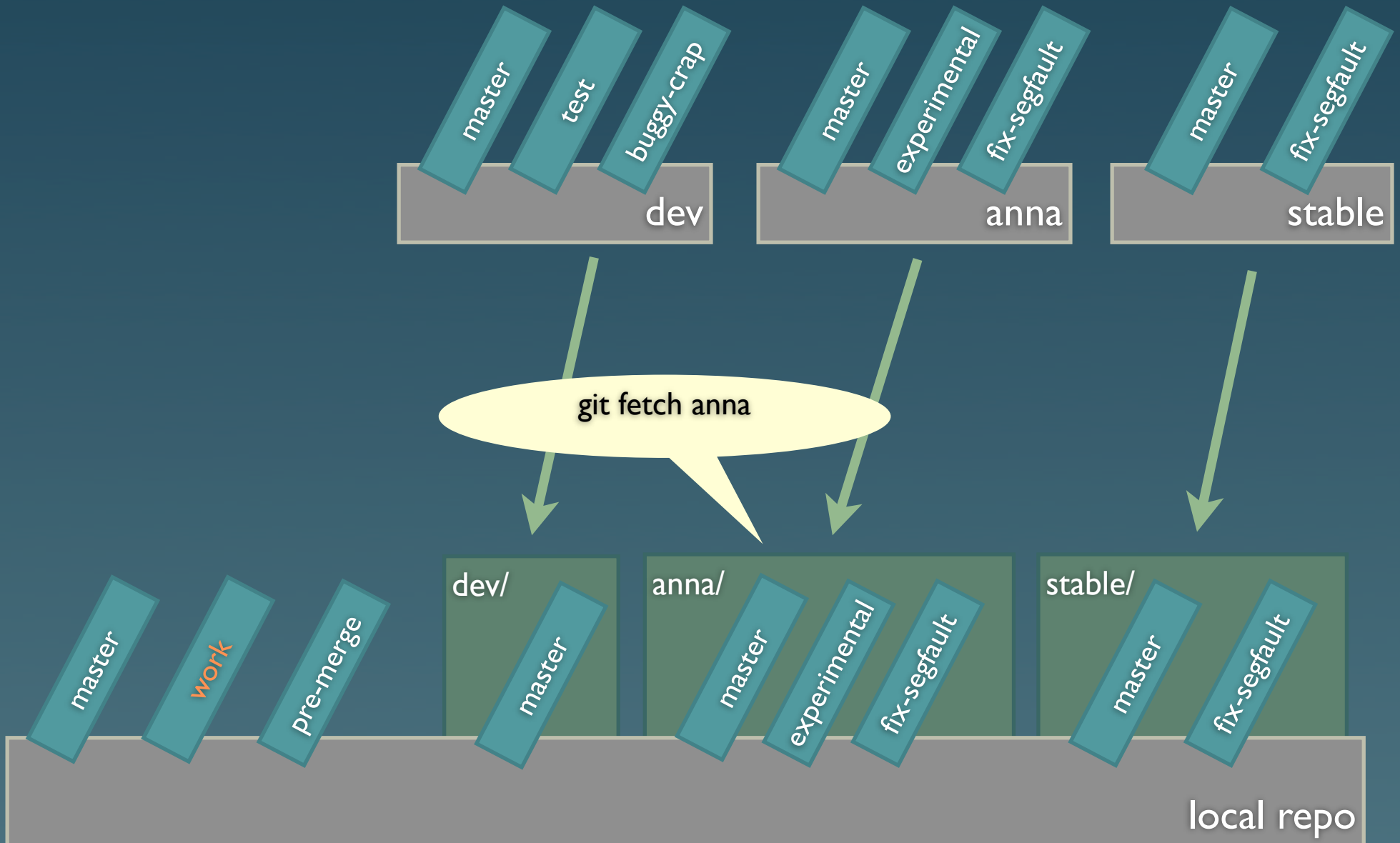
Real-life layout



Real-life layout



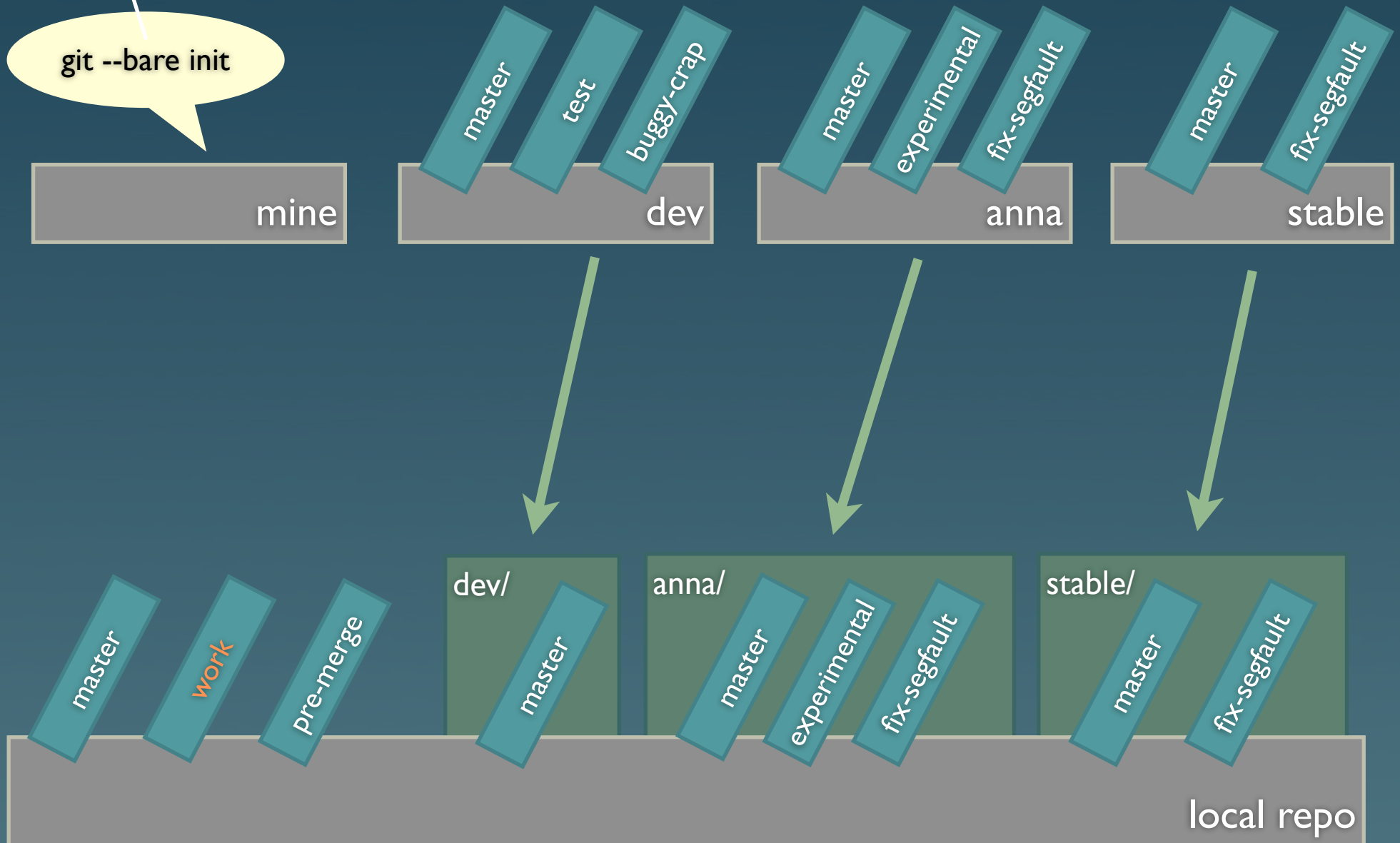
Real-life layout



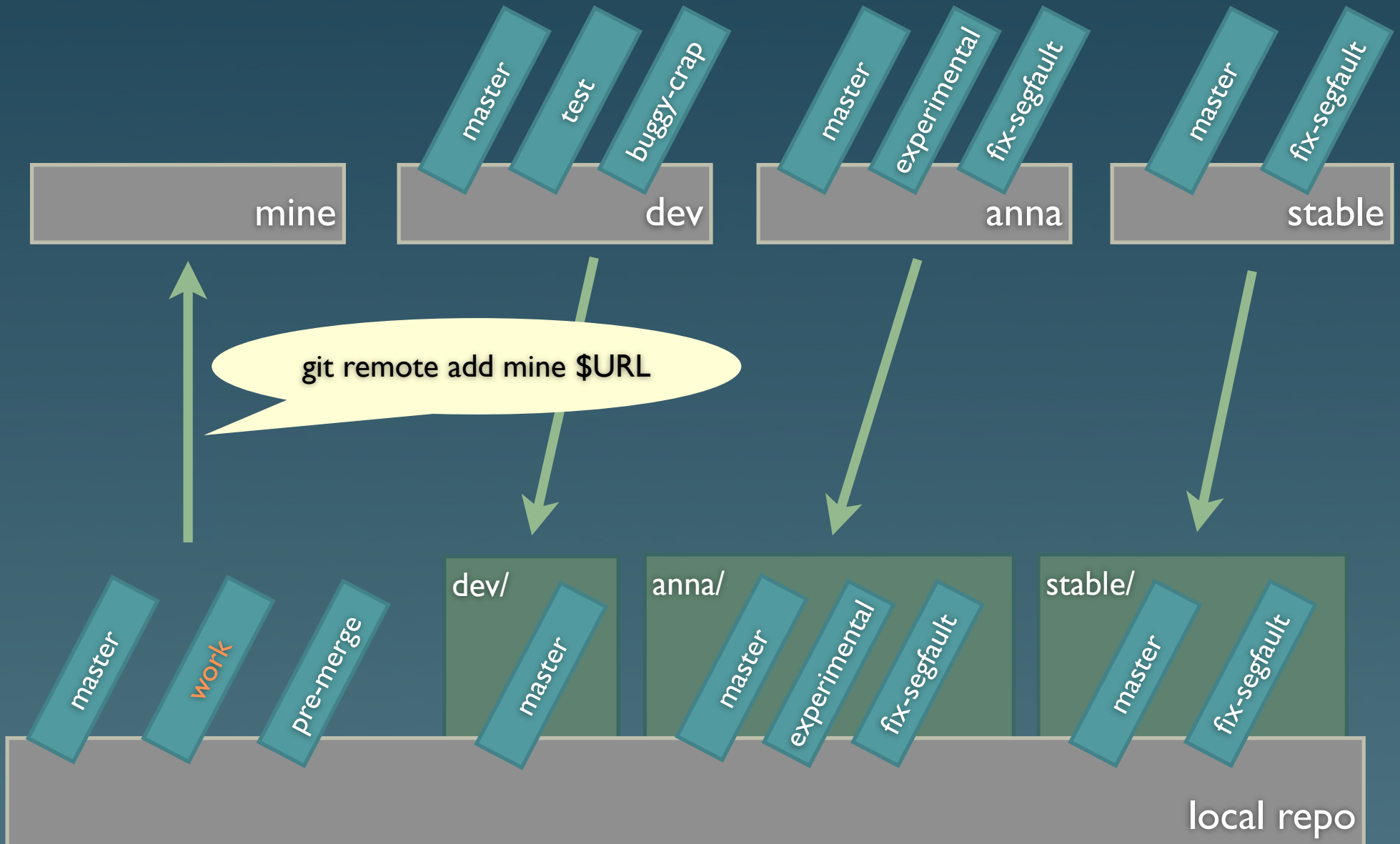
Real-life layout

“just a repo,
not in .git/”

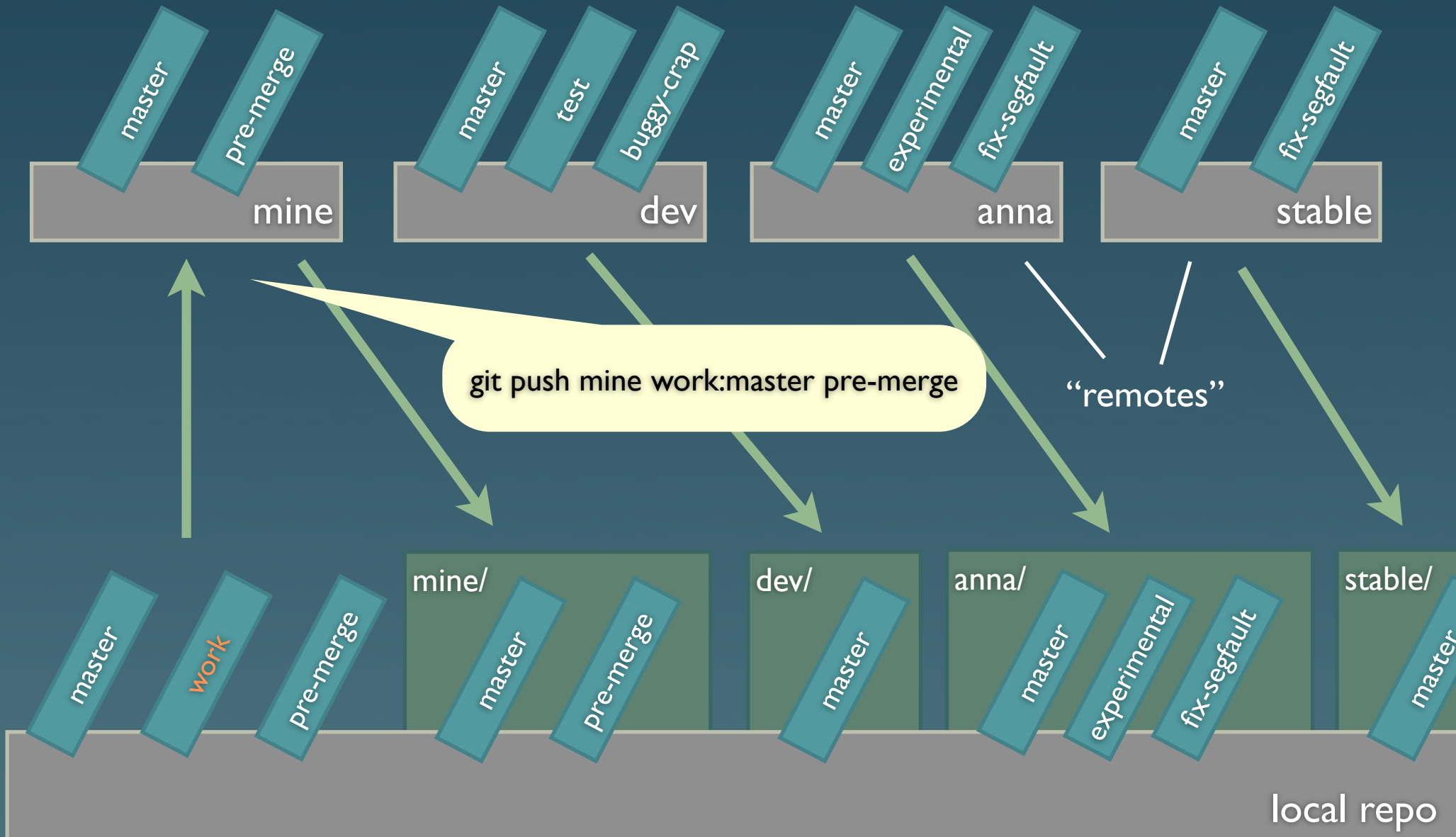
git --bare init



Real-life layout



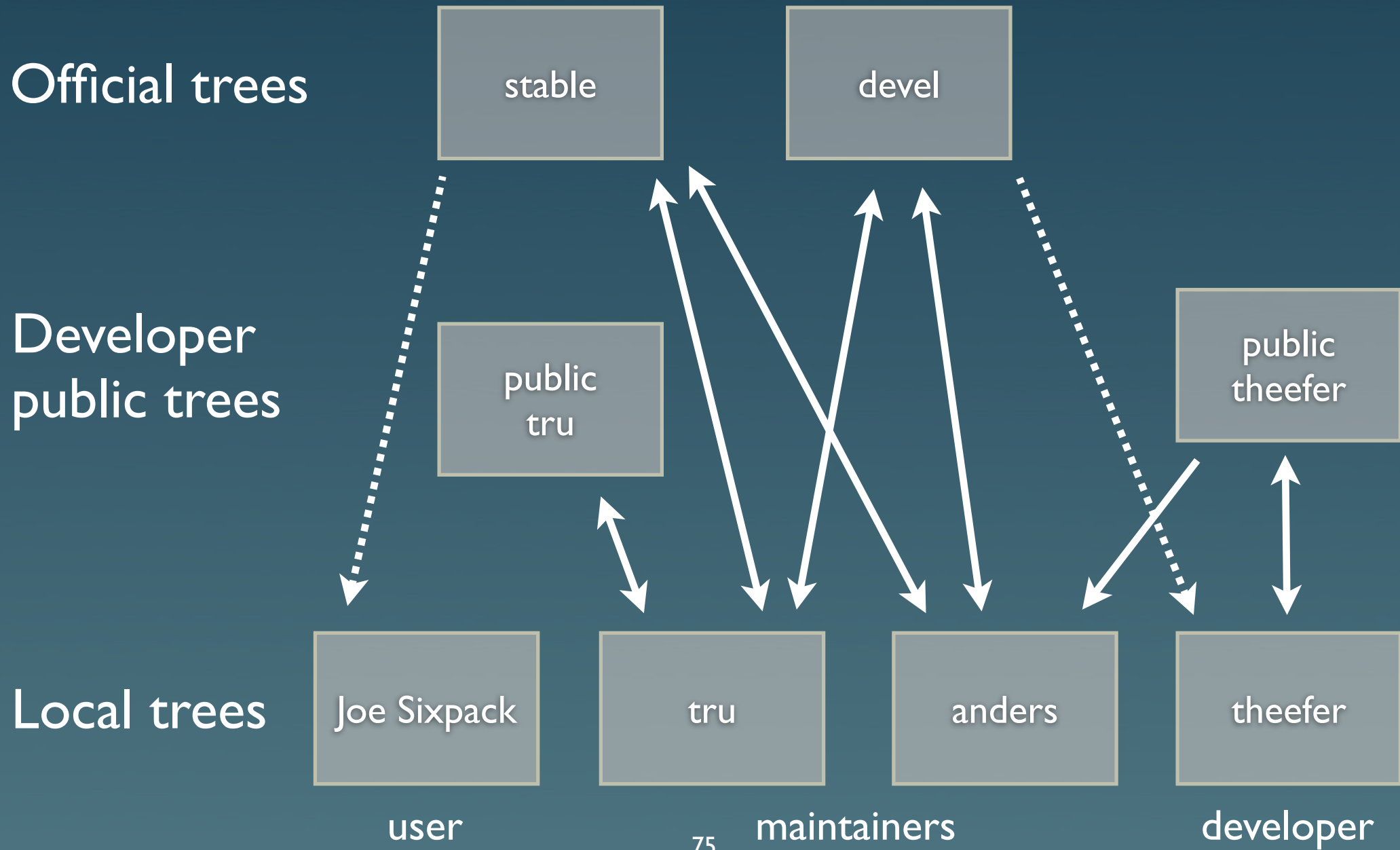
Real-life layout



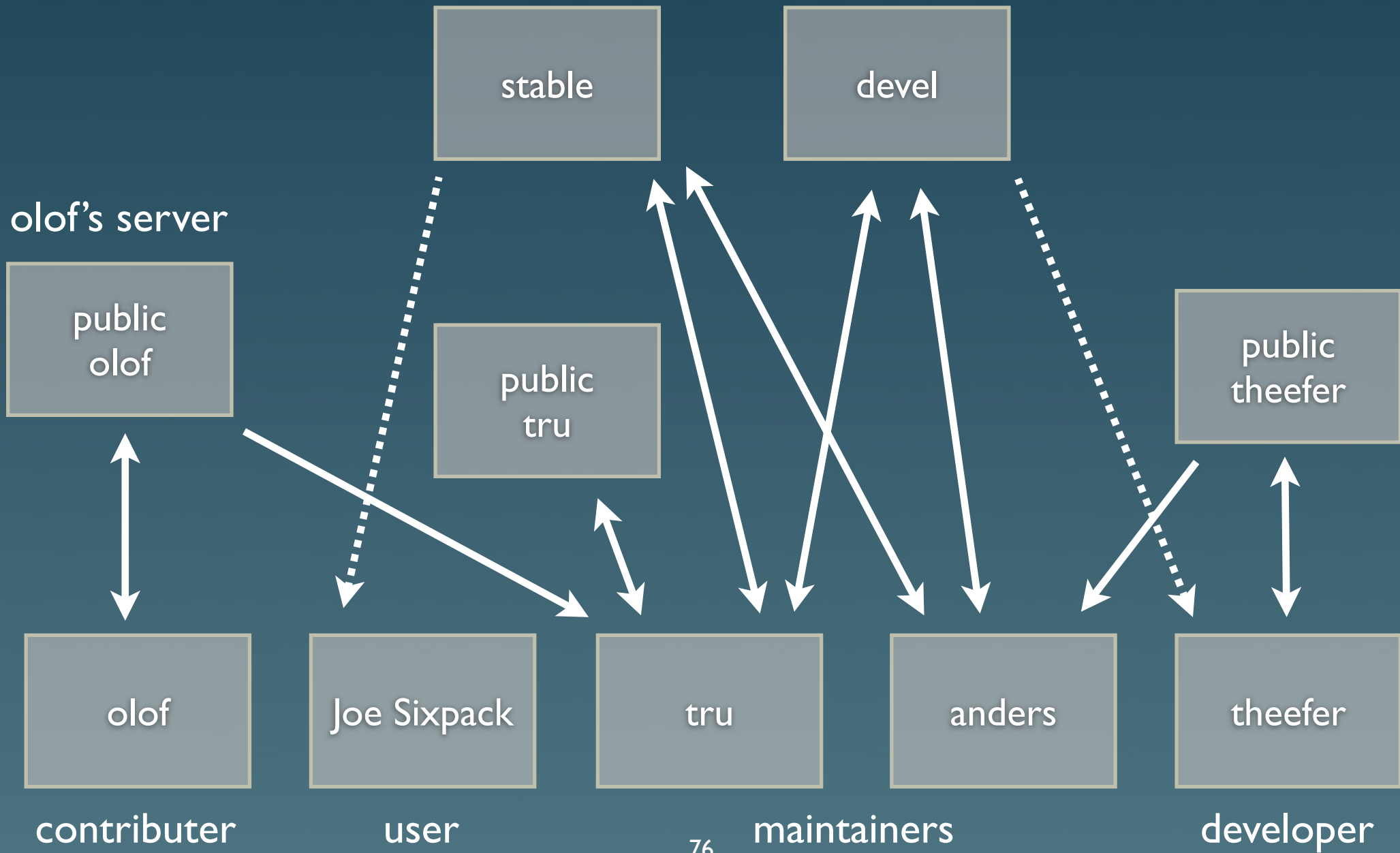
git remote

- Help track remote (i.e. other) repositories
- Pull from / push to them
- Use tracking branches like any branch (merge, rebase, diff, log, show, etc)

e.g. XMMS2 trees



e.g. XMMS2 trees



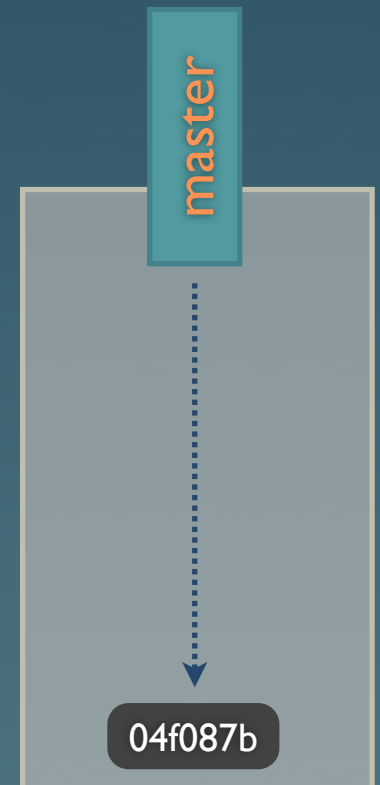
4. Advanced Features

Between the working directory and the repository

Working Directory

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
```

Repository



The Index (or “Staging Area”)

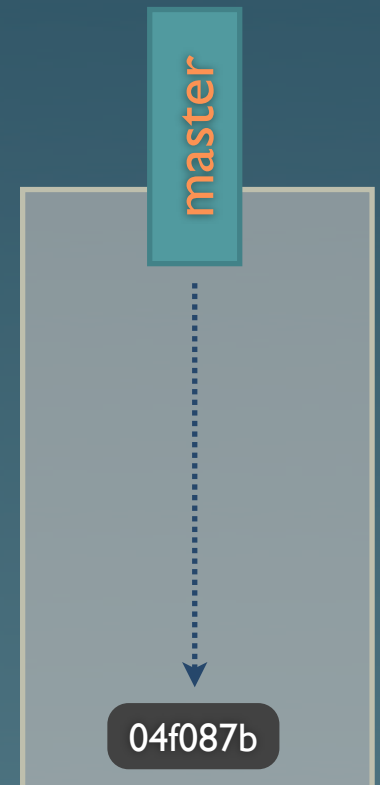
Working Directory

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
```

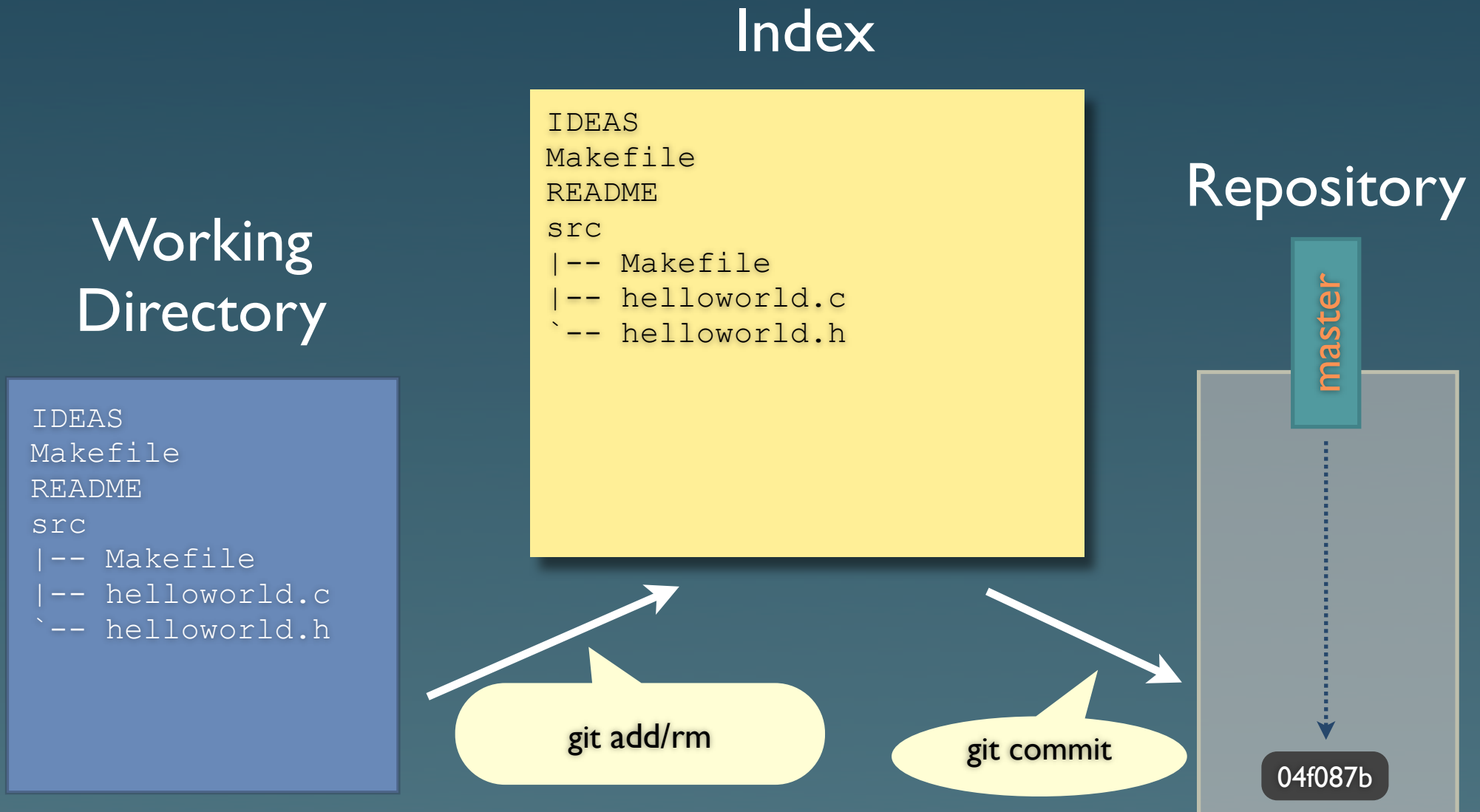
Index

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
```

Repository



Committing using the index



Bypassing the Index

Index

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
```

Repository

master

04f087b

Working Directory

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
```

git commit -a

new file

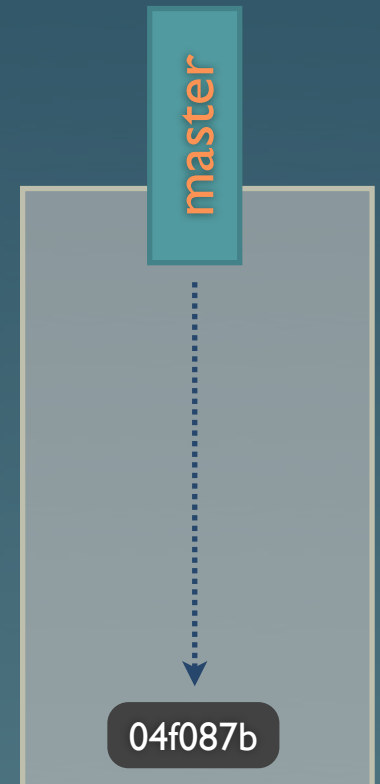
Index

Repository

Working Directory

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
test.c <- new file ★
TODO <- new file
```

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
```



new file

Index

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
```

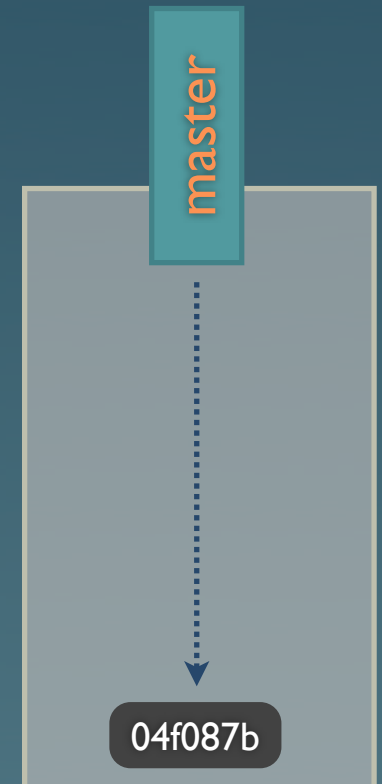
\$ git status

```
# On branch master
# Changed but not updated:
# (use "git add <file>..." to update
# what will be committed)
#
#       modified:   test.c
#       modified:   TODO
#
no changes added to commit (use
"git add" and/or "git commit -a")
```

Working Directory

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
test.c <- new file ★
TODO    <- new file
```

Repository



new file: add to index

Working Directory

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
test.c <- new file
TODO
```

Index

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
TODO <- new file★
```

git add TODO

Repository

master

04f087b

new file: add to index

Working Directory

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
test.c <- new file
TODO
```

Index

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
TODO <- new file★
```

git add TODO

```
$ git status
# On branch master
# Changes to be committed:
#   (use "git reset HEAD <file>..." to unstage)
#
#       modified:   TODO
#
# Changed but not updated: [...]
```

master

04f087b

new file: commit index

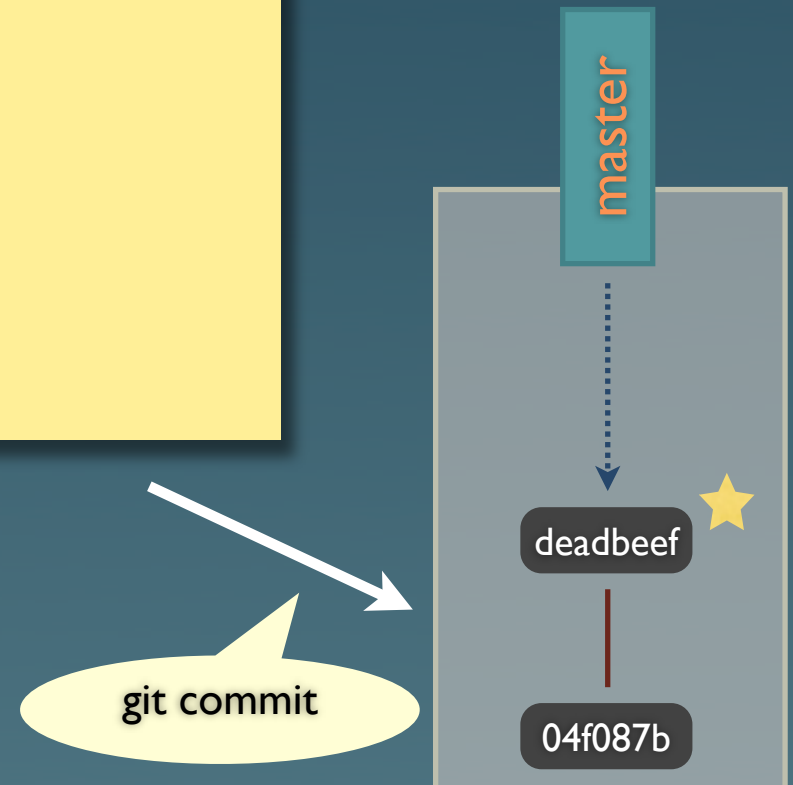
Working Directory

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
test.c <- new file
TODO
```

Index

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
TODO
```

Repository



edited file

Index

Repository

Working Directory

```
IDEAS
Makefile
README <- edited ★
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
test.c <- new file
TODO
```

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
TODO
```



edited file: update index

Index

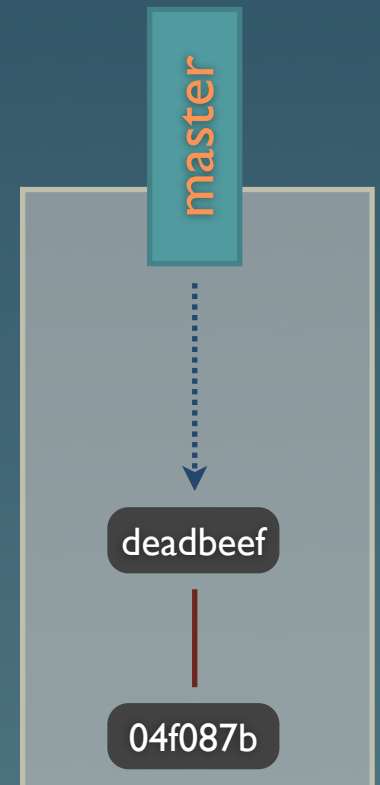
```
IDEAS
Makefile
README  <- edited★
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
TODO
```

Working Directory

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
test.c <- new file
TODO
```

git add README

Repository



edited file: commit index

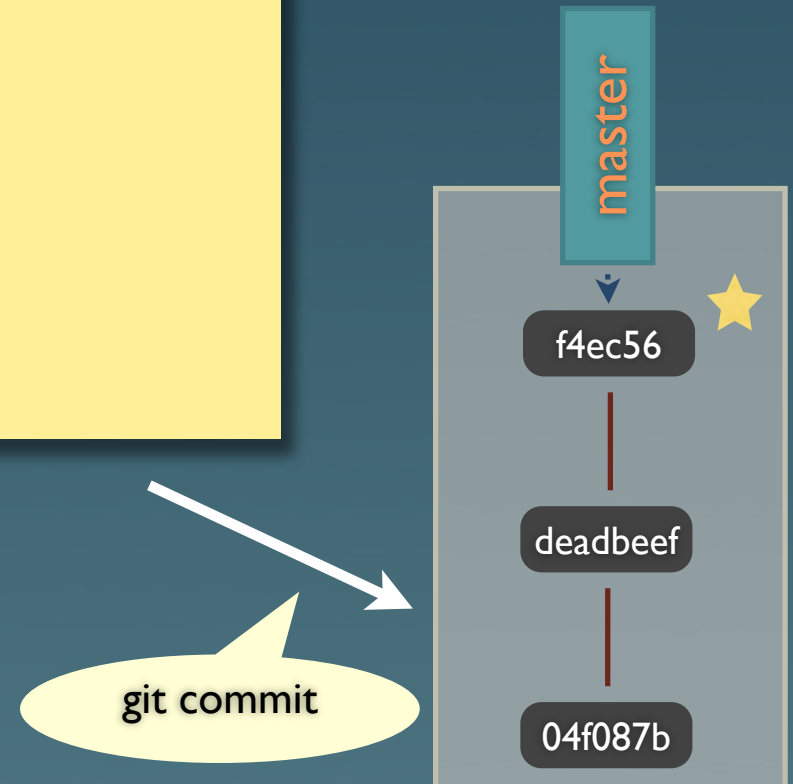
Working Directory

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
test.c <- new file
TODO
```

Index

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
TODO
```

Repository



edited file

Index

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
TODO
```

Working Directory

```
IDEAS <- 3 hunks ★
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
test.c <- new file
TODO
```

Repository



add selected hunks to index

Working Directory

```
IDEAS    <- 2 hunks ★  
Makefile  
README  
src  
|-- Makefile  
|-- helloworld.c  
`-- helloworld.h  
test.c <- new file  
TODO
```

Index

```
IDEAS    <- 1 hunk ★  
Makefile  
README  
src  
|-- Makefile  
|-- helloworld.c  
`-- helloworld.h  
TODO
```

Repository

master

f4ec56

deadbeef

04f087b

git add -p IDEAS

(also see git add --interactive)

add selected hunks to index

```
$ git add -p src/xmms/testclient.c  
[...]  
@@ -44,7 +44,7 @@ int main (int argc, char **argv)
```

```
    fd = xmms_ipc_transport_fd_get (transport);
```

```
-    msg = xmms_ipc_msg_string_new (42, "korv!");  
+    msg = xmms_ipc_msg_string_new (42, "apan!");
```

```
    i = 5;
```

```
Stage this hunk [y/n/a/d/i/J/?]?
```

index

hunk ★

d.c
d.h

Repository

master

f4ec56

deadbeef

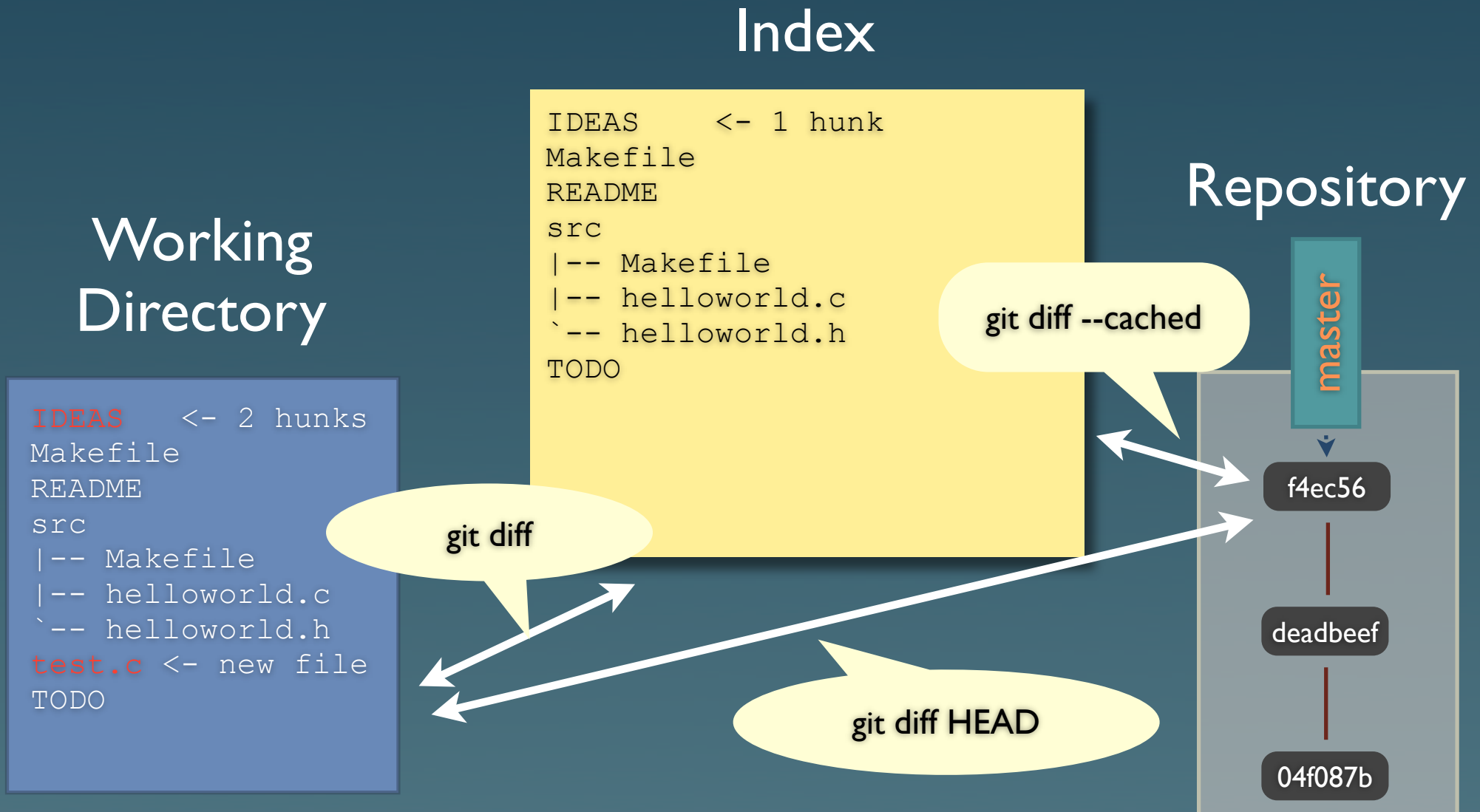
04f087b

```
IDEAS  
Makefile  
README  
src  
|-- Makefile  
|-- helloworld.c  
`-- helloworld.h  
test.c <- new file  
TODO
```

git add -p IDEAS

(also see git add --interactive)

diff'ing options



Conflicts: marked in index

Working Directory

```
IDEAS <- merged
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
TODO
```

Index

```
IDEAS <- conflicted
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
TODO
```

Repository



Reset changes: 3 options

Index

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
TODO
```

Working Directory

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
TODO
```

Repository



reset --hard

reset the repository HEAD, the index and the working directory.

Working Directory

deadbeef

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
TODO
```

Index

deadbeef

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
TODO
```

Repository

master

f4ec56

deadbeef

04f087b

git reset --hard deadbeef

Warning: any uncommitted change is lost!

reset --soft

only reset the repository HEAD.

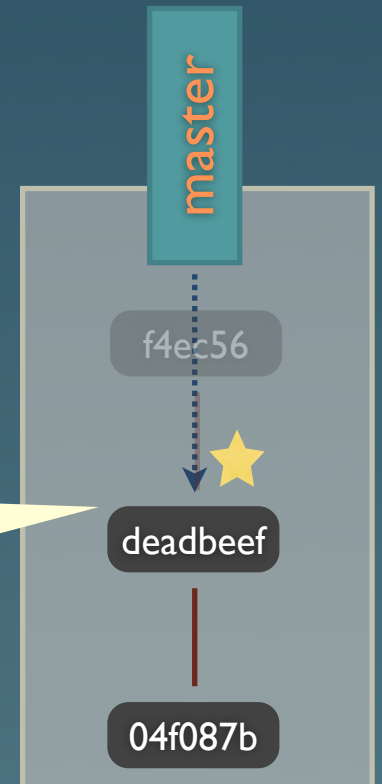
Working Directory

```
f4ec56
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
TODO
```

Index

```
f4ec56
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
TODO
```

Repository



git reset --soft deadbeef

Previous commit becomes “changes to be committed”.

reset --mixed (default)

reset the repository HEAD and the index, but not the working directory.

Working Directory

f4ec56

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
TODO
```

Index

deadbeef

```
IDEAS
Makefile
README
src
|-- Makefile
|-- helloworld.c
`-- helloworld.h
TODO
```



Repository

master

f4ec56

deadbeef

04f087b

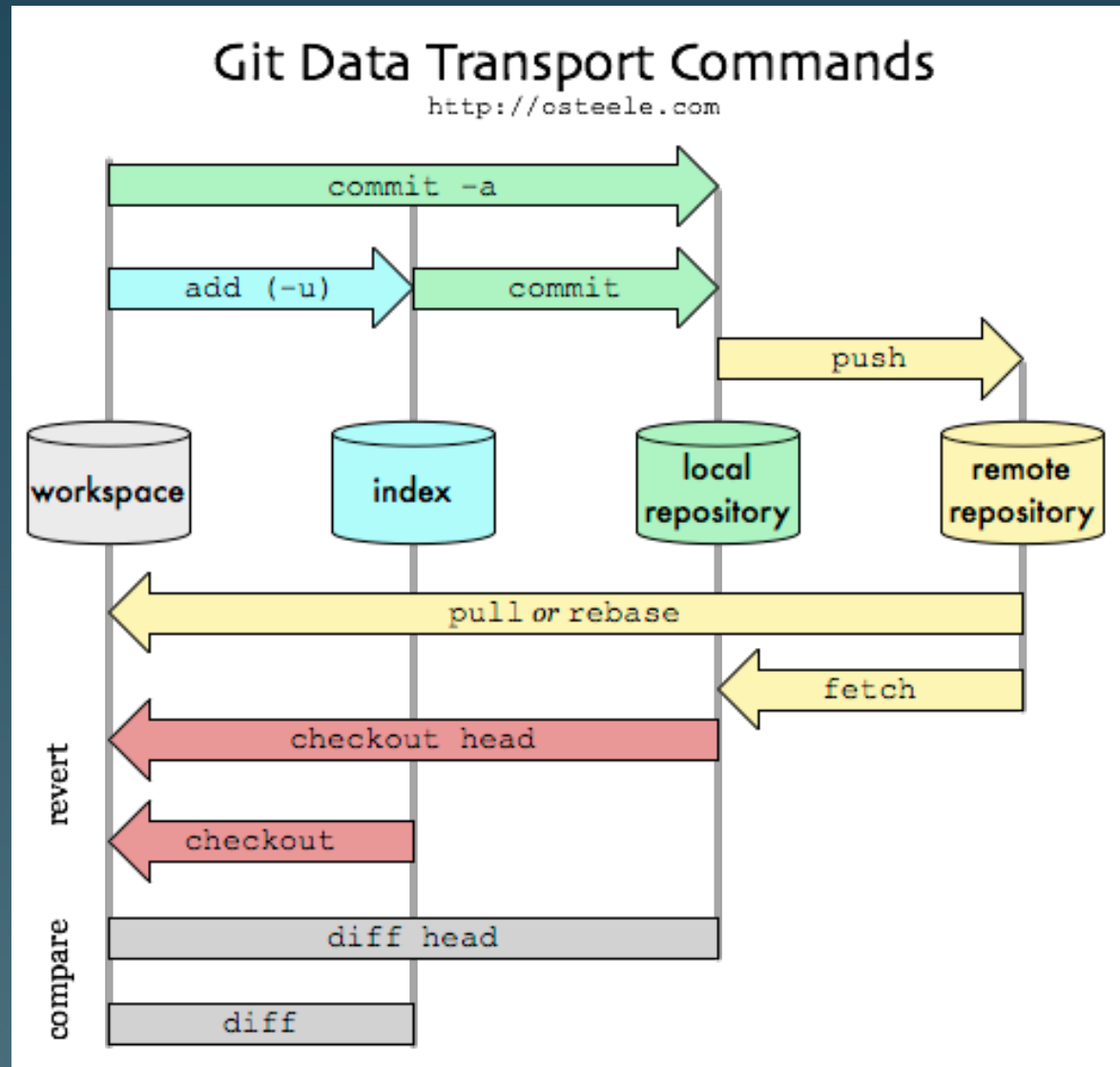
git reset --mixed deadbeef

Keep changes but not marked for commit.

Using the Index (or not)

- “Invisible” area to prepare commits
- Interact with:
 - working directory (add, rm)
 - repository (reset, commit)
- Analyze state (status, diff)
- Can usually be bypassed (using -a)
- **Warning:**
 - Can commit files in inconsistent state (e.g. not tested)

Git layers



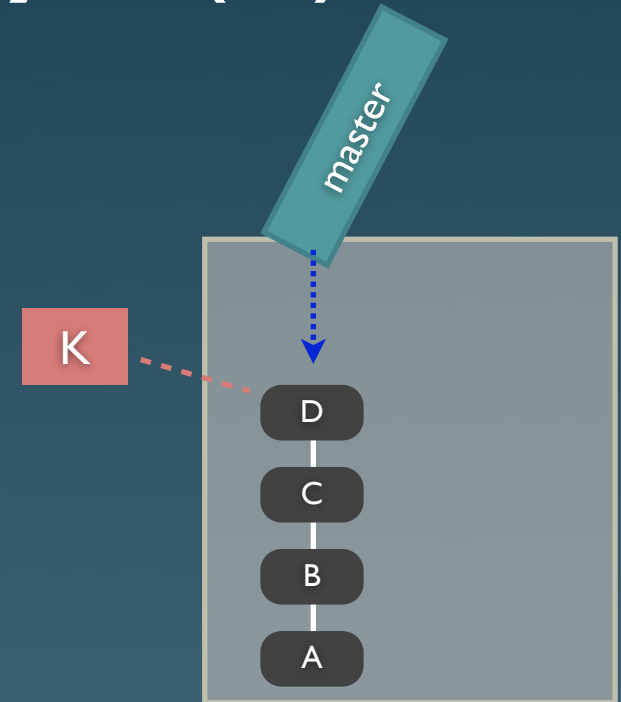
Source: <http://osteele.com/archives/2008/05/commit-policies>

Rewrite history!

- Changing the history = point to a new history
- Correct mistakes
- Cleanup messy iterative development
- **Warning:**
 - Changes commit ids
 - (Possibly) creates conflicts if when people merge the rewritten branch
 - Best used locally, not on an important tree

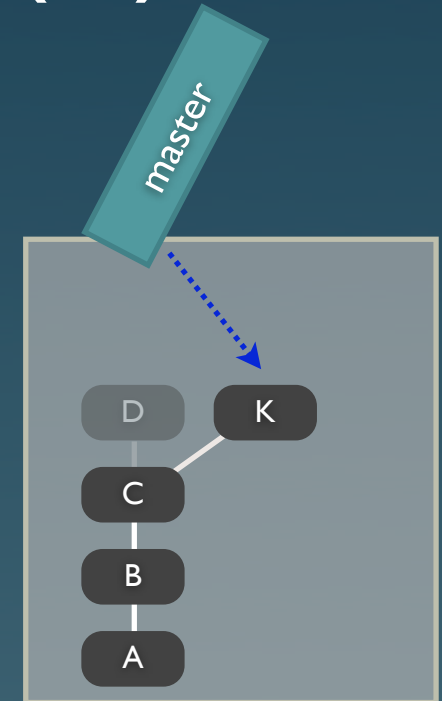
Rewrite history! (I)

- `git commit --amend`
- “Replace the latest commit by the current state of the index”
- Allows to keep or edit the commit message



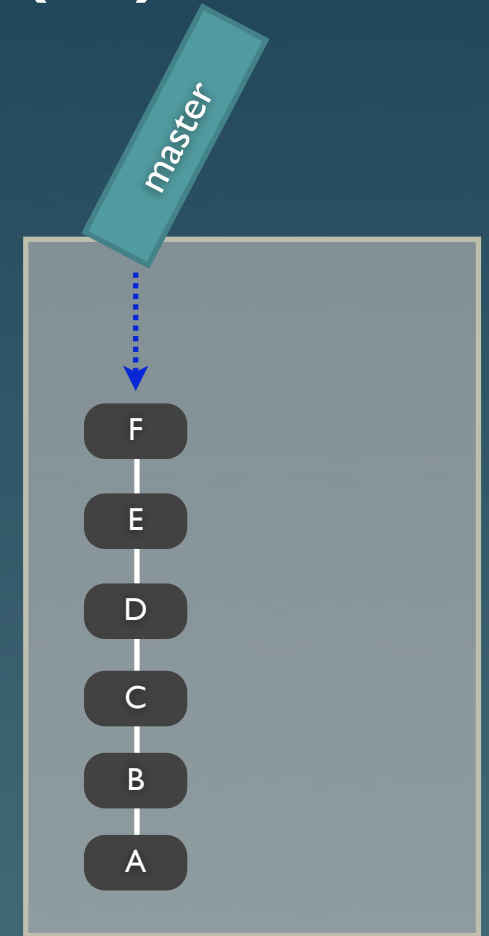
Rewrite history! (I)

- `git commit --amend`
- “Replace the latest commit by the current state of the index”
- Allows to keep or edit the commit message



Rewrite history! (2)

- `git rebase --interactive`
- Rewrite a sequence of commits:
 - omit
 - squash with parent
 - edit

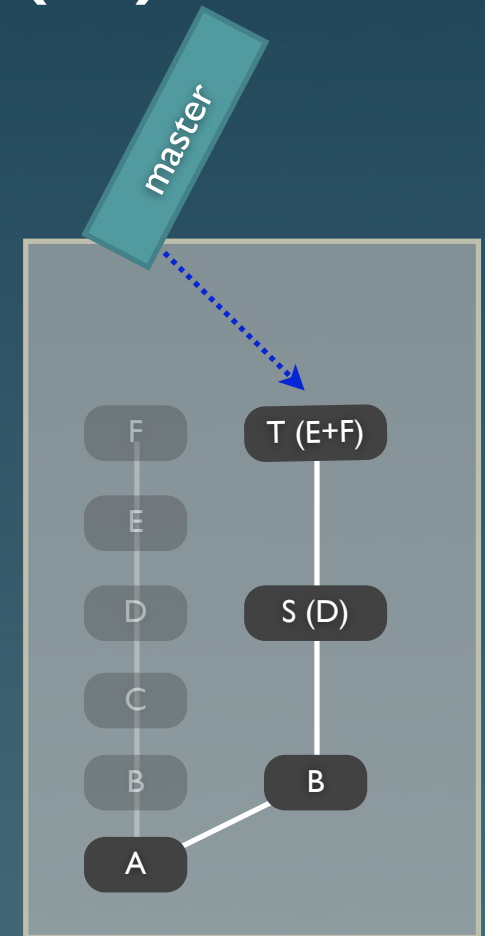


Rewrite history! (2)

- `git rebase --interactive`
- Rewrite a sequence of commits:
 - omit
 - squash with parent
 - edit

```
pick 3a8567d BUG(2086): format_entry
pick b73e373 OTHER: theeforamt
pick b163d1e BUG(2132): Expand tilde
pick 5feac59 OTHER: Emulate classic cli formatting
pick c59c886 BUG(2139): manpage for nycli

# Rebase 0862eb3..c59c886 onto 0862eb3
#
# Commands:
# p, pick = use commit
# e, edit = use commit, but stop for amending
# s, squash = use commit, but meld into previous commit
#
# If you remove a line here THAT COMMIT WILL BE LOST.
```



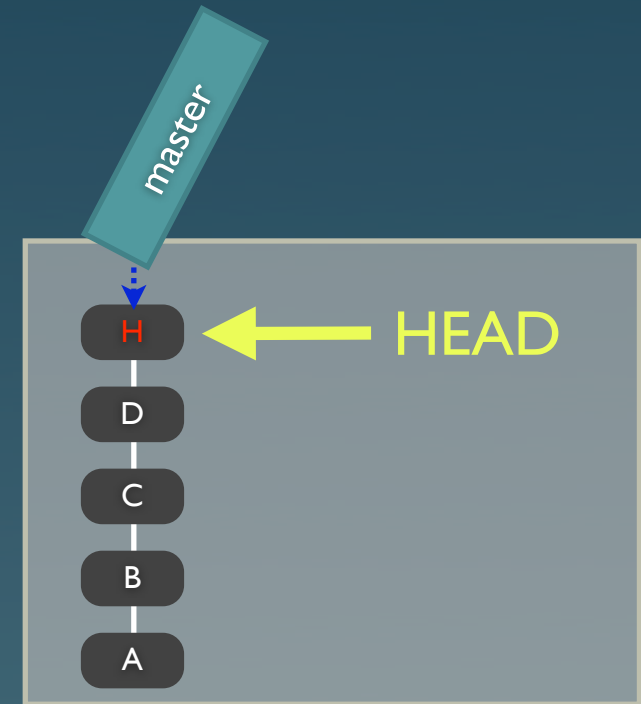
Rewrite history! (3)

- `git filter-branch`
- Rewrite history using functions/scripts
- Edit author infos, commit message, directories, commits, tags, etc.

- RTFM...

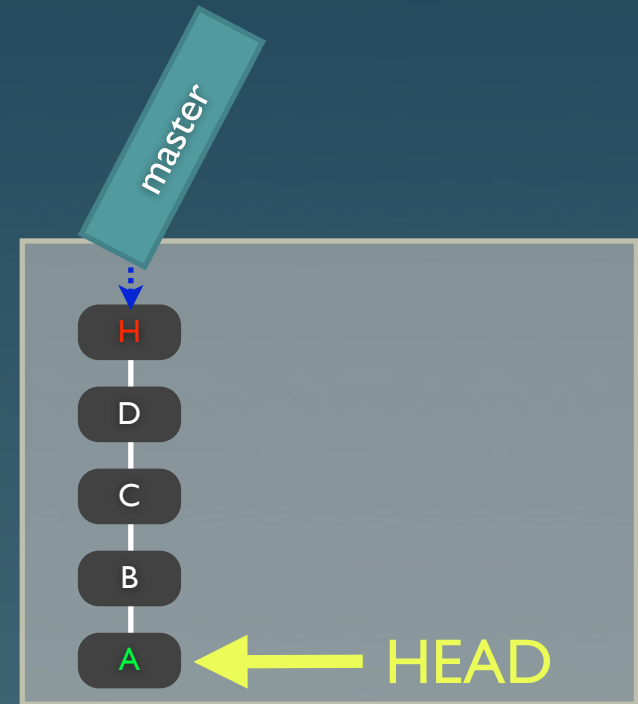
git bisect

- Useful to find the commit that introduces a problem
- `git bisect start <bad> [<good>]`



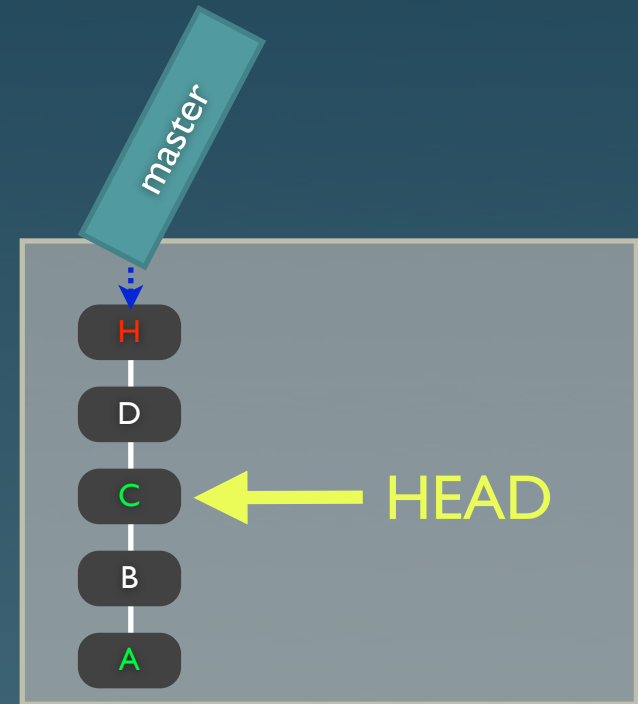
git bisect

- Useful to find the commit that introduces a problem
- `git bisect start <bad> [<good>]`
- `git bisect bag|good`



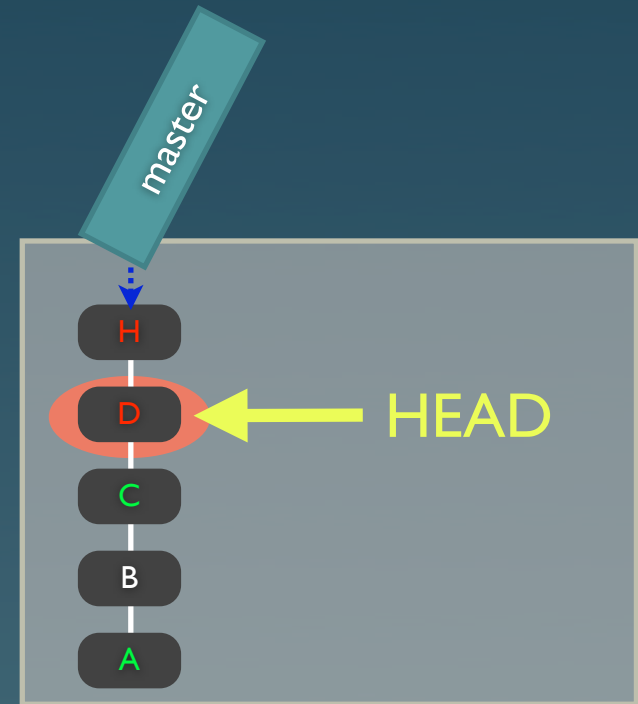
git bisect

- Useful to find the commit that introduces a problem
- `git bisect start <bad> [<good>]`
- `git bisect bag|good`



git bisect

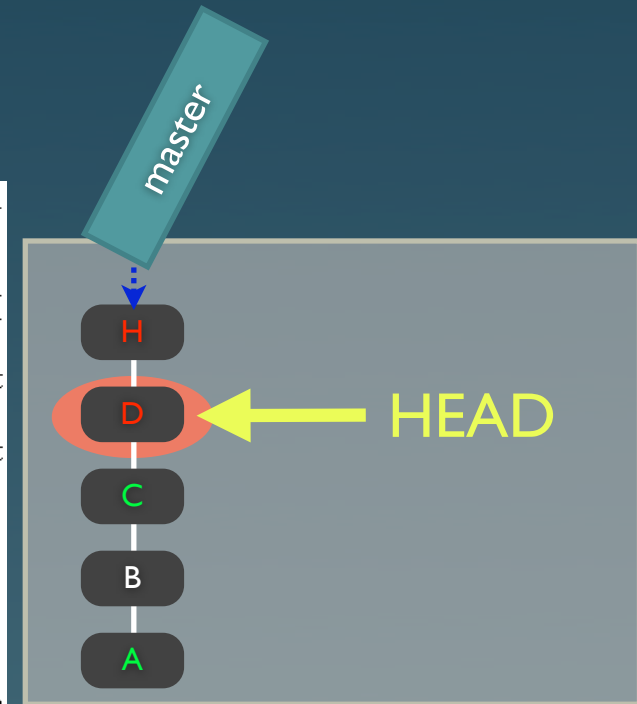
- Useful to find the commit that introduces a problem
- `git bisect start <bad> [<good>]`
- `git bisect bag|good`



git blame

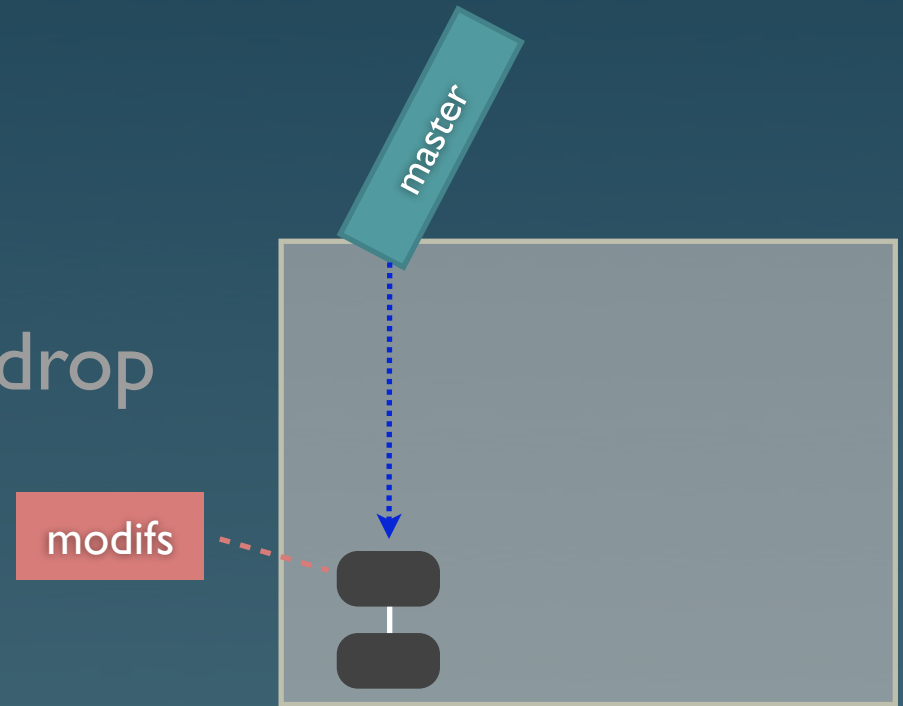
- git blame D <file>

```
c43ba10d (Tilman Sauerbeck      2008-05-04 22:02:42 +0200 111)      ret = g_tree_
eec93bcd (Sebastien Cevey      2008-07-25 15:35:06 +0200 112)
80fb38b0 (Tobias Rundstrom      2005-12-02 20:32:22 +0100 113)
80fb38b0 (Tobias Rundstrom      2005-12-02 20:32:22 +0100 114)      starttime = (
80fb38b0 (Tobias Rundstrom      2005-12-02 20:32:22 +0100 115)
c43ba10d (Tilman Sauerbeck      2008-05-04 22:02:42 +0200 116)      g_tree_insert
eec93bcd (Sebastien Cevey      2008-07-25 15:35:06 +0200 117)      g_tree_insert
c43ba10d (Tilman Sauerbeck      2008-05-04 22:02:42 +0200 118)      g_tree_insert
eec93bcd (Sebastien Cevey      2008-07-25 15:35:06 +0200 119)
80fb38b0 (Tobias Rundstrom      2005-12-02 20:32:22 +0100 120)
80fb38b0 (Tobias Rundstrom      2005-12-02 20:32:22 +0100 121)      return ret;
80fb38b0 (Tobias Rundstrom      2005-12-02 20:32:22 +0100 122) }
6a19e64b (                          2005-05-29 20:19:46 +0200 123)
50f5f346 (Sham Chukoury        2005-07-06 05:40:57 +0800 124) /**
50f5f346 (Sham Chukoury        2005-07-06 05:40:57 +0800 125)  * @internal Execute
50f5f346 (Sham Chukoury        2005-07-06 05:40:57 +0800 126)  * up and shutting d
8913e9e9 (Anders Gustafsson      2005-07-31 17:32:08 +0200 127)  *
50f5f346 (Sham Chukoury        2005-07-06 05:40:57 +0800 128)  * @param[in] script
50f5f346 (Sham Chukoury        2005-07-06 05:40:57 +0800 129)  * started.
50f5f346 (Sham Chukoury        2005-07-06 05:40:57 +0800 130)  */
6a19e64b (                          2005-05-29 20:19:46 +0200 131) static void
8913e9e9 (Anders Gustafsson      2005-07-31 17:32:08 +0200 132) do_scriptdir (const
6a19e64b (                          2005-05-29 20:19:46 +0200 133) {
```



git stash

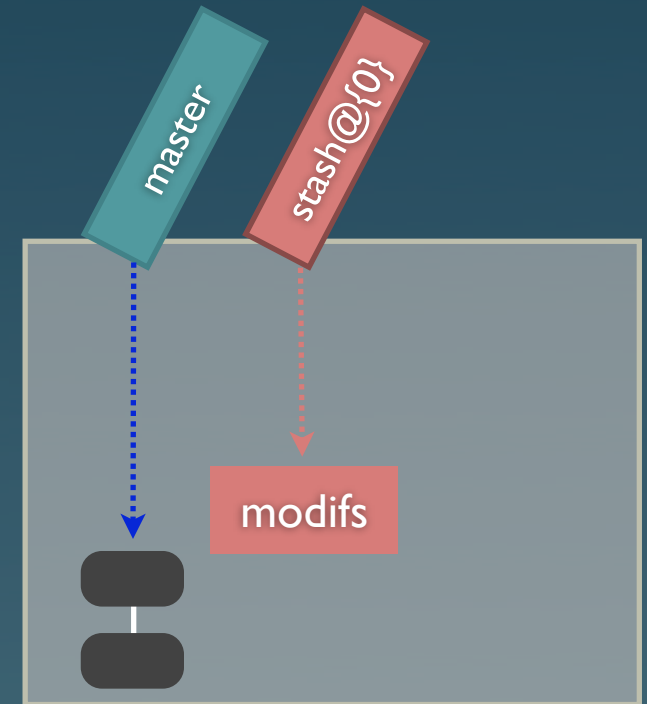
- `git stash [save [message]]`
- `git stash apply`
- `git stash pop # apply and drop`



- Can also preserve the state of the index

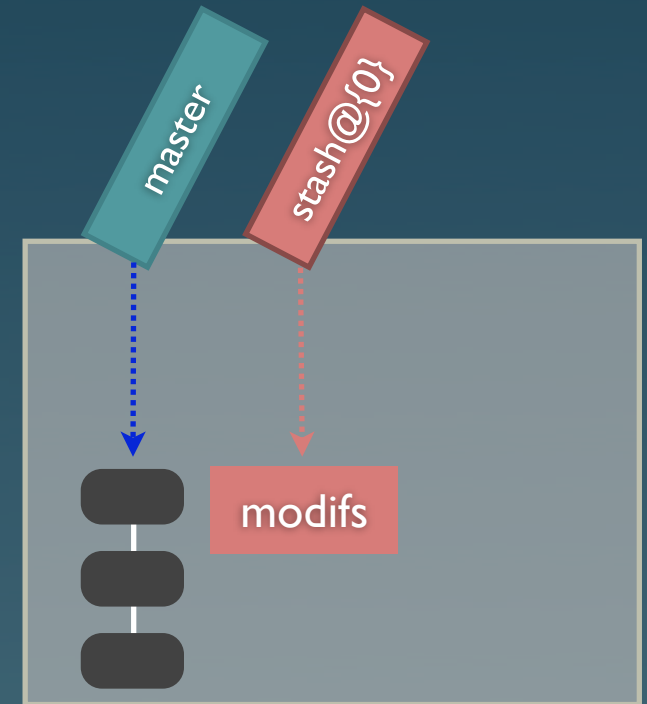
git stash

- `git stash [save [message]]`
- `git stash apply`
- `git stash pop # apply and drop`
- Can also preserve the state of the index



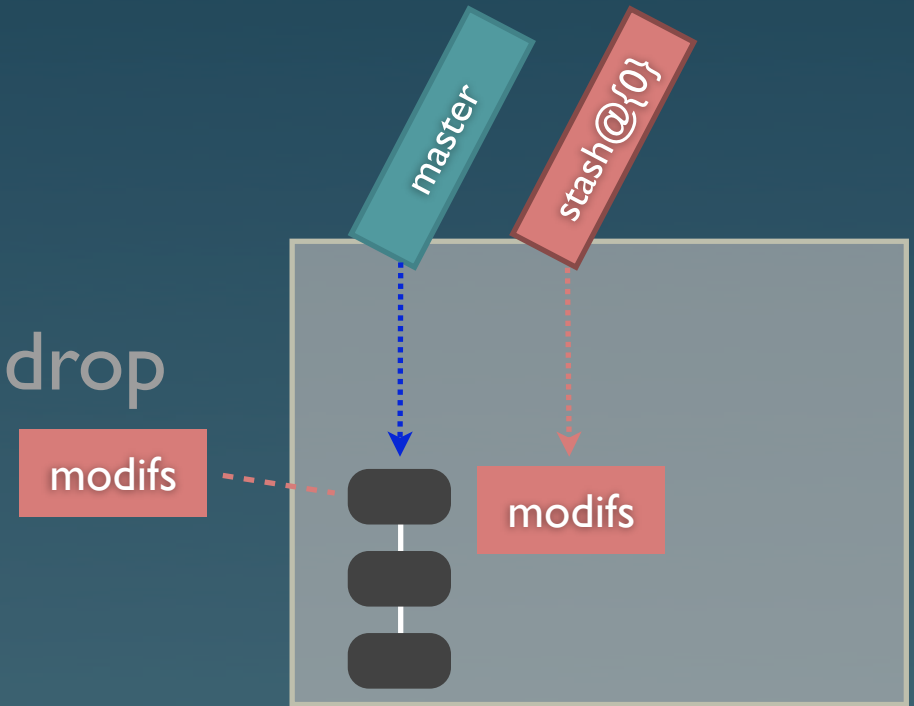
git stash

- `git stash [save [message]]`
 - `git stash apply`
 - `git stash pop # apply and drop`
-
- Can also preserve the state of the index



git stash

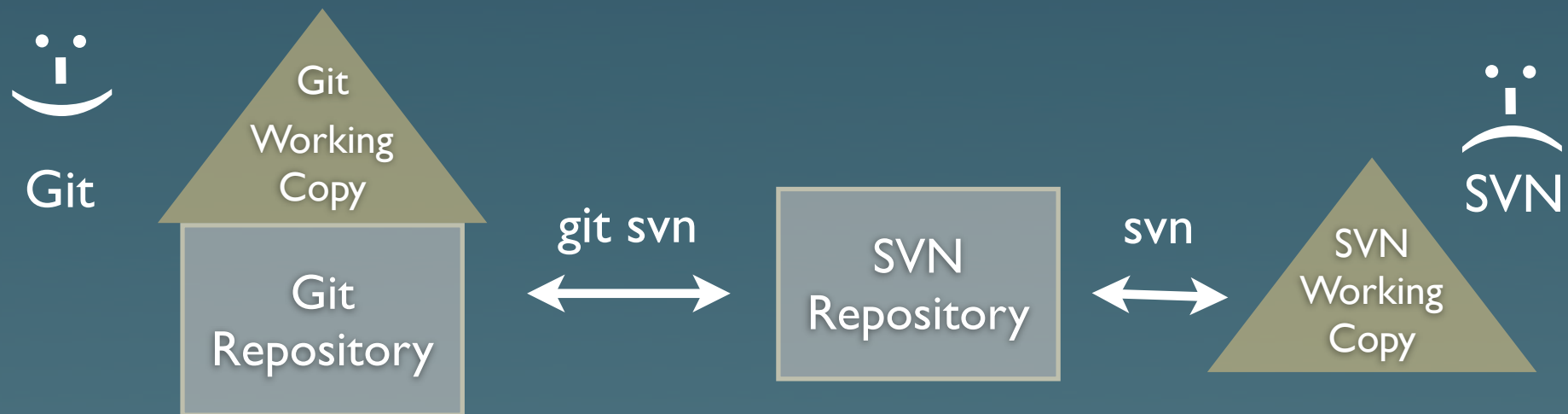
- `git stash [save [message]]`
- `git stash apply`
- `git stash pop # apply and drop`



- Can also preserve the state of the index

git svn

- Import an SVN repository into a local Git repository
- Use Git features (branches, merge, log, etc)
- Talk to SVN from Git
- Requires streamlined Git history



And also...

- Submodules
- Cherry-pick
- Shallow copies
- Bundles
- Reflog
- Git daemon
- Hooks
- etc...

Eclipse Git plugin

CDK
MetWare
Papers
Bioclipse2 CDK

- javax.vecmath [Git @ master]
 - JRE System Library [J2SE-1.5]
 - Referenced Libraries
 - Plug-in Dependencies
 - .settings
 - jar
 - META-INF
 - .classpath
 - .project
 - build.properties
 - net.bioclipse.cdk.business
 - net.bioclipse.cdk.business.test
 - net.bioclipse.cdk.debug
 - net.bioclipse.cdk.jchempaint
 - net.bioclipse.cdk.jchempaint.business
 - net.bioclipse.cdk.qsar
 - net.bioclipse.cdk.qsar.test

History

	Author	Date
Last few external plugins	Egon Willighagen <egon.willighagen@gmail.com>	2008-10-07 20:19:41
Added first draft of CDK150	Egon Willighagen <egon.willighagen@gmail.com>	2008-10-07 16:40:00

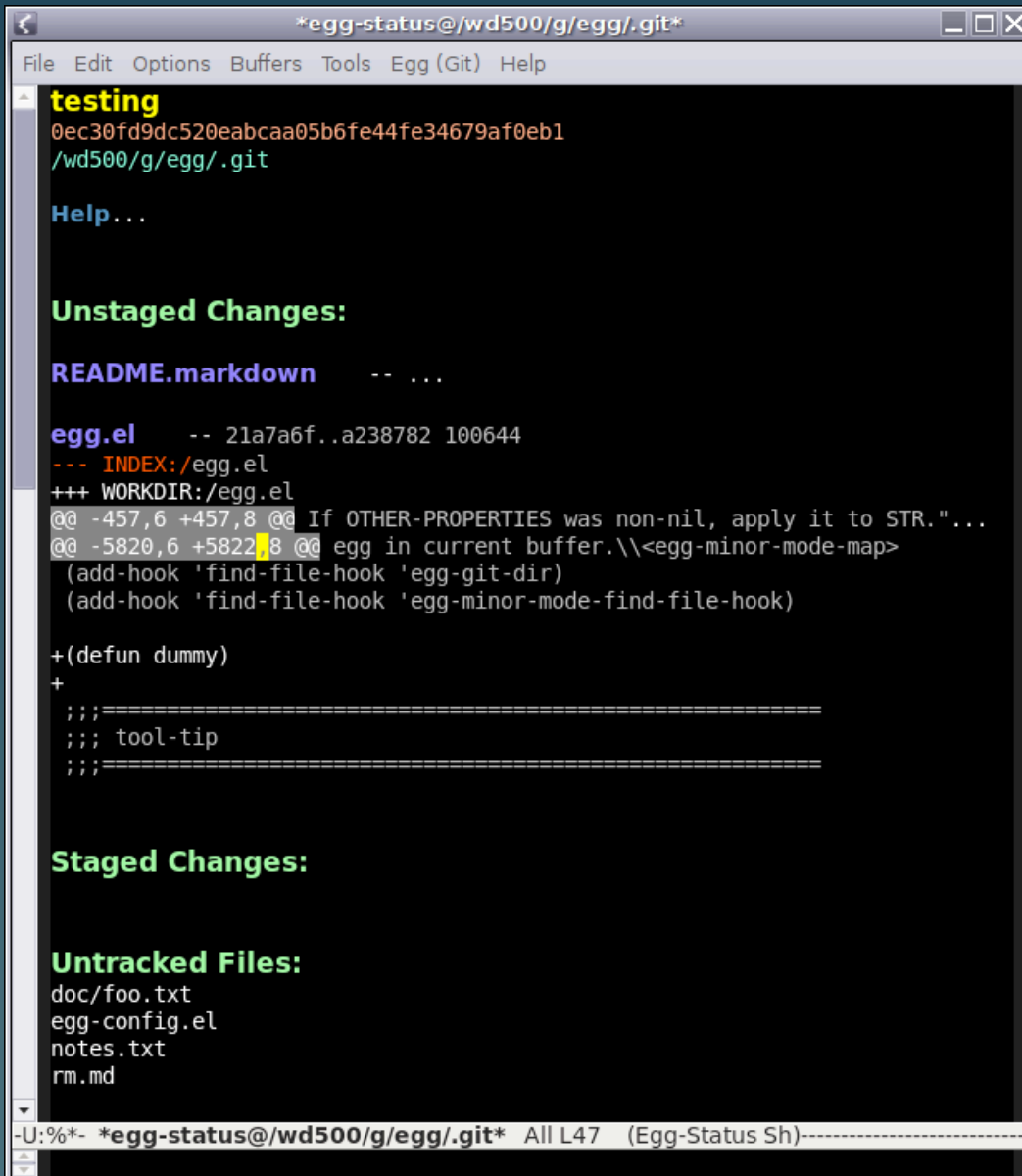
commit 2b96785a04715144423bd820ccab336caeeea57d
Author: Egon Willighagen <egon.willighagen@gmail.com>
2008-10-07 20:19:41
Committer: Egon Willighagen <egon.willighagen@gmail.com>
2008-10-07 20:19:41
Parent: [058d80c0efbedb8db4a0428b673d2b446e0bf886](#) (Added first draft of CDK150)

Last few external plugins

Path
M cdk-externals/javax.vecmath/.classpath
A cdk-externals/javax.vecmath/.project

Source: <http://chem-bla-ics.blogspot.com/2008/10/git-eclipse-integration.html>

egg-mode (emacs)



```
*egg-status@/wd500/g/egg/.git*
File Edit Options Buffers Tools Egg (Git) Help

testing
0ec30fd9dc520eabcaa05b6fe44fe34679af0eb1
/wd500/g/egg/.git

Help...

Unstaged Changes:

README.markdown -- ...

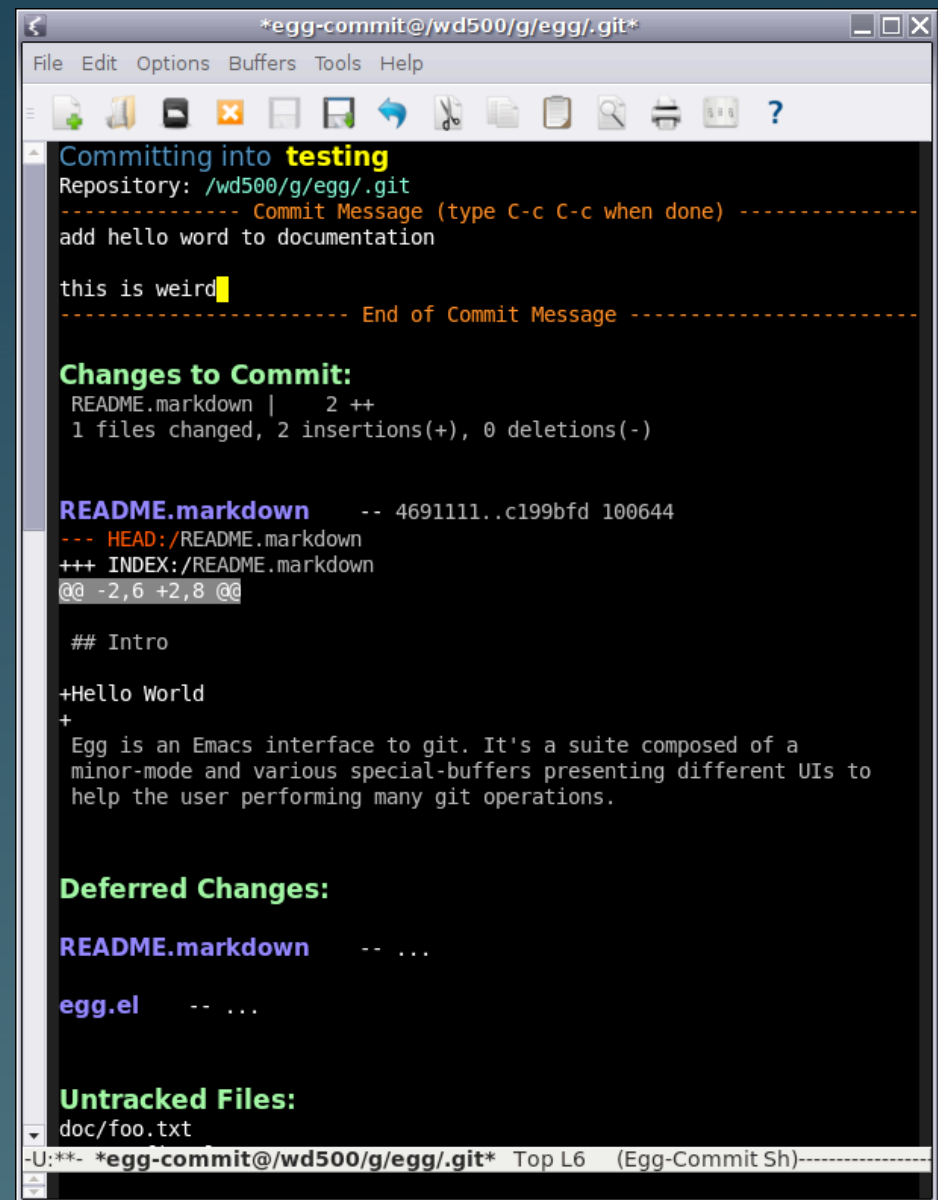
egg.el -- 21a7a6f..a238782 100644
--- INDEX:/egg.el
+++ WORKDIR:/egg.el
@@ -457,6 +457,8 @@ If OTHER-PROPERTIES was non-nil, apply it to STR."...
@@ -5820,6 +5822,8 @@ egg in current buffer.\\<egg-minor-mode-map>
 (add-hook 'find-file-hook 'egg-git-dir)
 (add-hook 'find-file-hook 'egg-minor-mode-find-file-hook)

+(defun dummy)
+
+;;=====
+;; tool-tip
+;;=====

Staged Changes:

Untracked Files:
doc/foo.txt
egg-config.el
notes.txt
rm.md

-U:%*- *egg-status@/wd500/g/egg/.git* All L47 (Egg-Status Sh)-----
```



```
*egg-commit@/wd500/g/egg/.git*
File Edit Options Buffers Tools Help

Committing into testing
Repository: /wd500/g/egg/.git
----- Commit Message (type C-c C-c when done) -----
add hello word to documentation

this is weird

----- End of Commit Message -----

Changes to Commit:
README.markdown | 2 ++
1 files changed, 2 insertions(+), 0 deletions(-)

README.markdown -- 4691111..c199bfd 100644
--- HEAD:/README.markdown
+++ INDEX:/README.markdown
@@ -2,6 +2,8 @@

## Intro

+Hello World
+
+ Egg is an Emacs interface to git. It's a suite composed of a
+ minor-mode and various special-buffers presenting different UIs to
+ help the user performing many git operations.

Deferred Changes:

README.markdown -- ...

egg.el -- ...

Untracked Files:
doc/foo.txt

-U:*- *egg-commit@/wd500/g/egg/.git* Top L6 (Egg-Commit Sh)-----
```

Gitweb – Web repo browser

The screenshot shows a web browser window with the address bar containing the URL `http://git.xmms.se/?p=xmms2-devel.git;a=sum`. The page title is `git - xmms2-devel.git/summary - Mozilla Firefox`. The main content area displays the repository summary for `xmms2-devel.git`.

projects / xmms2-devel.git / summary

summary | [shortlog](#) | [log](#) | [commit](#) | [commitdiff](#) | [tree](#) | [latest snapshot](#)

description XMMS2 Development tree.
owner Tobias Rundström
last change Wed, 5 Mar 2008 17:57:47 +0000
url [git://git.xmms.se/xmms2/xmms2-devel.git](http://git.xmms.se/xmms2/xmms2-devel.git)

shortlog

2 days ago	Erik Massop	OTHER: Fix a warning introduced in 01c0fceed53e6ead28fd ...	commit commitdiff snapshot
2 days ago	Erik Massop	BUG(1909): Absolute paths in playlistfiles malfunction	commit commitdiff snapshot
2 days ago	Erik Massop	BUG(1902): Allow for case-sensitive MATCH and make ...	commit commitdiff snapshot
2 days ago	Anders Waldenborg	BUG(1095): Do not require glib 2.14, but use it if ...	commit commitdiff snapshot
3 days ago	Sebastien Cevey	OTHER: Fix leaks with coll_read_collname.	commit commitdiff snapshot
3 days ago	Sebastien Cevey	BUG(1907): Allow 'All Media' as pshuffle input.	commit commitdiff snapshot
7 days ago	Erik Massop	BUG(1095): Make xmms2d handle -h.	commit commitdiff snapshot
7 days ago	Anders Waldenborg	BUG(1904): Fix crash in volume setting/getting in pulse ...	commit commitdiff snapshot
9 days ago	Sebastian Noack	OTHER: Added PGP fingerprint for Sebastian Noack (wallu ...	commit commitdiff snapshot
9 days ago	Tobias Rundstrom	OTHER: Updated my PGP key fingerprint	commit commitdiff snapshot
9 days ago	Florian Ragwitz	OTHER: Another try on implementing perl constant mapping.	commit commitdiff snapshot
9 days ago	Florian Ragwitz	OTHER: Fix some compilation warnings in the perl bindings.	commit commitdiff snapshot
12 days ago	Tilman Sauerbeck	BUG(1896): Made the config object use a BST instead ...	commit commitdiff snapshot
13 days ago	Anders Waldenborg	OTHER: Remove old unused visualisation	commit commitdiff snapshot
2 weeks ago	Anders Waldenborg	OTHER: Cache result of "get next medialib id" in xmms ...	commit commitdiff snapshot
2 weeks ago	Erik Massop	FEATURE(1470): Add xmmsc_playlist_add_idlist and make ...	commit commitdiff snapshot

...

tags

3 months ago	0.4DrKosmos	0.4 DrKosmos Release	tag commit shortlog log snapshot
3 months ago	DrJekyll+WIP+TEST2	DrJekyll+WIP+TEST2 Release	tag commit shortlog log snapshot
3 months ago	DrJekyll+WIP+TEST1	DrJekyll+WIP+TEST1 Release	tag commit shortlog log snapshot
9 months ago	0.2DrJekyll	0.2 DrJekyll Release	tag commit shortlog log snapshot
9 months ago	DrJ+WIP+TEST5	DrJ+WIP+TEST5 Release	tag commit shortlog log snapshot

Github – Git Social Network

The screenshot shows the GitHub interface for the repository 'caotic / xmms2-mpris-bridge'. At the top, the GitHub logo and navigation links are visible. The repository name is followed by 'watch' and 'download' buttons. Below this, the description and clone URL are provided. A commit message is shown, along with the author's name and date. A table of files is displayed, and a code block contains installation instructions.

github SOCIAL CODING Search Home **Pricing and Signup** Repositories Blog Login

Browse | Guides | Advanced

Source Commits Network (0) Downloads (0) Wiki (1) Graphs

master all branches all tags

caotic / xmms2-mpris-bridge watch download 1 0

Description: MPRIS bridge for xmms2 implemented in python
Clone URL: <git://github.com/caotic/xmms2-mpris-bridge.git>

OTHER: renamed to xmms2-mpris-bridge and adjusted some strings

caotic (author)
November 25, 2008

commit 177cd9425a3b151e323554c105e99e9f0b213de9
tree 896b04a65306a999bc974f3194e2cb0ad422f82f
parent bc4cade82111e045af9617d5d453d069332bc2f7

xmms2-mpris-bridge /

name	age	message	history
AUTHORS	November 11, 2008	Add some python magic to make the callback meth... [caotic]	
COPYING	November 11, 2008	Add some python magic to make the callback meth... [caotic]	
README	November 25, 2008	OTHER: renamed to xmms2-mpris-bridge and adjust... [caotic]	
xmms2-mpris-bridge	November 25, 2008	OTHER: renamed to xmms2-mpris-bridge and adjust... [caotic]	

```
This program needs the python bindings for:  
- xmms2  
- dbus  
- gobject
```

To get the MPRIS bridge on xmms2 startup, add this script to the startup.d directory.

Reference links

- Official site:
<http://git-scm.com/>
- `man gittutorial` / `git <command> --help`
- Randal Schwartz Google Tech Talk:
<http://www.youtube.com/watch?v=8dhZ9BXQgc4>
- Linus Torvalds Google Tech Talk:
<http://www.youtube.com/watch?v=4XpnKHJAok8>
- Why Git Is Better Than X?
<http://whygitisbetterthanx.com/>

5. Conclusion

Conclusion

- Different approach to VCS
- Custom and flexible workflow
- Power vs. Learning curve

“Smart tool to manipulate versioned information and throw it around.”

Questions?

<http://git-scm.com/>