THE EXPERT'S VOICE®

SECOND EDITION

Pro Git

EVERYTHING YOU NEED TO KNOW ABOUT GIT

Scott Chacon and Ben Straub

Apress®

Scott Chacon 序

Pro Git
Git Git

Git

Git

Git
Windows
IDE Pro Git
Git

Git

Git GitHub
GitHub
GitHub 1000 500
230
GitHub
Pro Git
Git GitHub

GitHub Git
GitHub
Git Git
GitHub
Git
Git HTTP
SSH HTTP
Git
Pro Git

Pro Git

Ben Straub 序

Git

Git Git

Git Scott

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 1  Chris Down
 1  Christian Kluge
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 2  Cor
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 1  Daniel Kay
 2  Daniel Rosen
 1  DanielWeber
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  3  W. Trevor King
  1  Wyatt Carss
  1  Włodzimierz Gajda
  1  Xue Fuqiao
  1  Yue Lin Ho
  2  adelcambre
```

```
1  anaran
1  bdukes
1  burningTyger
1  cor
1  iosias
7  nicesw123
1  onovy
2  pcasaretto
1  sampablokuper
```

리뷰

Git

VCSs Git —
Git VCSs
VCSs Git
Git Git

Git — Git
80%

Git
Git Git
Git
Git

Git
Git

Git

Git
GitHub
Git
GitHub
Git
“ reset ”
Git
Git

Git VCSs Subversion SVN Git
VCSs Git SVN

Git —
SVN
Git
Git Git
Git
Git Git

A Git
Git GUI IDE
shell Visual Studio Eclipse Git
B libgit2 JGit Git
Git Git

C Git

Git

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1 起步

Git

Git Git

Git

Git Git

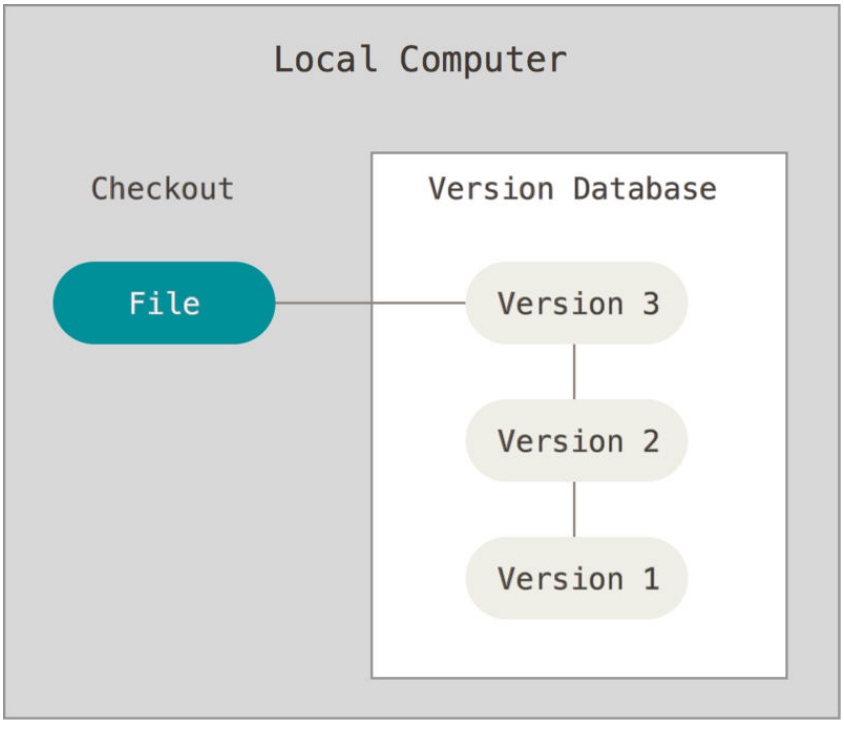
关于版本控制

“ ”

VCS

FIGURE 1-1

本地版本控制.



RCS

Mac OS X

`rcs`

Centralized Version Control Systems

CVCS CVS Subversion Perforce

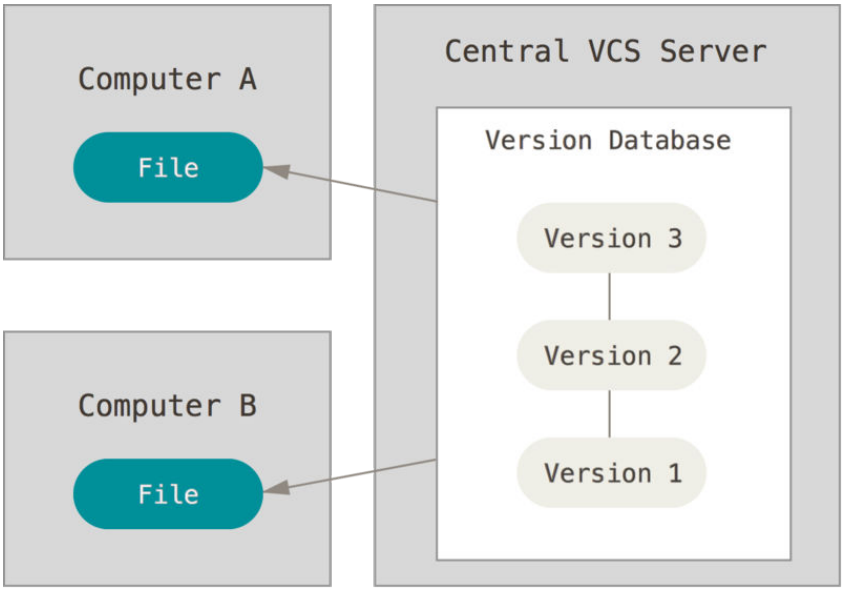


FIGURE 1-2

集中化的版本控制.

VCS

CVCS

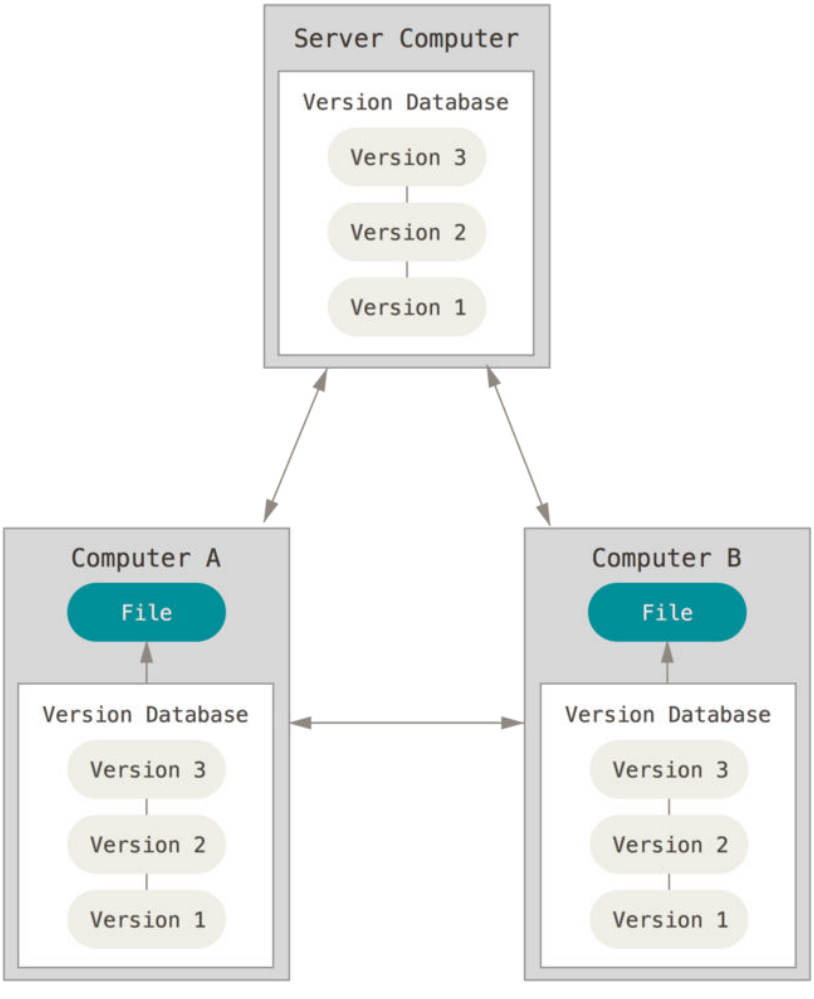
—

Distributed Version Control System

DVCS Git Mercurial Bazaar Darcs

FIGURE 1-3

分布式版本控制.



Git 简史

Git

Linux Linux
1991 2002
2002 BitKeeper

2005 BitKeeper Linux
Linux BitKeeper
Linux Linux Linux Torvalds
BitKcheper

-
-
-
-
- Linux

2005 Git

Chapter 3

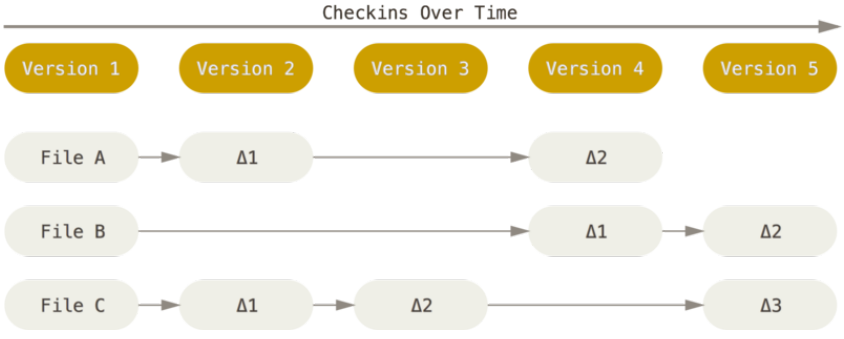
Git 基础

Git
Git
Git
Subversion Perforce
Git

Git Subversion
Git
CVS Subversion Perforce Bazaar

FIGURE 1-4

存储每个文件与初始版本的差异.

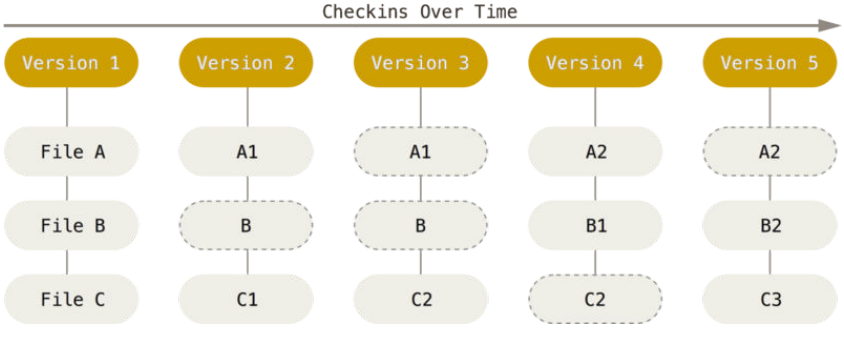


Git Git
Git

Git
Git

FIGURE 1-5

存储项目随时间改变的快照.



Git Git
Git
VCS

Chapter 3 Git

Git

Git Git

Git

—

Git

VPN

VPN

Perforce

Subversion CVS

Git

Git

Git Git

Git

Git

Git SHA-1 hash

40 0-9 a-f Git

SHA-1

```
24b9da6552252987aa493b52f8696cd6d3b00373
```

Git

Git

Git

Git Git Git

VCS

Git

Git

Git

“ ”

Git

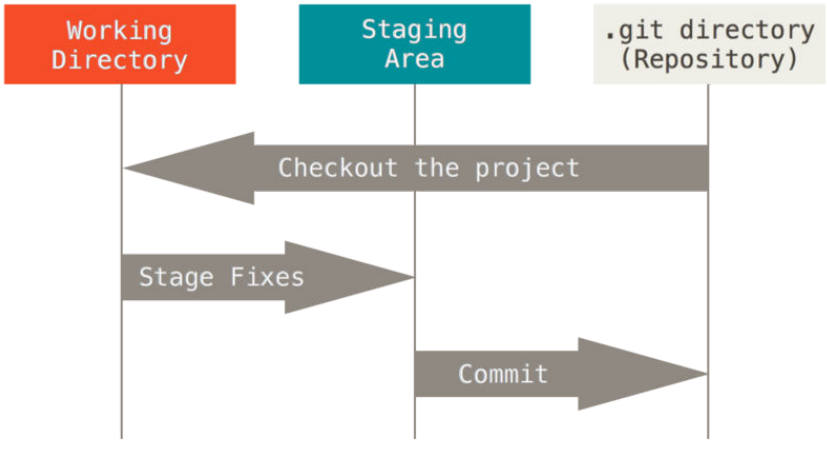
Git commit -

ted modifed staged

Git Git

FIGURE 1-6

工作目录、暂存区域以及 Git 仓库.



Git Git

Git

Git

Git

“ ”

Git

1.
2.
3. Git

Git

命令行

Git GUI
GUI
Git
GUI Git
GUI

GUI
Mac Terminal
Windows Command
Prompt PowerShell

安装 Git

Git

本书写作时使用的 Git 版本为 **2.0.0**。 我们使用的大部分命令仍然可以在很古老的 Git 版本上使用，但也有少部分命令不好用或者在旧版本中的行为有差异。 因为 Git 在保持向后兼容方便表现很好，本书使用的这些命令在 2.0 之后的版本应该有效。

Linux

Linux Git
Fedora yum

```
$ sudo yum install git
```

Debian apt-get

```
$ sudo apt-get install git
```

Git Unix
http://git-scm.com/download/linux

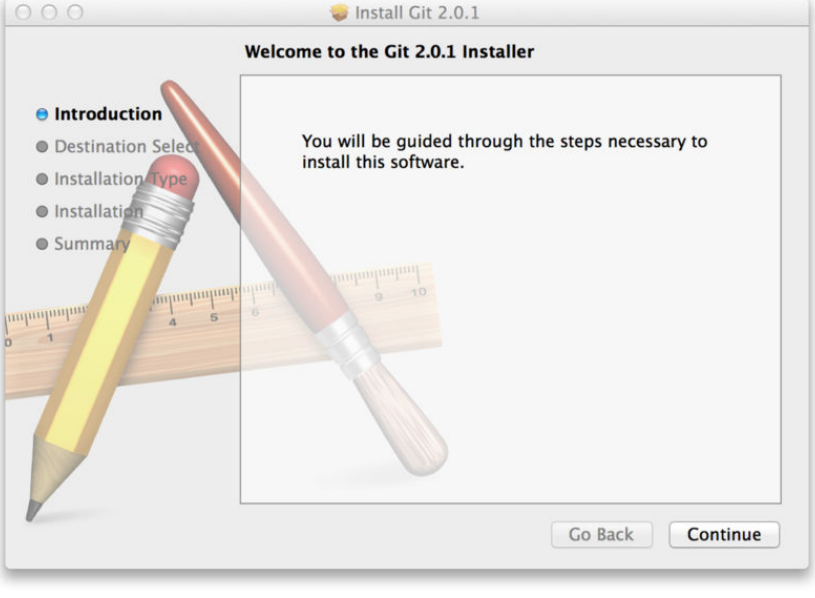
Mac

Mac Git Xcode Command Line Tools Mavericks 10.9 Terminal *git*

OSX Git Git *http://git-scm.com/down - load/mac*

FIGURE 1-7

Git OS X 安装程序.



GitHub for Mac Git GitHub for Mac

http://mac.github.com

Windows

Windows Git Git
http://git-scm.com/download/win
Git for Windows msysGit Git
http://msysgit.github.io/
GitHub for Windows
Git Powershell
CRLF
GitHub for Windows
http://windows.github.com

Git
Git
Git Git curl zlib
openssl expat libiconv yum Fedora
apt-get Debian
Git

```
$ sudo yum install curl-devel expat-devel gettext-devel \
  openssl-devel zlib-devel
$ sudo apt-get install libcurl4-gnutls-dev libexpat1-dev gettext \
  libz-dev libssl-dev
```

doc, html, info

```
$ sudo yum install asciidoc xmlto docbook2x
$ sudo apt-get install asciidoc xmlto docbook2x
```

tar Kernel.org *https://www.kernel.org/pub/software/scm/git* GitHub
https://github.com/git/git/releases GitHub
kernel.org

```
$ tar -zxf git-2.0.0.tar.gz
$ cd git-2.0.0
$ make configure
$ ./configure --prefix=/usr
$ make all doc info
$ sudo make install install-doc install-html install-info
```

Git Git

```
$ git clone git://git.kernel.org/pub/scm/git/git.git
```

初次运行 Git 前的配置

Git Git

Git git config Git

1. /etc/gitconfig :
--system git config

2. ~/.gitconfig ~/.config/git/config
--global Git

3. Git config .git/config

.git/config
/etc/gitconfig
Windows Git $HOME C:\Users
\$USER .gitconfig Git /etc/gitconfig
MSys Git

Git
Git

```
$ git config --global user.name "John Doe"
$ git config --global user.email johndoe@example.com
```

`--global`
Git

`--global`
GUI

Git
Git
Vim Emacs

```
$ git config --global core.editor emacs
```

Vim 和 Emacs 是像 Linux 与 Mac 等基于 Unix 的系统上开发者经常使用的流行的文本编辑器。 如果你对这些编辑器都不是很了解或者你使用的是 Windows 系统，那么可能需要搜索如何在 Git 中配置你最常用的编辑器。 如果你不设置编辑器并且不知道 Vim 或 Emacs 是什么，当它们运行起来后你可能会被弄糊涂、不知所措。

`git config --list` Git

```
$ git config --list
user.name=John Doe
user.email=johndoe@example.com
color.status=auto
color.branch=auto
color.interactive=auto
color.diff=auto
...
```

Git
/etc/gitconfig ~/.gitconfig Git

git config <key> Git

```
$ git config user.name
John Doe
```

获取帮助

Git Git

```
$ git help <verb>
$ git <verb> --help
$ man git-<verb>
```

confg

```
$ git help config
```

Freenode IRC irc.free - node.net #git #github Git

总结

Git Git

Git Git

Git 基础 2

Git
Git
repository
track stage commit)
Git
commits
push pull

获取 Git 仓库

Git
Git Git

Git

```
$ git init
```

.git Git
Git
(
Chapter 10 .git
)
Git
git
add git commit

```
$ git add *.c
$ git add LICENSE
$ git commit -m 'initial project version'
```

Git

Git

git clone

VCS Subversion

"clone" "checkout" Git

Git Git

git clone

Git

“ Git ”

git clone [url] Git

libgit2

```
$ git clone https://github.com/libgit2/libgit2
```

“ libgit2 ”

.git .git

libgit2

```
$ git clone https://github.com/libgit2/libgit2 mylibgit
```

my-

libgit

Git https://

git:// SSH user@serv-

er:path/to/repo.git “ Git ”

记录每次更新到仓库

Git

Git

Git

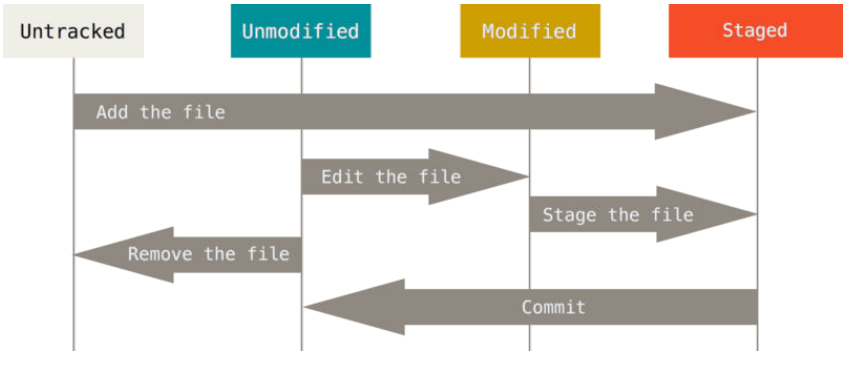


FIGURE 2-1

文件的状态变化周期

`git status`

```
$ git status
On branch master
nothing to commit, working directory clean
```

Git

“ master ” , Chapter 3

README

`git status`

```
$ echo 'My Project' > README
$ git status
On branch master
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)
```

README `Untracked files`

Git Git

“

”

README

`git add` README

```
$ git add README
```

`git status` README

```
$ git status
On branch master
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

    new file:   README
```

Changes to be committed

git init git add (files)
git add

CONTRIBU-
TING.md git status

```
$ git status
On branch master
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

    new file:   README

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:   CONTRIBUTING.md
```

CONTRIBUTING.md Changes not staged for commit

git add

“ ”
“ ” git
add "CONTRIBUTING.md" git status

```
$ git add CONTRIBUTING.md
$ git status
On branch master
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

    new file:   README
    modified:   CONTRIBUTING.md
```

CONTRIBUTING.md
git status

```
$ vim CONTRIBUTING.md
$ git status
On branch master
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

    new file:   README
    modified:   CONTRIBUTING.md

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:   CONTRIBUTING.md
```

CONTRIBUTING.md
Git git add
CONTRIBUTING.md git
add git commit
git add
git add

```
$ git add CONTRIBUTING.md
$ git status
On branch master
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

    new file:   README
    modified:   CONTRIBUTING.md
```

git status git
status -s git status --short
git status -s

```
$ git status -s
 M README
```

```
MM Rakefile
A  lib/git.rb
M  lib/simplegit.rb
?? LICENSE.txt
```

?? A
M M
M
M
README
,lib/simplegit.rb
Rakefile

Git

.gitignore

```
$ cat .gitignore
*.[oa]
*~
```

Git .o .a
Git ~
Emacs
log tmp pid
.gitignore

.gitignore

- # Git
- glob
- /
- /
- !

glob shell *
[abc]
a b c ?

[0-9] 0 9
*) a/**/z a/z,
a/b/z a/b/c/z
.gitignore

```
# no .a files
*.a

# but do track lib.a, even though you're ignoring .a files above
!lib.a

# only ignore the TODO file in the current directory, not subdir/TODO
/TODO

# ignore all files in the build/ directory
build/

# ignore doc/notes.txt, but not doc/server/arch.txt
doc/*.txt

# ignore all .pdf files in the doc/ directory
doc/**/*.pdf
```

GitHub 有一个十分详细的针对数十种项目及语言的 .gitignore 文件列表，你可以在 *https://github.com/github/gitignore* 找到它.

---

git status
git diff git diff

git status
git diff

README CONTRIBUTING.md
status

```
$ git status
On branch master
Changes to be committed:
```

```
  (use "git reset HEAD <file>..." to unstage)

    modified:   README

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:   CONTRIBUTING.md
```

git diff

```
$ git diff
diff --git a/CONTRIBUTING.md b/CONTRIBUTING.md
index 8ebb991..643e24f 100644
--- a/CONTRIBUTING.md
+++ b/CONTRIBUTING.md
@@ -65,7 +65,8 @@ branch directly, things can get messy.
 Please include a nice description of your changes when you submit your PR;
 if we have to read the whole diff to figure out why you're contributing
 in the first place, you're less likely to get feedback and have your change
-merged in.
+merged in. Also, split your changes into comprehensive chunks if your patch is
+longer than a dozen lines.

 If you are starting to work on a particular area, feel free to submit a PR
 that highlights your work in progress (and note in the PR title that it's
```

git diff --cached Git 1.6.1 git diff --staged

```
$ git diff --staged
diff --git a/README b/README
new file mode 100644
index 0000000..03902a1
--- /dev/null
+++ b/README
@@ -0,0 +1 @@
+My Project
```

git dif

git diff

CONTRIBUTING.md git status

```
$ git add CONTRIBUTING.md
$ echo '# test line' >> CONTRIBUTING.md
$ git status
On branch master
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

    modified:   CONTRIBUTING.md

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:   CONTRIBUTING.md
```

git diff

```
$ git diff
diff --git a/CONTRIBUTING.md b/CONTRIBUTING.md
index 643e24f..87f08c8 100644
--- a/CONTRIBUTING.md
+++ b/CONTRIBUTING.md
@@ -119,3 +119,4 @@ at the
 ## Starter Projects

 See our [projects list](https://github.com/libgit2/libgit2/blob/development/PROJE
+# test line
```

git diff --cached --staged --cached

```
$ git diff --cached
diff --git a/CONTRIBUTING.md b/CONTRIBUTING.md
index 8ebb991..643e24f 100644
--- a/CONTRIBUTING.md
+++ b/CONTRIBUTING.md
@@ -65,7 +65,8 @@ branch directly, things can get messy.
 Please include a nice description of your changes when you submit your PR;
```

```
 if we have to read the whole diff to figure out why you're contributing
 in the first place, you're less likely to get feedback and have your change
-merged in.
+merged in. Also, split your changes into comprehensive chunks if your patch is
+longer than a dozen lines.

 If you are starting to work on a particular area, feel free to submit a PR
 that highlights your work in progress (and note in the PR title that it's
```

GIT DIFF 的插件版本

在本书中，我们使用 `git diff` 来分析文件差异。但是，如果你喜欢通过图形化的方式或其它格式输出方式的话，可以使用 `git difftool` 命令来用 Araxis，emerge 或 vimdiff 等软件输出 diff 分析结果。使用 `git difftool --tool-help` 命令来看你的系统支持哪些 Git Diff 插件。

---

git add

git status

git commit

```
$ git commit
```

(shell

$EDITOR vim emacs

Chapter 1 git config --global core.editor

Vim

```
# Please enter the commit message for your changes. Lines starting
# with '#' will be ignored, and an empty message aborts the commit.
# On branch master
# Changes to be committed:
#       new file:   README
#       modified:   CONTRIBUTING.md
#
~
~
~
".git/COMMIT_EDITMSG" 9L, 283C
```

git status

(-v
dif
Git

commit -m

```
$ git commit -m "Story 182: Fix benchmarks for speed"
[master 463dc4f] Story 182: Fix benchmarks for speed
 2 files changed, 2 insertions(+)
 create mode 100644 README
```

master SHA-1
463dc4f

Git
git commit -a Git
git add

```
$ git status
On branch master
Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git checkout -- <file>..." to discard changes in working directory)

    modified:   CONTRIBUTING.md

no changes added to commit (use "git add" and/or "git commit -a")
$ git commit -a -m 'added new benchmarks'
[master 83e38c7] added new benchmarks
 1 file changed, 5 insertions(+), 0 deletions(-)
```

`git add` “ CONTRIBUTING.md ”

Git

`git rm`

`git status`

“ Changes not staged for commit ”

```
$ rm PROJECTS.md
$ git status
On branch master
Your branch is up-to-date with 'origin/master'.
Changes not staged for commit:
  (use "git add/rm <file>..." to update what will be committed)
  (use "git checkout -- <file>..." to discard changes in working directory)

        deleted:    PROJECTS.md

no changes added to commit (use "git add" and/or "git commit -a")
```

`git rm`

```
$ git rm PROJECTS.md
rm 'PROJECTS.md'
$ git status
On branch master
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

    deleted:    PROJECTS.md
```

`-f` force

Git

Git

Git `.gitignore`

.a

--cached

```
$ git rm --cached README
```

git rm glob

```
$ git rm log/\*.log
```

* \ Git

shell log/

.log

```
$ git rm \*~
```

~

VCS Git Git

Git

Git mv Git

```
$ git mv file_from file_to
```

```
$ git mv README.md README
$ git status
On branch master
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)
```

```
    renamed:    README.md -> README
```

git mv

```
$ mv README.md README
$ git rm README.md
$ git add README
```

Git

mv

git mv

查看提交历史

. git log
simplegit

```
git clone https://github.com/schacon/simplegit-progit
```

git log

```
$ git log
commit ca82a6dff817ec66f44342007202690a93763949
Author: Scott Chacon <schacon@gee-mail.com>
Date:   Mon Mar 17 21:52:11 2008 -0700

    changed the version number

commit 085bb3bcb608e1e8451d4b2432f8ecbe6306e7e7
Author: Scott Chacon <schacon@gee-mail.com>
Date:   Sat Mar 15 16:40:33 2008 -0700

    removed unnecessary test

commit a11bef06a3f659402fe7563abf99ad00de2209e6
Author: Scott Chacon <schacon@gee-mail.com>
Date:   Sat Mar 15 10:31:28 2008 -0700
```

```
    first commit
```

git log

SHA-1

git log

-p -2

```
$ git log -p -2
commit ca82a6dff817ec66f44342007202690a93763949
Author: Scott Chacon <schacon@gee-mail.com>
Date:   Mon Mar 17 21:52:11 2008 -0700

    changed the version number

diff --git a/Rakefile b/Rakefile
index a874b73..8f94139 100644
--- a/Rakefile
+++ b/Rakefile
@@ -5,7 +5,7 @@ require 'rake/gempackagetask'
 spec = Gem::Specification.new do |s|
     s.platform  =   Gem::Platform::RUBY
     s.name      =   "simplegit"
-    s.version   =   "0.1.0"
+    s.version   =   "0.1.1"
     s.author    =   "Scott Chacon"
     s.email     =   "schacon@gee-mail.com"
     s.summary   =   "A simple gem for using Git in Ruby code."

commit 085bb3bcb608e1e8451d4b2432f8ecbe6306e7e7
Author: Scott Chacon <schacon@gee-mail.com>
Date:   Sat Mar 15 16:40:33 2008 -0700

    removed unnecessary test

diff --git a/lib/simplegit.rb b/lib/simplegit.rb
index a0a60ae..47c6340 100644
--- a/lib/simplegit.rb
+++ b/lib/simplegit.rb
@@ -18,8 +18,3 @@ class SimpleGit
     end

 end
-
```

```
-if $0 == __FILE__
-  git = SimpleGit.new
-  puts git.show
-end
\ No newline at end of file
```

commit

commit

git log

--stat

```
$ git log --stat
commit ca82a6dff817ec66f44342007202690a93763949
Author: Scott Chacon <schacon@gee-mail.com>
Date:   Mon Mar 17 21:52:11 2008 -0700

    changed the version number

 Rakefile | 2 +-
 1 file changed, 1 insertion(+), 1 deletion(-)

commit 085bb3bcb608e1e8451d4b2432f8ecbe6306e7e7
Author: Scott Chacon <schacon@gee-mail.com>
Date:   Sat Mar 15 16:40:33 2008 -0700

    removed unnecessary test

 lib/simplegit.rb | 5 -----
 1 file changed, 5 deletions(-)

commit a11bef06a3f659402fe7563abf99ad00de2209e6
Author: Scott Chacon <schacon@gee-mail.com>
Date:   Sat Mar 15 10:31:28 2008 -0700

    first commit

 README           |  6 ++++++
 Rakefile         | 23 +++++++++++++++++++++
 lib/simplegit.rb | 25 +++++++++++++++++++++++++
 3 files changed, 54 insertions(+)
```

--stat

--pretty

oneline
short full fuller

```
$ git log --pretty=oneline
ca82a6dff817ec66f44342007202690a93763949 changed the version number
085bb3bcb608e1e8451d4b2432f8ecbe6306e7e7 removed unnecessary test
a11bef06a3f659402fe7563abf99ad00de2209e6 first commit
```

format
— Git

```
$ git log --pretty=format:"%h - %an, %ar : %s"
ca82a6d - Scott Chacon, 6 years ago : changed the version number
085bb3b - Scott Chacon, 6 years ago : removed unnecessary test
a11bef0 - Scott Chacon, 6 years ago : first commit
```

Table 2-1

TABLE 2-1. *git log --pretty=format 常用的选项*

%H	commit
%h	
%T	tree
%t	
%P	parent
%p	
%an	author
%ae	
%ad	--date=
%ar	
%cn	(committer)

%ce
%cd
%cr
%s

Chapter 5

oneline format log --graph
ASCII

```
$ git log --pretty=format:"%h %s" --graph
* 2d3acf9 ignore errors from SIGCHLD on trap
*  5e3ee11 Merge branch 'master' of git://github.com/dustin/grit
|\
| * 420eac9 Added a method for getting the current branch.
* | 30e367c timeout code and tests
* | 5a09431 add timeout protection to grit
* | e1193f8 support for heads with slashes in them
|/
* d6016bc require time for xmlschema
*  11d191e Merge branch 'defunkt' into local
```

git log Table 2-2
log

TABLE 2-2. *git log 的常用选项*

-p
--stat
--shortstat --stat
--name-only

`--name-status`	
`--abbrev-commit`	SHA-1 40
`--relative-date`	“ 2 weeks ago ”
`--graph`	ASCII
`--pretty`	one - line short full fuller format

git log

-2

-<n> n

Git

--since --until

```
$ git log --since=2.weeks
```

"2008-01-15"

"2 years 1 day 3 minutes ago"

--author

--grep

--all-match

-S

```
$ git log -Sfunction_name
```

git log (path)

git log

--

Table 2-3

TABLE 2-3. *限制 git log 输出的选项*

-(n)	n
--since, --after	
--until, --before	
--author	
--committer	
--grep	
-S	

Git 2008 10 Ju - nio Hamano

```
$ git log --pretty="%h - %s" --author=gitster --since="2008-10-01" \
   --before="2008-11-01" --no-merges -- t/
5610e3b - Fix testcase failure when extended attributes are in use
acd3b9e - Enhance hold_lock_file_for_{update,append}() API
f563754 - demonstrate breakage of detached checkout with symbolic link HEAD
d1a43f2 - reset --hard/read-tree --reset -u: remove unmerged new paths
51a94af - Fix "checkout --track -b newbranch" on detached HEAD
b0ad11e - pull: allow "git pull origin $something:$current_branch" into an unborn branch
```

40000 6

撤消操作

Git

--amend

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

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

-

git add * git status

```
$ git add *
$ git status
On branch master
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

    renamed:    README.md -> README
    modified:   CONTRIBUTING.md
```

“ Changes to be committed ” git reset HEAD <file>... CONTRIBUTING.md

```
$ git reset HEAD CONTRIBUTING.md
Unstaged changes after reset:
M       CONTRIBUTING.md
$ git status
On branch master
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)
```

```
    renamed:    README.md -> README

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:   CONTRIBUTING.md
```

CONTRIBUTING.md

虽然在调用时加上 --hard 选项**可以**令 git reset 成为一个危险的命令（译注：可能导致工作目录中所有当前进度丢失！），但本例中工作目录内的文件并不会被修改。 不加选项地调用 git reset 并不危险 — 它只会修改暂存区域。

---

git reset

“ ” reset

CONTRIBUTING.md

-

git status

```
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:   CONTRIBUTING.md
```

```
$ git checkout -- CONTRIBUTING.md
$ git status
On branch master
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)
```

```
    renamed:    README.md -> README
```

你需要知道 `git checkout -- [file]` 是一个危险的命令，这很重要。 你对那个文件做的任何修改都会消失 - 你只是拷贝了另一个文件来覆盖它。 除非你确实清楚不想要那个文件了，否则不要使用这个命令。

Chapter 3
Git

`--amend` “
”

远程仓库的使用

Git

`git remote`

origin - Git

```
$ git clone https://github.com/schacon/ticgit
Cloning into 'ticgit'...
remote: Reusing existing pack: 1857, done.
remote: Total 1857 (delta 0), reused 0 (delta 0)
Receiving objects: 100% (1857/1857), 374.35 KiB | 268.00 KiB/s, done.
Resolving deltas: 100% (772/772), done.
Checking connectivity... done.
$ cd ticgit
```

```
$ git remote
origin
```

-v Git
URL

```
$ git remote -v
origin  https://github.com/schacon/ticgit (fetch)
origin  https://github.com/schacon/ticgit (push)
```

```
$ cd grit
$ git remote -v
bakkdoor  https://github.com/bakkdoor/grit (fetch)
bakkdoor  https://github.com/bakkdoor/grit (push)
cho45     https://github.com/cho45/grit (fetch)
cho45     https://github.com/cho45/grit (push)
defunkt   https://github.com/defunkt/grit (fetch)
defunkt   https://github.com/defunkt/grit (push)
koke      git://github.com/koke/grit.git (fetch)
koke      git://github.com/koke/grit.git (push)
origin    git@github.com:mojombo/grit.git (fetch)
origin    git@github.com:mojombo/grit.git (push)
```

“
Git ”

git remote add <shortname>
<url> Git

```
$ git remote
origin
$ git remote add pb https://github.com/paulboone/ticgit
$ git remote -v
origin  https://github.com/schacon/ticgit (fetch)
```

```
origin  https://github.com/schacon/ticgit (push)
pb      https://github.com/paulboone/ticgit (fetch)
pb      https://github.com/paulboone/ticgit (push)
```

pb URL
Paul git fetch pb

```
$ git fetch pb
remote: Counting objects: 43, done.
remote: Compressing objects: 100% (36/36), done.
remote: Total 43 (delta 10), reused 31 (delta 5)
Unpacking objects: 100% (43/43), done.
From https://github.com/paulboone/ticgit
 * [new branch]      master     -> pb/master
 * [new branch]      ticgit     -> pb/ticgit
```

Paul master pb/master -

Chapter 3

```
$ git fetch [remote-name]
```

clone
“ origin ” git fetch origin
git fetch
-

Chapter 3

git pull

git clone master
master git pull

git push [remote-name] [branch-name] master origin

```
$ git push origin master
```

Chapter 3

git remote show [remote-name] origin

```
$ git remote show origin
* remote origin
  Fetch URL: https://github.com/schacon/ticgit
  Push  URL: https://github.com/schacon/ticgit
  HEAD branch: master
  Remote branches:
    master                               tracked
    dev-branch                           tracked
  Local branch configured for 'git pull':
    master merges with remote master
  Local ref configured for 'git push':
    master pushes to master (up to date)
```

URL

master git pull

master master

Git

git remote show

```
$ git remote show origin
* remote origin
  URL: https://github.com/my-org/complex-project
  Fetch URL: https://github.com/my-org/complex-project
  Push  URL: https://github.com/my-org/complex-project
  HEAD branch: master
  Remote branches:
    master                           tracked
    dev-branch                       tracked
    markdown-strip                   tracked
    issue-43                         new (next fetch will store in remotes/origin)
    issue-45                         new (next fetch will store in remotes/origin)
    refs/remotes/origin/issue-11     stale (use 'git remote prune' to remove)
  Local branches configured for 'git pull':
    dev-branch merges with remote dev-branch
    master     merges with remote master
  Local refs configured for 'git push':
    dev-branch                     pushes to dev-branch                     (up to
    markdown-strip                 pushes to markdown-strip                 (up to
    master                         pushes to master                         (up to
```

git push

git pull

git remote rename

pb paul git remote re-

name

```
$ git remote rename pb paul
$ git remote
origin
paul
```

pb/

master paul/master

-

-

git remote rm

```
$ git remote rm paul
$ git remote
origin
```

打标签

VCS Git

v1.0

Git git tag

```
$ git tag
v0.1
v1.3
```

Git
500 1.8.5

```
$ git tag -l 'v1.8.5*'
v1.8.5
v1.8.5-rc0
v1.8.5-rc1
v1.8.5-rc2
v1.8.5-rc3
v1.8.5.1
v1.8.5.2
v1.8.5.3
v1.8.5.4
v1.8.5.5
```

Git lightweight an -
notated
-

Git

GNU Privacy Guard GPG

Git tag
-a

```
$ git tag -a v1.4 -m 'my version 1.4'
$ git tag
v0.1
v1.3
v1.4
```

-m
Git
git show

```
$ git show v1.4
tag v1.4
Tagger: Ben Straub <ben@straub.cc>
Date:   Sat May 3 20:19:12 2014 -0700

my version 1.4

commit ca82a6dff817ec66f44342007202690a93763949
Author: Scott Chacon <schacon@gee-mail.com>
Date:   Mon Mar 17 21:52:11 2008 -0700

    changed the version number
```

-
-a -s -m

```
$ git tag v1.4-lw
$ git tag
v0.1
v1.3
v1.4
v1.4-lw
v1.5
```

git show

```
$ git show v1.4-lw
commit ca82a6dff817ec66f44342007202690a93763949
Author: Scott Chacon <schacon@gee-mail.com>
Date:   Mon Mar 17 21:52:11 2008 -0700

    changed the version number
```

```
$ git log --pretty=oneline
15027957951b64cf874c3557a0f3547bd83b3ff6 Merge branch 'experiment'
a6b4c97498bd301d84096da251c98a07c7723e65 beginning write support
0d52aaab4479697da7686c15f77a3d64d9165190 one more thing
6d52a271eda8725415634dd79daabbc4d9b6008e Merge branch 'experiment'
0b7434d86859cc7b8c3d5e1dddfed66ff742fcbc added a commit function
4682c3261057305bdd616e23b64b0857d832627b added a todo file
166ae0c4d3f420721acbb115cc33848dfcc2121a started write support
9fceb02d0ae598e95dc970b74767f19372d61af8 updated rakefile
964f16d36dfccde844893cac5b347e7b3d44abbc commit the todo
8a5cbc430f1a9c3d00faaeffd07798508422908a updated readme
```

v1.2 “ updated rake - file ”

:

```
$ git tag -a v1.2 9fceb02
```

```
$ git tag
v0.1
v1.2
v1.3
v1.4
v1.4-lw
v1.5

$ git show v1.2
tag v1.2
Tagger: Scott Chacon <schacon@gee-mail.com>
Date:   Mon Feb 9 15:32:16 2009 -0800

version 1.2
commit 9fceb02d0ae598e95dc970b74767f19372d61af8
Author: Magnus Chacon <mchacon@gee-mail.com>
Date:   Sun Apr 27 20:43:35 2008 -0700

    updated rakefile
...
```

git push

- git push origin [tagname]

```
$ git push origin v1.5
Counting objects: 14, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (12/12), done.
Writing objects: 100% (14/14), 2.05 KiB | 0 bytes/s, done.
Total 14 (delta 3), reused 0 (delta 0)
To git@github.com:schacon/simplegit.git
 * [new tag]         v1.5 -> v1.5
```

--tags git push

```
$ git push origin --tags
Counting objects: 1, done.
Writing objects: 100% (1/1), 160 bytes | 0 bytes/s, done.
Total 1 (delta 0), reused 0 (delta 0)
To git@github.com:schacon/simplegit.git
```

```
 * [new tag]         v1.4 -> v1.4
 * [new tag]         v1.4-lw -> v1.4-lw
```

Git

git checkout -b [branchname] [tagname]

```
$ git checkout -b version2 v2.0.0
Switched to a new branch 'version2'
```

version2

version2 v2.0.0

Git 别名

Git Git

Git

Git git config

```
$ git config --global alias.co checkout
$ git config --global alias.br branch
$ git config --global alias.ci commit
$ git config --global alias.st status
```

git commit git ci

Git

Git

```
$ git config --global alias.unstage 'reset HEAD --'
```

```
$ git unstage fileA
$ git reset HEAD -- fileA
```

last

```
$ git config --global alias.last 'log -1 HEAD'
```

```
$ git last
commit 66938dae3329c7aebe598c2246a8e6af90d04646
Author: Josh Goebel <dreamer3@example.com>
Date:   Tue Aug 26 19:48:51 2008 +0800

    test for current head

    Signed-off-by: Scott Chacon <schacon@example.com>
```

Git

Git

! Git

git visual gitk

```
$ git config --global alias.visual '!gitk'
```

总结

Git

Git

Git 分支 3

—

Git “ ”
Git Git
Git

Git
Git

分支简介

Git Git

Chapter 1 Git

Git commit object
Git —

Chapter 1 SHA-1
Git Git blob

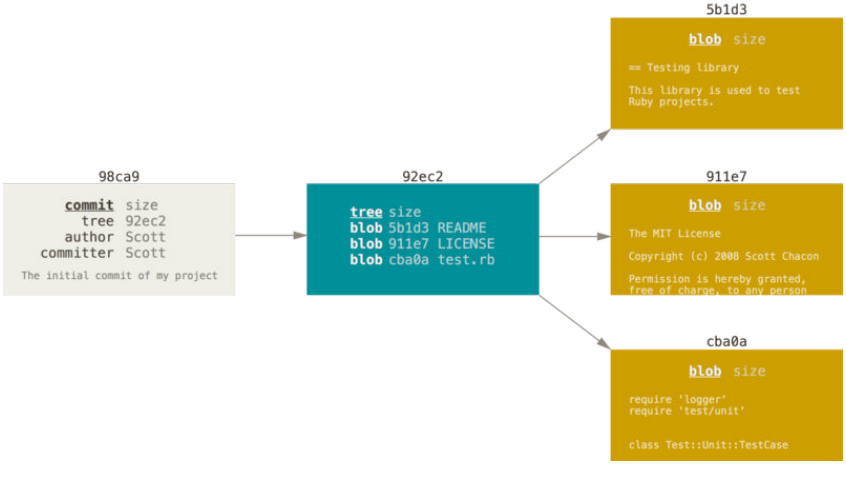
```
$ git add README test.rb LICENSE
$ git commit -m 'The initial commit of my project'
```

`git commit` Git
Git
Git
Git

Git blob
blob

FIGURE 3-1

首次提交对象及其树结构



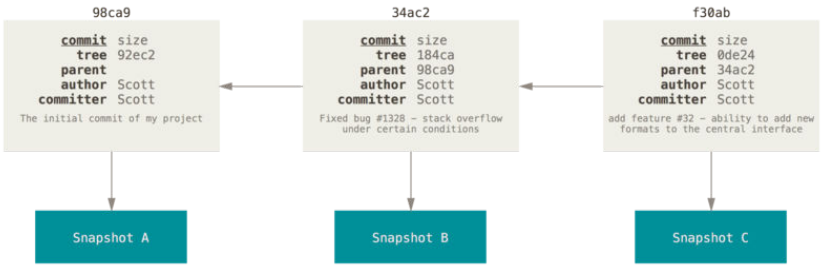


FIGURE 3-2

提交对象及其父对象

Git Git

`master`

`master`

Git 的“master”分支并不是一个特殊分支。 它就跟其它分支完全没有区别。 之所以几乎每一个仓库都有 master 分支，是因为 `git init` 命令默认创建它，并且大多数人都懒得去改动它。

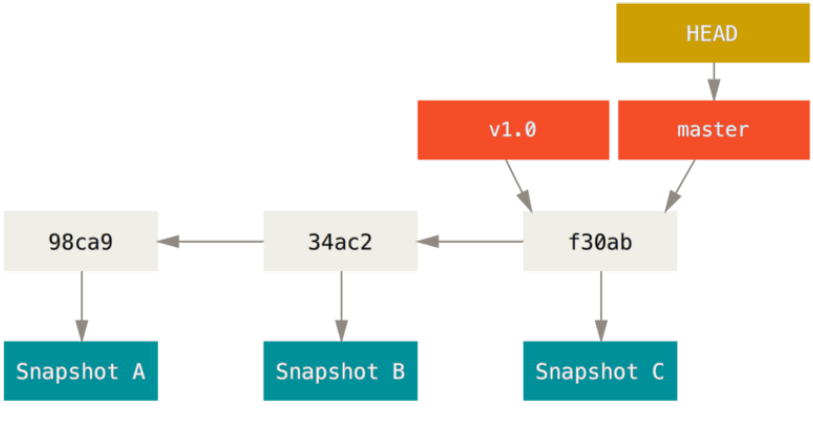


FIGURE 3-3

分支及其提交历史

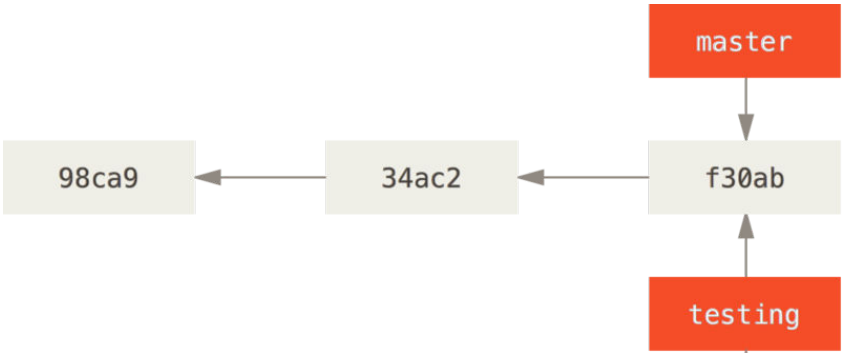
Git

testing `git branch`

```
$ git branch testing
```

FIGURE 3-4

两个指向相同提交历史的分支



Git

HEAD Subversion

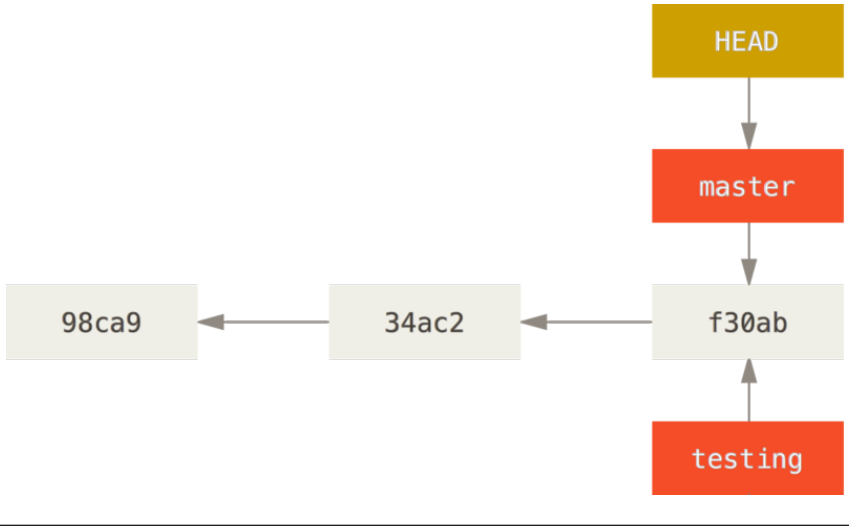
CVS HEAD Git

HEAD

master git branch

FIGURE 3-5

HEAD 指向当前所在的分支



git log
--decorate

```
$ git log --oneline --decorate
f30ab (HEAD, master, testing) add feature #32 - ability to add new
34ac2 fixed bug #1328 - stack overflow under certain conditions
98ca9 initial commit of my project
```

“ master ” “ testing ”
f30ab

git checkout
testing

```
$ git checkout testing
```

HEAD testing

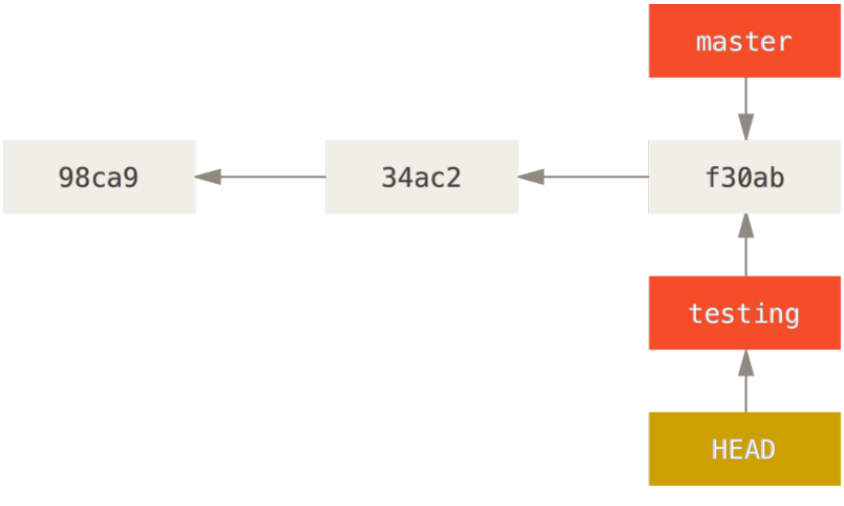


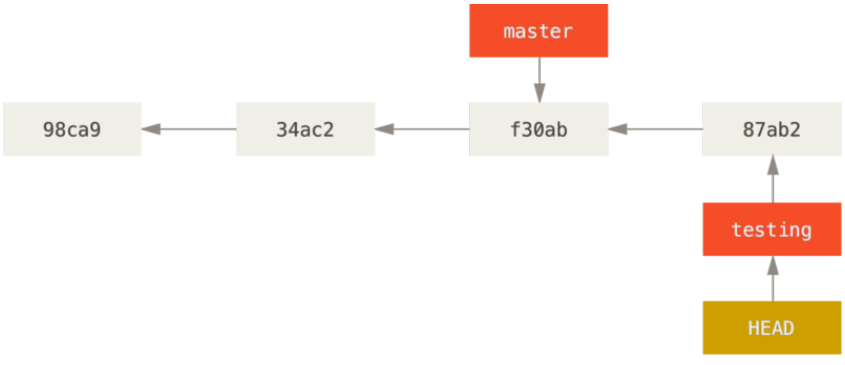
FIGURE 3-6

HEAD 指向当前所在的分支

```
$ vim test.rb
$ git commit -a -m 'made a change'
```

FIGURE 3-7

HEAD 分支随着提交操作自动向前移动



testing master

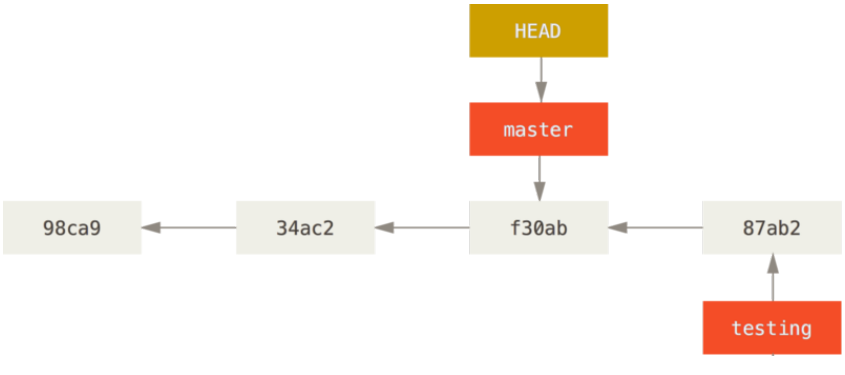
git checkout

master

```
$ git checkout master
```

FIGURE 3-8

检出时HEAD 随之移动



HEAD master

master

testing

> **分支切换会改变你工作目录中的文件**
>
> 在切换分支时，一定要注意你工作目录里的文件会被改变。 如果是切换到一个较旧的分支，你的工作目录会恢复到该分支最后一次提交时的样子。 如果 Git 不能干净利落地完成这个任务，它将禁止切换分支。

```
$ vim test.rb
$ git commit -a -m 'made other changes'
```

Figure 3-9

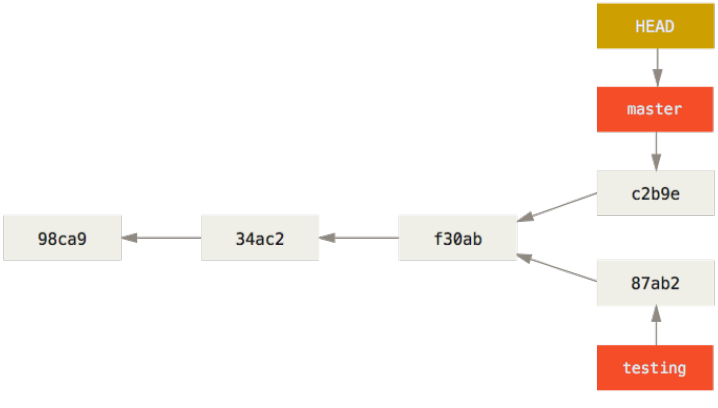
mas -

ter

branch checkout commit

FIGURE 3-9

项目分叉历史



git log git log --

oneline --decorate --graph --all

```
$ git log --oneline --decorate --graph --all
* c2b9e (HEAD, master) made other changes
| * 87ab2 (testing) made a change
|/
* f30ab add feature #32 - ability to add new formats to the
* 34ac2 fixed bug #1328 - stack overflow under certain conditions
* 98ca9 initial commit of my project
```

Git 40 SHA-1

41 40 1

Git

Git

分支的新建与合并

1.
2.
3.

1. production branch
2.
3.
4.

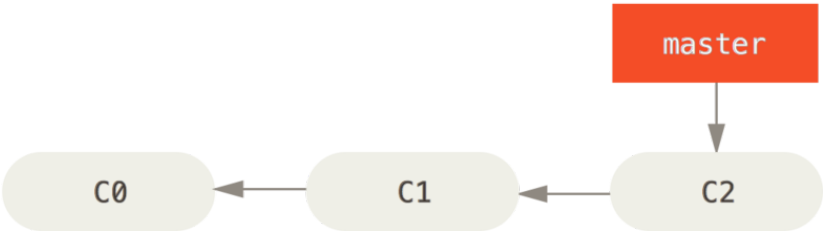


FIGURE 3-10

一个简单提交历史

#53

-b

git checkout

```
$ git checkout -b iss53
Switched to a new branch "iss53"
```

```
$ git branch iss53
$ git checkout iss53
```

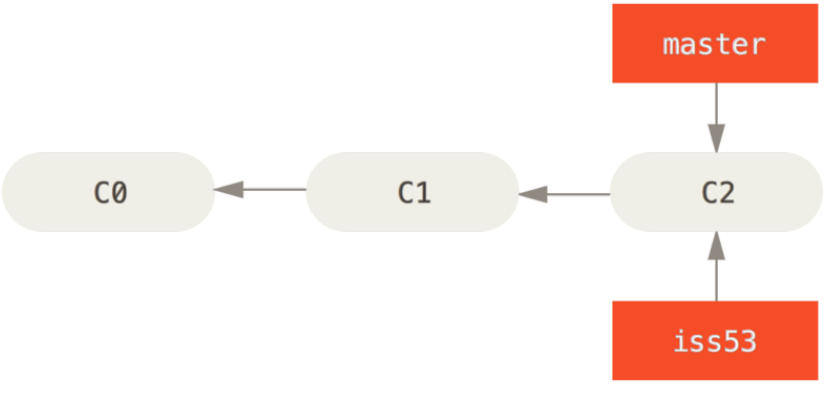


FIGURE 3-11

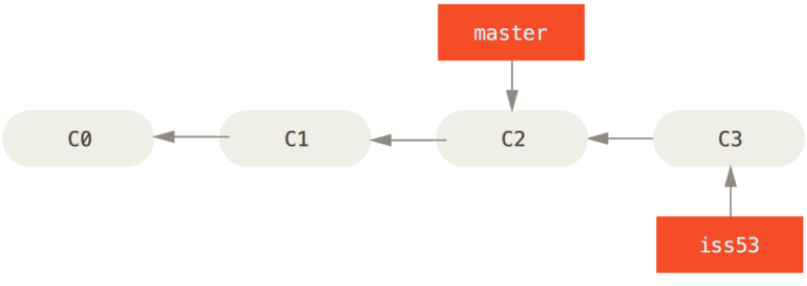
创建一个新分支指针

#53 iss53
HEAD
iss53

```
$ vim index.html
$ git commit -a -m 'added a new footer [issue 53]'
```

FIGURE 3-12

iss53 分支随着工作的进展向前推进



Git
iss53
53#
master
Git
stashing
commit amending “ ”

master

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

#53
Git
Git

hotfx branch

```
$ git checkout -b hotfix
Switched to a new branch 'hotfix'
$ vim index.html
$ git commit -a -m 'fixed the broken email address'
[hotfix 1fb7853] fixed the broken email address
 1 file changed, 2 insertions(+)
```

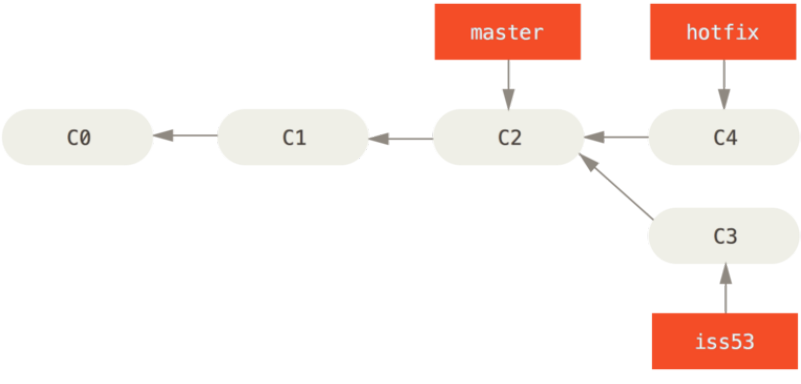


FIGURE 3-13

基于 master 分支的紧急问题分支 hotfix branch

master git merge

```
$ git checkout master
$ git merge hotfix
Updating f42c576..3a0874c
Fast-forward
 index.html | 2 ++
 1 file changed, 2 insertions(+)
```

" fast-forward "

master hotfx

Git

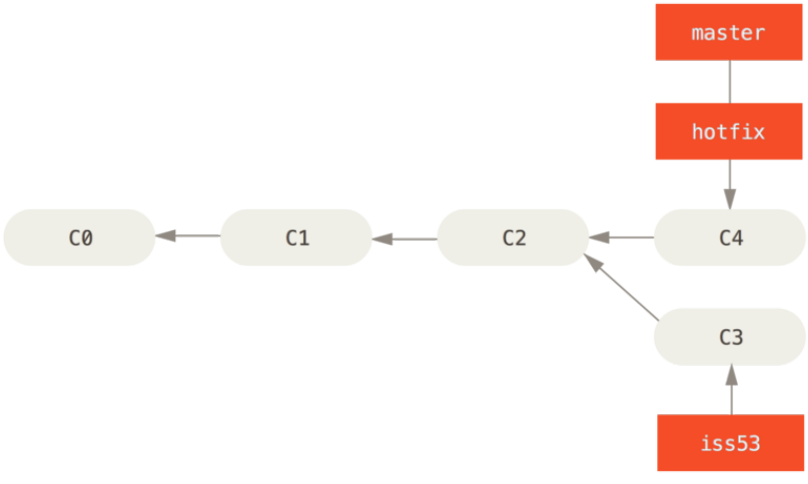
Git

— “ fast-forward ”

master

FIGURE 3-14

master 被快进到 hotfix



hotfix —
master -d git branch

```
$ git branch -d hotfix
Deleted branch hotfix (3a0874c).
```

#53
iss53

```
$ git checkout iss53
Switched to branch "iss53"
$ vim index.html
$ git commit -a -m 'finished the new footer [issue 53]'
[iss53 ad82d7a] finished the new footer [issue 53]
1 file changed, 1 insertion(+)
```

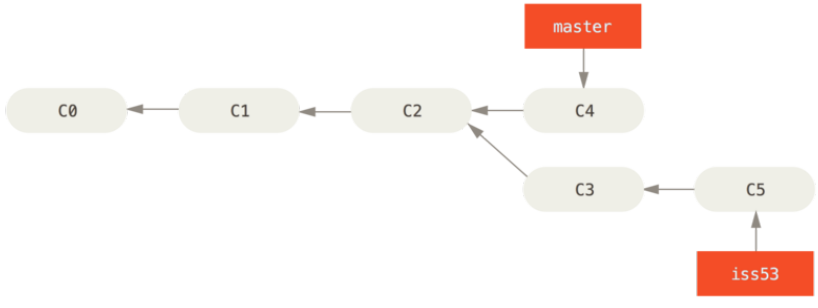


FIGURE 3-15

继续在 iss53 分支上的工作

hotfix iss53
hotfix git merge master master
iss53 iss53
master

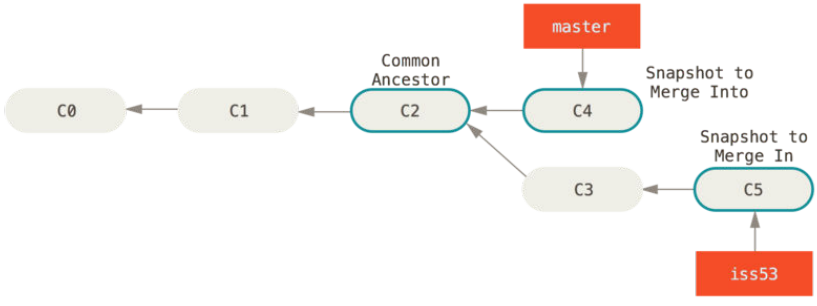
#53 master
iss53 master hotfix
git
merge

```
$ git checkout master
Switched to branch 'master'
$ git merge iss53
Merge made by the 'recursive' strategy.
index.html |    1 +
1 file changed, 1 insertion(+)
```

hotfix
diverged
master iss53 Git
Git
C4 C5 C2

FIGURE 3-16

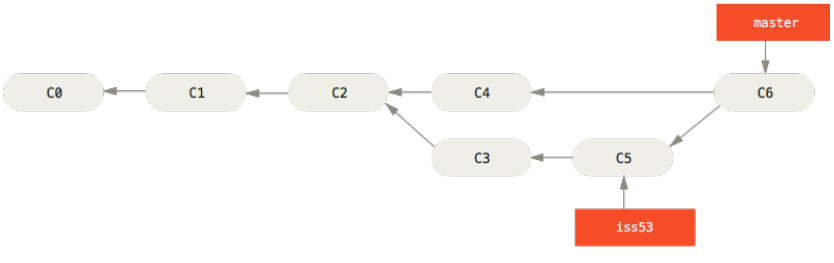
一次典型合并中所用到的三个快照



Git

FIGURE 3-17

一个合并提交



Git

CVS Subversion 1.5

Git

iss53

```
$ git branch -d iss53
```

Git

#53 hotfix

```
$ git merge iss53
Auto-merging index.html
CONFLICT (content): Merge conflict in index.html
Automatic merge failed; fix conflicts and then commit the result.
```

Git Git

git status un-merged

```
$ git status
On branch master
You have unmerged paths.
  (fix conflicts and run "git commit")

Unmerged paths:
  (use "git add <file>..." to mark resolution)

    both modified:      index.html

no changes added to commit (use "git add" and/or "git commit -a")
```

Git

```
<<<<<<< HEAD:index.html
<div id="footer">contact : email.support@github.com</div>
=======
<div id="footer">
 please contact us at support@github.com
</div>
>>>>>>> iss53:index.html
```

HEAD master

merge

```
=======                    iss53                    =======
                                        =======
```

```
<div id="footer">
please contact us at email.support@github.com
</div>
```

<<<<<<< ,
======= , >>>>>>>

git add
Git
git mergetool

```
$ git mergetool

This message is displayed because 'merge.tool' is not configured.
See 'git mergetool --tool-help' or 'git help config' for more details.
'git mergetool' will now attempt to use one of the following tools:
opendiff kdiff3 tkdiff xxdiff meld tortoisemerge gvimdiff diffuse diffmerge ecmerg
Merging:
index.html

Normal merge conflict for 'index.html':
  {local}: modified file
  {remote}: modified file
Hit return to start merge resolution tool (opendiff):
```

Git opendiff
Mac “
one of the following tools ”

如果你需要更加高级的工具来解决复杂的合并冲突，我们会在 “高级合并” 介绍更多关于分支合并的内容。

Git
Git git status

```
$ git status
On branch master
All conflicts fixed but you are still merging.
  (use "git commit" to conclude merge)

Changes to be committed:

    modified:   index.html
```

git commit

```
Merge branch 'iss53'

Conflicts:
    index.html
#
# It looks like you may be committing a merge.
# If this is not correct, please remove the file
#       .git/MERGE_HEAD
# and try again.


# Please enter the commit message for your changes. Lines starting
# with '#' will be ignored, and an empty message aborts the commit.
# On branch master
# All conflicts fixed but you are still merging.
#
# Changes to be committed:
#       modified:   index.html
#
```

分支管理

git branch

```
$ git branch
  iss53
* master
  testing
```

master * HEAD master

git branch -v

```
$ git branch -v
  iss53   93b412c fix javascript issue
* master  7a98805 Merge branch 'iss53'
  testing 782fd34 add scott to the author list in the readmes
```

--merged --no-merged

git branch --merged

```
$ git branch --merged
  iss53
* master
```

iss53 * git branch -d

git branch --no-merged

```
$ git branch --no-merged
  testing
```

git branch -d

```
$ git branch -d testing
error: The branch 'testing' is not fully merged.
If you are sure you want to delete it, run 'git branch -D testing'.
```

-D

分支开发工作流

Git

Git master

develop next

master

iss53 bug

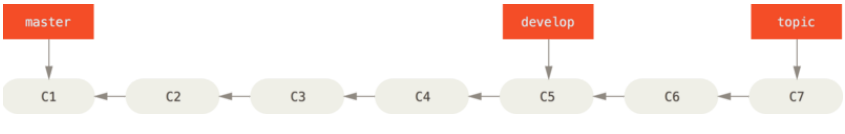


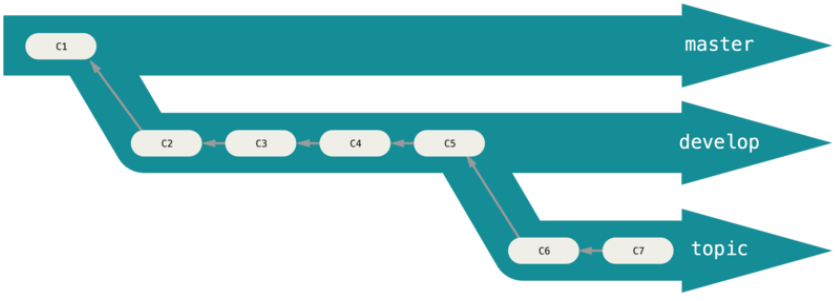
FIGURE 3-18

渐进稳定分支的线性图

work silos

FIGURE 3-19

渐进稳定分支的流水线（“silo”）视图



pro-

posed pu: proposed updates

next master

VCS

Git

iss53 hotfix

iss53 hotfix

context-switch —

master C1

iss91 iss91 C4

iss91v2

master

C10 dumbidea

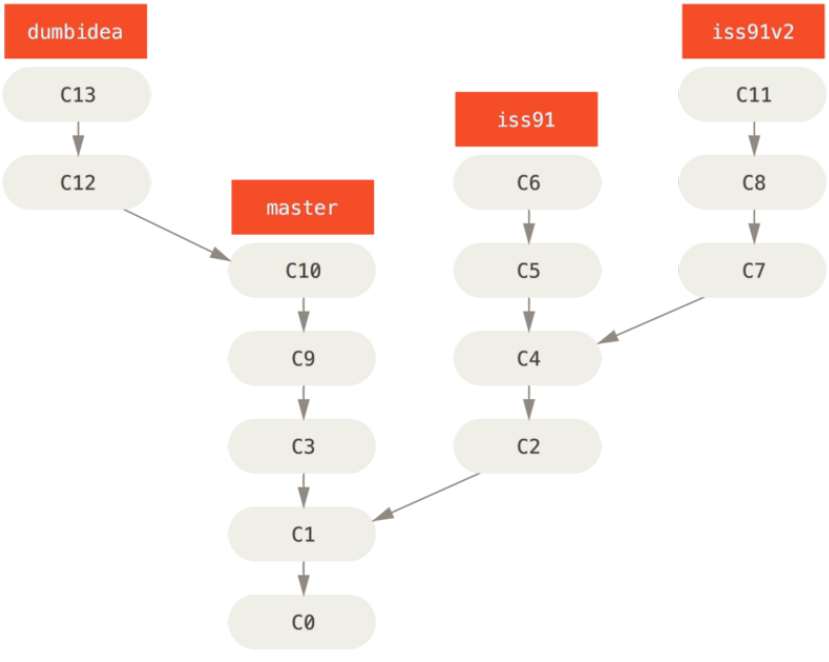


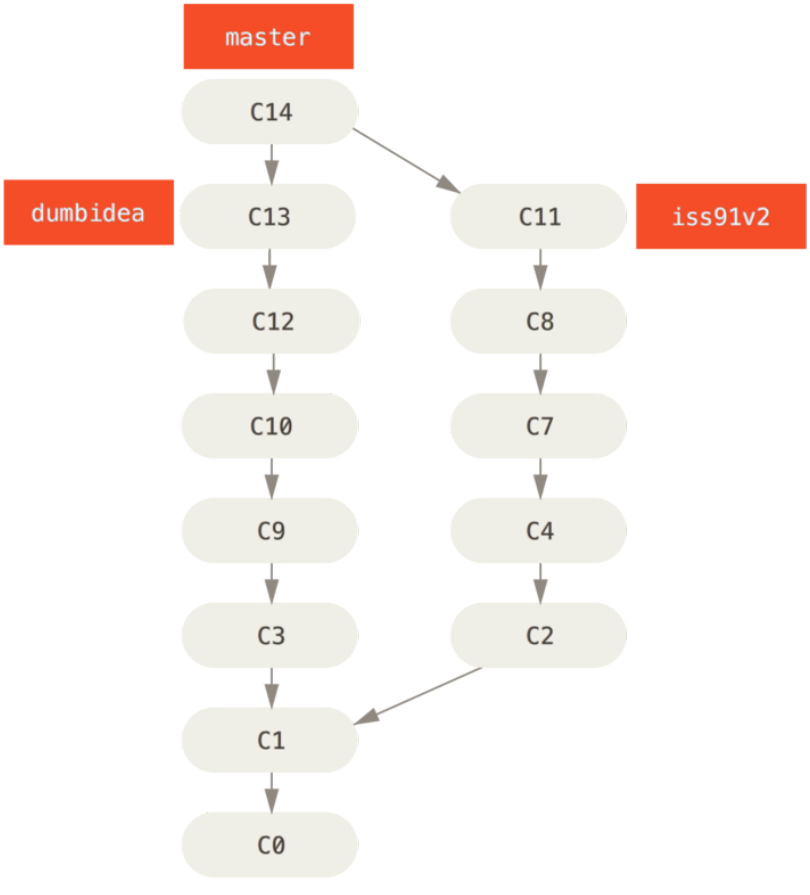
FIGURE 3-20

拥有多个特性分支的提交历史

iss91v2 dumbidea iss91 C5 C6

FIGURE 3-21

合并了 dumbidea 和 iss91v2 分支之后的提交历史



Chapter 5

branching scheme

Git —

远程分支

```
git ls-remote (remote)
```

```
git remote show (remote)
```

```
(remote)/(branch)
  origin        master                          origin/
master                                          iss53
                    iss53                           ori-
gin/iss53
```

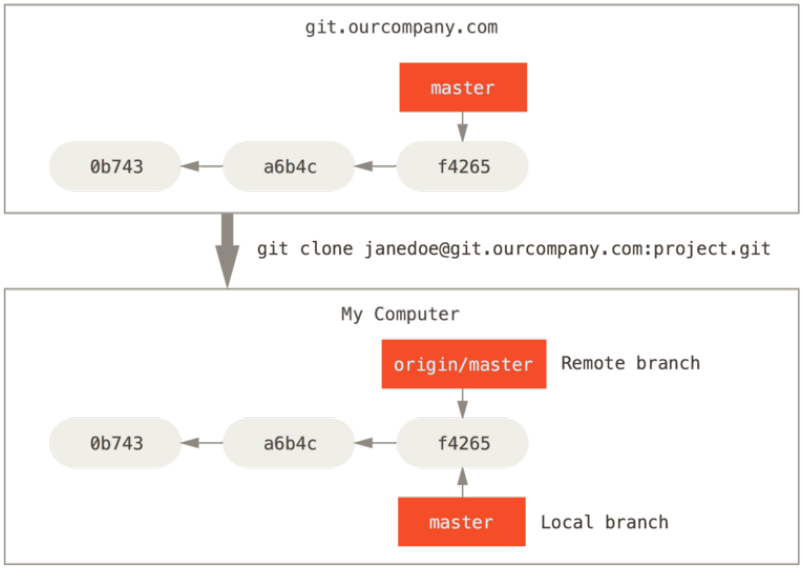
```
 git.ourcompany.com  Git                          Git
clone                       origin
        master                                origin/master
Git              origin  master                        master
```

“ORIGIN” 并无特殊含义

远程仓库名字 “origin” 与分支名字 “master” 一样，在 Git 中并没有任何特别的含义一样。 同时 “master” 是当你运行 `git init` 时默认的起始分支名字，原因仅仅是它的广泛使用，“origin” 是当你运行 `git clone` 时默认的远程仓库名字。 如果你运行 `git clone -o booyah`，那么你默认的远程分支名字将会是 `booyah/master`。

FIGURE 3-22

克隆之后的服务器与本地仓库



master

git.ourcompany.com master

origin

origin/master

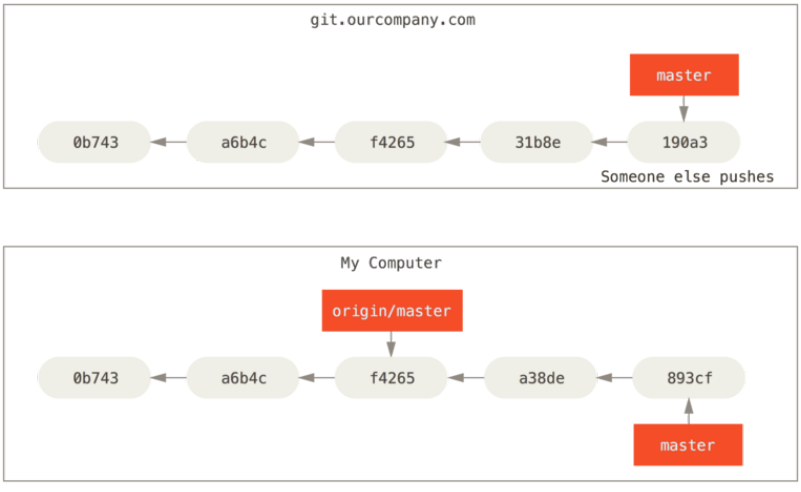


FIGURE 3-23

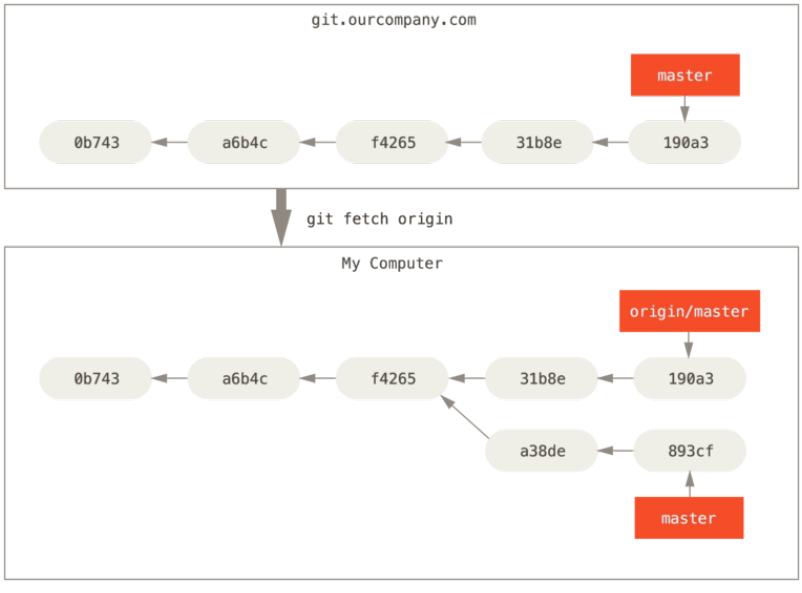
本地与远程的工作可以分叉

`git fetch origin`

“ origin ” `git.ourcompany.com` `origin/master`

FIGURE 3-24

git fetch 更新你的远程仓库引用



Git sprint
git.team1.ourcompany.com git remote add
Chapter 2
teamone URL

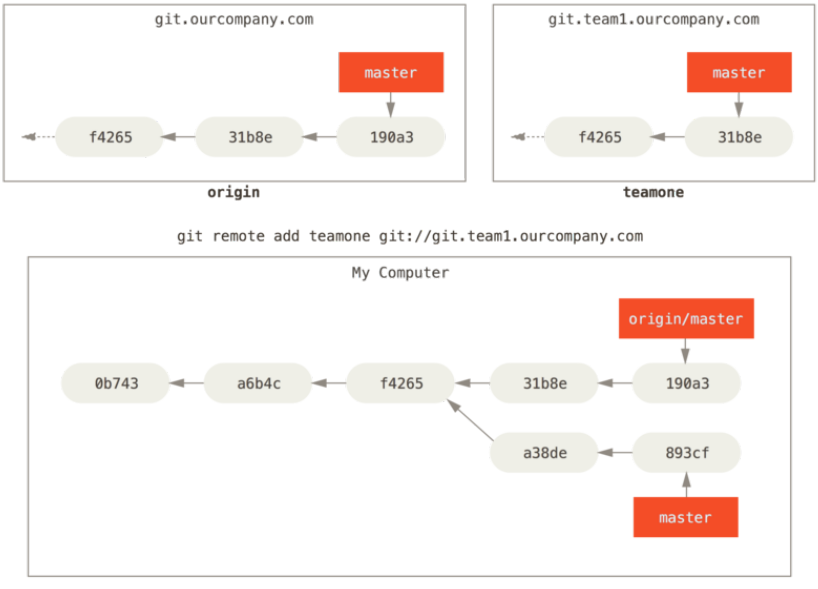


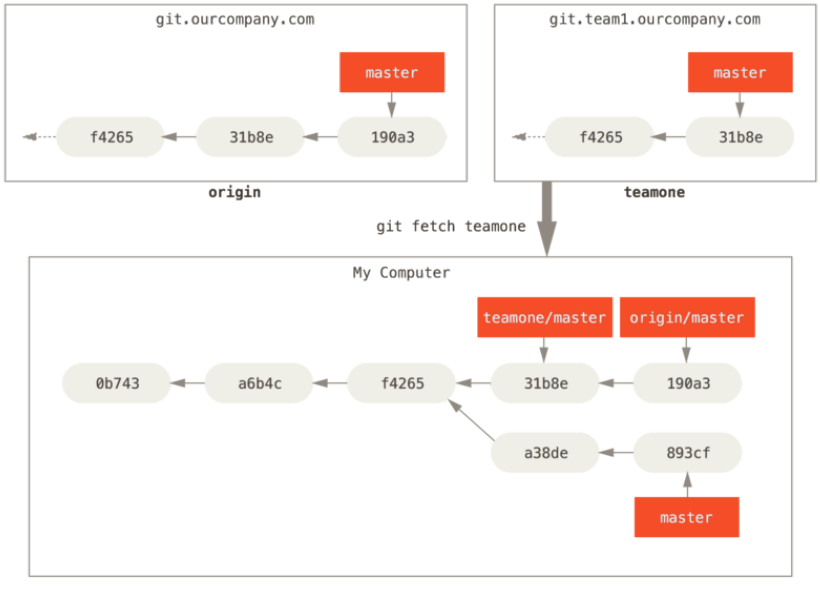
FIGURE 3-25

添加另一个远程仓库

`git fetch teamone` `teamone` `origin` Git `teamone/master` `teamone` `master`

FIGURE 3-26

远程跟踪分支 teamone/master



-

serverfix
git push (remote) (branch):

```
$ git push origin serverfix
Counting objects: 24, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (15/15), done.
Writing objects: 100% (24/24), 1.91 KiB | 0 bytes/s, done.
Total 24 (delta 2), reused 0 (delta 0)
To https://github.com/schacon/simplegit
 * [new branch]      serverfix -> serverfix
```

Git serverfix refs/heads/serverfix:refs/heads/serverfix “ serverfx serverfx ”
Chapter 10 refs/heads/

git push origin serverfix:serverfix -
“ serverfx serverfx ”

serverfix git push origin
serverfix:awesomebranch serverfix
awesomebranch

如何避免每次输入密码

如果你正在使用 HTTPS URL 来推送，Git 服务器会询问用户名与密码。 默认情况下它会在终端中提示服务器是否允许你进行推送。

如果不想在每一次推送时都输入用户名与密码，你可以设置一个 “credential cache”。 最简单的方式就是将其保存在内存中几分钟，可以简单地运行 `git config --global credential.helper cache` 来设置它。

想要了解更多关于不同验证缓存的可用选项，查看 **“凭证存储”**。

---

origin/serverfix serverfix

```
$ git fetch origin
remote: Counting objects: 7, done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 3 (delta 0), reused 3 (delta 0)
Unpacking objects: 100% (3/3), done.
From https://github.com/schacon/simplegit
 * [new branch]      serverfix    -> origin/serverfix
```

serverfix - origin/serverfix
git merge origin/serverfix
serverfix

```
$ git checkout -b serverfix origin/serverfix
Branch serverfix set up to track remote branch serverfix from origin.
Switched to a new branch 'serverfix'
```

origin/serverfix

“ ”

“ ”

git pull Git

origin/master

master -

master

git checkout -b [branch] [remotename]/[branch]

Git --track

```
$ git checkout --track origin/serverfix
Branch serverfix set up to track remote branch serverfix from origin.
Switched to a new branch 'serverfix'
```

```
$ git checkout -b sf origin/serverfix
Branch sf set up to track remote branch serverfix from origin.
Switched to a new branch 'sf'
```

sf origin/serverfix

-u --set-upstream-to

git branch

```
$ git branch -u origin/serverfix
Branch serverfix set up to track remote branch serverfix from origin.
```

上游快捷方式

当设置好跟踪分支后，可以通过 @{upstream} 或 @{u} 快捷方式来引用它。 所以在 master 分支时并且它正在跟踪 origin/master 时，如果愿意的话可以使用 git merge @{u} 来取代 git merge origin/master。

---

git branch -vv

```
$ git branch -vv
  iss53     7e424c3 [origin/iss53: ahead 2] forgot the brackets
  master    1ae2a45 [origin/master] deploying index fix
* serverfix f8674d9 [teamone/server-fix-good: ahead 3, behind 1] this should do it
  testing   5ea463a trying something new
```

iss53 origin/iss53 “ ahead ”
2 master
origin/master serverfix
teamone server-fix-good 2
1
testing

$ git fetch --all; git branch
-vv

git fetch

git pull git fetch git
merge
clone checkout git pull

git pull fetch
merge

-
master
--delete git push
serverfix

```
$ git push origin --delete serverfix
To https://github.com/schacon/simplegit
 - [deleted]         serverfix
```

Git

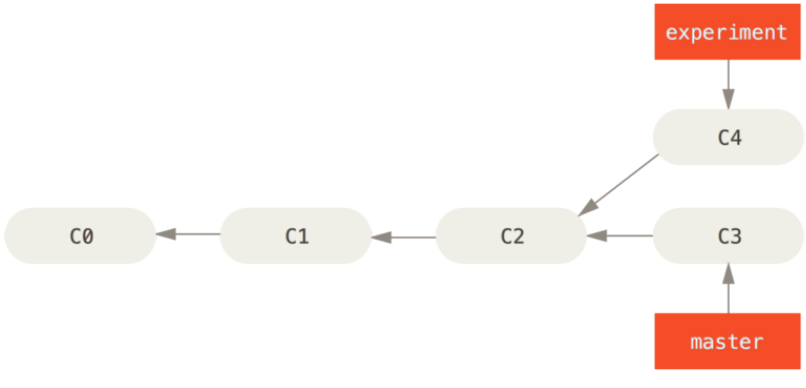
变基

Git merge rebase
“ ” “ ”

“ ”

FIGURE 3-27

分叉的提交历史



merge
C3 C4 C2

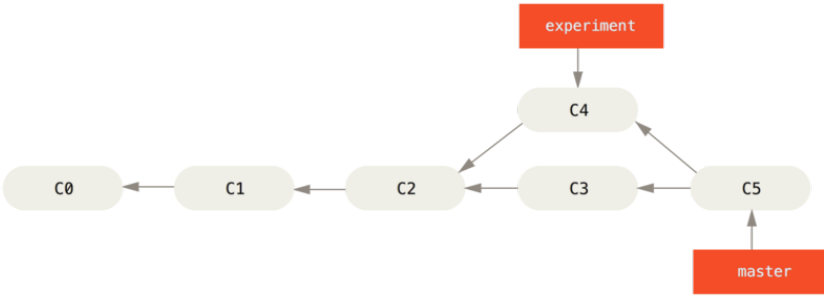


FIGURE 3-28

通过合并操作来整合分叉了的历史

C4 C3
Git re-
base “
”

```
$ git checkout experiment
$ git rebase master
First, rewinding head to replay your work on top of it...
Applying: added staged command
```

experiment
master C2

C3,
commit id

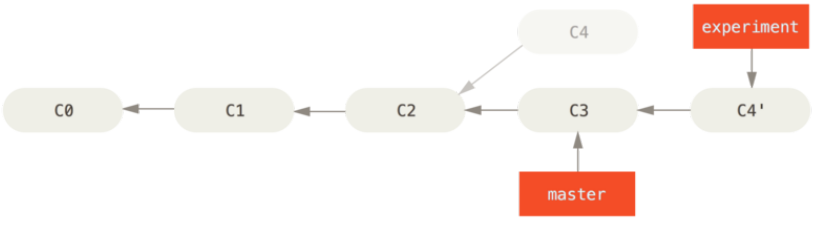


FIGURE 3-29

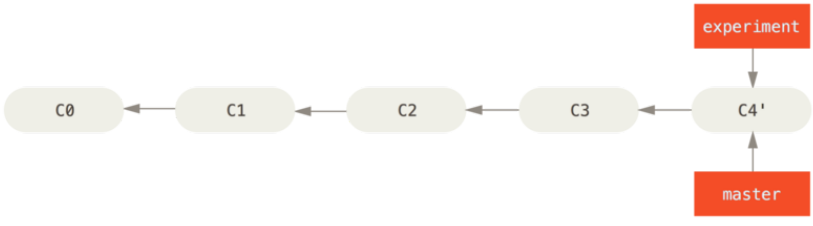
将 C4 中的修改变基到 C3 上

master

```
$ git checkout master
$ git merge experiment
```

FIGURE 3-30

master 分支的快进合并



C4' merge C5

—

ori-

gin/master

“ ”

Figure 3-31

server C3

C4 C3 client

C8 C9 server C10

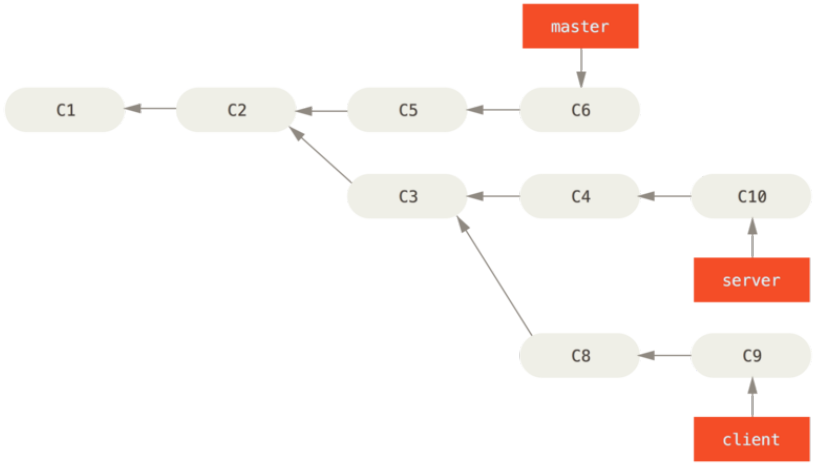


FIGURE 3-31

从一个特性分支里再分出一个特性分支的提交历史

client

server

git rebase --onto client server

C8 C9 master

```
$ git rebase --onto master server client
```

“ client client

server master

”

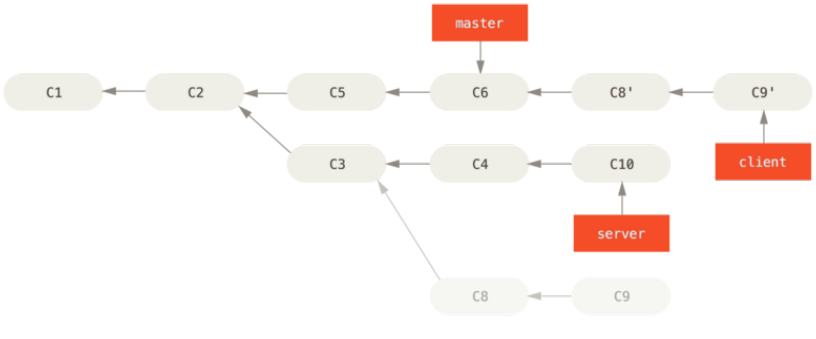


FIGURE 3-32

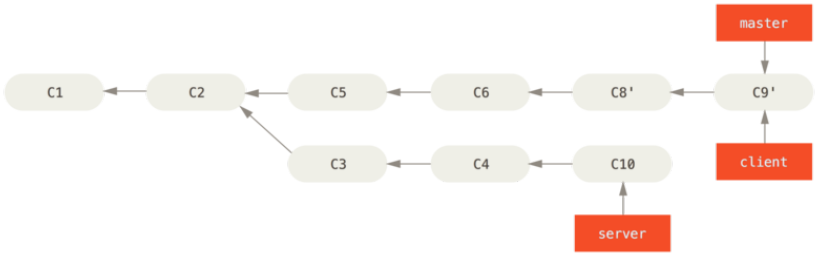
截取特性分支上的另一个特性分支，然后变基到其他分支

master Figure 3-33

```
$ git checkout master
$ git merge client
```

FIGURE 3-33

快进合并 master 分支，使之包含来自 client 分支的修改



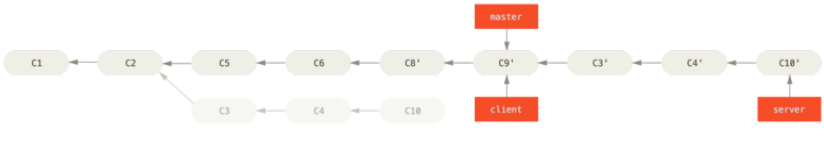
server git rebase
[basebranch] [topicbranch]
server master
server

```
$ git rebase master server
```

Figure 3-34 server “ ” master

FIGURE 3-34

将 server 中的修改变基到 master 上



master

```
$ git checkout master
$ git merge server
```

client server

Figure 3-35

```
$ git branch -d client
$ git branch -d server
```

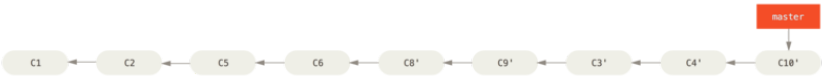


FIGURE 3-35

最终的提交历史

git rebase

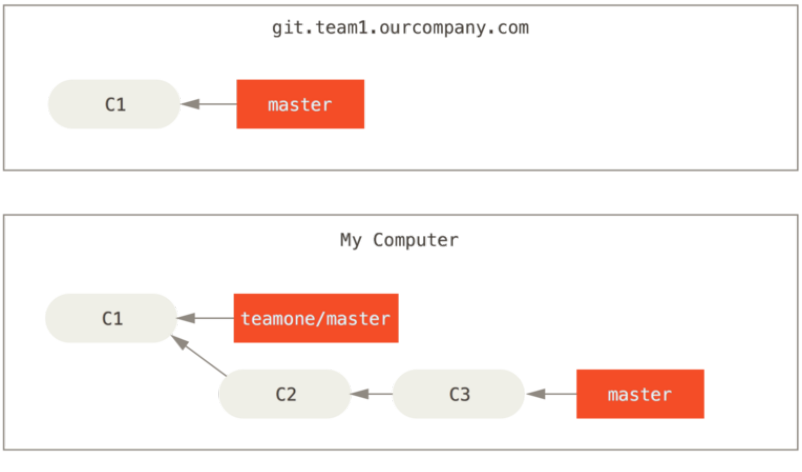
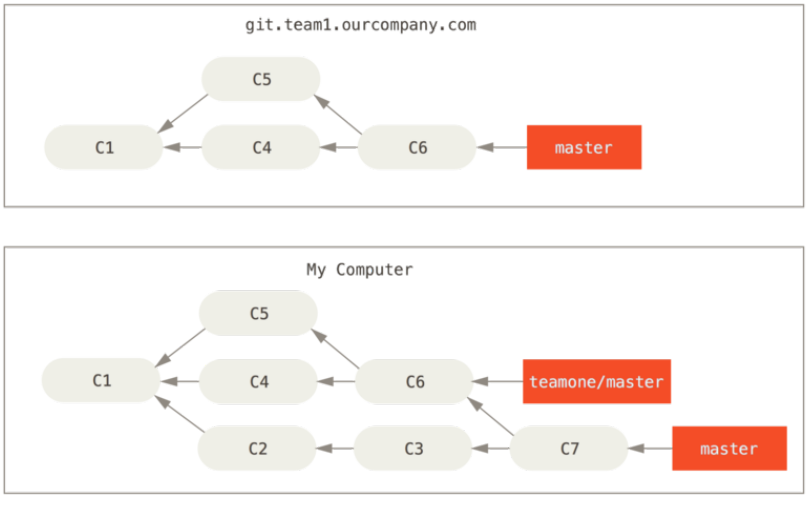


FIGURE 3-36

克隆一个仓库，然后在它的基础上进行了一些开发

FIGURE 3-37

抓取别人的提交，合并到自己的开发分支



`git push --force`

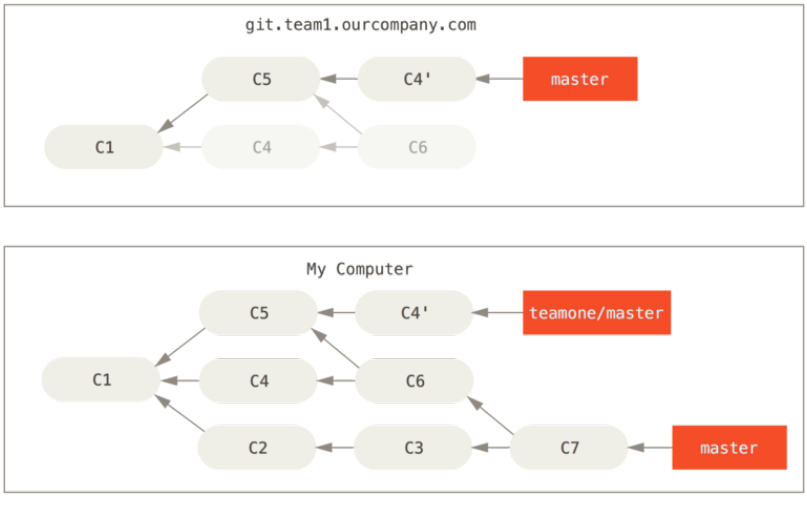


FIGURE 3-38

有人推送了经过变基的提交，并丢弃了你的本地开发所基于的一些提交

```
git pull
```

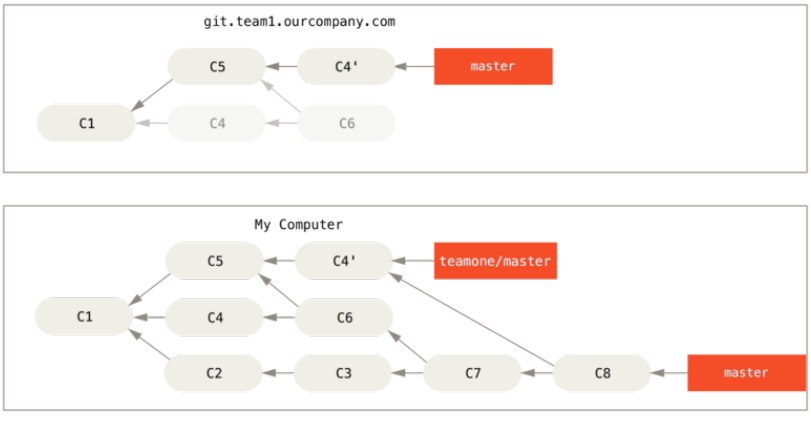


FIGURE 3-39

你将相同的内容又合并了一次，生成了一个新的提交

```
git log
```

C4 C6

Git

Git SHA-1
— “ patch-id ”

Git

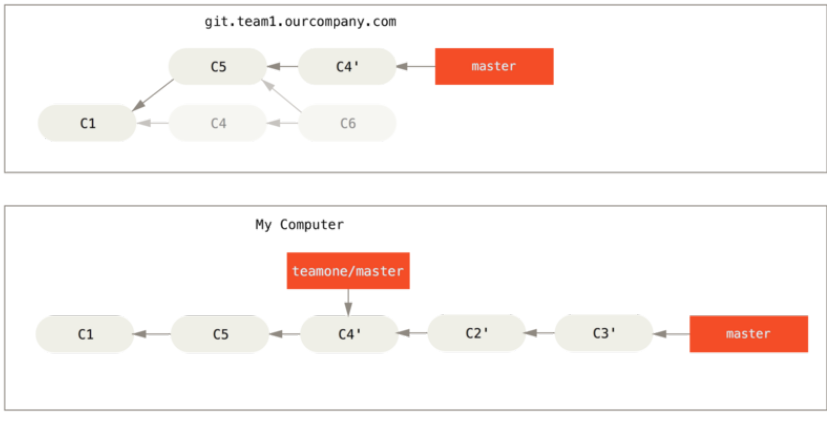
Figure 3-38
`git rebase teamone/master`, Git

- C2 C3 C4 C6 C7
- C2 C3 C4
- C2
  C3 C4 C4'
- `teamone/master`

Figure 3-39 Figure 3-40

FIGURE 3-40

在一个被变基然后强制推送的分支上再次执行变基



C4 ’ C4
C4

git pull --rebase

git pull git fetch git rebase teamone/master

git pull --rebase

git config --global pull.rebase true

pull.rebase

git pull --rebase

VS.

rebase filter-branch

Git

总结

Git

Git

4 服务器上的 Git

Git
Git Git
push pull

—

Git

bare repository —

Git .git

协议

Git Local HTTP
SSH Secure Shell Git

Local protocol

NFS

clone
push pull
URL

```
$ git clone /opt/git/project.git
```

```
$ git clone file:///opt/git/project.git
```

URL file:// Git
Git hard link
file:// Git
file://
extraneous references object –
Chapter 10 for
maintenance tasks

Git

```
$ git remote add local_proj /opt/git/project.git
```

优点

/ “
Git ”

git pull /
home/john/project

缺点

Git NFS
SSH
“
”shell Git

HTTP

Git HTTP Git 1.6.6
Git 1.6.6
Git SSH
HTTP HTTP
“ ”HTTP “ ”HTTP
“ ”HTTP

智能（SMART）HTTP 协议

“ ”HTTP SSH Git
HTTP/S HTTP
SSH HTTP
SSH
HTTP Git
git:// SSH
URL
URL

GitHub URL
https://github.com/schacon/simplegit[])

哑（DUMB）HTTP 协议

HTTP Git
“ ”HTTP HTTP web
HTTP

HTTP post-update “Git” web HTTP

```
$ cd /var/www/htdocs/
$ git clone --bare /path/to/git_project gitproject.git
$ cd gitproject.git
$ mv hooks/post-update.sample hooks/post-update
$ chmod a+x hooks/post-update
```

Git post-update git update-server-info HTTP SSH

```
$ git clone https://example.com/gitproject.git
```

Apache /var/www/htdocs web —
Git Chapter 10
HTTP HTTP

优点

HTTP URL Git SSH

Git SSH
SSH HTTP
SSH HTTP
HTTPS
SSL
HTTP/S

缺点

HTTP/S SSH
Git “ ” HTTP

HTTP SSH
OSX Keychain
Windows “ ” HTTP

SSH

Git SSH
SSH — SSH

SSH ssh:// URL

```
$ git clone ssh://user@server/project.git
```

scp

```
$ git clone user@server:project.git
```

Git

优势

SSH SSH — SSH

SSH —
HTTP/S Git SSH

缺点

SSH
SSH SSH
SSH
SSH
SSH

Git

Git Git
9418 SSH
Git `git-daemon-export-ok` —
Git —

Git
URL

优点

Git Git
Git
SSH

缺点

Git Git
SSH HTTPS
`git://`
Git
`xinetd`
9418

在服务器上搭建 Git

Git

> 这里我们将要演示在 Linux 服务器上进行一次基本且简化的安装所需的命令与步骤，当然在 Mac 或 Windows 服务器上同样可以运行这些服务。 事实上，在你的计算机基础架构中建立一个生产环境服务器，将不可避免的使用到不同的安全措施与操作系统工具。但是，希望你能从本节中获得一些必要的知识。

Git —

`--bare`
.git

```
$ git clone --bare my_project my_project.git
Cloning into bare repository 'my_project.git'...
done.
```

my_project.git Git

```
$ cp -Rf my_project/.git my_project.git
```

Git

git.example.com
SSH Git /opt/git
/opt/git/

```
$ scp -r my_project.git user@git.example.com:/opt/git
```

SSH /opt/git

```
$ git clone user@git.example.com:/opt/git/my_project.git
```

SSH /opt/git/
my_project.git
git init --shared
Git

```
$ ssh user@git.example.com
$ cd /opt/git/my_project.git
$ git init --bare --shared
```

Git

SSH

Git

— SSH

SSH

Git

Git

SSH 连接

SSH

SSH
SSH

`adduser`

git

SSH git `~/.ssh/authorized_keys`

git

—

SSH LDAP

shell

SSH

生成 SSH 公钥

Git SSH Git

SSH

SSH ~/.ssh

```
$ cd ~/.ssh
$ ls
authorized_keys2  id_dsa       known_hosts
config            id_dsa.pub
```

id_dsa id_rsa .pub
.pub
.ssh ssh-keygen
Linux/Mac ssh-keygen SSH Windows
MSysGit

```
$ ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/home/schacon/.ssh/id_rsa):
Created directory '/home/schacon/.ssh'.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/schacon/.ssh/id_rsa.
Your public key has been saved in /home/schacon/.ssh/id_rsa.pub.
The key fingerprint is:
d0:82:24:8e:d7:f1:bb:9b:33:53:96:93:49:da:9b:e3 schacon@mylaptop.local
```

ssh-keygen .ssh/id_rsa

Git
SSH
.pub

```
$ cat ~/.ssh/id_rsa.pub
ssh-rsa AAAAB3NzaC1yc2EAAAABIwAAAQEAklOUpkDHrfHY17SbrmTIpNLTGK9Tjom/BWDSU
GPl+nafzlHDTYW7hdI4yZ5ew18JH4JW9jbhUFrviQzM7xlELEVf4h9lFX5QVkbPppSwg0cda3
Pbv7kOdJ/MTyBlWXFCR+HAo3FXRitBqxiX1nKhXpHAZsMciLq8V6RjsNAQwdsdMFvSlVK/7XA
t3FaoJoAsncM1Q9x5+3V0Ww68/eIFmb1zuUFljQJKprrX88XypNDvjYNby6vw/Pb0rwert/En
mZ+AW4OZPnTPI89ZPmVMLuayrD2cE86Z/il8b+gw3r3+1nKatmIkjn2so1d01QraTlMqVSsbx
NrRFi9wrf+M7Q== schacon@mylaptop.local
```

SSH GitHub SSH *https://help.github.com/articles/generating-ssh-keys*

配置服务器

SSH authorized_keys Linux Ubuntu git .ssh

```
$ sudo adduser git
$ su git
$ cd
$ mkdir .ssh && chmod 700 .ssh
$ touch .ssh/authorized_keys && chmod 600 .ssh/authorized_keys
```

git authorized_keys SSH

```
$ cat /tmp/id_rsa.john.pub
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQCB007n/ww+ouN4gSLKssMxXnBOvf9LGt4L
ojG6rs6hPB09j9R/T17/x4lhJA0F3FR1rP6kYBRsWj2aThGw6HXLm9/5zytK6Ztg3RPKK+4k
Yjh6541NYsnEAZuXz0jTTyAUfrtU3Z5E003C4oxOj6H0rfIF1kKI9MAQLMdpGW1GYEIgS9Ez
Sdfd8AcCIicTDWbqLAcU4UpkaX8KyGlLwsNuuGztobF8m72ALC/nLF6JLtPofwFBlgc+myiv
O7TCUSBdLQlgMVOFq1I2uPWQOkOWQAHukEOmfjy2jctxSDBQ220ymjaNsHT4kgtZg2AYYgPq
dAv8JggJICUvax2T9va5 gsg-keypair
```

git .ssh authorized_keys

```
$ cat /tmp/id_rsa.john.pub >> ~/.ssh/authorized_keys
$ cat /tmp/id_rsa.josie.pub >> ~/.ssh/authorized_keys
$ cat /tmp/id_rsa.jessica.pub >> ~/.ssh/authorized_keys
```

--bare git init

```
$ cd /opt/git
$ mkdir project.git
```

```
$ cd project.git
$ git init --bare
Initialized empty Git repository in /opt/git/project.git/
```

John Josie Jessica

shell

git Git

gitserver

DNS gitserver

myproject

```
# on John's computer
$ cd myproject
$ git init
$ git add .
$ git commit -m 'initial commit'
$ git remote add origin git@gitserver:/opt/git/project.git
$ git push origin master
```

```
$ git clone git@gitserver:/opt/git/project.git
$ cd project
$ vim README
$ git commit -am 'fix for the README file'
$ git push origin master
```

Git

git

shell

passwd git shell

git-shell shell git

Git Git

git-shell git shell login shell git

shell git-shell

bash csh shell

git-shell /etc/shells

```
$ cat /etc/shells   # see if `git-shell` is already in there.  If not...
$ which git-shell   # make sure git-shell is installed on your system.
$ sudo vim /etc/shells  # and add the path to git-shell from last command
```

chsh <username> shell

```
$ sudo chsh git  # and enter the path to git-shell, usually: /usr/bin/git-shell
```

git SSH Git
shell

```
$ ssh git@gitserver
fatal: Interactive git shell is not enabled.
hint: ~/git-shell-commands should exist and have read and execute access.
Connection to gitserver closed.
```

Git
shell git
git-shell
Git SSH

shell git help
shell

Git 守护进程

“ Git ”
Git

SSH
Git

```
git daemon --reuseaddr --base-path=/opt/git/ /opt/git/
```

`--reuseaddr` `--base-path`

Git

9418

Ubuntu Upstart

```
/etc/event.d/local-git-daemon
```

```
start on startup
stop on shutdown
exec /usr/bin/git daemon \
    --user=git --group=git \
    --reuseaddr \
    --base-path=/opt/git/ \
    /opt/git/
respawn
```

- *git-ro*
`git-shell` *git*

Git

```
initctl start local-git-daemon
```

`sysvinit` `xinetd`

-
Git
`git-daemon-export-ok`

```
$ cd /path/to/project.git
$ touch git-daemon-export-ok
```

Git

Smart HTTP

SSH git:// Smart HTTP Git git-http-backend CGI CGI git fetch git push HTTP URL HTTP 1.6.6 CGI Smart Dumb

Apache CGI Apache Linux

```
$ sudo apt-get install apache2 apache2-utils
$ a2enmod cgi alias env
```

mod_cgi mod_alias mod_env Apache

Apache git-http-backend Web /git

```
SetEnv GIT_PROJECT_ROOT /opt/git
SetEnv GIT_HTTP_EXPORT_ALL
ScriptAlias /git/ /usr/lib/git-core/git-http-backend/
```

GIT_HTTP_EXPORT_ALL Git git-daemon-export-ok Git Apache Apache

```
<Directory "/usr/lib/git-core*">
   Options ExecCGI Indexes
   Order allow,deny
   Allow from all
   Require all granted
</Directory>
```

```
<LocationMatch "^/git/.*/git-receive-pack$">
    AuthType Basic
    AuthName "Git Access"
    AuthUserFile /opt/git/.htpasswd
    Require valid-user
</LocationMatch>
```

.htaccess

“ schacon ”

```
$ htdigest -c /opt/git/.htpasswd "Git Access" schacon
```

Apache

SSL

Apache Web

Git

git-http-backend CGI HTTP

Web

CGI Web

Web

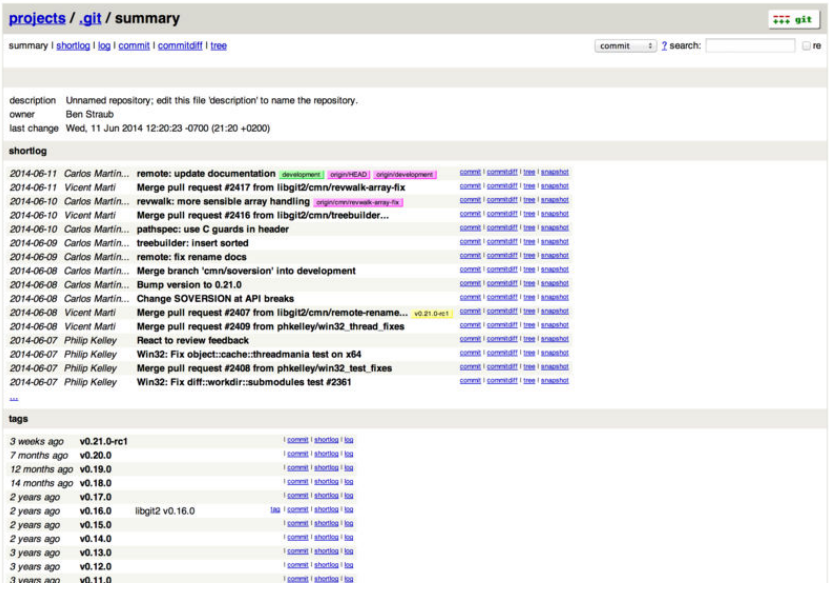
欲了解更多的有关配置 Apache 授权访问的信息，请通过以下链接浏览 Apache 文档： *http://httpd.apache.org/docs/current/howto/auth.html*

GitWeb

Git GitWeb CGI

FIGURE 4-1

GitWeb 的网页用户界面



GitWeb
lighttpd webrick Git
Linux lighttpd
git instaweb Mac
Mac OS X Leopard Ruby webrick
lighttpd instaweb
--httpd

```
$ git instaweb --httpd=webrick
[2009-02-21 10:02:21] INFO  WEBrick 1.3.1
[2009-02-21 10:02:21] INFO  ruby 1.8.6 (2008-03-03) [universal-darwin9.0]
```

1234 HTTP

--stop

```
$ git instaweb --httpd=webrick --stop
```

Web CGI Linux

gitweb apt yum
GitWeb Git
GitWeb CGI

```
$ git clone git://git.kernel.org/pub/scm/git/git.git
$ cd git/
$ make GITWEB_PROJECTROOT="/opt/git" prefix=/usr gitweb
    SUBDIR gitweb
    SUBDIR ../
make[2]: `GIT-VERSION-FILE' is up to date.
    GEN gitweb.cgi
    GEN static/gitweb.js
$ sudo cp -Rf gitweb /var/www/
```

GITWEB_PROJECTROOT
Git Apache CGI

```
<VirtualHost *:80>
    ServerName gitserver
    DocumentRoot /var/www/gitweb
    <Directory /var/www/gitweb>
        Options ExecCGI +FollowSymLinks +SymLinksIfOwnerMatch
        AllowOverride All
        order allow,deny
        Allow from all
        AddHandler cgi-script cgi
        DirectoryIndex gitweb.cgi
    </Directory>
</VirtualHost>
```

GitWeb CGI Perl

http://gitserver/

GitLab

GitWeb Git
GitLab
GitWeb

GitLab web git

GitLab
https://bitnami.com/stack/gitlab
Bitnami
alt-&rarr GitLab
IP

FIGURE 4-2

Bitnami GitLab 虚拟机登录界面。

GitLab readme
https://gitlab.com/gitlab-org/gitlab-ce/tree/master
GitLab Digital Ocean
RPM DEB “ ”
GitLab

GitLab GitLab
IP ad-
min@local.host 5iveL!fe
“ Admin area ”

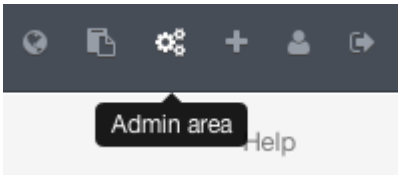


FIGURE 4-3

GitLab 主栏的“Admin area”图标。

使用者

GitLab

jane

`project` url *http://server/jane/project*

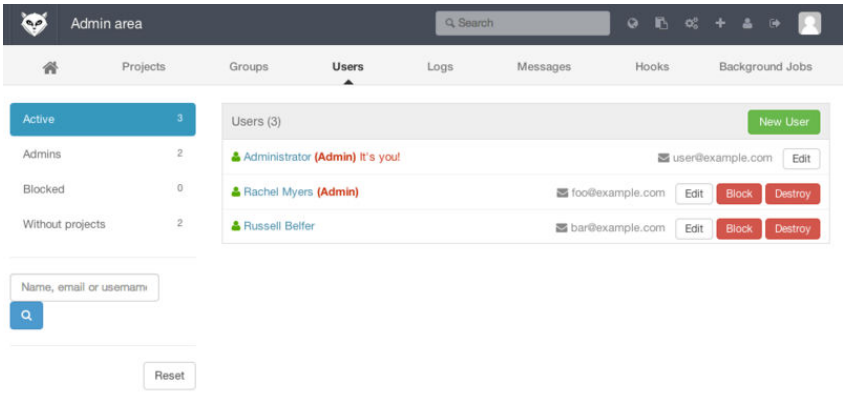


FIGURE 4-4

GitLab 用户管理界面。

“ Blocking ”

GitLab

“ Destroying ”

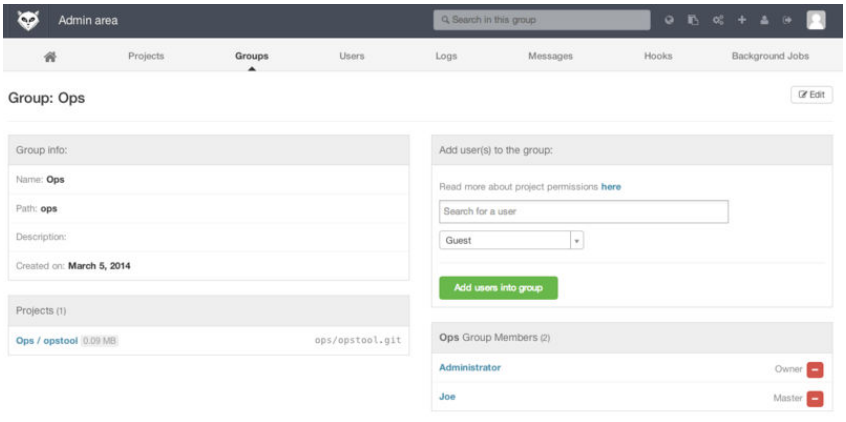
组

GitLab

`training` `materials` url
http://server/training/materials

FIGURE 4-5

GitLab 组 管理界面。



“ ”

“ ”

GitLab

项目

GitLab git

git “ fetch ”

web

钩子

GitLab

GitLab JSON HTTP

git GitLab CI

GitLab
“ + ”

“ Create Project ”
Git
HTTPS SSH Git
URLs
`gitlab`

```
$ git remote add gitlab https://server/namespace/project.git
```

```
$ git clone https://server/namespace/project.git
```

web

GitLab git
push “ Members ”

“ ” “ Developer
”

`master`
“ fork ”

GitLab

milestones
GitLab Git GitLab
wiki
GitLab
SSH

第三方托管的选择

Git Git

-

Git GitHosting *https://git.wiki.kernel.org/index.php/GitHosting*
Chapter 6 GitHub Git
GitHub
Git

总结

Git

5 分布式 Git

Git

Git

Git

Git

分布式工作流程

CVCS Git

Git

—

Git

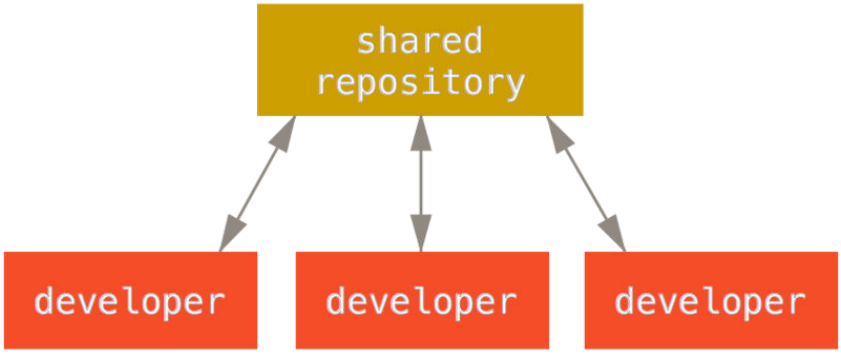
Git

—

— —

FIGURE 5-1

集中式工作流。



Subversion CVCS
Git

Git
John Jessica John
Jessica
non-fast-forward

Git

Git

“ ”

Figure 5-2

1.
2.

3.
4.
5.
6.

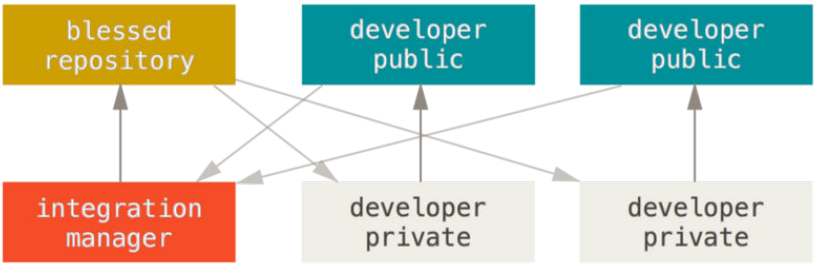


FIGURE 5-2

集成管理者工作流。

GitHub GitLab hub-based

—

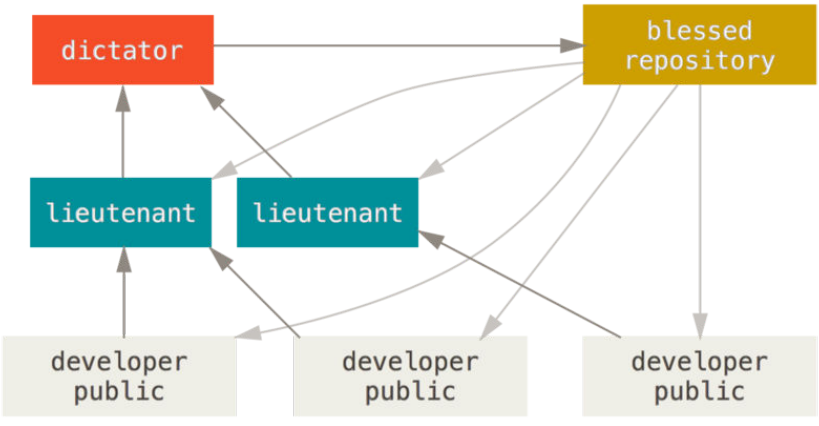
Linux
lieutenant
dictator

(Figure 5-3):

1. master
master
2. master
3. master master
4. master

FIGURE 5-3

司令官与副官工作流。



Git

向一个项目贡献

Git

-

-

Git

Git

- Git Documentation/SubmittingPatches

git help dif

Tab Tab

Git -

`git diff --check`

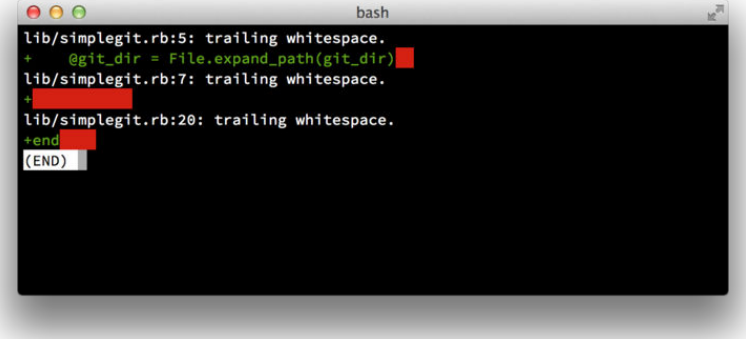


FIGURE 5-4

git diff --check 的输出

-

git
add --patch “ ”

“
” Git -

Git 50 25

Git
-

“ Add tests
for. ” “ I added tests for ” “ Adding tests for, ”
Tim Pope

```
修改的摘要（50 个字符或更少）

如果必要的话，加入更详细的解释文字。在
大概 72 个字符的时候换行。在某些情形下，
第一行被当作一封电子邮件的标题，剩下的
文本作为正文。分隔摘要与正文的空行是
必须的（除非你完全省略正文）；如果你将
两者混在一起，那么类似变基等工具无法
正常工作。

空行接着更进一步的段落。

- 句号也是可以的。

- 项目符号可以使用典型的连字符或星号
  前面一个空格，之间用空行隔开，
  但是可以依据不同的惯例有所不同。
```

Git -
git log --no-merges

-m git commit

“
” -

Subversion

John

...

```
# John's Machine
$ git clone john@githost:simplegit.git
Initialized empty Git repository in /home/john/simplegit/.git/
...
$ cd simplegit/
$ vim lib/simplegit.rb
$ git commit -am 'removed invalid default value'
[master 738ee87] removed invalid default value
 1 files changed, 1 insertions(+), 1 deletions(-)
```

Jessica -

```
# Jessica's Machine
$ git clone jessica@githost:simplegit.git
Initialized empty Git repository in /home/jessica/simplegit/.git/
...
$ cd simplegit/
$ vim TODO
$ git commit -am 'add reset task'
[master fbff5bc] add reset task
 1 files changed, 1 insertions(+), 0 deletions(-)
```

Jessica

```
# Jessica's Machine
$ git push origin master
...
To jessica@githost:simplegit.git
   1edee6b..fbff5bc  master -> master
```

John

```
# John's Machine
$ git push origin master
To john@githost:simplegit.git
 ! [rejected]        master -> master (non-fast forward)
error: failed to push some refs to 'john@githost:simplegit.git'
```

John Jessica
Subversion
Subversion
Git John Jessica

```
$ git fetch origin
...
From john@githost:simplegit
 + 049d078...fbff5bc master     -> origin/master
```

John

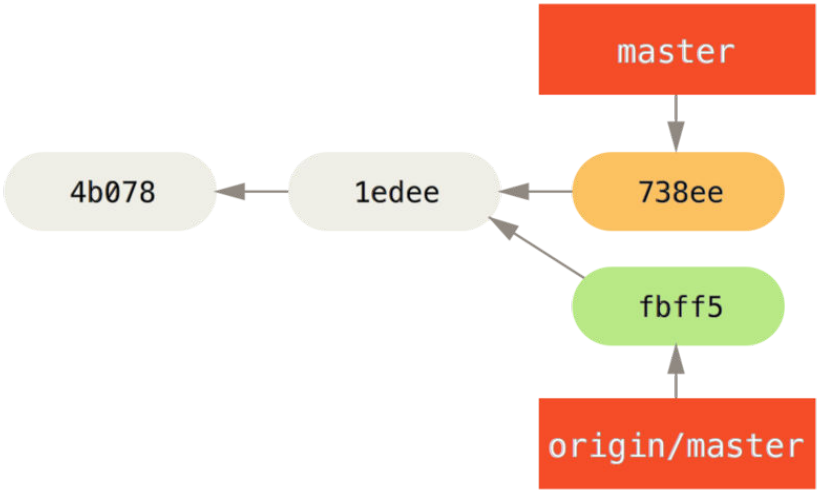


FIGURE 5-5

John 的分叉历史

John Jessica

```
$ git merge origin/master
Merge made by recursive.
 TODO |    1 +
 1 files changed, 1 insertions(+), 0 deletions(-)
```

- John

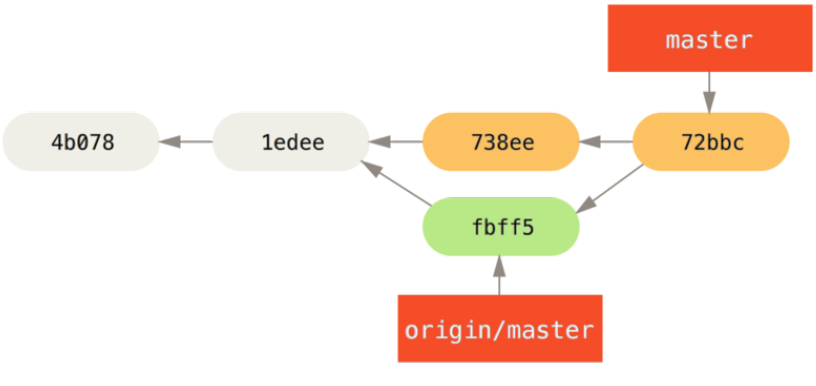


FIGURE 5-6

合并了 origin/master 之后 John 的仓库

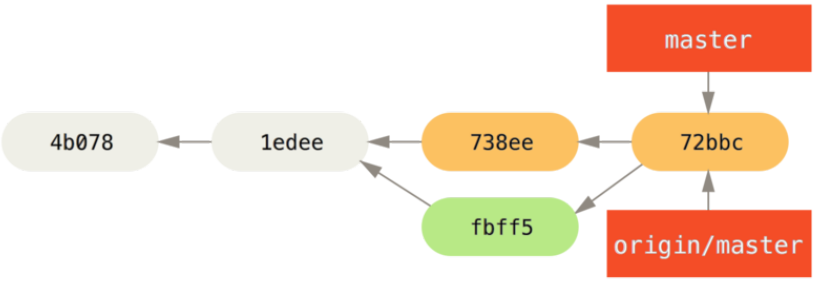
John

```
$ git push origin master
...
To john@githost:simplegit.git
   fbff5bc..72bbc59  master -> master
```

John

FIGURE 5-7

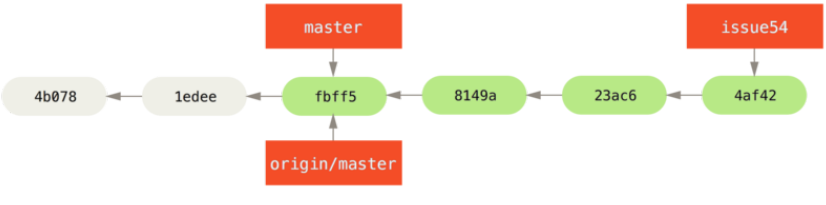
推送到 origin 服务器后 John 的历史



Jessica issue54
John

FIGURE 5-8

Jessica 的特性分支



Jessica John

```
# Jessica's Machine
$ git fetch origin
...
```

```
From jessica@githost:simplegit
   fbff5bc..72bbc59  master     -> origin/master
```

John Jessica

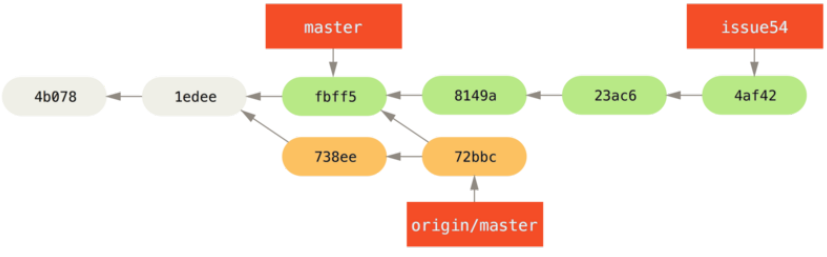


FIGURE 5-9

抓取 John 的改动后 Jessica 的历史

Jessica

git log

```
$ git log --no-merges issue54..origin/master
commit 738ee872852dfaa9d6634e0dea7a324040193016
Author: John Smith <jsmith@example.com>
Date:   Fri May 29 16:01:27 2009 -0700

    removed invalid default value
```

issue54..origin/master Git

origin/master

issue54 “ ”

John Jessica

origin/master

Jessica master John

origin/master master

master

```
$ git checkout master
Switched to branch 'master'
Your branch is behind 'origin/master' by 2 commits, and can be fast-forwarded.
```

origin/master issue54 -

issue54

```
$ git merge issue54
Updating fbff5bc..4af4298
Fast forward
 README           |    1 +
 lib/simplegit.rb |    6 +++++-
 2 files changed, 6 insertions(+), 1 deletions(-)
```

Jessica

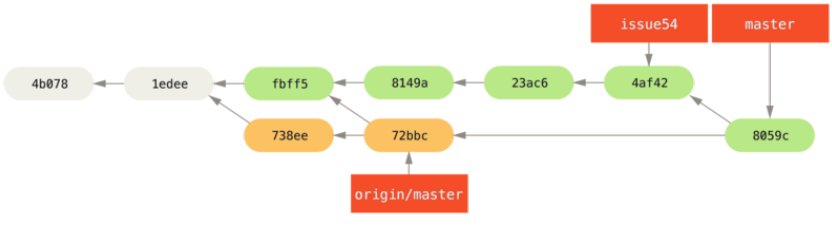
John origin/master

```
$ git merge origin/master
Auto-merging lib/simplegit.rb
Merge made by recursive.
 lib/simplegit.rb |    2 +-
 1 files changed, 1 insertions(+), 1 deletions(-)
```

Jessica

FIGURE 5-10

合并了 John 的改动后 Jessica 的历史



origin/master Jessica master
John

```
$ git push origin master
...
To jessica@githost:simplegit.git
   72bbc59..8059c15  master -> master
```

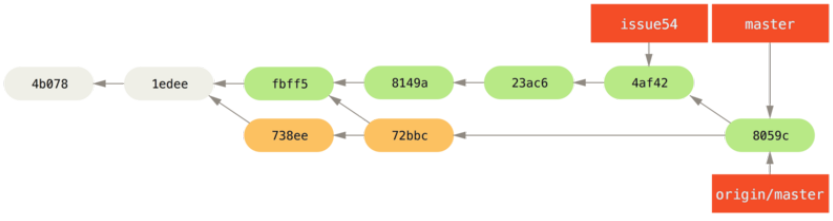


FIGURE 5-11

推送所有的改动回服务器后 Jessica 的历史

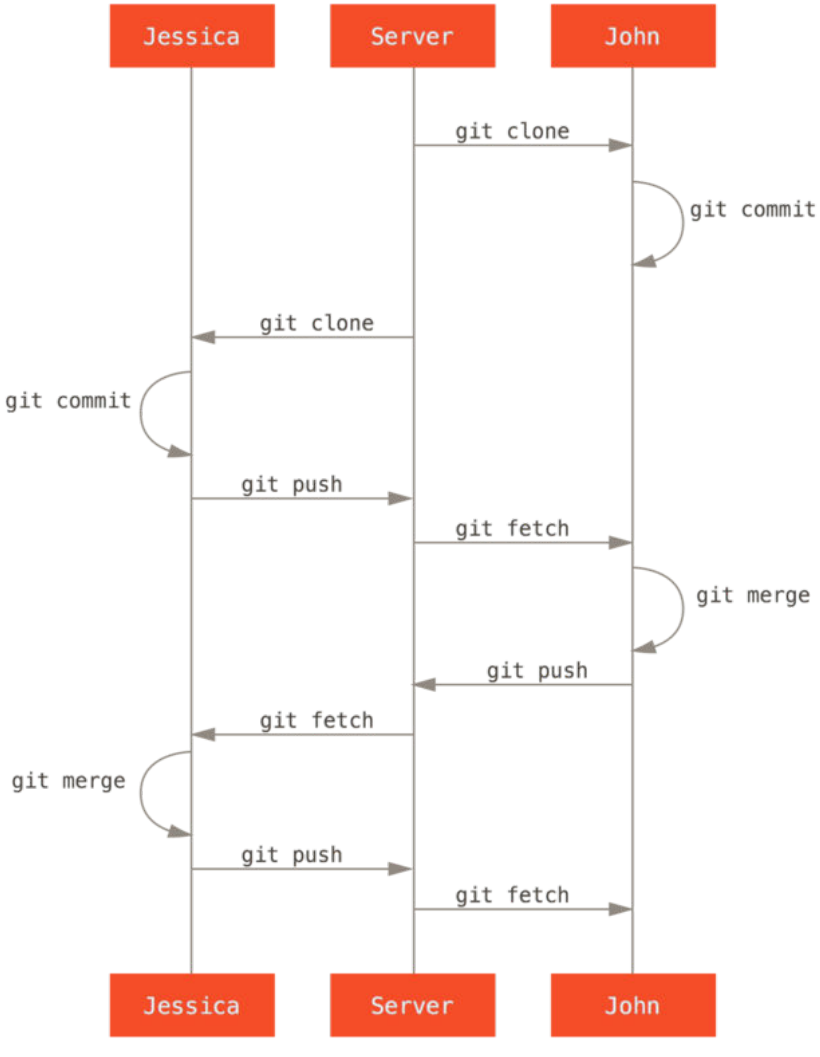
master

master origin/master

master

FIGURE 5-12

一个简单的多人 Git 工作流程的通常事件顺序



John Jessica Jessica Josie

-

master

Jessica

featureA

```
# Jessica's Machine
$ git checkout -b featureA
Switched to a new branch 'featureA'
$ vim lib/simplegit.rb
$ git commit -am 'add limit to log function'
[featureA 3300904] add limit to log function
 1 files changed, 1 insertions(+), 1 deletions(-)
```

John featureA

Jessica master - -

John

```
$ git push -u origin featureA
...
To jessica@githost:simplegit.git
 * [new branch]      featureA -> featureA
```

Jessica John featureA

John Jessica Josie

featureB master

```
# Jessica's Machine
$ git fetch origin
$ git checkout -b featureB origin/master
Switched to a new branch 'featureB'
```

Jessica featureB

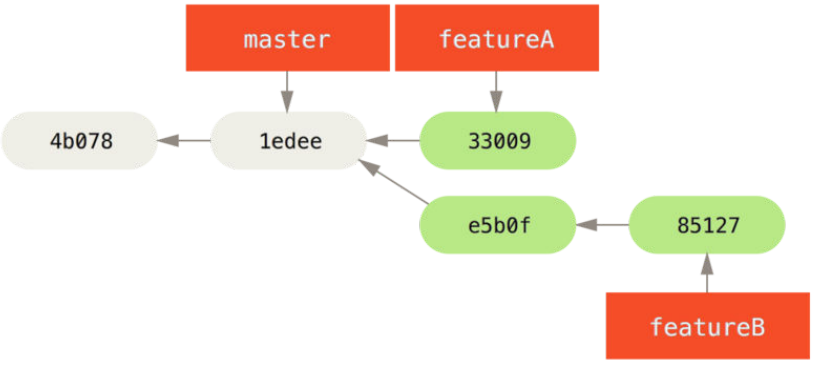
```
$ vim lib/simplegit.rb
$ git commit -am 'made the ls-tree function recursive'
[featureB e5b0fdc] made the ls-tree function recursive
 1 files changed, 1 insertions(+), 1 deletions(-)
$ vim lib/simplegit.rb
$ git commit -am 'add ls-files'
```

```
[featureB 8512791] add ls-files
 1 files changed, 5 insertions(+), 0 deletions(-)
```

Jessica

FIGURE 5-13

Jessica 的初始提交历史



Josie
featureBee Jessica
git fetch Josie

```
$ git fetch origin
...
From jessica@githost:simplegit
 * [new branch]      featureBee -> origin/featureBee
```

Jessica git merge

```
$ git merge origin/featureBee
Auto-merging lib/simplegit.rb
Merge made by recursive.
 lib/simplegit.rb |    4 ++++
 1 files changed, 4 insertions(+), 0 deletions(-)
```

- featureB
featureBee :
git push

```
$ git push -u origin featureB:featureBee
...
To jessica@githost:simplegit.git
   fba9af8..cd685d1  featureB -> featureBee
```

“ ” Git

-u --set-upstream

John Jessica featureA

git fetch

```
$ git fetch origin
...
From jessica@githost:simplegit
   3300904..aad881d  featureA   -> origin/featureA
```

git log

```
$ git log featureA..origin/featureA
commit aad881d154acdaeb2b6b18ea0e827ed8a6d671e6
Author: John Smith <jsmith@example.com>
Date:   Fri May 29 19:57:33 2009 -0700

    changed log output to 30 from 25
```

John featureA

```
$ git checkout featureA
Switched to branch 'featureA'
$ git merge origin/featureA
Updating 3300904..aad881d
Fast forward
 lib/simplegit.rb |   10 +++++++++-
1 files changed, 9 insertions(+), 1 deletions(-)
```

Jessica

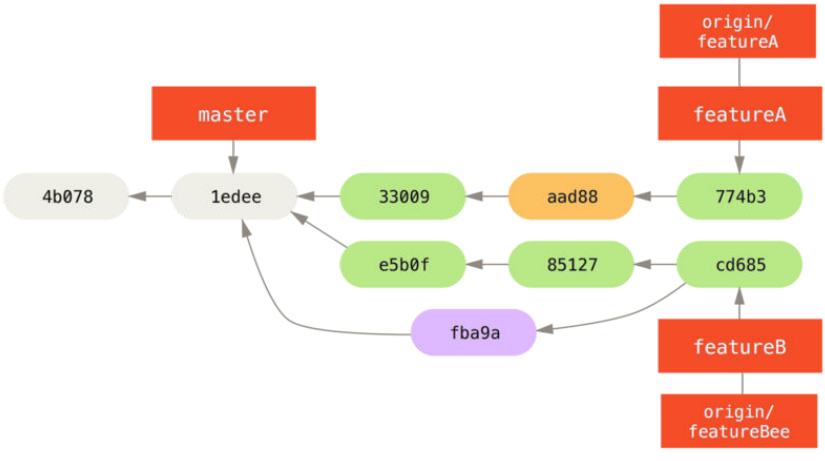
```
$ git commit -am 'small tweak'
[featureA 774b3ed] small tweak
 1 files changed, 1 insertions(+), 1 deletions(-)
```

```
$ git push
...
To jessica@githost:simplegit.git
   3300904..774b3ed  featureA -> featureA
```

Jessica

FIGURE 5-14

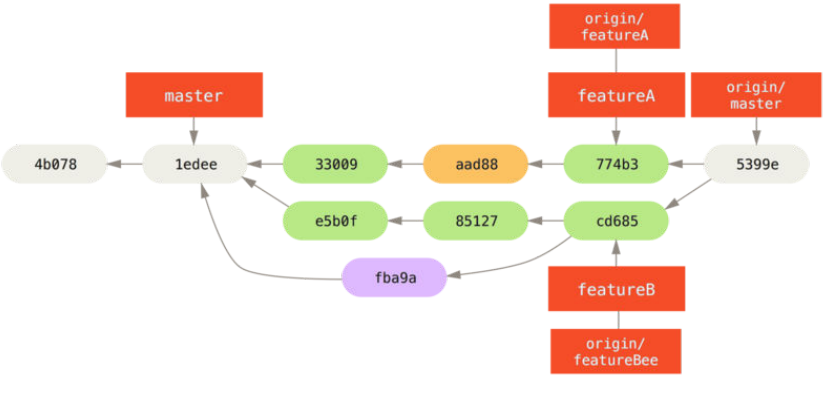
在一个特性分支提交后 Jessica 的历史



Jessica Josie John featureA featureBee

FIGURE 5-15

合并了 Jessica 的两个特性分支后她的历史



Git

Git

FIGURE 5-16

这种管理团队工作流程的基本顺序

Git

GitHub Bit -

Bucket Google Code repo.or.cz

```
$ git clone (url)
$ cd project
$ git checkout -b featureA
# (work)
$ git commit
# (work)
$ git commit
```

你可能会想要使用 `rebase -i` 来将工作压缩成一个单独的提交，或者重排提交中的工作使补丁更容易被维护者审核 – 查看 “**重写历史**” 了解关于交互式变基的更多信息。

“ Fork ”
URL `myfork`

```
$ git remote add myfork (url)
```

master

```
$ git push -u myfork featureA
```

pull request - GitHub
Pull Request Chapter 6 - `git request-pull`
`request-pull` Git
URL Jessica John

```
$ git request-pull origin/master myfork
The following changes since commit 1edee6b1d61823a2de3b09c160d7080b8d1b3a40:
  John Smith (1):
        added a new function

are available in the git repository at:

  git://githost/simplegit.git featureA

Jessica Smith (2):
      add limit to log function
      change log output to 30 from 25

 lib/simplegit.rb |   10 +++++++++-
 1 files changed, 9 insertions(+), 1 deletions(-)
```

-

origin/master

master

rebase

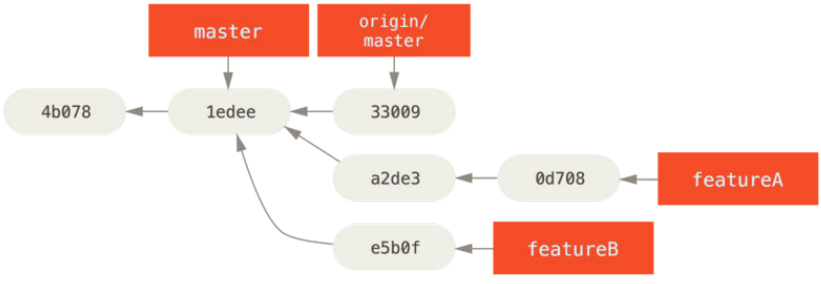
- master

```
$ git checkout -b featureB origin/master
# (work)
$ git commit
$ git push myfork featureB
# (email maintainer)
$ git fetch origin
```

- -

FIGURE 5-17

featureB 的初始提交历史



ori-

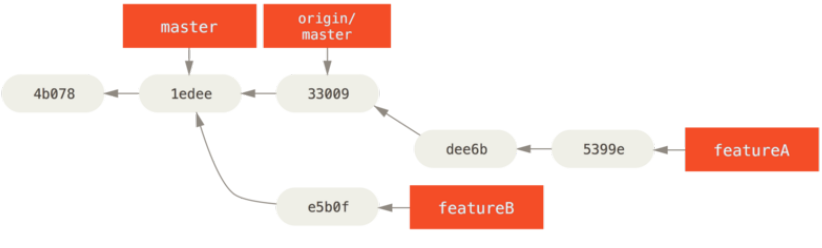
gin/master

```
$ git checkout featureA
$ git rebase origin/master
$ git push -f myfork featureA
```

Figure 5-18

FIGURE 5-18

featureA 工作之后的提交历史



-f

featureA

featur-

eAv2

master origin/master

featureB

```
$ git checkout -b featureBv2 origin/master
$ git merge --no-commit --squash featureB
# (change implementation)
$ git commit
$ git push myfork featureBv2
```

--squash

--no-commit

featureBv2

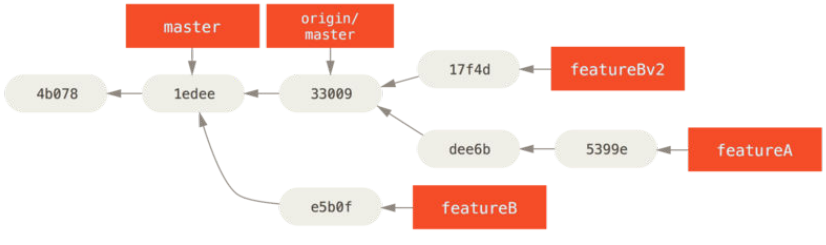


FIGURE 5-19

featureBv2 工作之后的提交历史

-

-

```
$ git checkout -b topicA
# (work)
$ git commit
```

```
# (work)
$ git commit
```

git format-patch
mbox -

format-patch

```
$ git format-patch -M origin/master
0001-add-limit-to-log-function.patch
0002-changed-log-output-to-30-from-25.patch
```

format-patch -M Git

```
$ cat 0001-add-limit-to-log-function.patch
From 330090432754092d704da8e76ca5c05c198e71a8 Mon Sep 17 00:00:00 2001
From: Jessica Smith <jessica@example.com>
Date: Sun, 6 Apr 2008 10:17:23 -0700
Subject: [PATCH 1/2] add limit to log function

Limit log functionality to the first 20

---
 lib/simplegit.rb |    2 +-
 1 files changed, 1 insertions(+), 1 deletions(-)

diff --git a/lib/simplegit.rb b/lib/simplegit.rb
index 76f47bc..f9815f1 100644
--- a/lib/simplegit.rb
+++ b/lib/simplegit.rb
@@ -14,7 +14,7 @@ class SimpleGit
   end

   def log(treeish = 'master')
-    command("git log #{treeish}")
+    command("git log -n 20 #{treeish}")
   end

   def ls_tree(treeish = 'master')
--
2.1.0
```

--- diff --git

“ ”

Git IMAP
Gmail
Git Documentation/SubmittingPatches
~/.gitconfig imap
git config

```
[imap]
  folder = "[Gmail]/Drafts"
  host = imaps://imap.gmail.com
  user = user@gmail.com
  pass = p4ssw0rd
  port = 993
  sslverify = false
```

IMAP SSL host
imap:// imaps:// git imap-send
IMAP Drafts

```
$ cat *.patch |git imap-send
Resolving imap.gmail.com... ok
Connecting to [74.125.142.109]:993... ok
Logging in...
sending 2 messages
100% (2/2) done
```

Drafts

SMTP
git config
~/.gitconfig sendmail

```
[sendemail]
  smtpencryption = tls
  smtpserver = smtp.gmail.com
```

```
smtpuser = user@gmail.com
smtpserverport = 587
```

git send-email

```
$ git send-email *.patch
0001-added-limit-to-log-function.patch
0002-changed-log-output-to-30-from-25.patch
Who should the emails appear to be from? [Jessica Smith <jessica@example.com>]
Emails will be sent from: Jessica Smith <jessica@example.com>
Who should the emails be sent to? jessica@example.com
Message-ID to be used as In-Reply-To for the first email? y
```

Git

```
(mbox) Adding cc: Jessica Smith <jessica@example.com> from
  \line 'From: Jessica Smith <jessica@example.com>'
OK. Log says:
Sendmail: /usr/sbin/sendmail -i jessica@example.com
From: Jessica Smith <jessica@example.com>
To: jessica@example.com
Subject: [PATCH 1/2] added limit to log function
Date: Sat, 30 May 2009 13:29:15 -0700
Message-Id: <1243715356-61726-1-git-send-email-jessica@example.com>
X-Mailer: git-send-email 1.6.2.rc1.20.g8c5b.dirty
In-Reply-To: <y>
References: <y>

Result: OK
```

Git

Git

维护项目

format-patch

—

ru-
by_client

sc/ruby_client sc
master

```
$ git branch sc/ruby_client master
```

checkout -b

```
$ git checkout -b sc/ruby_client master
```

git apply
git am

使用 APPLY 命令应用补丁

git diff Unix diff
git apply
/tmp/patch-ruby-client.patch

```
$ git apply /tmp/patch-ruby-client.patch
```

patch -p1
patch
git diff

patch git apply “
apply all or abort all ”
patch
git
apply patch —

git apply
— git apply --check

```
$ git apply --check 0001-seeing-if-this-helps-the-gem.patch
error: patch failed: ticgit.gemspec:1
error: ticgit.gemspec: patch does not apply
```

使用 AM 命令应用补丁

Git format-patch

format-patch diff
git apply
format-patch git am
git am mbox mbox

```
From 330090432754092d704da8e76ca5c05c198e71a8 Mon Sep 17 00:00:00 2001
From: Jessica Smith <jessica@example.com>
Date: Sun, 6 Apr 2008 10:17:23 -0700
Subject: [PATCH 1/2] add limit to log function

Limit log functionality to the first 20
```

format-patch
mbox git send-email
mbox
git am
mbox

mbox git am

format-patch Request
Ticket git am

```
$ git am 0001-limit-log-function.patch
Applying: add limit to log function
```

From Date
Subject mbox

```
$ git log --pretty=fuller -1
commit 6c5e70b984a60b3cecd395edd5b48a7575bf58e0
Author:     Jessica Smith <jessica@example.com>
AuthorDate: Sun Apr 6 10:17:23 2008 -0700
Commit:     Scott Chacon <schacon@gmail.com>
CommitDate: Thu Apr 9 09:19:06 2009 -0700

   add limit to log function

   Limit log functionality to the first 20
```

Commit Author

git am

```
$ git am 0001-seeing-if-this-helps-the-gem.patch
Applying: seeing if this helps the gem
error: patch failed: ticgit.gemspec:1
error: ticgit.gemspec: patch does not apply
Patch failed at 0001.
When you have resolved this problem run "git am --resolved".
If you would prefer to skip this patch, instead run "git am --skip".
To restore the original branch and stop patching run "git am --abort".
```

—

git am --resolved

```
$ (fix the file)
$ git add ticgit.gemspec
$ git am --resolved
Applying: seeing if this helps the gem
```

Git
-3 Git

— —
-3

```
$ git am -3 0001-seeing-if-this-helps-the-gem.patch
Applying: seeing if this helps the gem
error: patch failed: ticgit.gemspec:1
error: ticgit.gemspec: patch does not apply
Using index info to reconstruct a base tree...
Falling back to patching base and 3-way merge...
No changes -- Patch already applied.
```

-3

mbox
am

```
$ git am -3 -i mbox
Commit Body is:
--------------------------
seeing if this helps the gem
--------------------------
Apply? [y]es/[n]o/[e]dit/[v]iew patch/[a]ccept all
```

URL

Jessica ruby-client

```
$ git remote add jessica git://github.com/jessica/myproject.git
$ git fetch jessica
$ git checkout -b rubyclient jessica/ruby-client
```

—

Git -3

URL git pull URL

```
$ git pull https://github.com/onetimeguy/project
From https://github.com/onetimeguy/project
 * branch            HEAD       -> FETCH_HEAD
Merge made by recursive.
```

master --not master master..contrib

contrib

```
$ git log contrib --not master
commit 5b6235bd297351589efc4d73316f0a68d484f118
Author: Scott Chacon <schacon@gmail.com>
Date:   Fri Oct 24 09:53:59 2008 -0700

    seeing if this helps the gem

commit 7482e0d16d04bea79d0dba8988cc78df655f16a0
Author: Scott Chacon <schacon@gmail.com>
Date:   Mon Oct 22 19:38:36 2008 -0700

    updated the gemspec to hopefully work better
```

git log
-p dif
dif

```
$ git diff master
```

dif
master
Git master
master

master
dif
master
—
master
Git master

dif

```
$ git merge-base contrib master
36c7dba2c95e6bbb78dfa822519ecfec6e1ca649
$ git diff 36c7db
```

Git

diff ...

```
$ git diff master...contrib
```

master

合并工作流

master

master

master

Figure 5-20 ruby_client php_client

ruby_client php_client

Figure 5-21

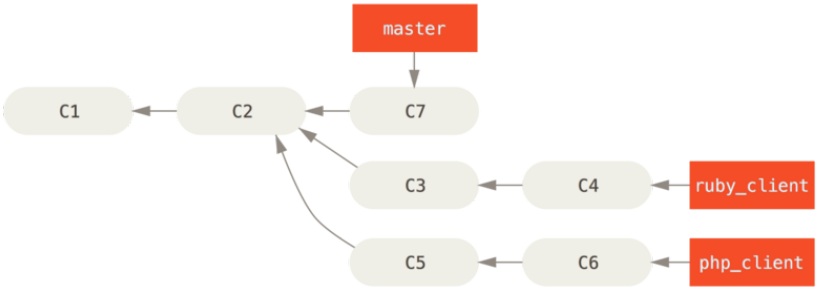
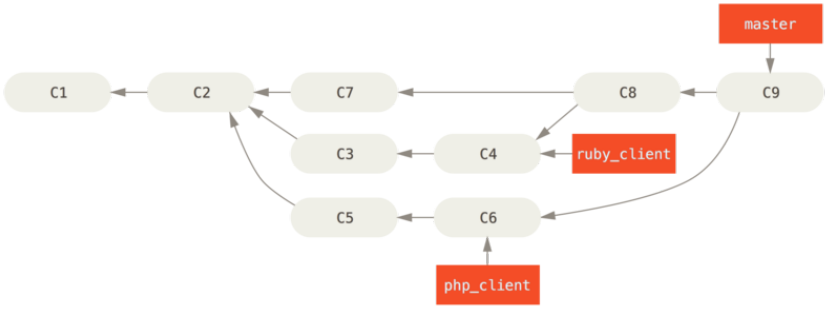


FIGURE 5-20

包含若干特性分支的提交历史。

FIGURE 5-21

合并特性分支之后。



master develop master

develop

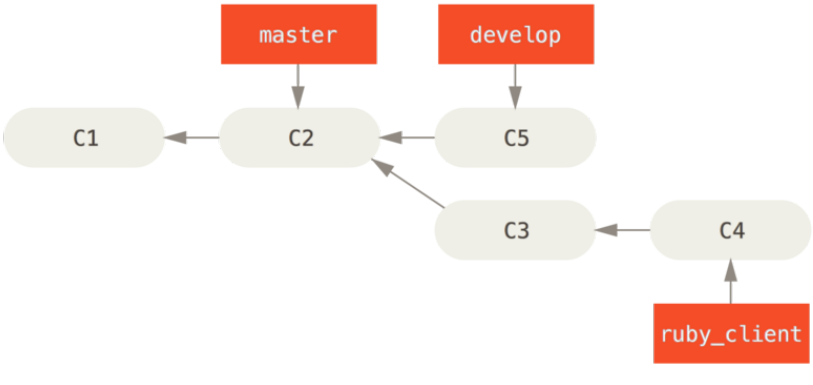
Figure 5-22 develop

Figure 5-23 master

develop Figure 5-24

FIGURE 5-22

合并特性分支前。



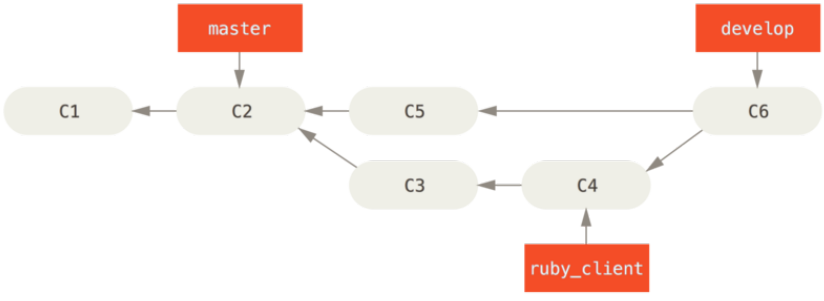


FIGURE 5-23

合并特性分支后。

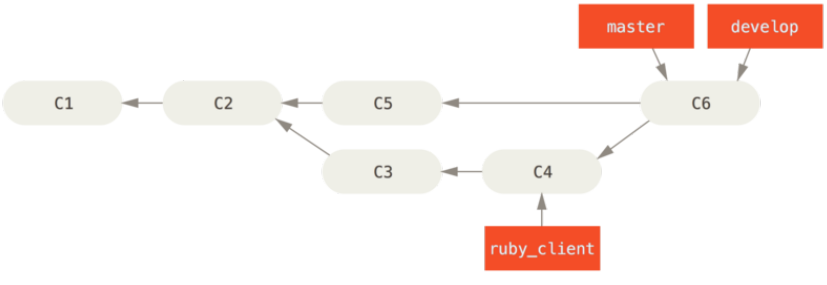


FIGURE 5-24

一次发布之后。

master

develop

develop

master

大项目合并工作流

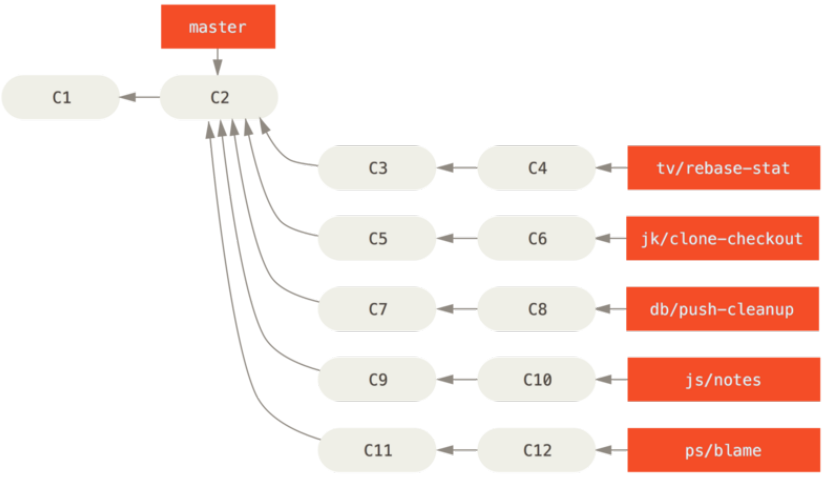
Git master next pu proposed updates maintenance backports maint

Figure 5-25

next

FIGURE 5-25

管理复杂的一系列接收贡献的平行特性分支。



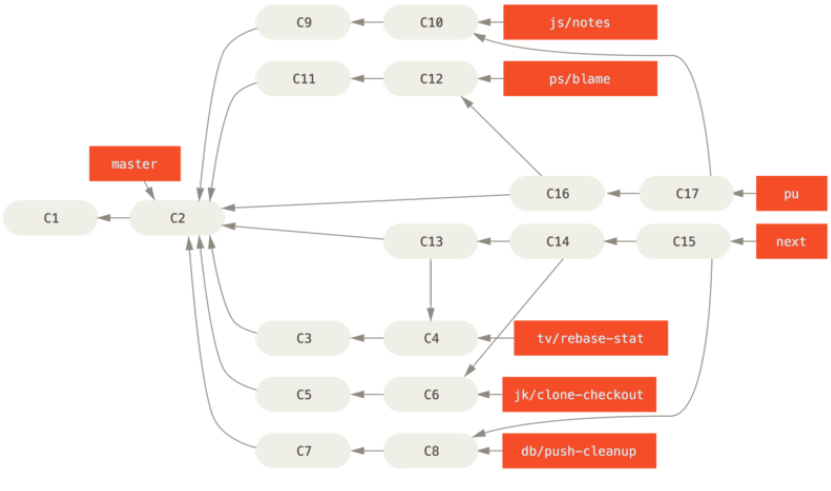
pu

master master

next pu

FIGURE 5-26

将贡献的特性分支并入长期整合分支。



master Git

maint

Git

变基与拣选工作流

master

master develop
master

Git

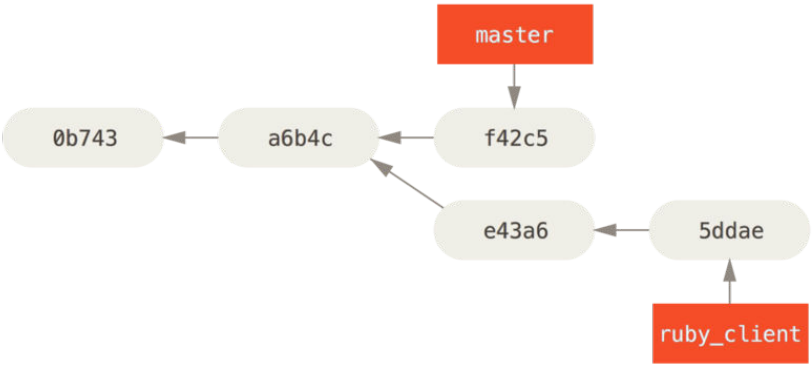


FIGURE 5-27

拣选之前的示例历史。

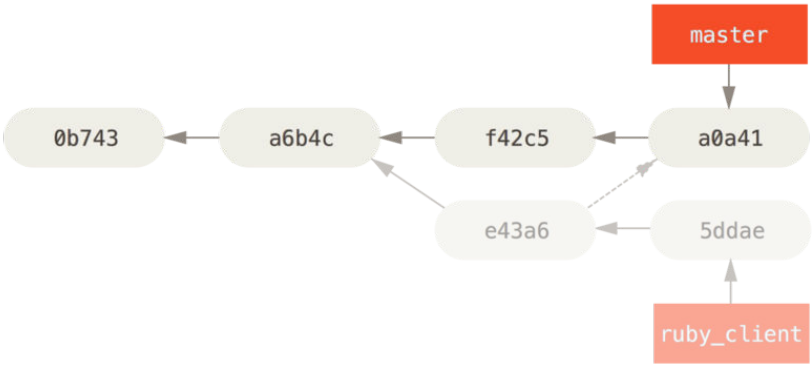
e43a6 master

```
$ git cherry-pick e43a6fd3e94888d76779ad79fb568ed180e5fcdf
Finished one cherry-pick.
[master]: created a0a41a9: "More friendly message when locking the index fails."
 3 files changed, 17 insertions(+), 3 deletions(-)
```

e43a6
SHA-1

FIGURE 5-28

拣选特性分支中的一个提交后的历史。



RERERE

Git

“ rerere ”

Rerere “ reuse recorded resolution ”

— rerere Git

Git

`rerere.enabled`

```
$ git config --global rerere.enabled true
```

rerere `git rerere`

Git

`rerere.enabled` `true`

“ Rerere ”

```
$ git tag -s v1.5 -m 'my signed 1.5 tag'
You need a passphrase to unlock the secret key for
user: "Scott Chacon <schacon@gmail.com>"
1024-bit DSA key, ID F721C45A, created 2009-02-09
```

PGP
Git blob

gpg --list-keys key

```
$ gpg --list-keys
/Users/schacon/.gnupg/pubring.gpg
---------------------------------
pub   1024D/F721C45A 2009-02-09 [expires: 2010-02-09]
uid                  Scott Chacon <schacon@gmail.com>
sub   2048g/45D02282 2009-02-09 [expires: 2010-02-09]
```

key git hash-object
key Git git hash-object Git
blob blob SHA-1

```
$ gpg -a --export F721C45A | git hash-object -w --stdin
659ef797d181633c87ec71ac3f9ba29fe5775b92
```

Git key hash-
object SHA-1

```
$ git tag -a maintainer-pgp-pub 659ef797d181633c87ec71ac3f9ba29fe5775b92
```

git push --tags maintainer-pgp-pub
blob
GPG PGP key

```
$ git show maintainer-pgp-pub | gpg --import
```

key

git show <tag>

Git “ v123 ”

git describe Git

SHA-1

```
$ git describe master
v1.6.2-rc1-20-g8c5b85c
```

Git Git git --version

git describe -a -s

git describe

checkout show

SHA-1 Linux SHA-1

8 10 git describe

Git

git archive

```
$ git archive master --prefix='project/' | gzip > `git describe master`.tar.gz
$ ls *.tar.gz
v1.6.2-rc1-20-g8c5b85c.tar.gz
```

zip git archive --format=zip

```
$ git archive master --prefix='project/' --format=zip > `git describe master`.zip
```

tar zip

git shortlog changelog v1.0.1

```
$ git shortlog --no-merges master --not v1.0.1
Chris Wanstrath (8):
      Add support for annotated tags to Grit::Tag
      Add packed-refs annotated tag support.
      Add Grit::Commit#to_patch
      Update version and History.txt
      Remove stray `puts`
      Make ls_tree ignore nils

Tom Preston-Werner (4):
      fix dates in history
      dynamic version method
      Version bump to 1.0.2
      Regenerated gemspec for version 1.0.2
```

v1.0.1

总结

Git Git Git GitHub

6 GitHub

GitHub Git
Git GitHub GitHub
Git Git
Git Git -
Hub
GitHub
Git
GitHub

GitHub GitHub
Chapter 7

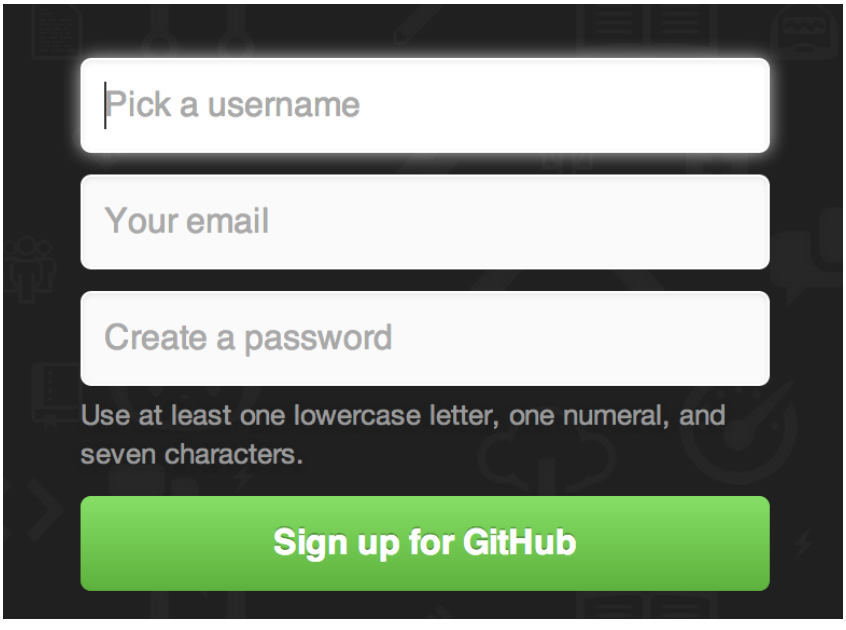
> **接口的改变**
>
> 需要注意一点，同很多活跃的网站一样，书中截取的界面会随时间而改变。 希望我们试图表达的核心思想一直是不变的，但是，如果你想要这些截图的更新版本，本书的在线版本或许有更新的截图。

账户的创建和配置

https://
github.com
“ Sign up for GitHub ”

FIGURE 6-1

GitHub 注册表单。



GitHub

GitHub 为免费账户提供了完整功能，限制是你的项目都将被完全公开（每个人都具有读权限）。GitHub 的付费计划可以让你拥有一定数目的私有项目，不过本书将不涉及这部分内容。

Octocat
GitHub

SSH

https://
Git —
fork
SSH
“ SSH ”

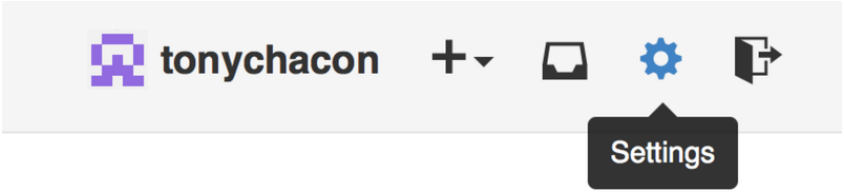


FIGURE 6-2

“Account settings”链接。

“ SSH keys ”

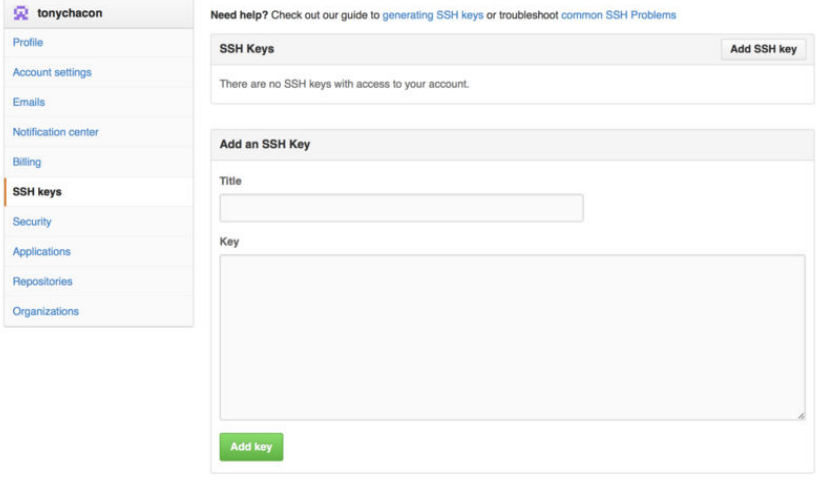


FIGURE 6-3

“SSH keys”链接。

“ Add an SSH key ”

```
~/.ssh/id_rsa.pub
```

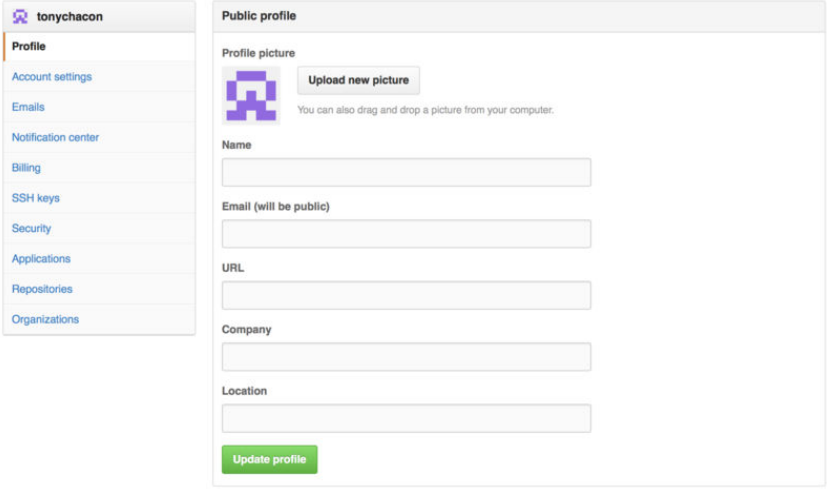
“ Add key ”

确保给你的 SSH 密钥起一个能够记得住的名字。 你可以为每一个密钥起名字（例如，“我的笔记本电脑”或者“工作账户”等），以便以后需要吊销密钥时能够方便地区分。

“ Profle ” “ SSH Keys ” “ Upload new picture ”

FIGURE 6-4

“Profile”链接。



Git

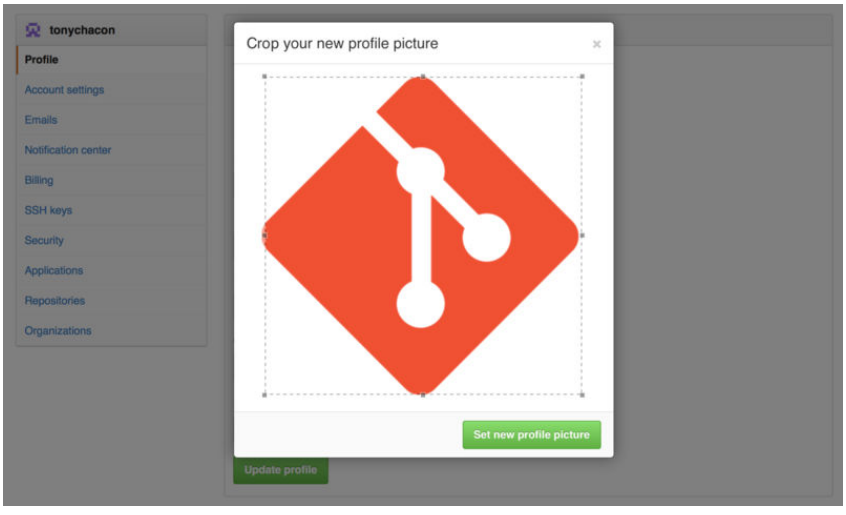


FIGURE 6-5

裁剪头像

Gravatar Wordpress

GitHub Git

GitHub

Emails

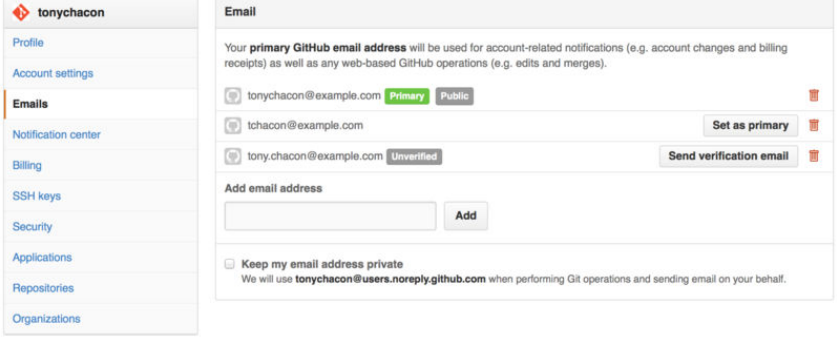


FIGURE 6-6

添加邮件地址

Figure 6-6

GitHub

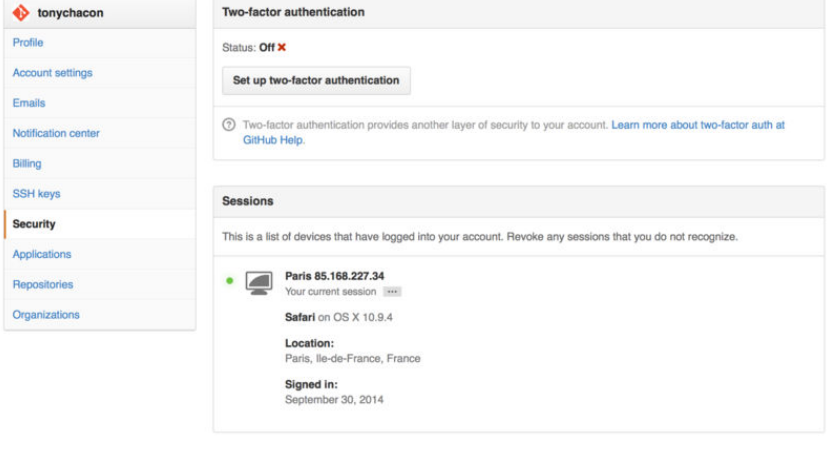
“ 2FA ”

GitHub

Account settings Security Two-factor Authentication

FIGURE 6-7

Security 标签页中的 2FA



“ Set up two-factor authentication ”

app “

” GitHub SMS

2FA

GitHub

对项目做出贡献

Fork

“ ” GitHub

> 在以前，“fork”是一个贬义词，指的是某个人使开源项目向不同的方向发展，或者创建一个竞争项目，使得原项目的贡献者分裂。 在 GitHub，“fork”指的是你自己的空间中创建的项目副本，这个副本允许你以一种更开放的方式对其进行修改。

Pull Request

“ Fork ”

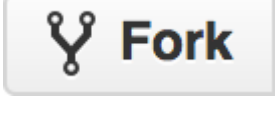


FIGURE 6-8

“Fork”按钮

GitHub

GitHub
Chapter 3 “ ”

“ Fork ”

1. `master`
2.

3. GitHub
4.
5.
6.

“ ”

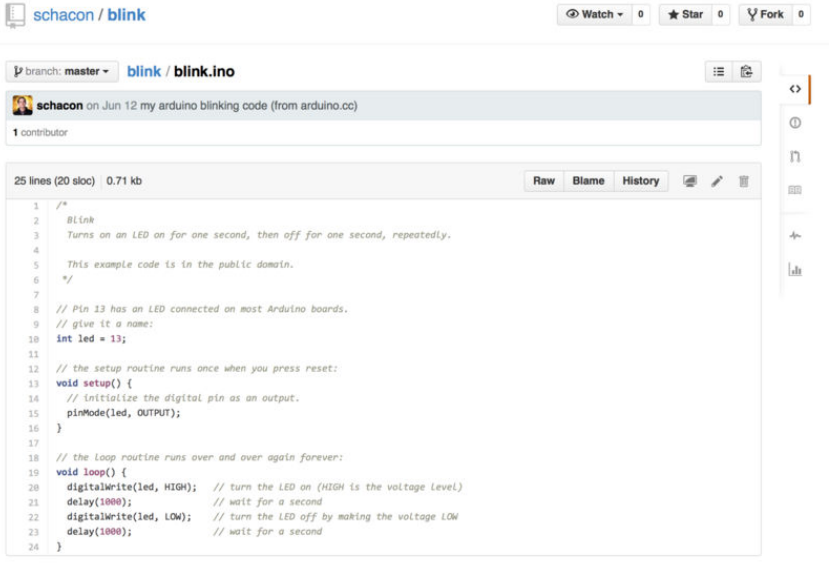
GitHub

创建合并请求

Tony Arduino *https://github.com/schacon/blink*

FIGURE 6-9

他想要做出贡献的项目



3 1

“ Fork ”

“ tonychacon ” `https://github.com/tonychacon/blink`

GitHub

```
$ git clone https://github.com/tonychacon/blink ❶
Cloning into 'blink'...

$ cd blink
$ git checkout -b slow-blink ❷
Switched to a new branch 'slow-blink'

$ sed -i '' 's/1000/3000/' blink.ino ❸

$ git diff --word-diff ❹
diff --git a/blink.ino b/blink.ino
index 15b9911..a6cc5a5 100644
--- a/blink.ino
+++ b/blink.ino
@@ -18,7 +18,7 @@ void setup() {
// the loop routine runs over and over again forever:
void loop() {
  digitalWrite(led, HIGH);   // turn the LED on (HIGH is the voltage level)
  [-delay(1000);-]{+delay(3000);+}               // wait for a second
  digitalWrite(led, LOW);    // turn the LED off by making the voltage LOW
  [-delay(1000);-]{+delay(3000);+}               // wait for a second
}

$ git commit -a -m 'three seconds is better' ❺
[slow-blink 5ca509d] three seconds is better
 1 file changed, 2 insertions(+), 2 deletions(-)

$ git push origin slow-blink ❻
Username for 'https://github.com': tonychacon
Password for 'https://tonychacon@github.com':
Counting objects: 5, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 340 bytes | 0 bytes/s, done.
Total 3 (delta 1), reused 0 (delta 0)
To https://github.com/tonychacon/blink
 * [new branch]      slow-blink -> slow-blink
```

❶

❷

❸

❹

❺

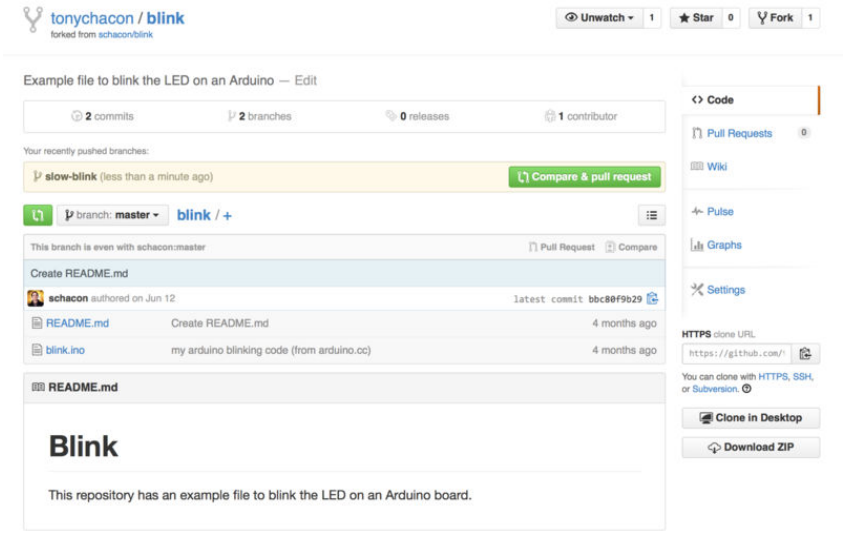
❻ GitHub

GitHub GitHub

“ Branches ”
`https://github.com/<用户名>/<项目名>/branches`

FIGURE 6-10

合并请求按钮



“ ” ahead

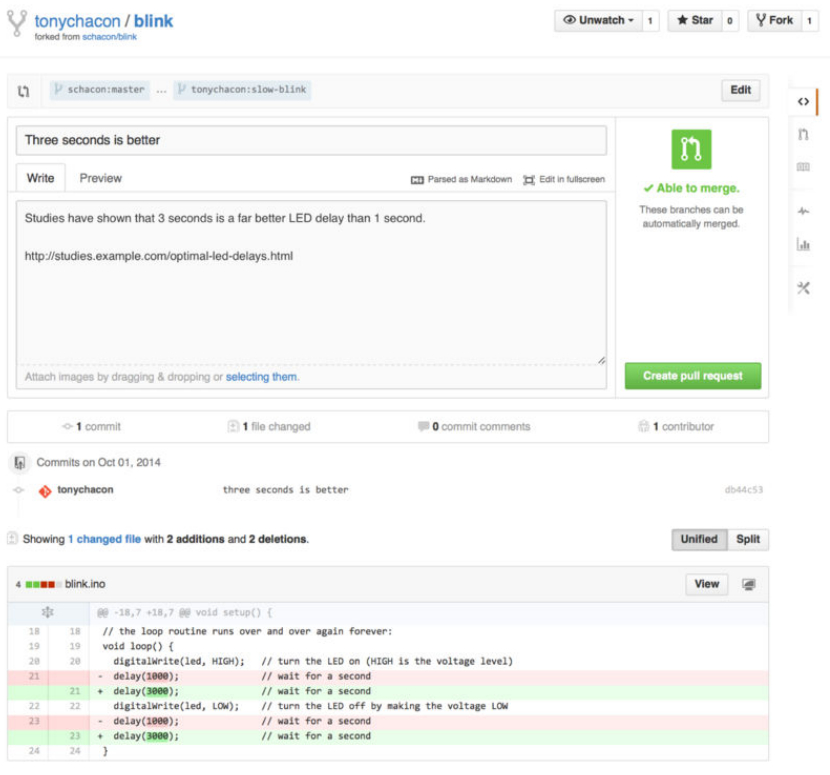


FIGURE 6-11

合并请求创建页面

“ Create pull request ”

虽然合并请求通常是在贡献者准备好在公开项目中提交改动的时候提交，但是也常被用在仍处于开发阶段的内部项目中。因为合并请求在提交后 **依然可以加入新的改动** ，它也经常被用来建立团队合作的环境，而不只是在最终阶段使用。

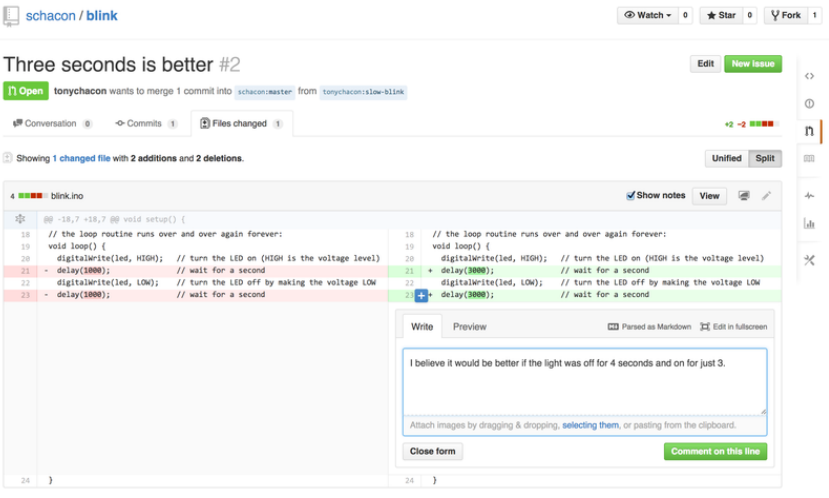
利用合并请求

Chapter 5

GitHub

FIGURE 6-12

对合并请求内的特定一行发表评论



Watch -

ing

Tony

FIGURE 6-13

通过电子邮件发送的评论提醒

Figure 6-14

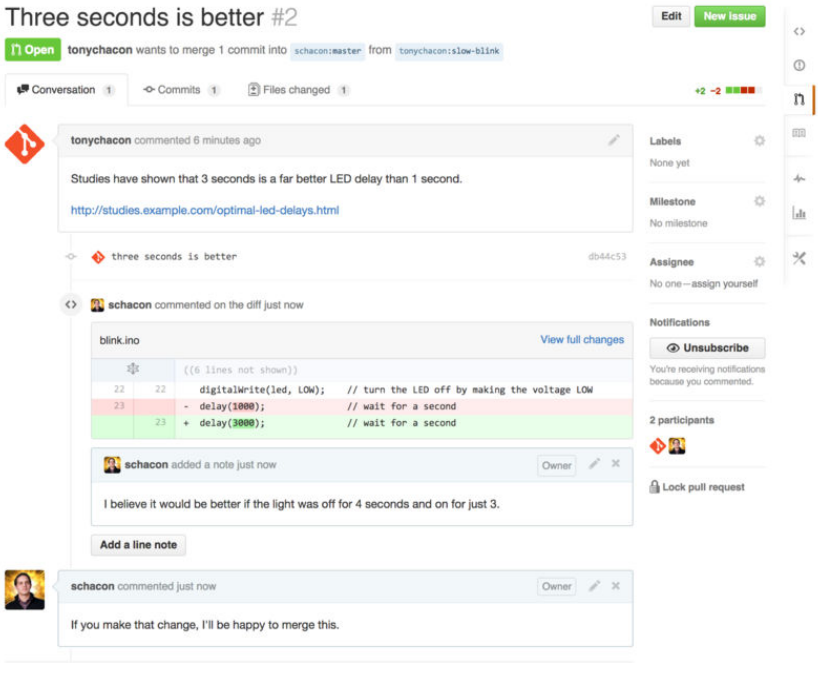


FIGURE 6-14

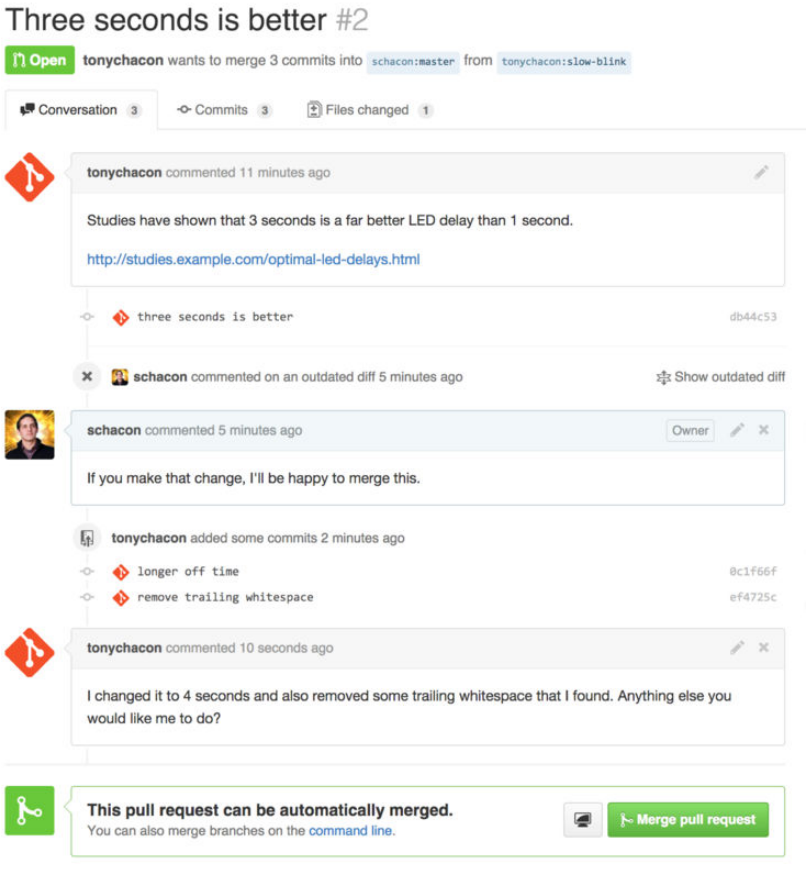
合并请求讨论页面

GitHub

GitHub

FIGURE 6-15

最终的合并请求



“ Files Changed ”

“ ” —

```
git diff master...<分支名>
```

“ ”

GitHub

GitHub “

” non-fast-forward fast-forward GitHub

`master` GitHub

GitHub

不必总是 FORK

有件很重要的事情：你可以在同一个版本库中不同的分支提交合并请求。如果你正在和某人实现某个功能，而且你对项目有写权限，你可以推送分支到版本库，并在 `master` 分支提交一个合并请求并在此进行代码审查和讨论的操作。不需要进行“Fork”。

GitHub

将合并请求制作成补丁

GitHub

Figure 6-15

“ Merge ”

与上游保持同步

GitHub

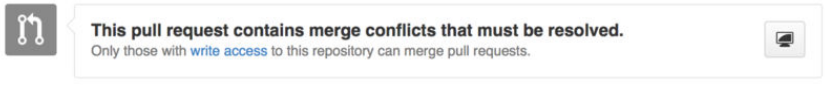


FIGURE 6-16

不能进行干净合并

Figure 6-16

`master`

GitHub

“ tonychacon ”

```
$ git remote add upstream https://github.com/schacon/blink ❶

$ git fetch upstream ❷
remote: Counting objects: 3, done.
remote: Compressing objects: 100% (3/3), done.
Unpacking objects: 100% (3/3), done.
remote: Total 3 (delta 0), reused 0 (delta 0)
From https://github.com/schacon/blink
 * [new branch]      master     -> upstream/master

$ git merge upstream/master ❸
Auto-merging blink.ino
CONFLICT (content): Merge conflict in blink.ino
Automatic merge failed; fix conflicts and then commit the result.

$ vim blink.ino ❹
$ git add blink.ino
$ git commit
[slow-blink 3c8d735] Merge remote-tracking branch 'upstream/master' \
    into slower-blink

$ git push origin slow-blink ❺
Counting objects: 6, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (6/6), done.
Writing objects: 100% (6/6), 682 bytes | 0 bytes/s, done.
Total 6 (delta 2), reused 0 (delta 0)
To https://github.com/tonychacon/blink
   ef4725c..3c8d735  slower-blink -> slow-blink
```

❶ “ upstream ”

❷

❸

❹

❺

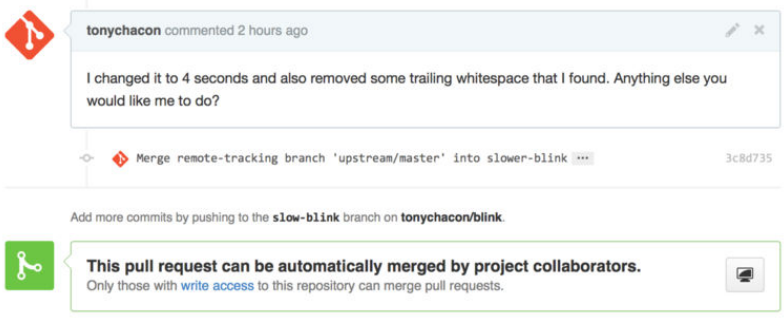


FIGURE 6-17

合并请求现在可以干净地合并了

Git

“ ”

GitHub

参考

“ ”

GitHub

Issue

3 3

#<编号>

“ Fork ”

用户名#<编号> 用户名/版本库名#<编号>

Figure 6-18

FIGURE 6-18

在合并请求中的交叉引用

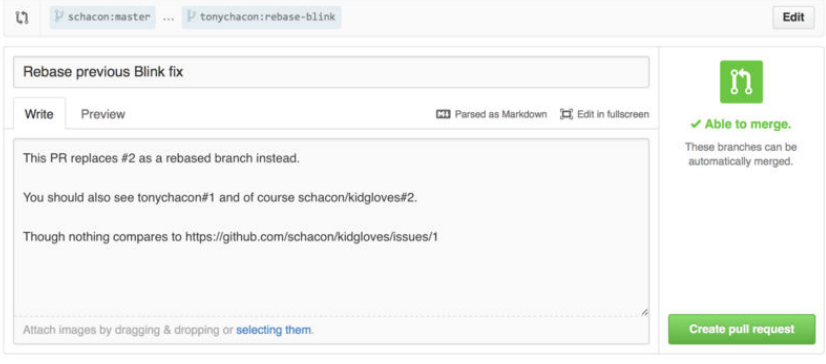
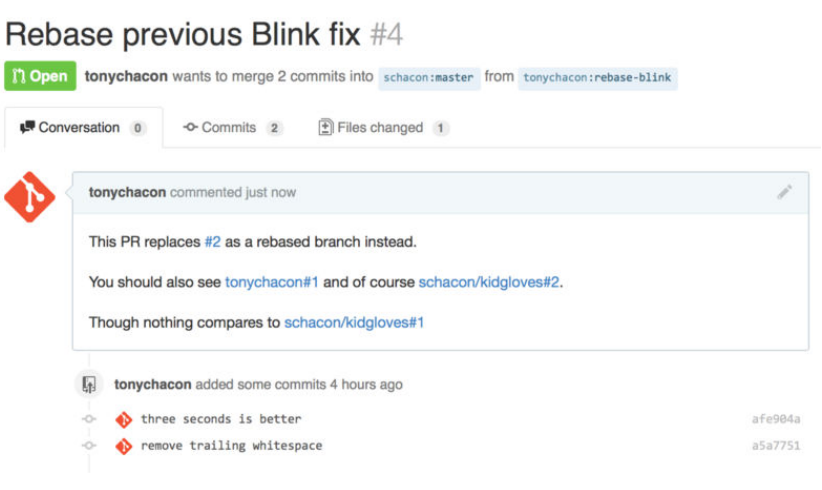


Figure 6-19

FIGURE 6-19

在合并请求中渲染后的交叉引用



GitHub

Tony

GitHub

Figure 6-20

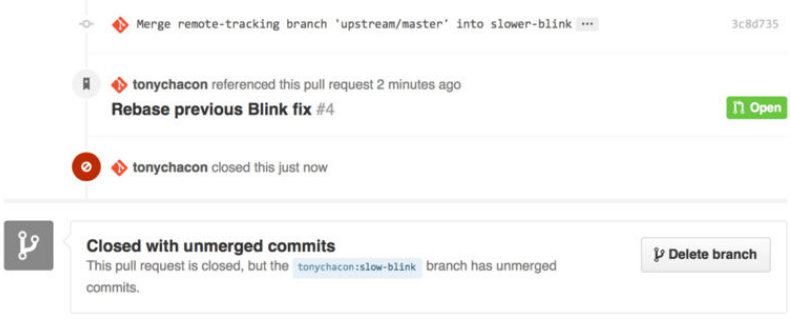


FIGURE 6-20

在合并请求中渲染后的交叉引用

SHA-1

40 SHA GitHub

“ Fork ”

Markdown

GitHub

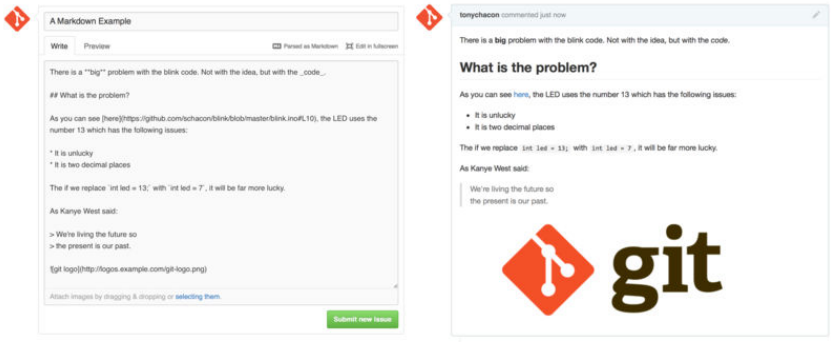
“ GitHub Markdown ” Markdown

Figure 6-21 Mark -

down

FIGURE 6-21

一个 Markdown 的例子和渲染效果



GITHUB 风格的 MARKDOWN

GitHub Markdown Markdown

GitHub Markdown

- [X] 编写代码
- [ ] 编写所有测试程序
- [ ] 为代码编写文档

Figure 6-22

FIGURE 6-22

Markdown 评论中渲染后的任务列表

—

Markdown

GitHub

Figure 6-23

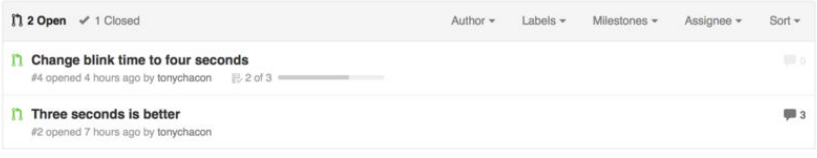


FIGURE 6-23

在合并请求列表中的任务列表总结

“ ”

```java
for(int i=0 ; i < 5 ; i++)
{
   System.out.println("i is : " + i);
}
```

“ java ” GitHub

Figure 6-24

FIGURE 6-24

渲染后的摘录代码示例

>

r

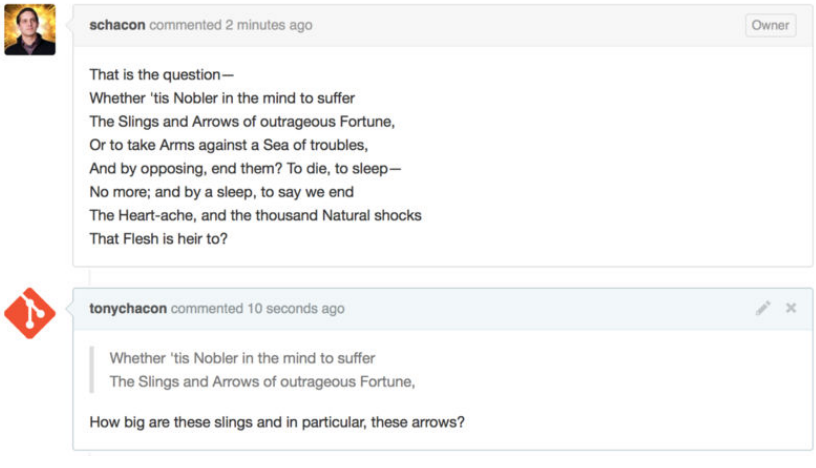
:

```
> Whether 'tis Nobler in the mind to suffer
> The Slings and Arrows of outrageous Fortune,

How big are these slings and in particular, these arrows?
```

Figure 6-25

FIGURE 6-25

渲染后的引用示例



Emoji

GitHub

GitHub :

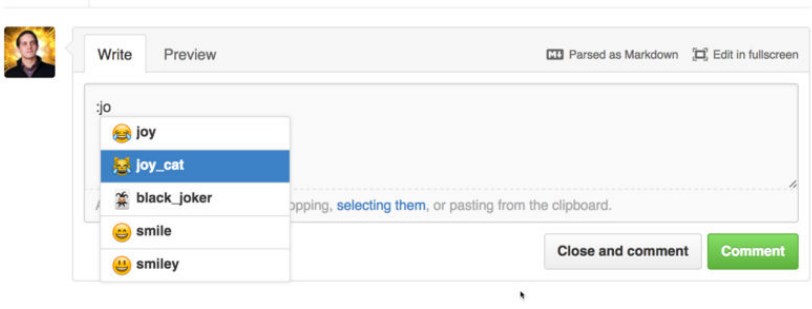


FIGURE 6-26

表情符号自动完成器

:<表情名称>:

```
I :eyes: that :bug: and I :cold_sweat:.

:trophy: for :microscope: it.

:+1: and :sparkles: on this :ship:, it's :fire::poop:!

:clap::tada::panda_face:
```

Figure 6-27

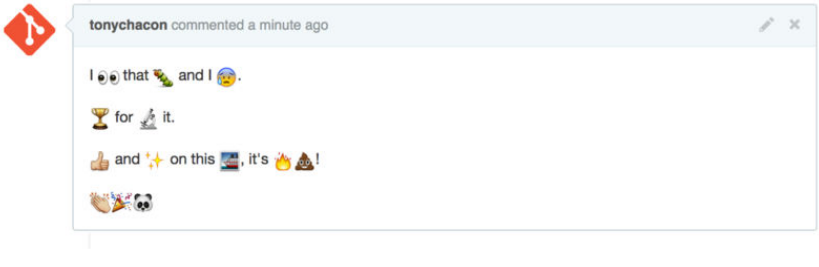


FIGURE 6-27

使用了大量表情符号的评论

事实上现在已经有大量的在线服务可以使用表情符号，这里有个列表可以让你快速的找到能表达你的情绪的表情符号：

http://www.emoji-cheat-sheet.com

GitHub Markdown
Markdown GitHub

FIGURE 6-28

通过拖拽的方式自动插入图片

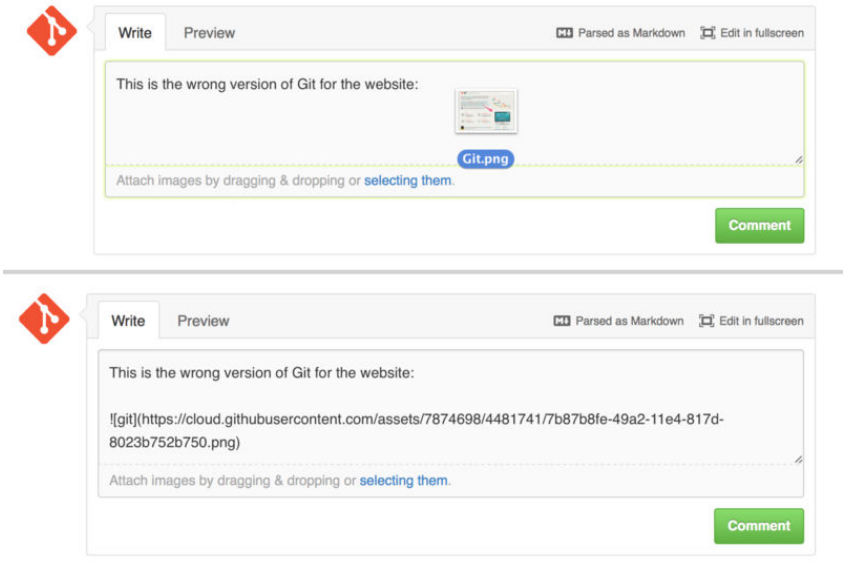


Figure 6-18 “ Parsed as Markdown ” GitHub Mark - down

维护项目

“ New repository ” + Figure 6-30

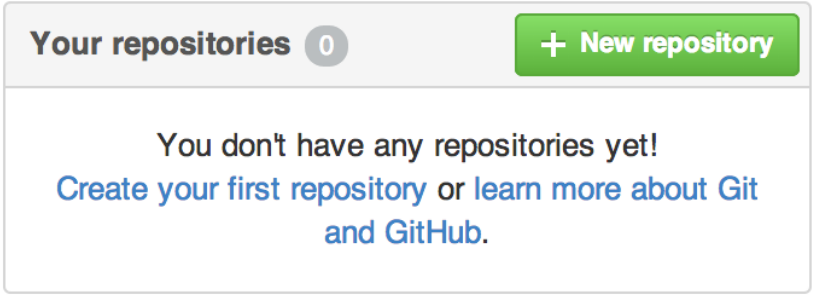


FIGURE 6-29

这是“Your repositories”区域.

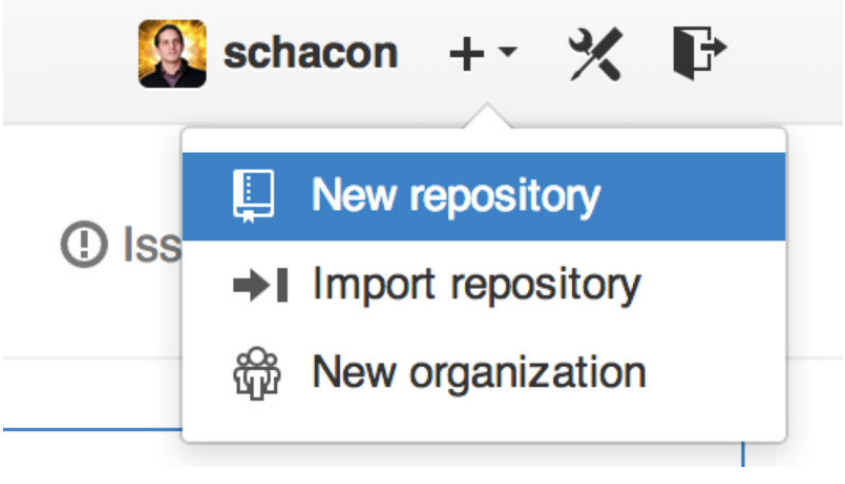


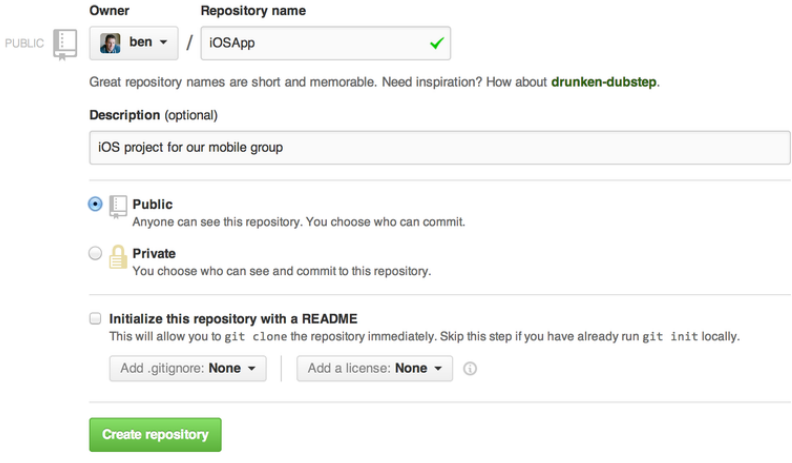
FIGURE 6-30

这是“New repository”下拉列表.

“ new repository ” :

FIGURE 6-31

这是“new repository”表单.



“Create Repository” Duang!!! – GitHub <user>/<project_name>

GitHub

Git

Chapter 2

GitHub URL

GitHub HTTP SSH HTTP https://github.com/<user>/<project_name> SSH git@github.com:<user>/<project_name> Git URL

通常对于公开项目可以优先分享基于 HTTP 的 URL，因为用户克隆项目不需要有一个 GitHub 帐号。 如果你分享 SSH URL，用户必须有一个帐号并且上传 SSH 密钥才能访问你的项目。 HTTP URL 与你贴到浏览器里查看项目用的地址是一样的。

“Collaborators” Ben Jef Louise GitHub

“

”

Git

“Settings”

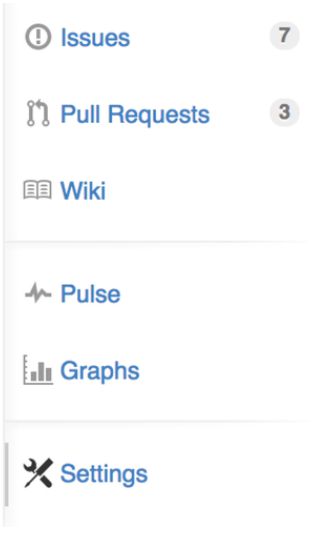


FIGURE 6-32

版本库设置链接.

“ Collaborators ”

“ Add collaborator. ”

“ X ”

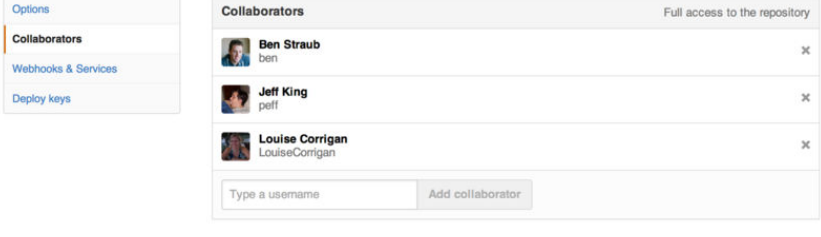


FIGURE 6-33

版本库合作者.

fork

“ tonychacon ” “ fade ”

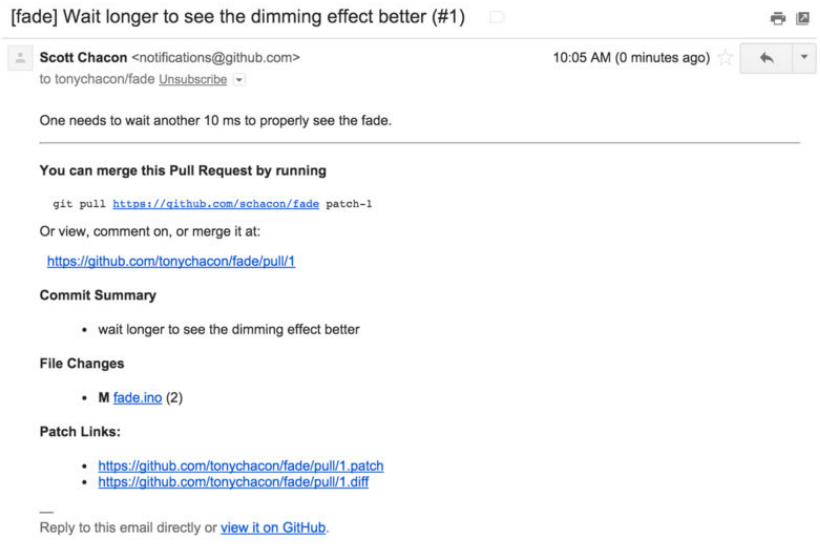
Arduino .

邮件通知

Figure 6-34

FIGURE 6-34

新的合并请求的邮件通知.



—

Git -

Hub URL

`git pull <url> patch-1`

“

”.—

URL .diff .patch

dif patch “

”

```
$ curl http://github.com/tonychacon/fade/pull/1.patch | git am
```

在合并请求上进行合作

“ GitHub ” _

GitHub Flavored Mark - down

FIGURE 6-35

Responses to emails are included in the thread.

`git pull <url> <branch>`

fork remote

GitHub “ Merge ”

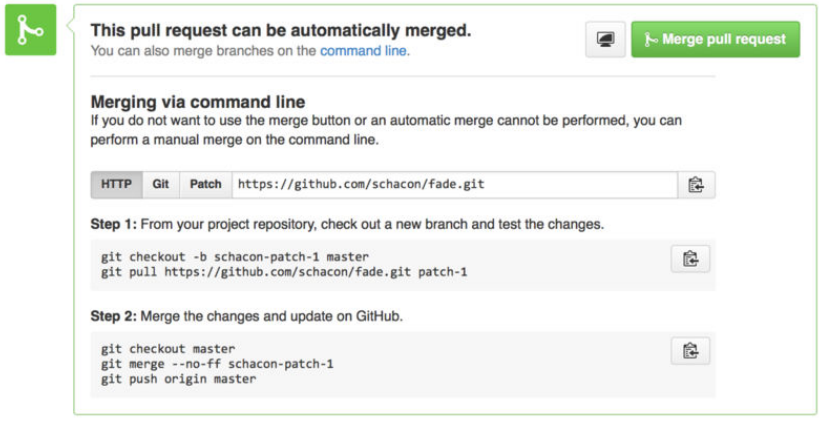
“ non-fast-forward ” fast-forward merge

Figure 6-36

GitHub

FIGURE 6-36

合并按钮和手工合并一个合并请求的指令.



合并请求引用

remote

GitHub

“ ”

GitHub “ ”

`ls-remote`

“ plumbing ” “ ”

Git

reference

“ blink ”

reference

```
$ git ls-remote https://github.com/schacon/blink
10d539600d86723087810ec636870a504f4fee4d        HEAD
10d539600d86723087810ec636870a504f4fee4d        refs/heads/master
6a83107c62950be9453aac297bb0193fd743cd6e        refs/pull/1/head
afe83c2d1a70674c9505cc1d8b7d380d5e076ed3        refs/pull/1/merge
3c8d735ee16296c242be7a9742ebfbc2665adec1        refs/pull/2/head
15c9f4f80973a2758462ab2066b6ad9fe8dcf03d        refs/pull/2/merge
a5a7751a33b7e86c5e9bb07b26001bb17d775d1a        refs/pull/4/head
31a45fc257e8433c8d8804e3e848cf61c9d3166c        refs/pull/4/merge
```

git ls-remote origin GitHub refs/pull/ refs/heads/ —

- /head

bug-fix a5a775 bug-fix fork pull/<pr#>/head a5a775 remote

```
$ git fetch origin refs/pull/958/head
From https://github.com/libgit2/libgit2
 * branch            refs/pull/958/head -> FETCH_HEAD
```

Git “ origin remote refs/pull/958/head ” Git .git/FETCH_HEAD git merge FETCH_HEAD

re - mote .git/config origin remote

```
[remote "origin"]
    url = https://github.com/libgit2/libgit2
    fetch = +refs/heads/*:refs/remotes/origin/*
```

fetch = “ refspec. ” remote .git Git “ remote refs/heads refs/remotes/origin ” refspec

```
[remote "origin"]
    url = https://github.com/libgit2/libgit2.git
    fetch = +refs/heads/*:refs/remotes/origin/*
    fetch = +refs/pull/*/head:refs/remotes/origin/pr/*
```

Git “ refs/pull/123/head
refs/remotes/origin/pr/123 ”
git fetch

```
$ git fetch
# …
 * [new ref]         refs/pull/1/head -> origin/pr/1
 * [new ref]         refs/pull/2/head -> origin/pr/2
 * [new ref]         refs/pull/4/head -> origin/pr/4
# …
```

```
$ git checkout pr/2
Checking out files: 100% (3769/3769), done.
Branch pr/2 set up to track remote branch pr/2 from origin.
Switched to a new branch 'pr/2'
```

refspec remote head
GitHub refs/pull/#/merge
“ merge ”

合并请求之上的合并请求

master

“ Edit ”
fork

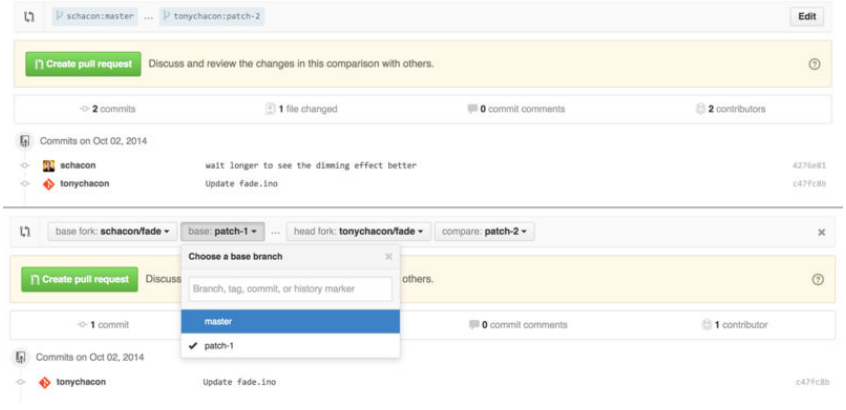


FIGURE 6-37

手工修改合并请求的目标.

fork

GitHub

@

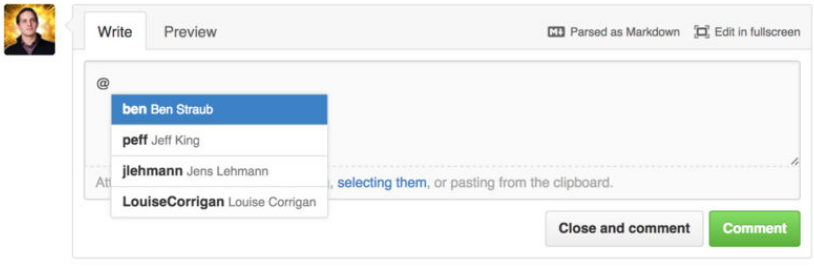


FIGURE 6-38

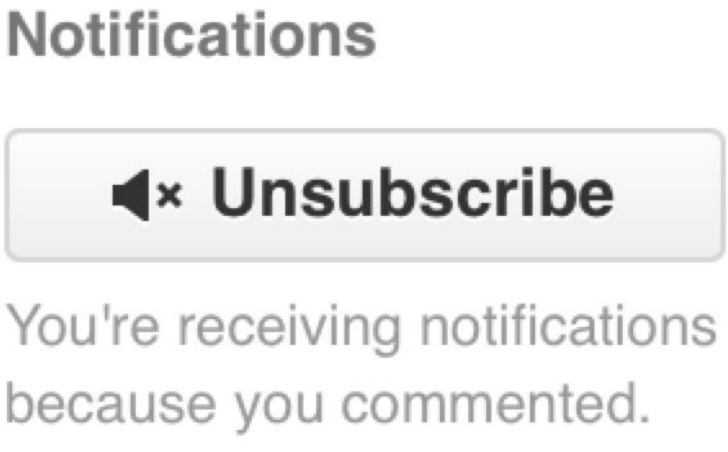
输入 @ 来提醒某人.

GitHub

“ Unsubscribe ”

FIGURE 6-39

取消订阅一个问题或合并请求.



GitHub “ notifcations ” GitHub

“ Notifcation center ”

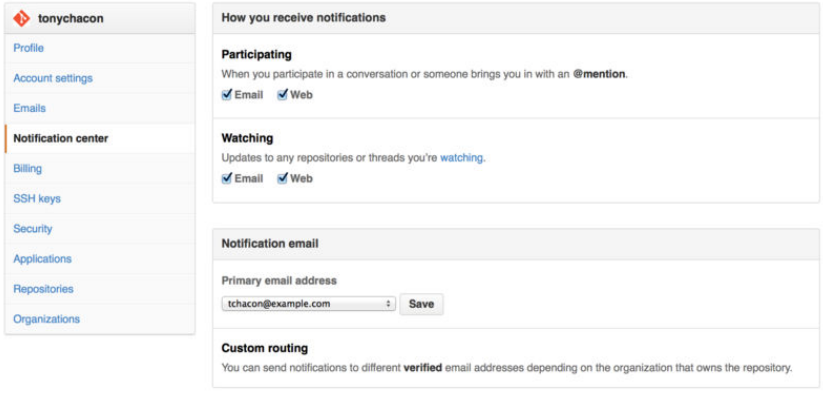


FIGURE 6-40

通知中心选项.

(Email) (Web)

GitHub GitHub

Figure 6-41

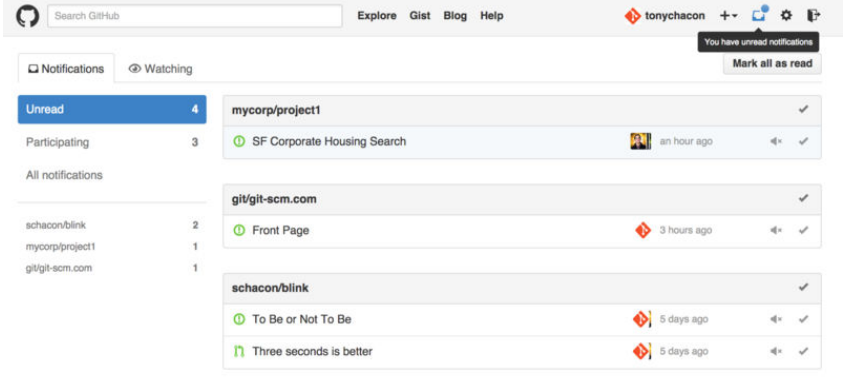


FIGURE 6-41

通知中心.

GitHub

GitHub

Figure 6-13 Figure 6-34

GitHub

Figure 6-34 Tony

```
To: tonychacon/fade <fade@noreply.github.com>
Message-ID: <tonychacon/fade/pull/1@github.com>
Subject: [fade] Wait longer to see the dimming effect better (#1)
X-GitHub-Recipient: tonychacon
List-ID: tonychacon/fade <fade.tonychacon.github.com>
List-Archive: https://github.com/tonychacon/fade
List-Post: <mailto:reply+i-4XXX@reply.github.com>
List-Unsubscribe: <mailto:unsub+i-XXX@reply.github.com> , ...
X-GitHub-Recipient-Address: tchacon@example.com
```

Message-ID <user>/<project>/<type>/<id> (issue) <type> “ issues ” “ pull ”

List-Post List-Unsubscribe

“ Unsubscribe ”

GitHub

README

README GitHub
README README.md README.asciidoc GitHub
README

-
-
-
-
-

GitHub

CONTRIBUTING

GitHub CONTRIBUTING
CONTRIBUTING GitHub
Figure 6-42

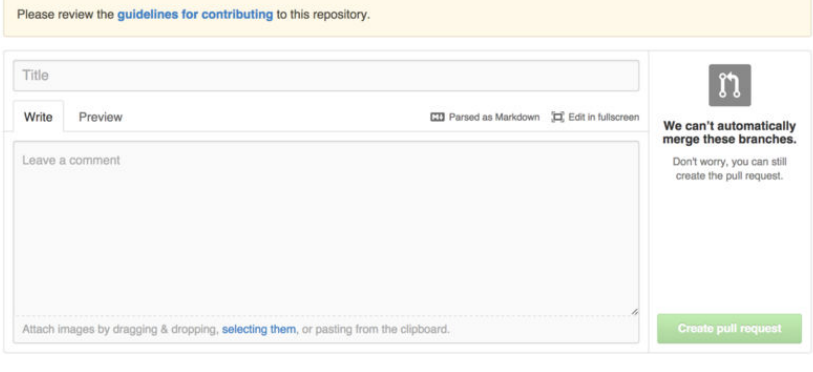


FIGURE 6-42

开启合并请求时有 CONTRIBUTING 文件存在.

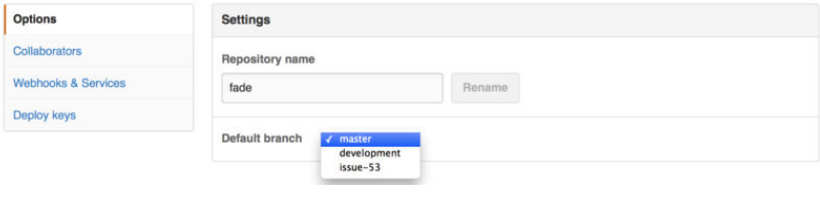
改变默认分支

“ master ”

“ options ”

FIGURE 6-43

改变项目的默认分支.



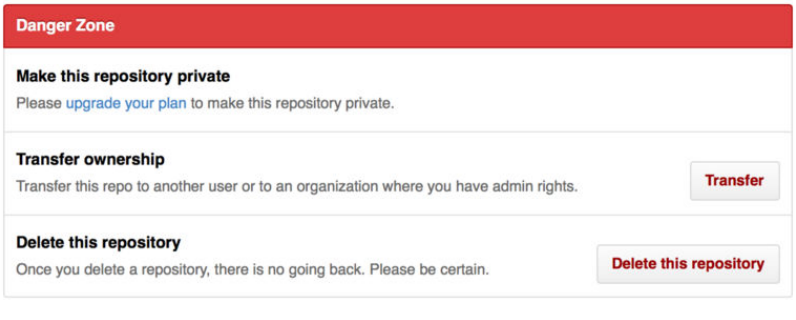
移交项目

GitHub

options “ Transfer ownership ”

FIGURE 6-44

把项目移交给另一个 GitHub 用户或组织。



URL Git

管理组织

GitHub Organizations

“ perl ” “ rails ” “ google ” “ twitter ”

GitHub “ + ” “ New organization ”

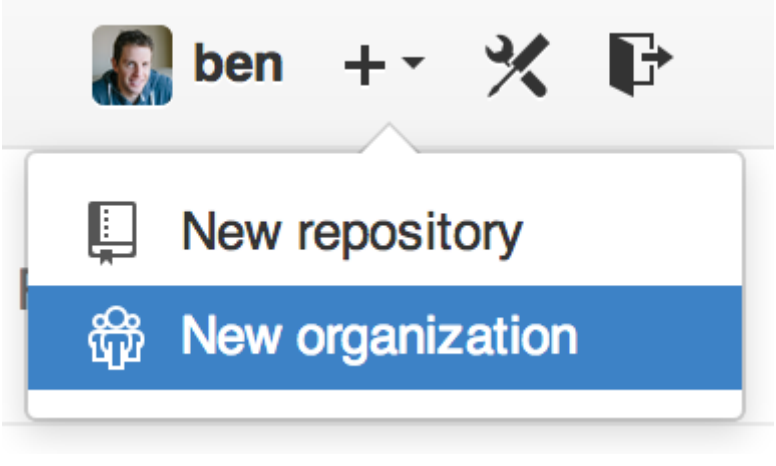


FIGURE 6-45

“New organization” 菜单项

“ ”

“ ”

landing page

Teams

`frontend` `backend` `deploy-scripts` HTML/CSS/Javascript `frontend` `backend` `backend` `deployscripts`

dashboard

FIGURE 6-46

组织页面

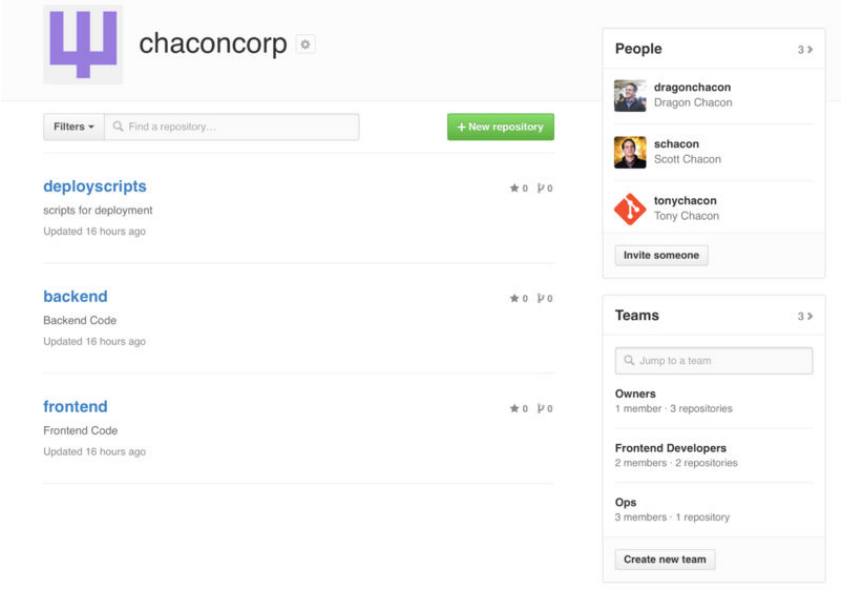


Figure 6-46 Teams

Figure 6-47 “ Set -
tings ”

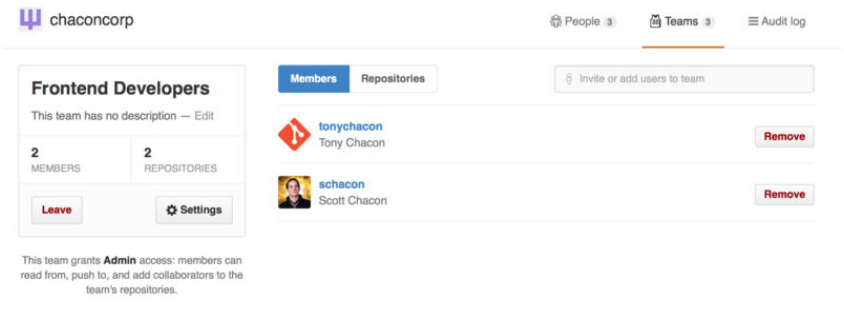


FIGURE 6-47

团队页面

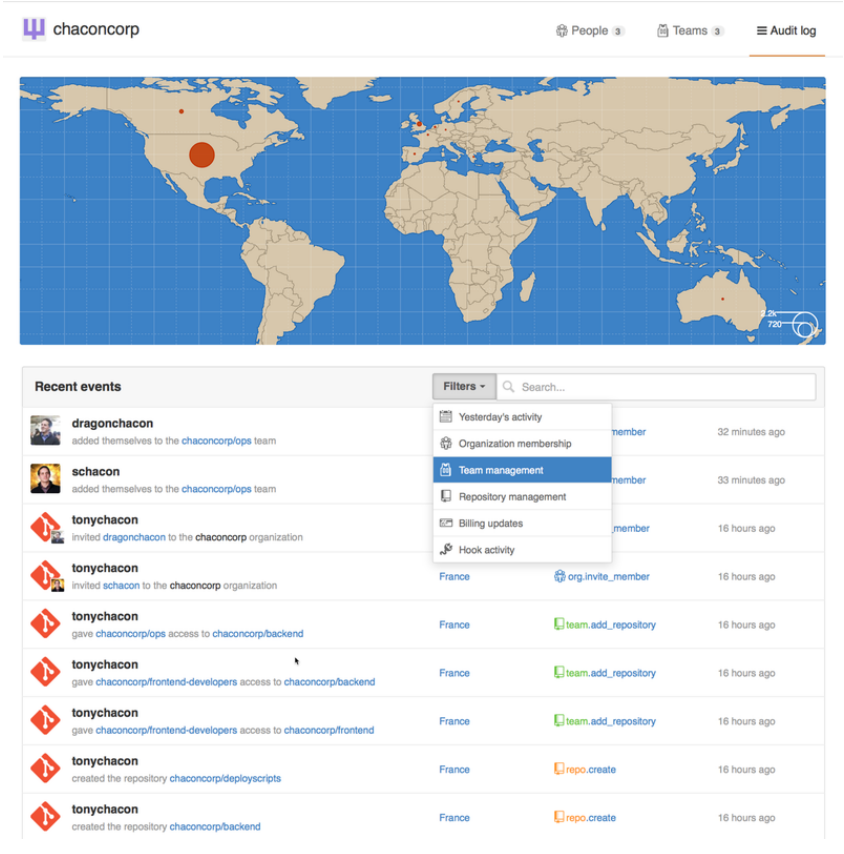
`@mentions` `@acmecorp/frontend`

`ux`, `css` `refactoring` `legal` `colorblind`

Audit Log

FIGURE 6-48

审计日志



脚本 GitHub

GitHub

GitHub Hack
GitHub API GitHub

GitHub GitHub

服务

“ Web -

hooks and Services ” Figure 6-49

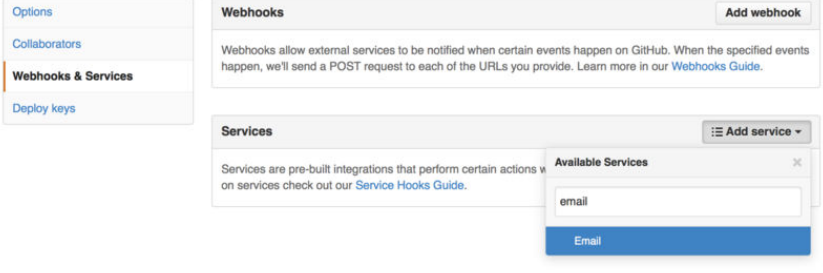


FIGURE 6-49

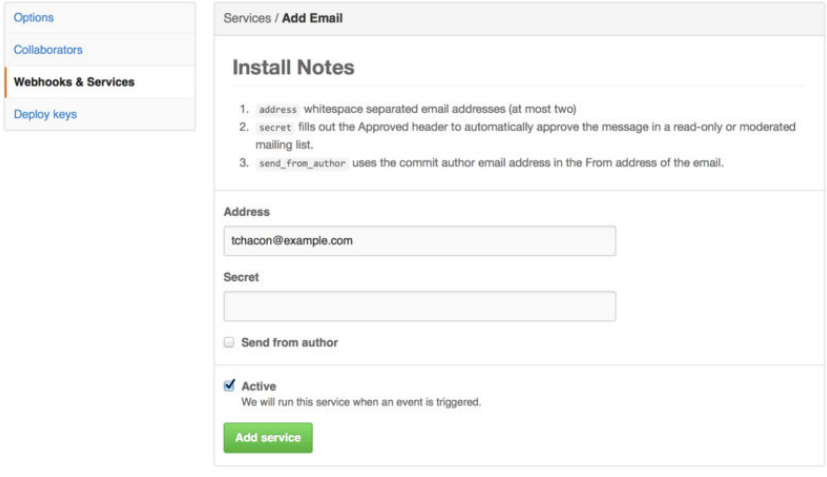
服务与钩子配置区域

BUG

“ Add Service ” “ email ” Figure 6-50

FIGURE 6-50

电子邮件服务配置



“ Add service ”

GitHub
Jenkins
Jenkins

钩子

GitHub
URL GitHub HTTP
URL
web GitHub

Figure 6-49 “ Add webhook ”
Figure 6-51

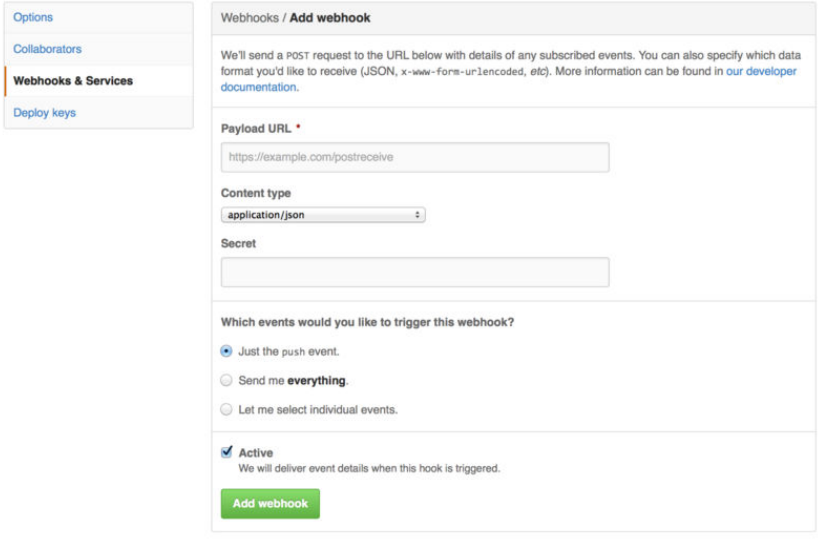


FIGURE 6-51

Web 钩子配置

Web URL

“ Add webhook ”

GitHub —

push

web web

Ruby web Sinatra

```
require 'sinatra'
require 'json'
require 'mail'

post '/payload' do
  push = JSON.parse(request.body.read) # parse the JSON

  # gather the data we're looking for
  pusher = push["pusher"]["name"]
  branch = push["ref"]

  # get a list of all the files touched
  files = push["commits"].map do |commit|
    commit['added'] + commit['modified'] + commit['removed']
```

```
  end
  files = files.flatten.uniq

  # check for our criteria
  if pusher == 'schacon' &&
     branch == 'ref/heads/special-branch' &&
     files.include?('special-file.txt')

    Mail.deliver do
      from     'tchacon@example.com'
      to       'tchacon@example.com'
      subject  'Scott Changed the File'
      body     "ALARM"
    end
  end
end
```

GitHub JSON

GitHub webhook

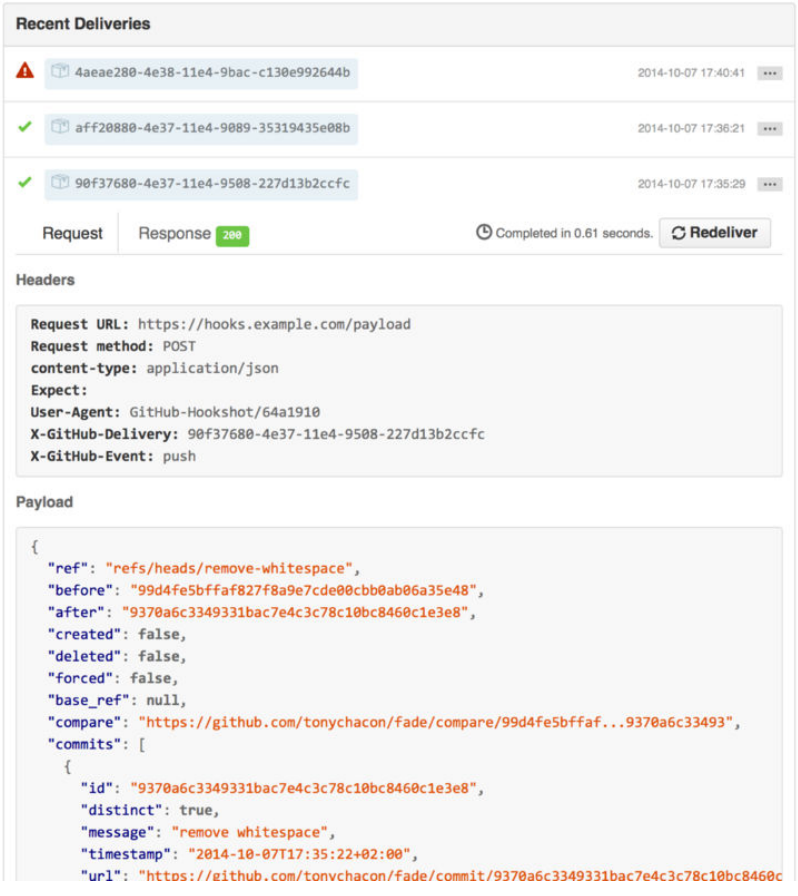


FIGURE 6-52

Web 钩子调试信息

web

https://developer.github.com/webhooks/ GitHub

GitHub API

GitHub API GitHub

API

API API
Pull Request

GET

“ schacon ”

```
$ curl https://api.github.com/users/schacon
{
  "login": "schacon",
  "id": 70,
  "avatar_url": "https://avatars.githubusercontent.com/u/70",
# …
  "name": "Scott Chacon",
  "company": "GitHub",
  "following": 19,
  "created_at": "2008-01-27T17:19:28Z",
  "updated_at": "2014-06-10T02:37:23Z"
}
```

—

GitHub API
Markdown .gitignore

```
$ curl https://api.github.com/gitignore/templates/Java
{
  "name": "Java",
  "source": "*.class

# Mobile Tools for Java (J2ME)
.mtj.tmp/

# Package Files #
*.jar
*.war
*.ear

# virtual machine crash logs, see http://www.java.com/en/download/help/error_hotspot
hs_err_pid*
"
}
```

Issue Pull Request

“ Appli -
cations ”

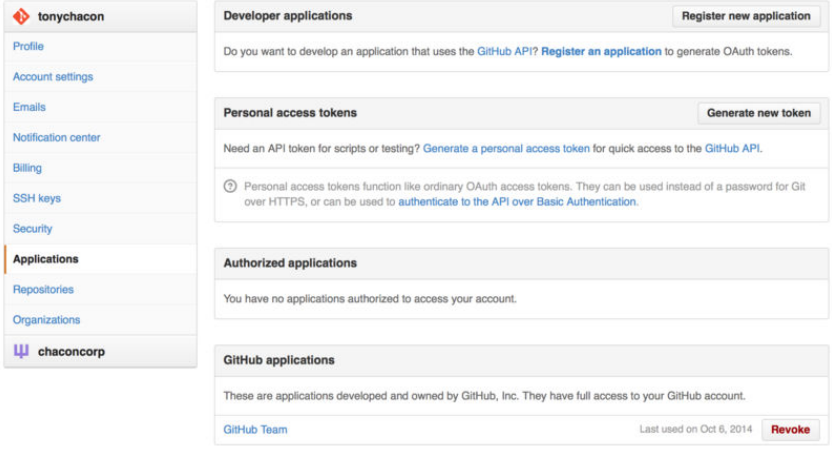


FIGURE 6-53

从设置页的“Applications”标签生成访问令牌。

GitHub

60 5000

Issue #6 Authorization
`repos/<user>/<repo>/issues/<num>/comments`
HTTP POST

```
$ curl -H "Content-Type: application/json" \
       -H "Authorization: token TOKEN" \
       --data '{"body":"A new comment, :+1:"}' \
       https://api.github.com/repos/schacon/blink/issues/6/comments
{
```

```
    "id": 58322100,
    "html_url": "https://github.com/schacon/blink/issues/6#issuecomment-58322100",
    ...
    "user": {
      "login": "tonychacon",
      "id": 7874698,
      "avatar_url": "https://avatars.githubusercontent.com/u/7874698?v=2",
      "type": "User",
    },
    "created_at": "2014-10-08T07:48:19Z",
    "updated_at": "2014-10-08T07:48:19Z",
    "body": "A new comment, :+1:"
}
```

Figure 6-54

FIGURE 6-54

从 GitHub API 发布的一条评论

API —
Issues Pull Requests
Pull Requests
Pull Request

Pull Request

Pull Requests
API
API

—
web
`Signed-off-by` web

```
require 'httparty'
require 'sinatra'
require 'json'

post '/payload' do
```

```
  push = JSON.parse(request.body.read) # parse the JSON
  repo_name = push['repository']['full_name']

  # look through each commit message
  push["commits"].each do |commit|

    # look for a Signed-off-by string
    if /Signed-off-by/.match commit['message']
      state = 'success'
      description = 'Successfully signed off!'
    else
      state = 'failure'
      description = 'No signoff found.'
    end

    # post status to GitHub
    sha = commit["id"]
    status_url = "https://api.github.com/repos/#{repo_name}/statuses/#{sha}"

    status = {
      "state"       => state,
      "description" => description,
      "target_url"  => "http://example.com/how-to-signoff",
      "context"     => "validate/signoff"
    }
    HTTParty.post(status_url,
      :body => status.to_json,
      :headers => {
        'Content-Type'  => 'application/json',
        'User-Agent'    => 'tonychacon/signoff',
        'Authorization' => "token #{ENV['TOKEN']}" }
    )
  end
end
```

web

Signed-off-by HTTP

`/repos/<user>/<repo>/statuses/<commit_sha>` API

POST

success, *failure*, *error*

URL “ context ”

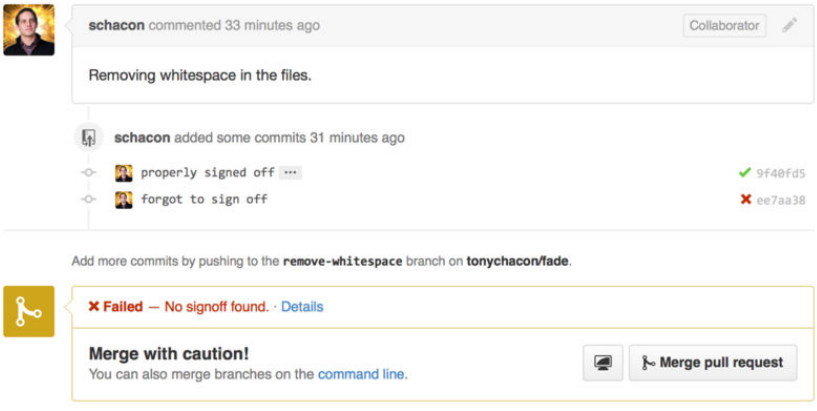
— “ context ”

GitHub Pull Request

Figure 6-55

FIGURE 6-55

通过 API 的提交状态



“ Signed-o f-by ”

Pull Request

API

Octokit

curl HTTP

API

Go Objective-C Ruby .NET *http://github.com/octokit* HTTP

GitHub

API *https://developer.github.com*

总结

GitHub

Git

7 Git 工具

Git

Git

选择修订版本

Git

Git SHA-1

SHA-1

Git SHA-1
SHA-1 4 —
SHA-1
git log
:

```
$ git log
commit 734713bc047d87bf7eac9674765ae793478c50d3
Author: Scott Chacon <schacon@gmail.com>
Date:   Fri Jan 2 18:32:33 2009 -0800

    fixed refs handling, added gc auto, updated tests
```

```
commit d921970aadf03b3cf0e71becdaab3147ba71cdef
Merge: 1c002dd... 35cfb2b...
Author: Scott Chacon <schacon@gmail.com>
Date:   Thu Dec 11 15:08:43 2008 -0800

    Merge commit 'phedders/rdocs'

commit 1c002dd4b536e7479fe34593e72e6c6c1819e53b
Author: Scott Chacon <schacon@gmail.com>
Date:   Thu Dec 11 14:58:32 2008 -0800

    added some blame and merge stuff
```

1c002dd.... git show

```
$ git show 1c002dd4b536e7479fe34593e72e6c6c1819e53b
$ git show 1c002dd4b536e7479f
$ git show 1c002d
```

Git SHA-1 git log --abbrev-commit SHA-1

```
$ git log --abbrev-commit --pretty=oneline
ca82a6d changed the version number
085bb3b removed unnecessary test code
a11bef0 first commit
```

8 10 SHA-1 Linux Git 45 360 11

关于 **SHA-1** 的简短说明

许多人觉得他们的仓库里有可能出现两个 SHA-1 值相同的对象。 然后呢？

如果你真的向仓库里提交了一个跟之前的某个对象具有相同 SHA-1 值的对象，Git 发现仓库里已经存在了拥有相同 HASH 值的对象，就会认为这个新的提交是已经被写入仓库的。 如果之后你想检出那个对象时，你将得到先前那个对象的数据。

但是这种情况发生的概率十分渺小。 SHA-1 摘要长度是 20 字节，也就是 160 位。 2^{80} 个随机哈希对象才有 50% 的概率出现一次冲突（计算冲突机率的公式是 `p = (n(n-1)/2) * (1/2^160))`）。2^{80} 是 1.2 x 10^24 也就是一亿亿亿。 那是地球上沙粒总数的 1200 倍。

举例说一下怎样才能产生一次 SHA-1 冲突。 如果地球上 65 亿个人类都在编程，每人每秒都在产生等价于整个 Linux 内核历史（360 万个 Git 对象）的代码，并将之提交到一个巨大的 Git 仓库里面，这样持续两年的时间才会产生足够的对象，使其拥有 50% 的概率产生一次 SHA-1 对象冲突。 这要比你编程团队的成员同一个晚上在互不相干的意外中被狼袭击并杀死的机率还要小。

Git SHA-1
`topic1`
`ca82a6d` :

```
$ git show ca82a6dff817ec66f44342007202690a93763949
$ git show topic1
```

SHA-1
SHA-1 `rev-parse` Git
Chapter 10 `rev-parse`
Git
`rev-parse`

```
$ git rev-parse topic1
ca82a6dff817ec66f44342007202690a93763949
```

Git (refog)
HEAD
`git reflog`

```
$ git reflog
734713b HEAD@{0}: commit: fixed refs handling, added gc auto, updated
d921970 HEAD@{1}: merge phedders/rdocs: Merge made by recursive.
1c002dd HEAD@{2}: commit: added some blame and merge stuff
1c36188 HEAD@{3}: rebase -i (squash): updating HEAD
95df984 HEAD@{4}: commit: # This is a combination of two commits.
1c36188 HEAD@{5}: rebase -i (squash): updating HEAD
7e05da5 HEAD@{6}: rebase -i (pick): updating HEAD
```

HEAD Git

HEAD

@{n} refog

```
$ git show HEAD@{5}
```

master

```
$ git show master@{yesterday}
```

git log -g git log

```
$ git log -g master
commit 734713bc047d87bf7eac9674765ae793478c50d3
Reflog: master@{0} (Scott Chacon <schacon@gmail.com>)
Reflog message: commit: fixed refs handling, added gc auto, updated
Author: Scott Chacon <schacon@gmail.com>
Date:   Fri Jan 2 18:32:33 2009 -0800

    fixed refs handling, added gc auto, updated tests

commit d921970aadf03b3cf0e71becdaab3147ba71cdef
Reflog: master@{1} (Scott Chacon <schacon@gmail.com>)
Reflog message: merge phedders/rdocs: Merge made by recursive.
Author: Scott Chacon <schacon@gmail.com>
Date:   Thu Dec 11 15:08:43 2008 -0800

    Merge commit 'phedders/rdocs'
```

```
git show HEAD@{2.months.ago}
```

—

^

Git

```
$ git log --pretty=format:'%h %s' --graph
* 734713b fixed refs handling, added gc auto, updated tests
*   d921970 Merge commit 'phedders/rdocs'
|\
| * 35cfb2b Some rdoc changes
* | 1c002dd added some blame and merge stuff
|/
* 1c36188 ignore *.gem
* 9b29157 add open3_detach to gemspec file list
```

HEAD^ “ HEAD ”

```
$ git show HEAD^
commit d921970aadf03b3cf0e71becdaab3147ba71cdef
Merge: 1c002dd... 35cfb2b...
Author: Scott Chacon <schacon@gmail.com>
Date:   Thu Dec 11 15:08:43 2008 -0800

    Merge commit 'phedders/rdocs'
```

^ — d921970^2 “ d921970 ” (merge)

```
$ git show d921970^
commit 1c002dd4b536e7479fe34593e72e6c6c1819e53b
Author: Scott Chacon <schacon@gmail.com>
Date:   Thu Dec 11 14:58:32 2008 -0800

    added some blame and merge stuff
```

```
$ git show d921970^2
commit 35cfb2b795a55793d7cc56a6cc2060b4bb732548
Author: Paul Hedderly <paul+git@mjr.org>
Date:   Wed Dec 10 22:22:03 2008 +0000

    Some rdoc changes
```

~ HEAD~

HEAD^ HEAD~2

“ ” “ ” — Git

HEAD~3

```
$ git show HEAD~3
commit 1c3618887afb5fbcbea25b7c013f4e2114448b8d
Author: Tom Preston-Werner <tom@mojombo.com>
Date:   Fri Nov 7 13:47:59 2008 -0500

    ignore *.gem
```

HEAD^^^

```
$ git show HEAD^^^
commit 1c3618887afb5fbcbea25b7c013f4e2114448b8d
Author: Tom Preston-Werner <tom@mojombo.com>
Date:   Fri Nov 7 13:47:59 2008 -0500

    ignore *.gem
```

— HEAD~3^2

“ ”

双点

Git

Figure 7-1

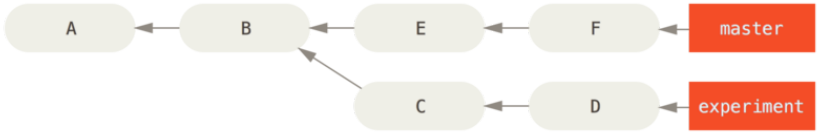


FIGURE 7-1

Example history for range selection.

experiment master

master..experiment Git

“ experiment master ”

```
$ git log master..experiment
D
C
```

master experiment

experiment..master master

experiment

```
$ git log experiment..master
F
E
```

experiment

```
$ git log origin/master..HEAD
```

origin

git push origin/master git log origin/master..HEAD

Git HEAD git log origin/

master.. — Git HEAD

多点

Git ^ --not
3

```
$ git log refA..refB
$ git log ^refA refB
$ git log refB --not refA
```

refA refB
refC

```
$ git log refA refB ^refC
$ git log refA refB --not refC
```

三点

master experiment

```
$ git log master...experiment
F
E
D
C
```

log 4
log --left-right

```
$ git log --left-right master...experiment
< F
< E
> D
> C
```

Git

交互式暂存

Git

git add -i --interactive Git

```
$ git add -i
           staged     unstaged path
  1:    unchanged        +0/-1 TODO
  2:    unchanged        +1/-1 index.html
  3:    unchanged        +5/-1 lib/simplegit.rb

*** Commands ***
  1: status     2: update      3: revert     4: add untracked
  5: patch      6: diff        7: quit       8: help
What now>
```

- git status

What now> 2 u

```
What now> 2
           staged     unstaged path
  1:    unchanged        +0/-1 TODO
  2:    unchanged        +1/-1 index.html
  3:    unchanged        +5/-1 lib/simplegit.rb
Update>>
```

TODO index.html

```
Update>> 1,2
           staged     unstaged path
* 1:    unchanged        +0/-1 TODO
* 2:    unchanged        +1/-1 index.html
  3:    unchanged        +5/-1 lib/simplegit.rb
Update>>
```

* Update>>

Git

```
Update>>
updated 2 paths

*** Commands ***
  1: status     2: update      3: revert     4: add untracked
  5: patch      6: diff        7: quit       8: help
What now> 1
           staged     unstaged path
  1:        +0/-1      nothing TODO
  2:        +1/-1      nothing index.html
  3:    unchanged        +5/-1 lib/simplegit.rb
```

TODO index.html simplegit.rb

TODO 3 r

```
*** Commands ***
  1: status     2: update      3: revert     4: add untracked
  5: patch      6: diff        7: quit       8: help
What now> 3
           staged     unstaged path
  1:        +0/-1      nothing TODO
  2:        +1/-1      nothing index.html
  3:    unchanged        +5/-1 lib/simplegit.rb
```

```
Revert>> 1
           staged     unstaged path
* 1:        +0/-1      nothing TODO
  2:        +1/-1      nothing index.html
  3:    unchanged        +5/-1 lib/simplegit.rb
Revert>> [enter]
reverted one path
```

Git TODO

```
*** Commands ***
  1: status     2: update      3: revert     4: add untracked
  5: patch      6: diff        7: quit       8: help
What now> 1
           staged     unstaged path
  1:    unchanged        +0/-1 TODO
  2:        +1/-1      nothing index.html
  3:    unchanged        +5/-1 lib/simplegit.rb
```

6 d

git diff --cached

```
*** Commands ***
  1: status     2: update      3: revert     4: add untracked
  5: patch      6: diff        7: quit       8: help
What now> 6
           staged     unstaged path
  1:        +1/-1      nothing index.html
Review diff>> 1
diff --git a/index.html b/index.html
index 4d07108..4335f49 100644
--- a/index.html
+++ b/index.html
@@ -16,7 +16,7 @@ Date Finder

 <p id="out">...</p>

-<div id="footer">contact : support@github.com</div>
+<div id="footer">contact : email.support@github.com</div>

 <script type="text/javascript">
```

Git simplegit.rb
Git
5 p Git

```
diff --git a/lib/simplegit.rb b/lib/simplegit.rb
index dd5ecc4..57399e0 100644
--- a/lib/simplegit.rb
+++ b/lib/simplegit.rb
@@ -22,7 +22,7 @@ class SimpleGit
   end

   def log(treeish = 'master')
-    command("git log -n 25 #{treeish}")
+    command("git log -n 30 #{treeish}")
   end

   def blame(path)
Stage this hunk [y,n,a,d,/,j,J,g,e,?]?
```

?

```
Stage this hunk [y,n,a,d,/,j,J,g,e,?]? ?
y - stage this hunk
n - do not stage this hunk
a - stage this and all the remaining hunks in the file
d - do not stage this hunk nor any of the remaining hunks in the file
g - select a hunk to go to
/ - search for a hunk matching the given regex
j - leave this hunk undecided, see next undecided hunk
J - leave this hunk undecided, see next hunk
k - leave this hunk undecided, see previous undecided hunk
K - leave this hunk undecided, see previous hunk
s - split the current hunk into smaller hunks
e - manually edit the current hunk
? - print help
```

y n

```
What now> 1
           staged     unstaged path
  1:    unchanged        +0/-1 TODO
  2:        +1/-1      nothing index.html
  3:        +1/-1        +4/-0 lib/simplegit.rb
```

simplegit.rb

git commit

-

git add -p git add --patch

reset --patch

checkout --patch stash save --patch

储藏与清理

git stash

- -

git status

```
$ git status
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

        modified:   index.html

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:   lib/simplegit.rb
```

git stash git stash save

```
$ git stash
Saved working directory and index state \
  "WIP on master: 049d078 added the index file"
HEAD is now at 049d078 added the index file
(To restore them type "git stash apply")
```

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

git stash list

```
$ git stash list
stash@{0}: WIP on master: 049d078 added the index file
stash@{1}: WIP on master: c264051 Revert "added file_size"
stash@{2}: WIP on master: 21d80a5 added number to log
```

stash
git stash apply
git stash apply stash@{2}
Git

```
$ git stash apply
# On branch master
# Changed but not updated:
#   (use "git add <file>..." to update what will be committed)
#
#       modified:   index.html
#       modified:   lib/simplegit.rb
#
```

Git

- Git

--index git stash apply

```
$ git stash apply --index
# On branch master
# Changes to be committed:
#   (use "git reset HEAD <file>..." to unstage)
#
#       modified:   index.html
#
# Changed but not updated:
#   (use "git add <file>..." to update what will be committed)
#
#       modified:   lib/simplegit.rb
#
```

- git stash drop

```
$ git stash list
stash@{0}: WIP on master: 049d078 added the index file
stash@{1}: WIP on master: c264051 Revert "added file_size"
stash@{2}: WIP on master: 21d80a5 added number to log
$ git stash drop stash@{0}
Dropped stash@{0} (364e91f3f268f0900bc3ee613f9f733e82aaed43)
```

git stash pop

stash save

--keep-index Git git add

```
$ git status -s
M  index.html
```

```
 M lib/simplegit.rb

$ git stash --keep-index
Saved working directory and index state WIP on master: 1b65b17 added the index fil
HEAD is now at 1b65b17 added the index file

$ git status -s
M  index.html
```

git stash --include-untracked -u Git

```
$ git status -s
M  index.html
 M lib/simplegit.rb
?? new-file.txt

$ git stash -u
Saved working directory and index state WIP on master: 1b65b17 added the index fil
HEAD is now at 1b65b17 added the index file

$ git status -s
$
```

--patch Git

```
$ git stash --patch
diff --git a/lib/simplegit.rb b/lib/simplegit.rb
index 66d332e..8bb5674 100644
--- a/lib/simplegit.rb
+++ b/lib/simplegit.rb
@@ -16,6 +16,10 @@ class SimpleGit
         return `#{git_cmd} 2>&1`.chomp
       end
     end
+
+    def show(treeish = 'master')
+      command("git show #{treeish}")
+    end

 end
 test
Stash this hunk [y,n,q,a,d,/,e,?]? y
```

```
Saved working directory and index state WIP on master: 1b65b17 added the index file
```

git stash branch

```
$ git stash branch testchanges
Switched to a new branch "testchanges"
# On branch testchanges
# Changes to be committed:
#   (use "git reset HEAD <file>..." to unstage)
#
#       modified:   index.html
#
# Changed but not updated:
#   (use "git add <file>..." to update what will be committed)
#
#       modified:   lib/simplegit.rb
#
Dropped refs/stash@{0} (f0dfc4d5dc332d1cee34a634182e168c4efc3359)
```

git clean

git stash --all

git clean git clean -f -d -f “ ”

-n
“ ”

```
$ git clean -d -n
Would remove test.o
Would remove tmp/
```

git clean
.gitiignore

.o clean -x

```
$ git status -s
 M lib/simplegit.rb
?? build.TMP
?? tmp/

$ git clean -n -d
Would remove build.TMP
Would remove tmp/

$ git clean -n -d -x
Would remove build.TMP
Would remove test.o
Would remove tmp/
```

git clean -n -f
-n -i
“ interactive ”
clean

```
$ git clean -x -i
Would remove the following items:
  build.TMP  test.o
*** Commands ***
    1: clean                2: filter by pattern    3: select by numbers    4: ask
    6: help
What now>
```

签署工作

Git

Git

GPG

GPG

GPG

```
$ gpg --list-keys
/Users/schacon/.gnupg/pubring.gpg
---------------------------------
pub   2048R/0A46826A 2014-06-04
uid                  Scott Chacon (Git signing key) <schacon@gmail.com>
sub   2048R/874529A9 2014-06-04
```

`gpg --gen-key`

```
gpg --gen-key
```

Git `user.signingkey`

```
git config --global user.signingkey 0A46826A
```

Git

GPG

`-s` `-a`

```
$ git tag -s v1.5 -m 'my signed 1.5 tag'

You need a passphrase to unlock the secret key for
user: "Ben Straub <ben@straub.cc>"
2048-bit RSA key, ID 800430EB, created 2014-05-04
```

`git show` GPG

```
$ git show v1.5
tag v1.5
Tagger: Ben Straub <ben@straub.cc>
Date:   Sat May 3 20:29:41 2014 -0700

my signed 1.5 tag
-----BEGIN PGP SIGNATURE-----
Version: GnuPG v1

iQEcBAABAgAGBQJTZbQlAAoJEF0+sviABDDrZbQH/09PfE51KPVPlanr6q1v4/Ut
LQxfojUWiLQdg2ESJItkcuweYg+kc3HCyFejeDIBw9dpXt00rY26p05qrpnG+85b
hM1/PswpPLuBSr+oCIDj5GMC2r2iEKsfv2fJbNW8iWAXVLoWZRF8B0MfqX/YTMbm
ecorc4iXzQu7tupRihslbNkfvfciMnSDeSvzCpWAHl7h8Wj6hhqePmLm9lAYqnKp
8S5B/1SSQuEAjRZgI4IexpZoeKGVDptPHxLLS38fozsyi0QyDyzEgJxcJQVMXxVi
RUysgqjcpT8+iQM1PblGfHR4XAhuOqN5Fx06PSaFZhqvWFezJ28/CLyX5q+oIVk=
=EFTF
-----END PGP SIGNATURE-----

commit ca82a6dff817ec66f44342007202690a93763949
Author: Scott Chacon <schacon@gee-mail.com>
Date:   Mon Mar 17 21:52:11 2008 -0700

    changed the version number
```

`git tag -v [tag-name]`
GPG

```
$ git tag -v v1.4.2.1
object 883653babd8ee7ea23e6a5c392bb739348b1eb61
type commit
tag v1.4.2.1
tagger Junio C Hamano <junkio@cox.net> 1158138501 -0700

GIT 1.4.2.1

Minor fixes since 1.4.2, including git-mv and git-http with alternates.
gpg: Signature made Wed Sep 13 02:08:25 2006 PDT using DSA key ID F3119B9A
gpg: Good signature from "Junio C Hamano <junkio@cox.net>"
gpg:                 aka "[jpeg image of size 1513]"
Primary key fingerprint: 3565 2A26 2040 E066 C9A7  4A7D C0C6 D9A4 F311 9B9A
```

```
gpg: Signature made Wed Sep 13 02:08:25 2006 PDT using DSA key ID F3119B9A
gpg: Can't check signature: public key not found
error: could not verify the tag 'v1.4.2.1'
```

Git v1.7.9 -S git commit

```
$ git commit -a -S -m 'signed commit'

You need a passphrase to unlock the secret key for
user: "Scott Chacon (Git signing key) <schacon@gmail.com>"
2048-bit RSA key, ID 0A46826A, created 2014-06-04

[master 5c3386c] signed commit
 4 files changed, 4 insertions(+), 24 deletions(-)
 rewrite Rakefile (100%)
 create mode 100644 lib/git.rb
```

git log --show-signature

```
$ git log --show-signature -1
commit 5c3386cf54bba0a33a32da706aa52bc0155503c2
gpg: Signature made Wed Jun  4 19:49:17 2014 PDT using RSA key ID 0A46826A
gpg: Good signature from "Scott Chacon (Git signing key) <schacon@gmail.com>"
Author: Scott Chacon <schacon@gmail.com>
Date:   Wed Jun 4 19:49:17 2014 -0700

    signed commit
```

git log %G?

```
$ git log --pretty="format:%h %G? %aN  %s"

5c3386c G Scott Chacon  signed commit
ca82a6d N Scott Chacon  changed the version number
```

```
085bb3b N Scott Chacon  removed unnecessary test code
a11bef0 N Scott Chacon  first commit
```

Git 1.8.3 “ git merge ” “ git pull ” `--verify-signatures` GPG

```
$ git merge --verify-signatures non-verify
fatal: Commit ab06180 does not have a GPG signature.
```

```
$ git merge --verify-signatures signed-branch
Commit 13ad65e has a good GPG signature by Scott Chacon (Git signing key) <schacon
Updating 5c3386c..13ad65e
Fast-forward
 README | 2 ++
 1 file changed, 2 insertions(+)
```

`git merge` `-S`

```
$ git merge --verify-signatures -S  signed-branch
Commit 13ad65e has a good GPG signature by Scott Chacon (Git signing key) <schacon

You need a passphrase to unlock the secret key for
user: "Scott Chacon (Git signing key) <schacon@gmail.com>"
2048-bit RSA key, ID 0A46826A, created 2014-06-04

Merge made by the 'recursive' strategy.
 README | 2 ++
 1 file changed, 2 insertions(+)
```

GPG

搜索

Git

Git Grep

Git grep
Git
Git -n
Git

```
$ git grep -n gmtime_r
compat/gmtime.c:3:#undef gmtime_r
compat/gmtime.c:8:      return git_gmtime_r(timep, &result);
compat/gmtime.c:11:struct tm *git_gmtime_r(const time_t *timep, struct tm *result)
compat/gmtime.c:16:     ret = gmtime_r(timep, result);
compat/mingw.c:606:struct tm *gmtime_r(const time_t *timep, struct tm *result)
compat/mingw.h:162:struct tm *gmtime_r(const time_t *timep, struct tm *result);
date.c:429:             if (gmtime_r(&now, &now_tm))
date.c:492:             if (gmtime_r(&time, tm)) {
git-compat-util.h:721:struct tm *git_gmtime_r(const time_t *, struct tm *);
git-compat-util.h:723:#define gmtime_r git_gmtime_r
```

grep
--count Git

```
$ git grep --count gmtime_r
compat/gmtime.c:4
compat/mingw.c:1
compat/mingw.h:1
date.c:2
git-compat-util.h:2
```

-p

```
$ git grep -p gmtime_r *.c
date.c=static int match_multi_number(unsigned long num, char c, const char *date,
date.c:         if (gmtime_r(&now, &now_tm))
date.c=static int match_digit(const char *date, struct tm *tm, int *offset, int *t
date.c:         if (gmtime_r(&time, tm)) {
```

date.c match_multi_number
match_digit gmtime_r
--and
1.8.0 Git
“ LINK ” “ BUF_MAX ”
--break --heading

```
$ git grep --break --heading \
    -n -e '#define' --and \( -e LINK -e BUF_MAX \) v1.8.0
v1.8.0:builtin/index-pack.c
62:#define FLAG_LINK (1u<<20)

v1.8.0:cache.h
73:#define S_IFGITLINK  0160000
74:#define S_ISGITLINK(m)       (((m) & S_IFMT) == S_IFGITLINK)

v1.8.0:environment.c
54:#define OBJECT_CREATION_MODE OBJECT_CREATION_USES_HARDLINKS

v1.8.0:strbuf.c
326:#define STRBUF_MAXLINK (2*PATH_MAX)

v1.8.0:symlinks.c
53:#define FL_SYMLINK  (1 << 2)

v1.8.0:zlib.c
30:/* #define ZLIB_BUF_MAX ((uInt)-1) */
31:#define ZLIB_BUF_MAX ((uInt) 1024 * 1024 * 1024) /* 1GB */
```

grep ack git grep

Git Git

Git

git log dif

ZLIB_BUF_MAX
-S

```
$ git log -SZLIB_BUF_MAX --oneline
e01503b zlib: allow feeding more than 4GB in one go
ef49a7a zlib: zlib can only process 4GB at a time
```

dif ef49a7a
e01503b
-G

行日志搜索

git log -L

zlib.c git_deflate_bound
git log -L :git_deflate_bound:zlib.c Git

```
$ git log -L :git_deflate_bound:zlib.c
commit ef49a7a0126d64359c974b4b3b71d7ad42ee3bca
Author: Junio C Hamano <gitster@pobox.com>
Date:   Fri Jun 10 11:52:15 2011 -0700

    zlib: zlib can only process 4GB at a time

diff --git a/zlib.c b/zlib.c
--- a/zlib.c
+++ b/zlib.c
@@ -85,5 +130,5 @@
-unsigned long git_deflate_bound(z_streamp strm, unsigned long size)
+unsigned long git_deflate_bound(git_zstream *strm, unsigned long size)
 {
-       return deflateBound(strm, size);
+       return deflateBound(&strm->z, size);
 }
```

```
commit 225a6f1068f71723a910e8565db4e252b3ca21fa
Author: Junio C Hamano <gitster@pobox.com>
Date:   Fri Jun 10 11:18:17 2011 -0700

    zlib: wrap deflateBound() too

diff --git a/zlib.c b/zlib.c
--- a/zlib.c
+++ b/zlib.c
@@ -81,0 +85,5 @@
+unsigned long git_deflate_bound(z_streamp strm, unsigned long size)
+{
+       return deflateBound(strm, size);
+}
+
```

Git

`git log -L '/unsigned long git_deflate_bound/',/^}/:zlib.c`

重写历史

Git Git

stash

-

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

git add git rm
git commit --amend
SHA-1
-

Git
HEAD
git rebase -i

git rebase
-i HEAD~2^ HEAD~3 ~3

```
$ git rebase -i HEAD~3
```

- HEAD~3..HEAD

-

```
pick f7f3f6d changed my name a bit
pick 310154e updated README formatting and added blame
pick a5f4a0d added cat-file

# Rebase 710f0f8..a5f4a0d onto 710f0f8
#
# Commands:
#  p, pick = use commit
#  r, reword = use commit, but edit the commit message
#  e, edit = use commit, but stop for amending
```

```
#  s, squash = use commit, but meld into previous commit
#  f, fixup = like "squash", but discard this commit's log message
#  x, exec = run command (the rest of the line) using shell
#
# These lines can be re-ordered; they are executed from top to bottom.
#
# If you remove a line here THAT COMMIT WILL BE LOST.
#
# However, if you remove everything, the rebase will be aborted.
#
# Note that empty commits are commented out
```

log

log

```
$ git log --pretty=format:"%h %s" HEAD~3..HEAD
a5f4a0d added cat-file
310154e updated README formatting and added blame
f7f3f6d changed my name a bit
```

HEAD~3

‘ pick ’ ‘ edit ’

```
edit f7f3f6d changed my name a bit
pick 310154e updated README formatting and added blame
pick a5f4a0d added cat-file
```

Git

```
$ git rebase -i HEAD~3
Stopped at f7f3f6d... changed my name a bit
You can amend the commit now, with

       git commit --amend

Once you’re satisfied with your changes, run
```

```
git rebase --continue
```

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

```
$ git rebase --continue
```

pick edit edit
Git

“ added cat-file ”

```
pick f7f3f6d changed my name a bit
pick 310154e updated README formatting and added blame
pick a5f4a0d added cat-file
```

```
pick 310154e updated README formatting and added blame
pick f7f3f6d changed my name a bit
```

Git
310154e f7f3f6d
“ added cat-file ”

```
#
# Commands:
#  p, pick = use commit
#  r, reword = use commit, but edit the commit message
#  e, edit = use commit, but stop for amending
#  s, squash = use commit, but meld into previous commit
#  f, fixup = like "squash", but discard this commit's log message
#  x, exec = run command (the rest of the line) using shell
#
# These lines can be re-ordered; they are executed from top to bottom.
#
# If you remove a line here THAT COMMIT WILL BE LOST.
#
# However, if you remove everything, the rebase will be aborted.
#
# Note that empty commits are commented out
```

“ squash ” “ pick ” “ edit ” Git

```
pick f7f3f6d changed my name a bit
squash 310154e updated README formatting and added blame
squash a5f4a0d added cat-file
```

Git

```
# This is a combination of 3 commits.
# The first commit's message is:
changed my name a bit

# This is the 2nd commit message:

updated README formatting and added blame

# This is the 3rd commit message:

added cat-file
```

“ updated README formatting ”
“ added blame ” “ updated README formatting and added blame ” `rebase -i`
“ edit ”

```
pick f7f3f6d changed my name a bit
edit 310154e updated README formatting and added blame
pick a5f4a0d added cat-file
```

Git
`f7f3f6d`
`310154e` `git reset HEAD^`

`git rebase --continue`

```
$ git reset HEAD^
$ git add README
$ git commit -m 'updated README formatting'
$ git add lib/simplegit.rb
$ git commit -m 'added blame'
$ git rebase --continue
```

Git `a5f4a0d`

```
$ git log -4 --pretty=format:"%h %s"
1c002dd added cat-file
9b29157 added blame
35cfb2b updated README formatting
f3cc40e changed my name a bit
```

SHA-1

filter-branch

-
filter-branch

从每一个提交移除一个文件

git add .

filter-branch
passwords.txt
--tree-filter filter-branch

```
$ git filter-branch --tree-filter 'rm -f passwords.txt' HEAD
Rewrite 6b9b3cf04e7c5686a9cb838c3f36a8cb6a0fc2bd (21/21)
Ref 'refs/heads/master' was rewritten
```

--tree-filter
passwords.txt

git filter-branch --tree-filter 'rm -f *~' HEAD
Git

master filter-branch
--all

使一个子目录做为新的根目录

trunk tags trunk
filter-branch

```
$ git filter-branch --subdirectory-filter trunk HEAD
Rewrite 856f0bf61e41a27326cdae8f09fe708d679f596f (12/12)
Ref 'refs/heads/master' was rewritten
```

trunk Git

全局修改邮箱地址

git config

filter-branch

--commit-filter

```
$ git filter-branch --commit-filter '
        if [ "$GIT_AUTHOR_EMAIL" = "schacon@localhost" ];
        then
                GIT_AUTHOR_NAME="Scott Chacon";
                GIT_AUTHOR_EMAIL="schacon@example.com";
                git commit-tree "$@";
        else
                git commit-tree "$@";
        fi' HEAD
```

SHA-1
SHA-1

重置揭密

reset checkout
Git

reset checkout Git
“ ” “
”

Git

HEAD	
Index	
Working Directory	

HEAD

HEAD
HEAD HEAD

HEAD
SHA-1

```
$ git cat-file -p HEAD
tree cfda3bf379e4f8dba8717dee55aab78aef7f4daf
author Scott Chacon  1301511835 -0700
committer Scott Chacon  1301511835 -0700

initial commit

$ git ls-tree -r HEAD
100644 blob a906cb2a4a904a152...   README
100644 blob 8f94139338f9404f2...   Rakefile
040000 tree 99f1a6d12cb4b6f19...   lib
```

`cat-file` `ls-tree`

索引

Git “
” `git commit` Git
Git

`git commit`

```
$ git ls-files -s
100644 a906cb2a4a904a152e80877d4088654daad0c859 0       README
100644 8f94139338f9404f26296befa88755fc2598c289 0       Rakefile
100644 47c6340d6459e05787f644c2447d2595f5d3a54b 0       lib/simplegit.rb
```

ls-files

工作目录

.git

```
$ tree
.
├── README
├── Rakefile
└── lib
    └── simplegit.rb

1 directory, 3 files
```

Git

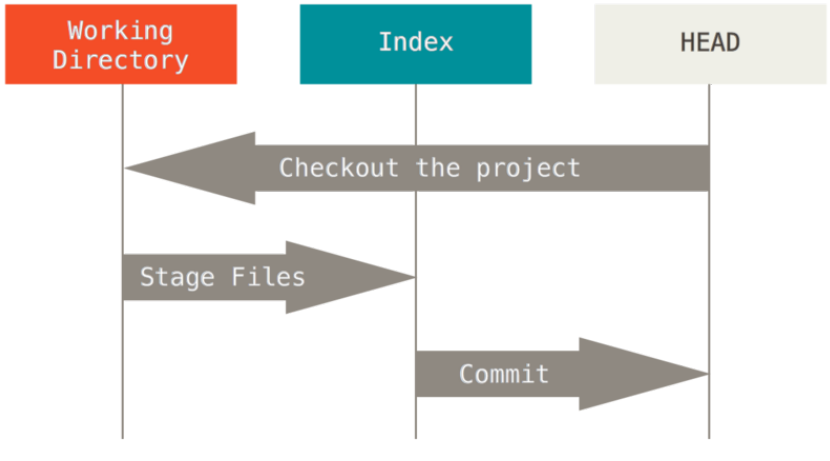
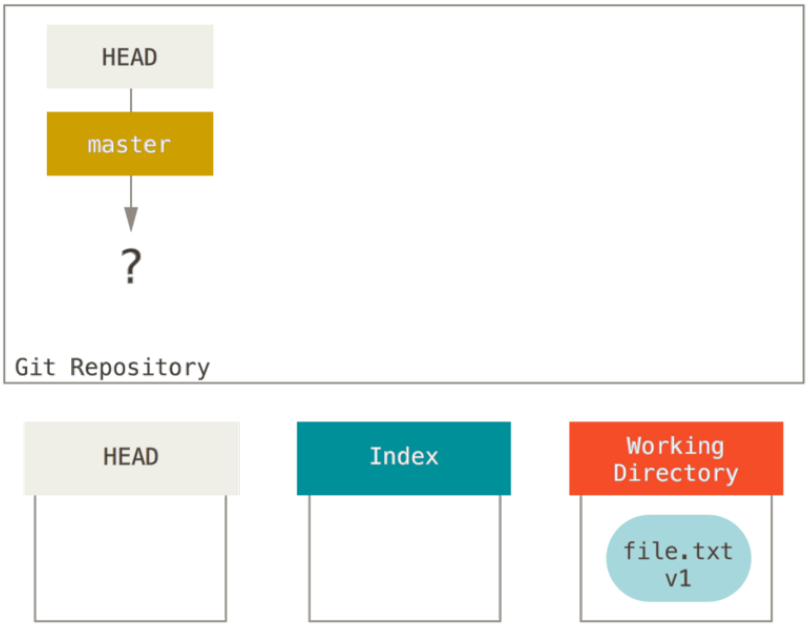


FIGURE 7-2

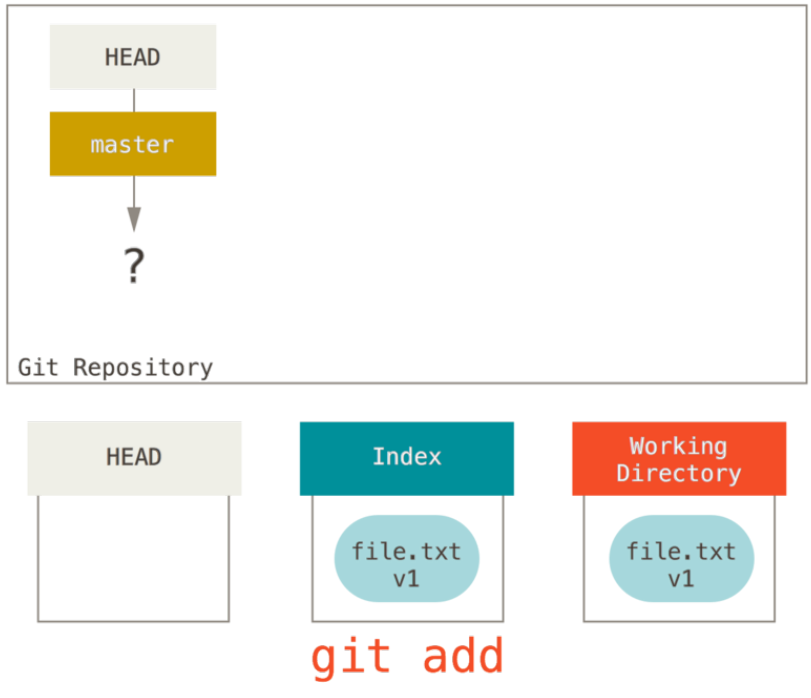
v1 `git in-`
`it` Git HEAD `master`

FIGURE 7-3



`git add`

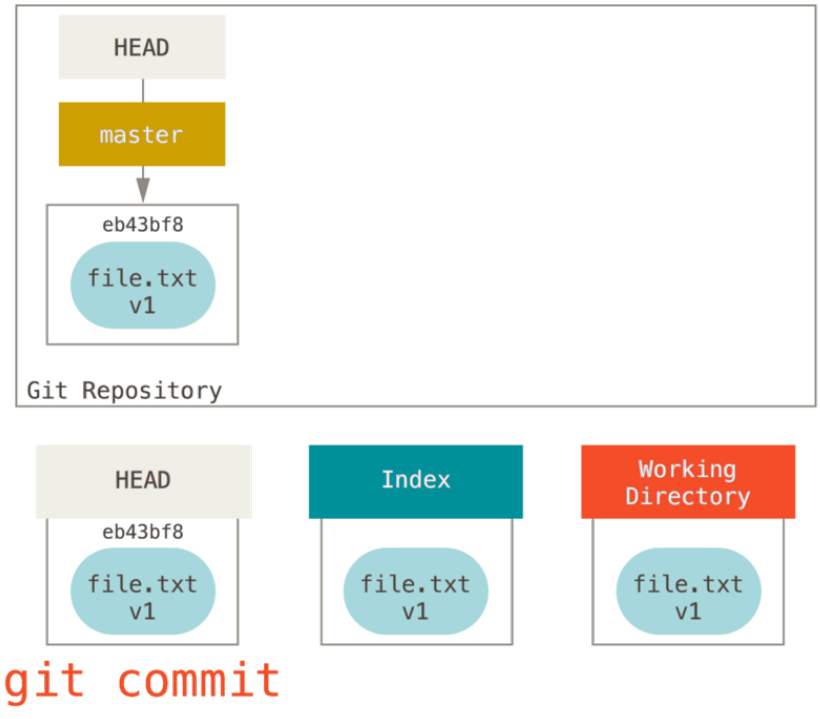
FIGURE 7-4



`git commit`

`master`

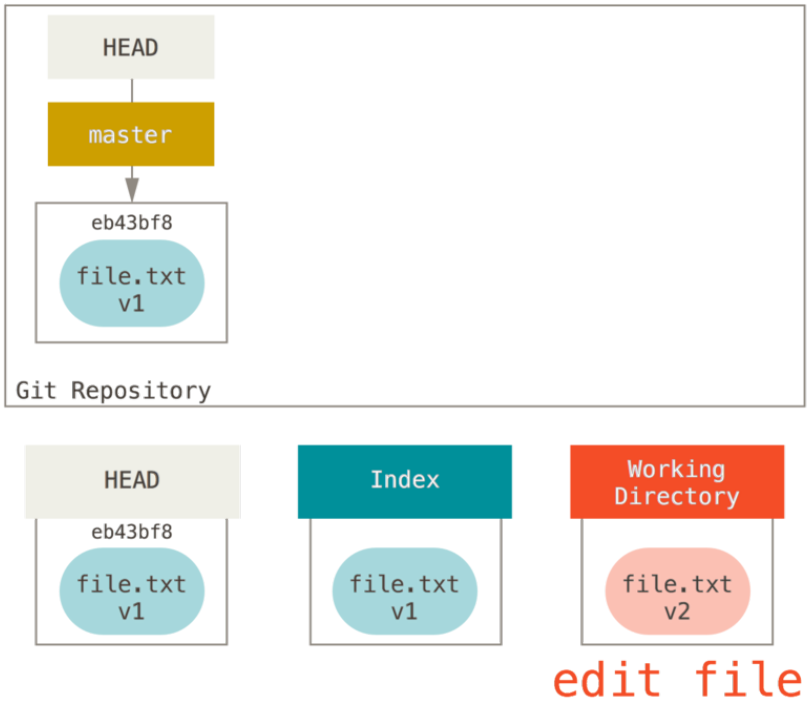
FIGURE 7-5




```
git status
```

v2

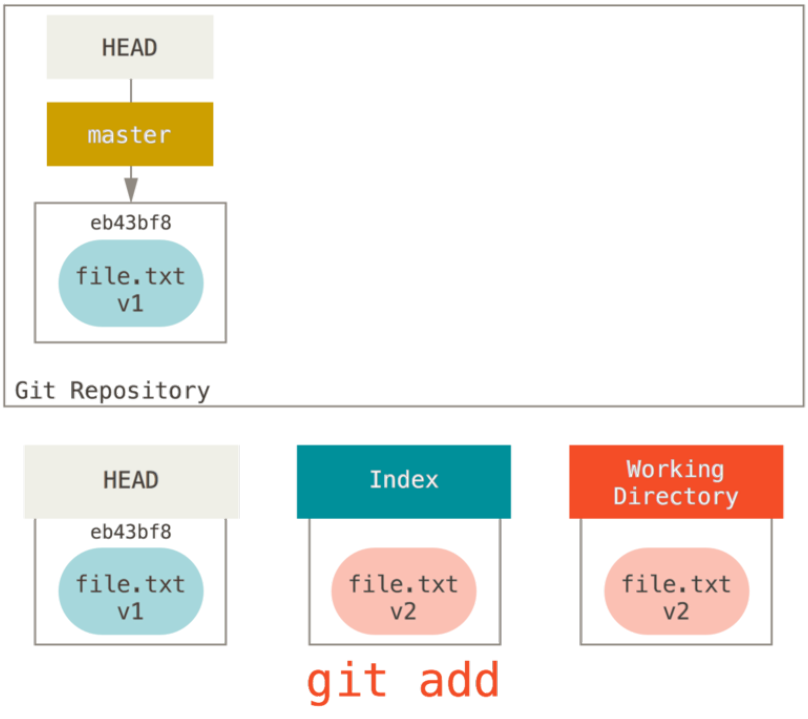
FIGURE 7-6



`git status` “Changes not staged for commit,”

`git add`

FIGURE 7-7



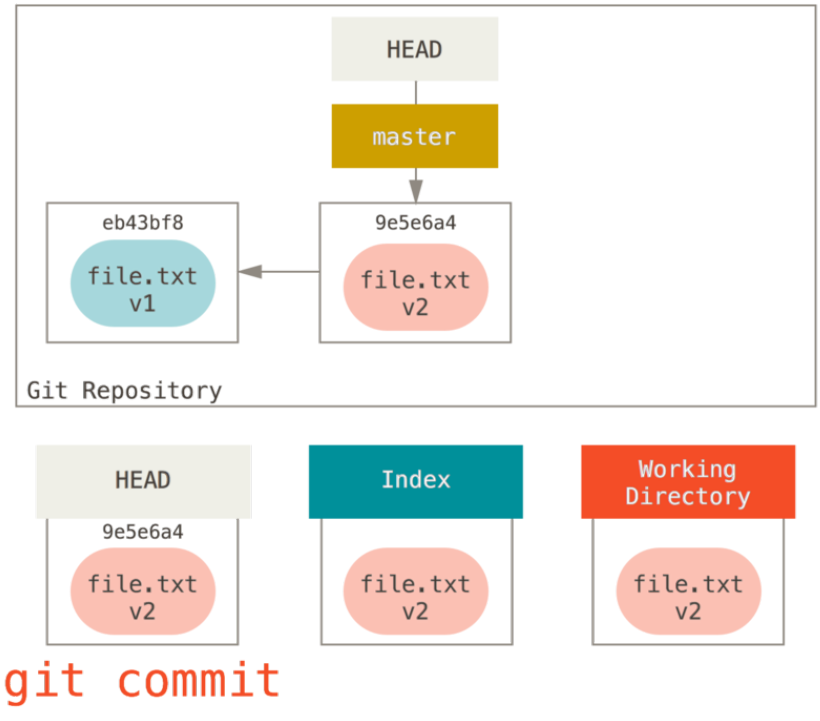
HEAD `git status`

“ Changes to be committed ”

—

`git commit`

FIGURE 7-8



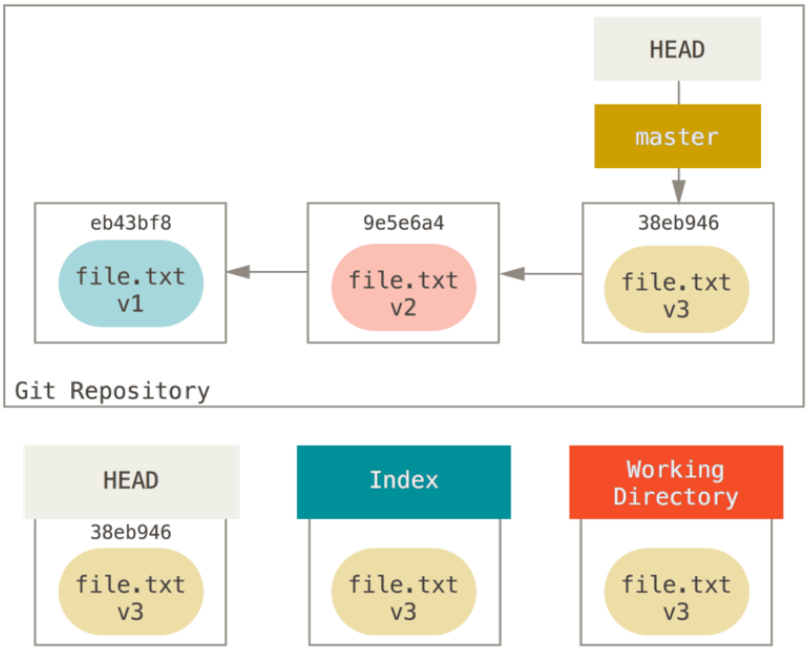
`git status`

HEAD

`reset`

`file.txt`

FIGURE 7-9

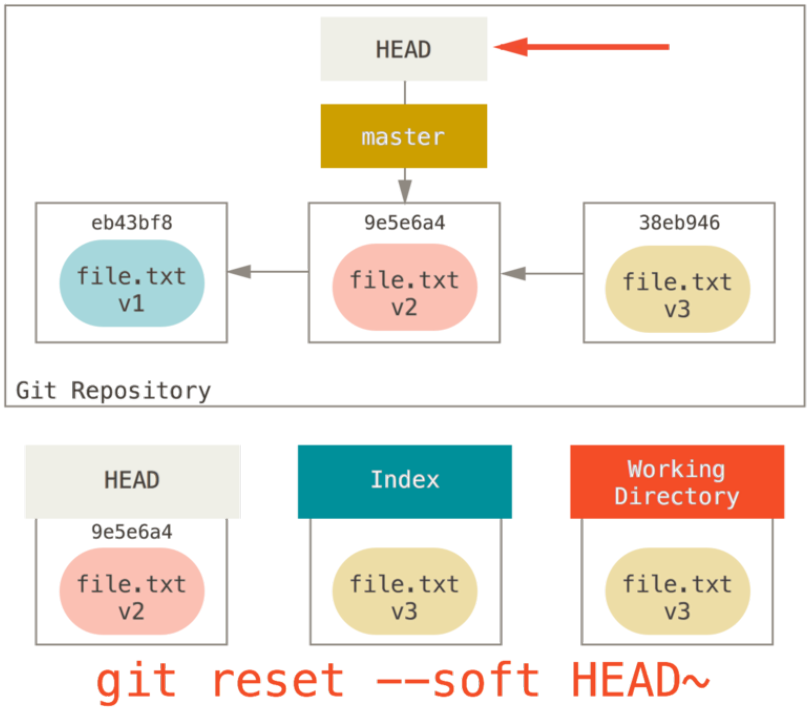


reset

第 1 步：移动 HEAD

reset HEAD HEAD checkout reset HEAD HEAD master master git reset 9e5e64a master 9e5e64a

FIGURE 7-10



reset

reset --soft

git

commit git commit Git

HEAD reset HEAD~

HEAD

git commit git

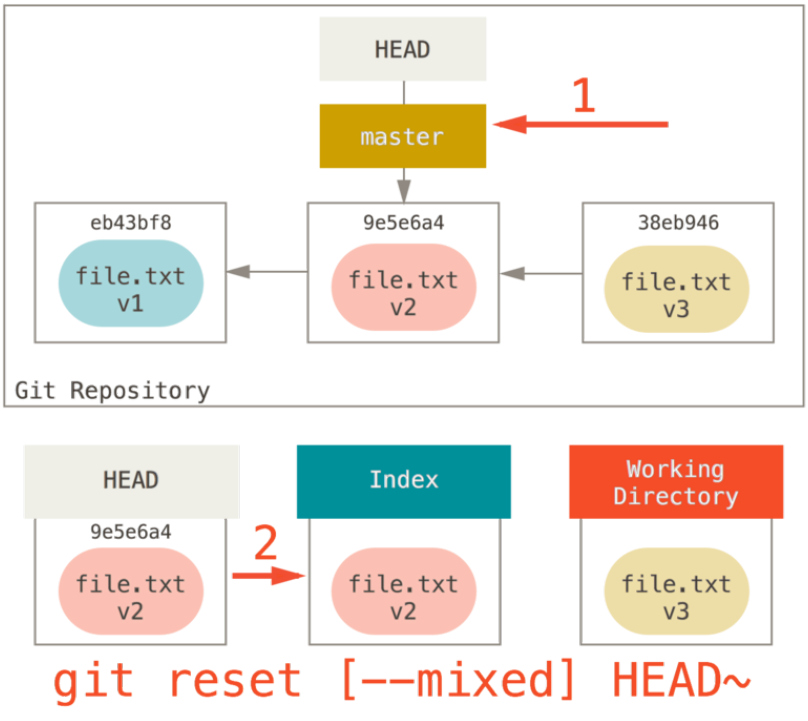
commit --amend “ ”

第 2 步：更新索引（--MIXED）

git status HEAD

reset HEAD

FIGURE 7-11



--mixed reset

git reset HEAD~

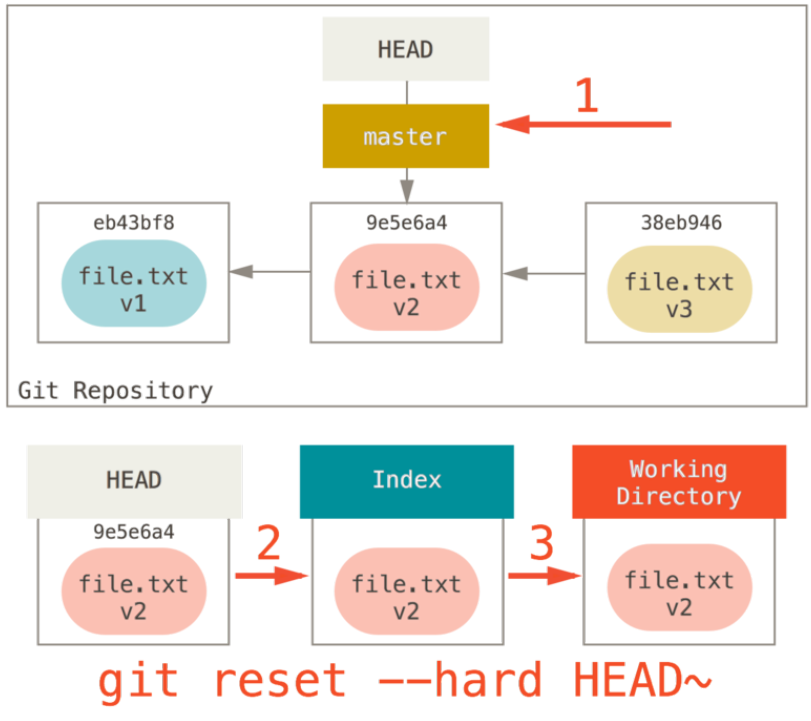
提交

git add git commit

第 3 步：更新工作目录（--HARD）

reset --hard

FIGURE 7-12



git add

git commit

--hard reset Git

reset

--hard

Git v3

reflog Git

回顾

reset

1. HEAD *--soft*
2. HEAD *--hard*
3.

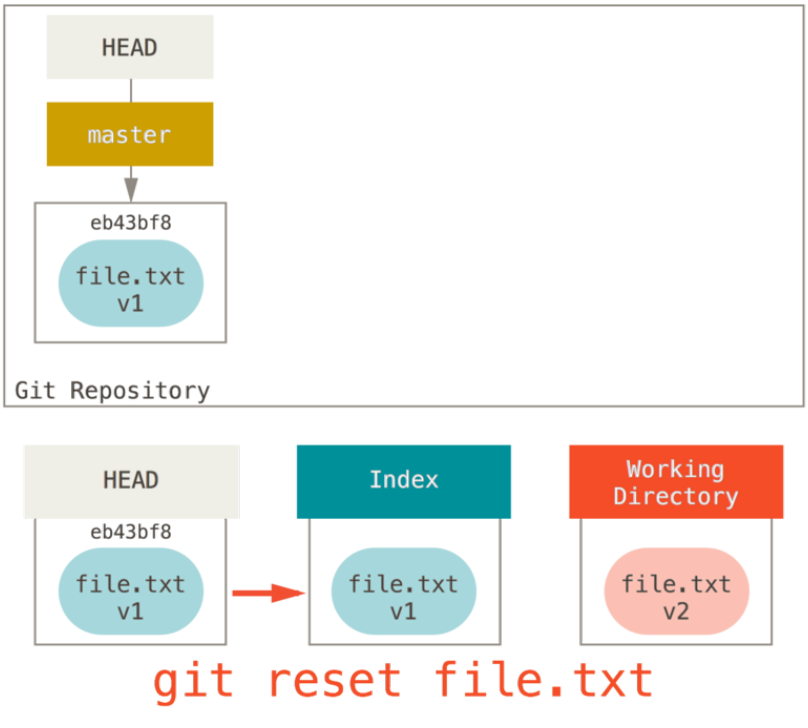
reset
reset 1
HEAD

2 3
git reset file.txt git reset --
mixed HEAD file.txt SHA-1
--soft --hard

1. HEAD
2. HEAD

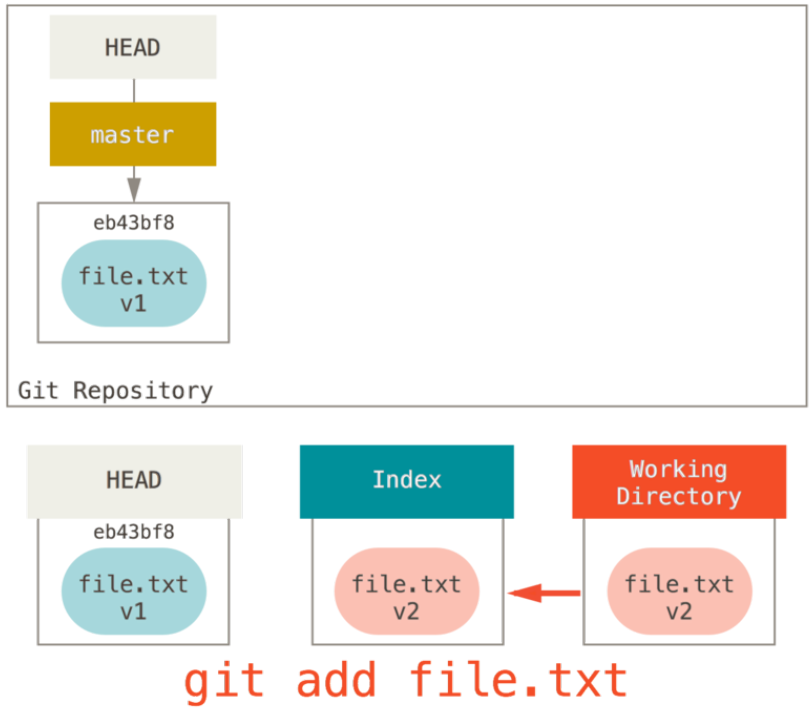
file.txt HEAD

FIGURE 7-13



git add

FIGURE 7-14



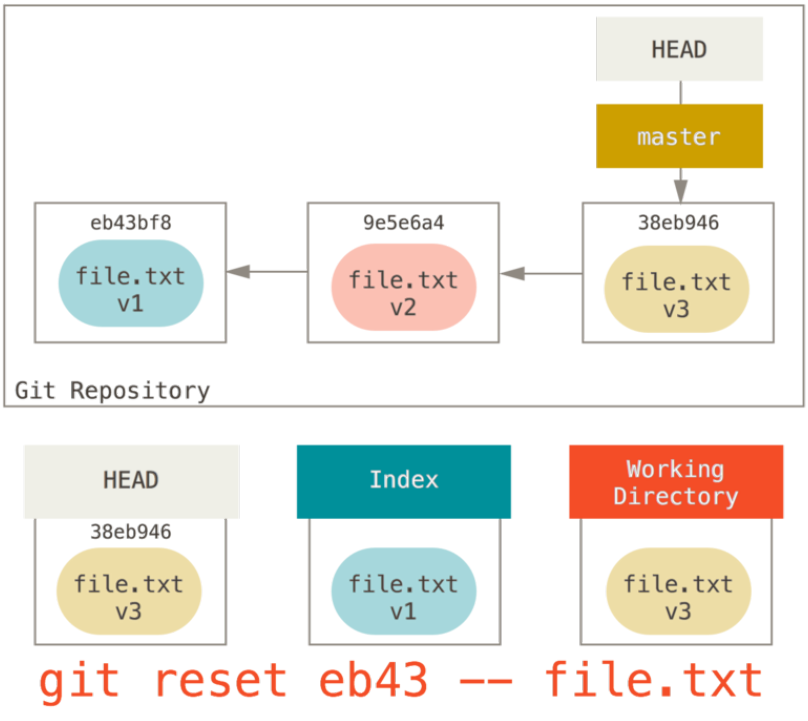

```
git status
```

“ ”

Git HEAD

```
git reset eb43bf file.txt
```

FIGURE 7-15



v1

git add v3

git commit “

v1 ”

git add reset --patch

-

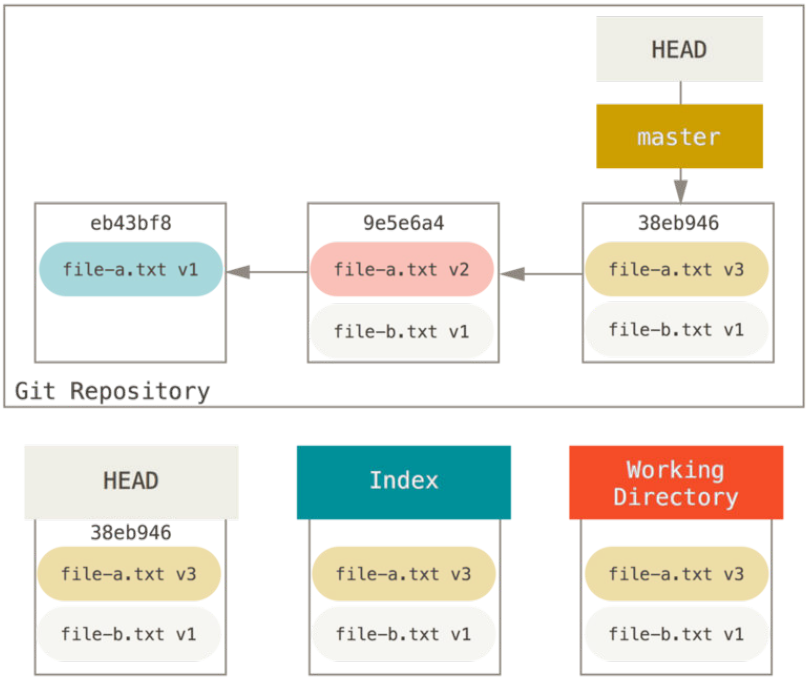
“ oops. ” “ WIP ” “ forgot this

fle ” reset

“ ” re-

set

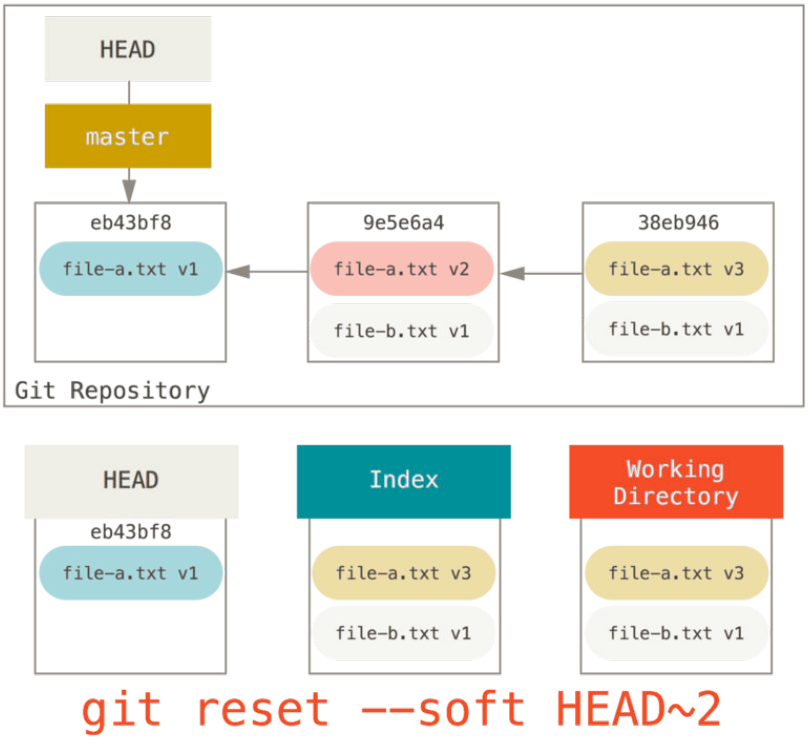
FIGURE 7-16




```
git reset --soft HEAD~2
```

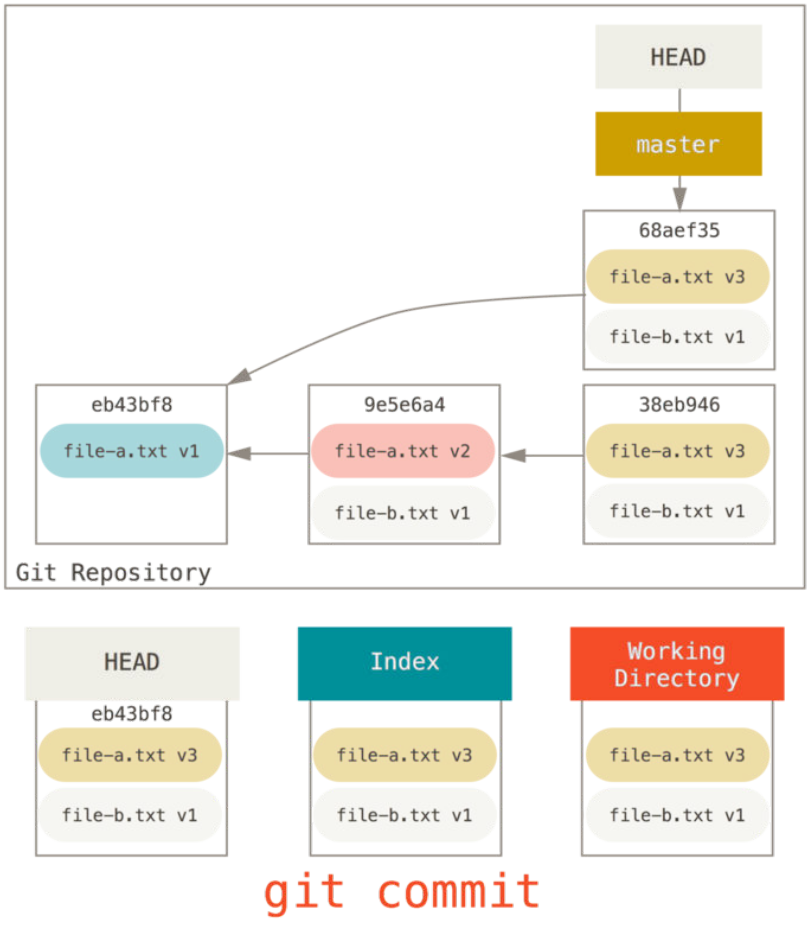
HEAD

FIGURE 7-17




```
git commit
```

FIGURE 7-18



v1

file-a.txt file-a.txt v3
file-b.txt v2

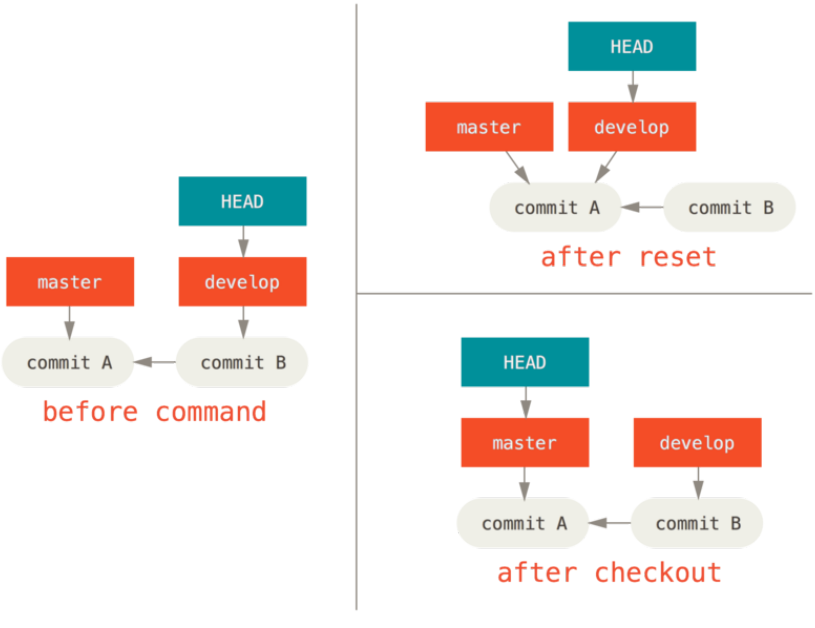
checkout reset reset
checkout

不带路径

```
    git checkout [branch]       git reset --hard [branch]
                                      [branch]

              reset --hard  checkout
```

```
reset --hard
                              HEAD   reset       HEAD
  checkout         HEAD
                  master   develop
          develop         HEAD                          git reset
master       develop             master
      git checkout master       develop           HEAD
        HEAD         master
                                      HEAD              A
              reset        HEAD                  checkout
HEAD
```

FIGURE 7-19



带路径

checkout reset
HEAD git reset [branch] file
git
reset --hard [branch] file reset -
HEAD
git reset git add checkout --patch

reset checkout

“ HEAD ” “ REF ”
HEAD “ HEAD ”
HEAD *WD Safe?* - **NO**

	HEAD	Index	Workdir	WD Safe?
Commit Level				
`reset --soft [commit]`	REF	NO	NO	YES
`reset [commit]`	REF	YES	NO	YES
`reset --hard [commit]`	REF	YES	YES	**NO**
`checkout [commit]`	HEAD	YES	YES	YES
File Level				
`reset (commit) [file]`	NO	YES	NO	YES
`checkout (commit) [file]`	NO	YES	YES	**NO**

高级合并

Git Git

Git
Git

Git

“ ”

Git

hello world Ruby

```ruby
#! /usr/bin/env ruby

def hello
  puts 'hello world'
end

hello()
```

whitespace Unix

DOS

“ hello world ” “ hello mundo ”

```
$ git checkout -b whitespace
Switched to a new branch 'whitespace'

$ unix2dos hello.rb
unix2dos: converting file hello.rb to DOS format ...
$ git commit -am 'converted hello.rb to DOS'
[whitespace 3270f76] converted hello.rb to DOS
 1 file changed, 7 insertions(+), 7 deletions(-)

$ vim hello.rb
$ git diff -b
diff --git a/hello.rb b/hello.rb
index ac51efd..e85207e 100755
--- a/hello.rb
+++ b/hello.rb
```

```
@@ -1,7 +1,7 @@
 #! /usr/bin/env ruby

 def hello
-  puts 'hello world'
+  puts 'hello mundo'^M
 end

 hello()

$ git commit -am 'hello mundo change'
[whitespace 6d338d2] hello mundo change
 1 file changed, 1 insertion(+), 1 deletion(-)
```

master

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

$ vim hello.rb
$ git diff
diff --git a/hello.rb b/hello.rb
index ac51efd..36c06c8 100755
--- a/hello.rb
+++ b/hello.rb
@@ -1,5 +1,6 @@
 #! /usr/bin/env ruby

+# prints out a greeting
 def hello
   puts 'hello world'
 end

$ git commit -am 'document the function'
[master bec6336] document the function
 1 file changed, 1 insertion(+)
```

whitespace

```
$ git merge whitespace
Auto-merging hello.rb
CONFLICT (content): Merge conflict in hello.rb
Automatic merge failed; fix conflicts and then commit the result.
```

中断一次合并

git merge --abort

```
$ git status -sb
## master
UU hello.rb

$ git merge --abort

$ git status -sb
## master
```

git merge --abort

git reset --hard HEAD

忽略空白

Git

-Xignore-all-space -Xignore-space-change

```
$ git merge -Xignore-space-change whitespace
Auto-merging hello.rb
Merge made by the 'recursive' strategy.
 hello.rb | 2 +-
 1 file changed, 1 insertion(+), 1 deletion(-)
```

手动文件再合并

Git Git
Git

dos2unix

Git
“ stages ” Stage 1
stage 2 stage 3 MERGE_HEAD
“ theirs ”
git show

```
$ git show :1:hello.rb > hello.common.rb
$ git show :2:hello.rb > hello.ours.rb
$ git show :3:hello.rb > hello.theirs.rb
```

ls-files -u
Git blob SHA-1

```
$ git ls-files -u
100755 ac51efdc3df4f4fd328d1a02ad05331d8e2c9111 1       hello.rb
100755 36c06c8752c78d2aff89571132f3bf7841a7b5c3 2       hello.rb
100755 e85207e04dfdd5eb0a1e9febbc67fd837c44a1cd 3       hello.rb
```

:1:hello.rb blob SHA-1

git merge-file

```
$ dos2unix hello.theirs.rb
dos2unix: converting file hello.theirs.rb to Unix format ...

$ git merge-file -p \
    hello.ours.rb hello.common.rb hello.theirs.rb > hello.rb

$ git diff -b
diff --cc hello.rb
index 36c06c8,e85207e..0000000
--- a/hello.rb
+++ b/hello.rb
@@@ -1,8 -1,7 +1,8 @@@
  #! /usr/bin/env ruby

 +# prints out a greeting
  def hello
-   puts 'hello world'
+   puts 'hello mundo'
  end

  hello()
```

ignore-space-change

ignore-space-change

DOS

git diff

git diff --ours

```
$ git diff --ours
* Unmerged path hello.rb
diff --git a/hello.rb b/hello.rb
index 36c06c8..44d0a25 100755
--- a/hello.rb
+++ b/hello.rb
@@ -2,7 +2,7 @@

 # prints out a greeting
 def hello
-  puts 'hello world'
+  puts 'hello mundo'
 end
```

```
hello()
```

git diff --theirs -b Git hello.theirs.rb

```
$ git diff --theirs -b
* Unmerged path hello.rb
diff --git a/hello.rb b/hello.rb
index e85207e..44d0a25 100755
--- a/hello.rb
+++ b/hello.rb
@@ -1,5 +1,6 @@
 #! /usr/bin/env ruby

+# prints out a greeting
 def hello
   puts 'hello mundo'
 end
```

git diff --base

```
$ git diff --base -b
* Unmerged path hello.rb
diff --git a/hello.rb b/hello.rb
index ac51efd..44d0a25 100755
--- a/hello.rb
+++ b/hello.rb
@@ -1,7 +1,8 @@
 #! /usr/bin/env ruby

+# prints out a greeting
 def hello
-  puts 'hello world'
+  puts 'hello mundo'
 end

 hello()
```

git clean

```
$ git clean -f
Removing hello.common.rb
Removing hello.ours.rb
Removing hello.theirs.rb
```

检出冲突

```
$ git log --graph --oneline --decorate --all
* f1270f7 (HEAD, master) update README
* 9af9d3b add a README
* 694971d update phrase to hola world
| * e3eb223 (mundo) add more tests
| * 7cff591 add testing script
| * c3ffff1 changed text to hello mundo
|/
* b7dcc89 initial hello world code
```

master mundo

mundo master

```
$ git merge mundo
Auto-merging hello.rb
CONFLICT (content): Merge conflict in hello.rb
Automatic merge failed; fix conflicts and then commit the result.
```

```
#! /usr/bin/env ruby

def hello
<<<<<<< HEAD
```

```
  puts 'hola world'
=======
  puts 'hello mundo'
>>>>>>> mundo
end

hello()
```

--conflict git checkout

--conflict diff3 merge
diff3 Git
“ ours ” “ theirs ” “ base ”

```
$ git checkout --conflict=diff3 hello.rb
```

```
#! /usr/bin/env ruby

def hello
<<<<<<< ours
  puts 'hola world'
||||||| base
  puts 'hello world'
=======
  puts 'hello mundo'
>>>>>>> theirs
end

hello()
```

merge.conflictstyle
diff3

```
$ git config --global merge.conflictstyle diff3
```

git checkout --ours --theirs

-

合并日志

git log

“ ” “ ”

```
$ git log --oneline --left-right HEAD...MERGE_HEAD
< f1270f7 update README
< 9af9d3b add a README
< 694971d update phrase to hola world
> e3eb223 add more tests
> 7cff591 add testing script
> c3ffff1 changed text to hello mundo
```

6

--merge git log

```
$ git log --oneline --left-right --merge
< 694971d update phrase to hola world
> c3ffff1 changed text to hello mundo
```

-p

组合式差异格式

Git git diff

git diff

```
$ git diff
diff --cc hello.rb
index 0399cd5,59727f0..0000000
--- a/hello.rb
+++ b/hello.rb
@@@ -1,7 -1,7 +1,11 @@@
  #! /usr/bin/env ruby

  def hello
++<<<<<<< HEAD
 +  puts 'hola world'
++=======
+   puts 'hello mundo'
++>>>>>>> mundo
  end

  hello()
```

“ ”

“ ours ”

“ theirs ”

<<<<<<< >>>>>>>

git diff

```
$ vim hello.rb
$ git diff
diff --cc hello.rb
index 0399cd5,59727f0..0000000
--- a/hello.rb
+++ b/hello.rb
@@@ -1,7 -1,7 +1,7 @@@
  #! /usr/bin/env ruby

  def hello
-   puts 'hola world'
 -  puts 'hello mundo'
++  puts 'hola mundo'
  end

  hello()
```

“ hola world ” “ hello mundo ” “ hola mundo ”

`git log` `git show` Git `git log -p` `--cc`

```
$ git log --cc -p -1
commit 14f41939956d80b9e17bb8721354c33f8d5b5a79
Merge: f1270f7 e3eb223
Author: Scott Chacon <schacon@gmail.com>
Date:   Fri Sep 19 18:14:49 2014 +0200

    Merge branch 'mundo'

    Conflicts:
        hello.rb

diff --cc hello.rb
index 0399cd5,59727f0..e1d0799
--- a/hello.rb
+++ b/hello.rb
@@@ -1,7 -1,7 +1,7 @@@
  #! /usr/bin/env ruby

  def hello
-   puts 'hola world'
 -  puts 'hello mundo'
++  puts 'hola mundo'
  end

  hello()
```

Git

`master`

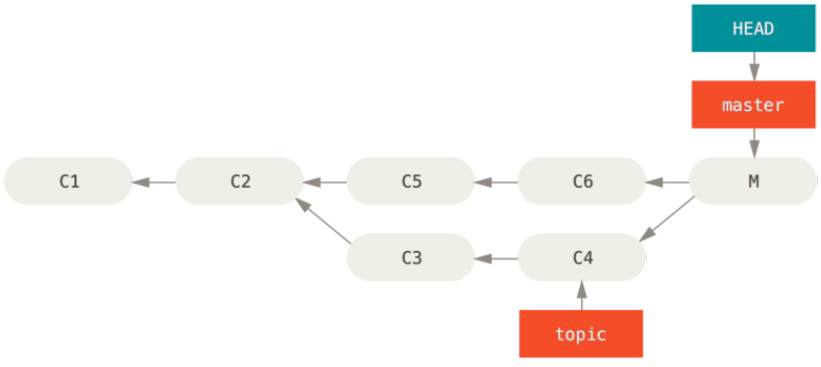


FIGURE 7-20

意外的合并提交

修复引用

`git merge` `git reset --hard HEAD~`

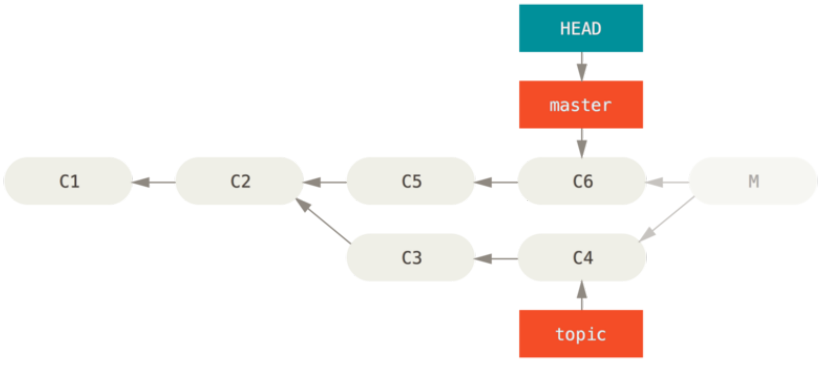


FIGURE 7-21

在 git reset --hard HEAD~ 之后的历史

“ ” `reset`
`reset --hard`

1. HEAD `master`
   C6

2. HEAD
3.

“ ”

reset

还原提交

Git

Git “ ”

```
$ git revert -m 1 HEAD
[master b1d8379] Revert "Merge branch 'topic'"
```

-m 1 “ mainline ”

HEAD git merge topic HEAD

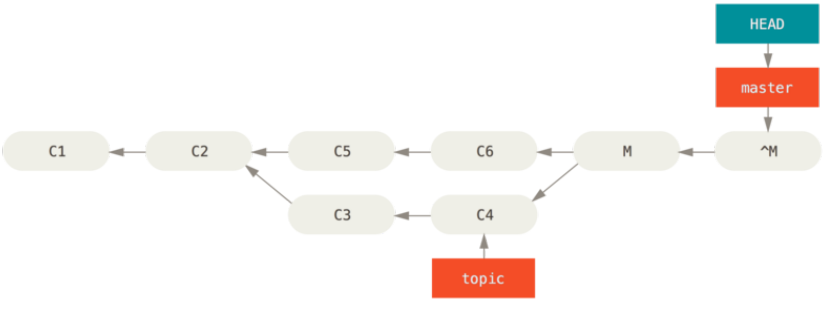
C6 C4

#2 C4 #1

C4

FIGURE 7-22

在 git revert -m 1 后的历史



^M C6

“ ” HEAD

topic master Git

```
$ git merge topic
Already up-to-date.
```

topic master
topic Git

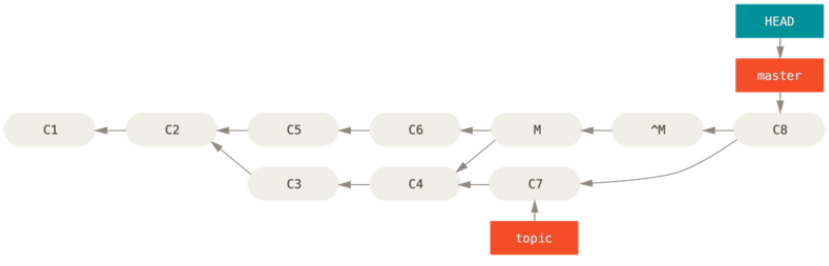


FIGURE 7-23

含有坏掉合并的历史

```
$ git revert ^M
[master 09f0126] Revert "Revert "Merge branch 'topic'""
$ git merge topic
```

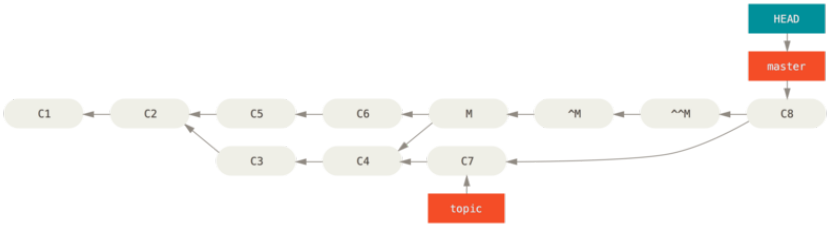


FIGURE 7-24

在重新合并一个还原合并后的历史

M ^M ^^M C3 C4 C8
C7 topic

“ recursive ”

我们的或他们的偏好

“ recursive ”
`-X ignore-all-space ignore-space-change`
Git
Git
Git

`merge` `-Xours` `-Xtheirs`
Git

“ hello world ”

```
$ git merge mundo
Auto-merging hello.rb
CONFLICT (content): Merge conflict in hello.rb
Resolved 'hello.rb' using previous resolution.
Automatic merge failed; fix conflicts and then commit the result.
```

`-Xours` `-Xtheirs`

```
$ git merge -Xours mundo
Auto-merging hello.rb
Merge made by the 'recursive' strategy.
 hello.rb | 2 +-
 test.sh  | 2 ++
 2 files changed, 3 insertions(+), 1 deletion(-)
 create mode 100644 test.sh
```

“ hello mundo ” “ hola world ”
“ hola world ”

`git merge-file`
`git merge-file --ours`

Git

“ ours ” “ ours ” recursive

```
$ git merge -s ours mundo
Merge made by the 'ours' strategy.
$ git diff HEAD HEAD~
$
```

Git

release

master master

bugfx release bugfx re-

lease merge -s ours master

release

bugfx

子树合并

Git

Rack Rack

```
$ git remote add rack_remote https://github.com/rack/rack
$ git fetch rack_remote
warning: no common commits
remote: Counting objects: 3184, done.
remote: Compressing objects: 100% (1465/1465), done.
remote: Total 3184 (delta 1952), reused 2770 (delta 1675)
Receiving objects: 100% (3184/3184), 677.42 KiB | 4 KiB/s, done.
Resolving deltas: 100% (1952/1952), done.
From https://github.com/rack/rack
 * [new branch]      build      -> rack_remote/build
 * [new branch]      master     -> rack_remote/master
 * [new branch]      rack-0.4   -> rack_remote/rack-0.4
```

```
 * [new branch]      rack-0.9   -> rack_remote/rack-0.9
$ git checkout -b rack_branch rack_remote/master
Branch rack_branch set up to track remote branch refs/remotes/rack_remote/master.
Switched to a new branch "rack_branch"
```

rack_branch Rack master

```
$ ls
AUTHORS         KNOWN-ISSUES   Rakefile      contrib         lib
COPYING         README         bin           example         test
$ git checkout master
Switched to branch "master"
$ ls
README
```

.

Rack master Git git read-tree Chapter 10 read-tree master rack_back master rack

```
$ git read-tree --prefix=rack/ -u rack_branch
```

Rack —

Rack

```
$ git checkout rack_branch
$ git pull
```

master --squash -Xsubtree

```
$ git checkout master
$ git merge --squash -s recursive -Xsubtree=rack rack_branch
Squash commit -- not updating HEAD
Automatic merge went well; stopped before committing as requested
```

Rack
— master rack
rack_branch

“ ”

rack rack_branch
— — diff
git diff-tree

```
$ git diff-tree -p rack_branch
```

rack master

```
$ git diff-tree -p rack_remote/master
```

Rerere

git rerere “ reuse recorded
resolution ” Git
Git

rerere
rerere

-

Git

rerere

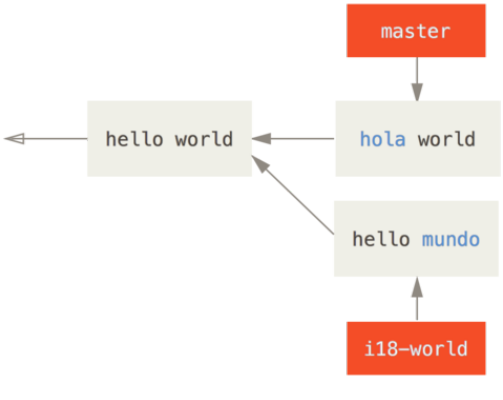
```
$ git config --global rerere.enabled true
```

.git/rr-cache

```
#! /usr/bin/env ruby

def hello
  puts 'hello world'
end
```

“ hello ” “ hola ”
“ world ” “ mundo ”

FIGURE 7-25



```
$ git merge i18n-world
Auto-merging hello.rb
CONFLICT (content): Merge conflict in hello.rb
Recorded preimage for 'hello.rb'
Automatic merge failed; fix conflicts and then commit the result.
```

Recorded preimage for FILE

rerere

git status

```
$ git status
# On branch master
# Unmerged paths:
#   (use "git reset HEAD <file>..." to unstage)
#   (use "git add <file>..." to mark resolution)
#
#       both modified:      hello.rb
#
```

git rerere git rerere status

```
$ git rerere status
hello.rb
```

git rerere diff -

```
$ git rerere diff
--- a/hello.rb
+++ b/hello.rb
@@ -1,11 +1,11 @@
 #! /usr/bin/env ruby

 def hello
-<<<<<<<
-  puts 'hello mundo'
-=======
+<<<<<<< HEAD
   puts 'hola world'
```

```
->>>>>>>
+=======
+  puts 'hello mundo'
+>>>>>>> i18n-world
 end
```

rerere ls-files -u

```
$ git ls-files -u
100644 39804c942a9c1f2c03dc7c5ebcd7f3e3a6b97519 1       hello.rb
100644 a440db6e8d1fd76ad438a49025a9ad9ce746f581 2       hello.rb
100644 54336ba847c3758ab604876419607e9443848474 3       hello.rb
```

puts 'hola mundo' re-
rere diff rerere

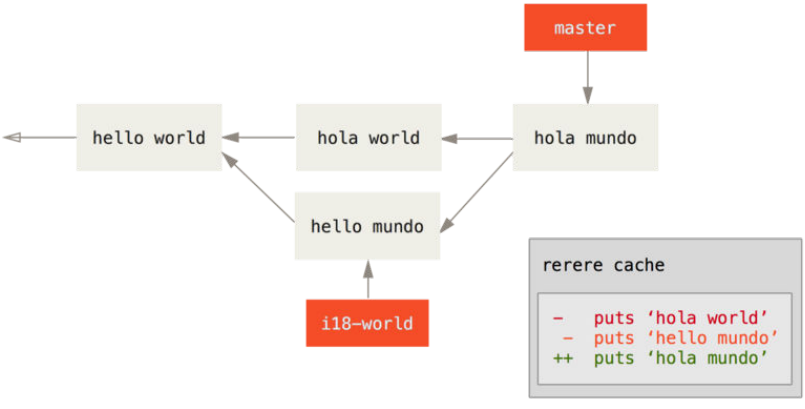
```
$ git rerere diff
--- a/hello.rb
+++ b/hello.rb
@@ -1,11 +1,7 @@
 #! /usr/bin/env ruby

 def hello
-<<<<<<<
-  puts 'hello mundo'
-=======
-  puts 'hola world'
->>>>>>>
+  puts 'hola mundo'
 end
```

Git hello.rb
“ hello mundo ” “ hola world ”
“ hola mundo ”

```
$ git add hello.rb
$ git commit
Recorded resolution for 'hello.rb'.
[master 68e16e5] Merge branch 'i18n'
```

“ Recorded resolution for FILE"

FIGURE 7-26



master

“ ” reset

```
$ git reset --hard HEAD^
HEAD is now at ad63f15 i18n the hello
```

```
$ git checkout i18n-world
Switched to branch 'i18n-world'

$ git rebase master
First, rewinding head to replay your work on top of it...
Applying: i18n one word
Using index info to reconstruct a base tree...
Falling back to patching base and 3-way merge...
Auto-merging hello.rb
CONFLICT (content): Merge conflict in hello.rb
Resolved 'hello.rb' using previous resolution.
Failed to merge in the changes.
Patch failed at 0001 i18n one word
```

Re-

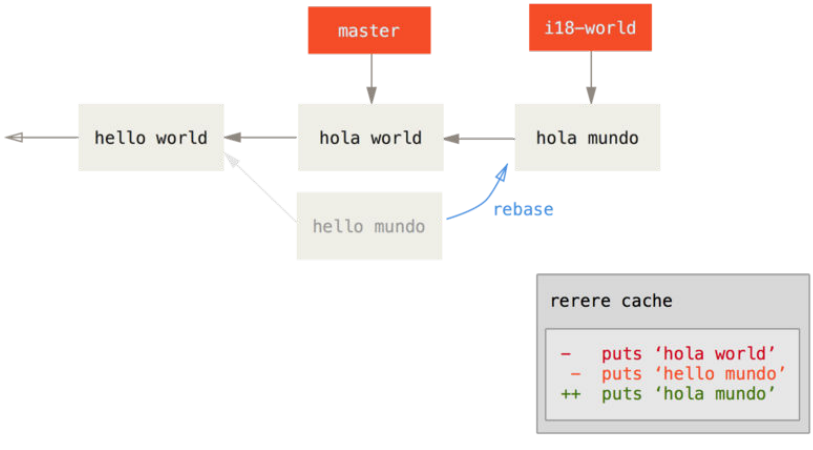
solved FILE using previous resolution

```
$ cat hello.rb
#! /usr/bin/env ruby

def hello
  puts 'hola mundo'
end
```

git diff

```
$ git diff
diff --cc hello.rb
index a440db6,54336ba..0000000
--- a/hello.rb
+++ b/hello.rb
@@@ -1,7 -1,7 +1,7 @@@
  #! /usr/bin/env ruby

  def hello
-   puts 'hola world'
 -  puts 'hello mundo'
++  puts 'hola mundo'
  end
```

FIGURE 7-27



checkout

```
$ git checkout --conflict=merge hello.rb
$ cat hello.rb
#! /usr/bin/env ruby

def hello
<<<<<<< ours
  puts 'hola world'
=======
  puts 'hello mundo'
>>>>>>> theirs
end
```

“ ”

rerere

```
$ git rerere
Resolved 'hello.rb' using previous resolution.
$ cat hello.rb
#! /usr/bin/env ruby

def hello
  puts 'hola mundo'
end
```

rerere

```
$ git add hello.rb
$ git rebase --continue
Applying: i18n one word
```

master rerere

使用 Git 调试

Git Git

bug

bug

git blame -L 12 22

```
$ git blame -L 12,22 simplegit.rb
^4832fe2 (Scott Chacon  2008-03-15 10:31:28 -0700 12)  def show(tree = 'master')
^4832fe2 (Scott Chacon  2008-03-15 10:31:28 -0700 13)   command("git show #{tree}"
^4832fe2 (Scott Chacon  2008-03-15 10:31:28 -0700 14)  end
^4832fe2 (Scott Chacon  2008-03-15 10:31:28 -0700 15)
9f6560e4 (Scott Chacon  2008-03-17 21:52:20 -0700 16)  def log(tree = 'master')
79eaf55d (Scott Chacon  2008-04-06 10:15:08 -0700 17)   command("git log #{tree}")
9f6560e4 (Scott Chacon  2008-03-17 21:52:20 -0700 18)  end
9f6560e4 (Scott Chacon  2008-03-17 21:52:20 -0700 19)
42cf2861 (Magnus Chacon 2008-04-13 10:45:01 -0700 20)  def blame(path)
42cf2861 (Magnus Chacon 2008-04-13 10:45:01 -0700 21)   command("git blame #{path}
42cf2861 (Magnus Chacon 2008-04-13 10:45:01 -0700 22)  end
```

SHA-1

— —

^4832fe2

Git ^ SHA-1

Git

Git git blame -C Git

GITServerHandler.m GITPackUpload.m GITPackUpload.m -C blame

```
$ git blame -C -L 141,153 GITPackUpload.m
f344f58d GITServerHandler.m (Scott 2009-01-04 141)
f344f58d GITServerHandler.m (Scott 2009-01-04 142) - (void) gatherObjectShasFromC
f344f58d GITServerHandler.m (Scott 2009-01-04 143) {
70befddd GITServerHandler.m (Scott 2009-03-22 144)         //NSLog(@"GATHER COMMI
ad11ac80 GITPackUpload.m    (Scott 2009-03-24 145)
```

```
ad11ac80 GITPackUpload.m    (Scott 2009-03-24 146)        NSString *parentSha;
ad11ac80 GITPackUpload.m    (Scott 2009-03-24 147)        GITCommit *commit = [g
ad11ac80 GITPackUpload.m    (Scott 2009-03-24 148)
ad11ac80 GITPackUpload.m    (Scott 2009-03-24 149)        //NSLog(@"GATHER COMMI
ad11ac80 GITPackUpload.m    (Scott 2009-03-24 150)
56ef2caf GITServerHandler.m (Scott 2009-01-05 151)        if(commit) {
56ef2caf GITServerHandler.m (Scott 2009-01-05 152)                [refDict setOb
56ef2caf GITServerHandler.m (Scott 2009-01-05 153)
```

Git

git bisect bisect

bug

bug

git bisect start

git bisect bad

bisect git bisect good [good_commit]

```
$ git bisect start
$ git bisect bad
$ git bisect good v1.0
Bisecting: 6 revisions left to test after this
[ecb6e1bc347ccecc5f9350d878ce677feb13d3b2] error handling on repo
```

Git (v1.0) 12

Git

git bisect good Git

```
$ git bisect good
Bisecting: 3 revisions left to test after this
[b047b02ea83310a70fd603dc8cd7a6cd13d15c04] secure this thing
```

`git bisect bad` Git

```
$ git bisect bad
Bisecting: 1 revisions left to test after this
[f71ce38690acf49c1f3c9bea38e09d82a5ce6014] drop exceptions table
```

Git
SHA-1
bug

```
$ git bisect good
b047b02ea83310a70fd603dc8cd7a6cd13d15c04 is first bad commit
commit b047b02ea83310a70fd603dc8cd7a6cd13d15c04
Author: PJ Hyett <pjhyett@example.com>
Date:   Tue Jan 27 14:48:32 2009 -0800

    secure this thing

:040000 040000 40ee3e7821b895e52c1695092db9bdc4c61d1730
f24d3c6ebcfc639b1a3814550e62d60b8e68a8e4 M  config
```

`git bisect reset` HEAD

```
$ git bisect reset
```

bug
0
0 `git bisect`
`bisect start`

```
$ git bisect start HEAD v1.0
$ git bisect run test-error.sh
```

Git test-error.sh
make make tests

子模块

Atom
Atom
CPAN Ruby gem

Git Git
Git

Git
git submodule add URL
“ DbConnector ”

```
$ git submodule add https://github.com/chaconinc/DbConnector
Cloning into 'DbConnector'...
remote: Counting objects: 11, done.
remote: Compressing objects: 100% (10/10), done.
remote: Total 11 (delta 0), reused 11 (delta 0)
Unpacking objects: 100% (11/11), done.
Checking connectivity... done.
```

“ DbConnector ”

git status

```
$ git status
On branch master
Your branch is up-to-date with 'origin/master'.

Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

        new file:   .gitmodules
        new file:   DbConnector
```

.gitmodules URL

```
$ cat .gitmodules
[submodule "DbConnector"]
        path = DbConnector
        url = https://github.com/chaconinc/DbConnector
```

.gitignore

由于 .gitmodules 文件中的 URL 是人们首先尝试克隆/拉取的地方，因此请尽可能确保你使用的 URL 大家都能访问。 例如，若你要使用的推送 URL 与他人的拉取 URL 不同，那么请使用他人能访问到的 URL。 你也可以根据自己的需要，通过在本地执行 `git config submodule.DbConnector.url <私有 URL>` 来覆盖这个选项的值。 如果可行的话，一个相对路径会很有帮助。

---

git status git diff

```
$ git diff --cached DbConnector
diff --git a/DbConnector b/DbConnector
new file mode 160000
index 0000000..c3f01dc
--- /dev/null
+++ b/DbConnector
```

```
@@ -0,0 +1 @@
+Subproject commit c3f01dc8862123d317dd46284b05b6892c7b29bc
```

DbConnector Git
Git

git diff --submodule

```
$ git diff --cached --submodule
diff --git a/.gitmodules b/.gitmodules
new file mode 100644
index 0000000..71fc376
--- /dev/null
+++ b/.gitmodules
@@ -0,0 +1,3 @@
+[submodule "DbConnector"]
+       path = DbConnector
+       url = https://github.com/chaconinc/DbConnector
Submodule DbConnector 0000000...c3f01dc (new submodule)
```

```
$ git commit -am 'added DbConnector module'
[master fb9093c] added DbConnector module
 2 files changed, 4 insertions(+)
 create mode 100644 .gitmodules
 create mode 160000 DbConnector
```

DbConnector 160000 Git

```
$ git clone https://github.com/chaconinc/MainProject
Cloning into 'MainProject'...
remote: Counting objects: 14, done.
remote: Compressing objects: 100% (13/13), done.
```

```
remote: Total 14 (delta 1), reused 13 (delta 0)
Unpacking objects: 100% (14/14), done.
Checking connectivity... done.
$ cd MainProject
$ ls -la
total 16
drwxr-xr-x   9 schacon  staff  306 Sep 17 15:21 .
drwxr-xr-x   7 schacon  staff  238 Sep 17 15:21 ..
drwxr-xr-x  13 schacon  staff  442 Sep 17 15:21 .git
-rw-r--r--   1 schacon  staff   92 Sep 17 15:21 .gitmodules
drwxr-xr-x   2 schacon  staff   68 Sep 17 15:21 DbConnector
-rw-r--r--   1 schacon  staff  756 Sep 17 15:21 Makefile
drwxr-xr-x   3 schacon  staff  102 Sep 17 15:21 includes
drwxr-xr-x   4 schacon  staff  136 Sep 17 15:21 scripts
drwxr-xr-x   4 schacon  staff  136 Sep 17 15:21 src
$ cd DbConnector/
$ ls
$
```

DbConnector git submodule init git submodule update

```
$ git submodule init
Submodule 'DbConnector' (https://github.com/chaconinc/DbConnector) registered for
$ git submodule update
Cloning into 'DbConnector'...
remote: Counting objects: 11, done.
remote: Compressing objects: 100% (10/10), done.
remote: Total 11 (delta 0), reused 11 (delta 0)
Unpacking objects: 100% (11/11), done.
Checking connectivity... done.
Submodule path 'DbConnector': checked out 'c3f01dc8862123d317dd46284b05b6892c7b29b
```

DbConnector git clone --recursive

```
$ git clone --recursive https://github.com/chaconinc/MainProject
Cloning into 'MainProject'...
remote: Counting objects: 14, done.
remote: Compressing objects: 100% (13/13), done.
remote: Total 14 (delta 1), reused 13 (delta 0)
Unpacking objects: 100% (14/14), done.
Checking connectivity... done.
Submodule 'DbConnector' (https://github.com/chaconinc/DbConnector) registered for
```

```
Cloning into 'DbConnector'...
remote: Counting objects: 11, done.
remote: Compressing objects: 100% (10/10), done.
remote: Total 11 (delta 0), reused 11 (delta 0)
Unpacking objects: 100% (11/11), done.
Checking connectivity... done.
Submodule path 'DbConnector': checked out 'c3f01dc8862123d317dd46284b05b6892c7b29bc'
```

拉取上游修改

git fetch

git merge

```
$ git fetch
From https://github.com/chaconinc/DbConnector
   c3f01dc..d0354fc  master     -> origin/master
$ git merge origin/master
Updating c3f01dc..d0354fc
Fast-forward
 scripts/connect.sh | 1 +
 src/db.c           | 1 +
 2 files changed, 2 insertions(+)
```

git diff --submodule

git diff --submodle diff.submodule “log”

```
$ git config --global diff.submodule log
$ git diff
Submodule DbConnector c3f01dc..d0354fc:
  > more efficient db routine
  > better connection routine
```

git submodule update --remote Git

```
$ git submodule update --remote DbConnector
remote: Counting objects: 4, done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 4 (delta 2), reused 4 (delta 2)
Unpacking objects: 100% (4/4), done.
From https://github.com/chaconinc/DbConnector
   3f19983..d0354fc  master     -> origin/master
Submodule path 'DbConnector': checked out 'd0354fc054692d3906c85c3af05ddce39a1c064
```

master
DbConnector
“ stable ” .gitmodules
.git/config
.gitmodules

```
$ git config -f .gitmodules submodule.DbConnector.branch stable

$ git submodule update --remote
remote: Counting objects: 4, done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 4 (delta 2), reused 4 (delta 2)
Unpacking objects: 100% (4/4), done.
From https://github.com/chaconinc/DbConnector
   27cf5d3..c87d55d  stable -> origin/stable
Submodule path 'DbConnector': checked out 'c87d55d4c6d4b05ee34fbc8cb6f7bf4585ae668
```

-f .gitmodules

git status Git “ ”

```
$ git status
On branch master
Your branch is up-to-date with 'origin/master'.

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git checkout -- <file>..." to discard changes in working directory)

  modified:   .gitmodules
  modified:   DbConnector (new commits)
```

```
no changes added to commit (use "git add" and/or "git commit -a")
```

status.submodulesummary Git

```
$ git config status.submodulesummary 1

$ git status
On branch master
Your branch is up-to-date with 'origin/master'.

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git checkout -- <file>..." to discard changes in working directory)

        modified:   .gitmodules
        modified:   DbConnector (new commits)

Submodules changed but not updated:

* DbConnector c3f01dc...c87d55d (4):
  > catch non-null terminated lines
```

git diff .gitmodules

```
$ git diff
diff --git a/.gitmodules b/.gitmodules
index 6fc0b3d..fd1cc29 100644
--- a/.gitmodules
+++ b/.gitmodules
@@ -1,3 +1,4 @@
 [submodule "DbConnector"]
        path = DbConnector
        url = https://github.com/chaconinc/DbConnector
+       branch = stable
 Submodule DbConnector c3f01dc..c87d55d:
  > catch non-null terminated lines
  > more robust error handling
  > more efficient db routine
  > better connection routine
```

git log -p

```
$ git log -p --submodule
commit 0a24cfc121a8a3c118e0105ae4ae4c00281cf7ae
Author: Scott Chacon <schacon@gmail.com>
Date:   Wed Sep 17 16:37:02 2014 +0200

    updating DbConnector for bug fixes

diff --git a/.gitmodules b/.gitmodules
index 6fc0b3d..fd1cc29 100644
--- a/.gitmodules
+++ b/.gitmodules
@@ -1,3 +1,4 @@
 [submodule "DbConnector"]
        path = DbConnector
        url = https://github.com/chaconinc/DbConnector
+       branch = stable
Submodule DbConnector c3f01dc..c87d55d:
  > catch non-null terminated lines
  > more robust error handling
  > more efficient db routine
  > better connection routine
```

`git submodule update --remote` Git

在子模块上工作

Maven Rubygems

`git submodule update`

Git

“ HEAD ”

“ master ”

Git

`git submodule update --remote`

```
$ git checkout stable
Switched to branch 'stable'
```

“ merge ” update
--merge

```
$ git submodule update --remote --merge
remote: Counting objects: 4, done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 4 (delta 2), reused 4 (delta 2)
Unpacking objects: 100% (4/4), done.
From https://github.com/chaconinc/DbConnector
   c87d55d..92c7337  stable     -> origin/stable
Updating c87d55d..92c7337
Fast-forward
 src/main.c | 1 +
 1 file changed, 1 insertion(+)
Submodule path 'DbConnector': merged in '92c7337b30ef9e0893e758dac2459d07362ab5ea'
```

DbConnector
stable

```
$ cd DbConnector/
$ vim src/db.c
$ git commit -am 'unicode support'
[stable f906e16] unicode support
 1 file changed, 1 insertion(+)
```

```
$ git submodule update --remote --rebase
First, rewinding head to replay your work on top of it...
Applying: unicode support
Submodule path 'DbConnector': rebased into '5d60ef9bbebf5a0c1c1050f242ceeb54ad58da94'
```

--rebase --merge Git
HEAD

```
$ git submodule update --remote
Submodule path 'DbConnector': checked out '5d60ef9bbebf5a0c1c1050f242ceeb54ad58da9
```

origin/stable

Git

```
$ git submodule update --remote
remote: Counting objects: 4, done.
remote: Compressing objects: 100% (3/3), done.
remote: Total 4 (delta 0), reused 4 (delta 0)
Unpacking objects: 100% (4/4), done.
From https://github.com/chaconinc/DbConnector
   5d60ef9..c75e92a  stable     -> origin/stable
error: Your local changes to the following files would be overwritten by checkout:
        scripts/setup.sh
Please, commit your changes or stash them before you can switch branches.
Aborting
Unable to checkout 'c75e92a2b3855c9e5b66f915308390d9db204aca' in submodule path 'D
```

Git

```
$ git submodule update --remote --merge
Auto-merging scripts/setup.sh
CONFLICT (content): Merge conflict in scripts/setup.sh
Recorded preimage for 'scripts/setup.sh'
Automatic merge failed; fix conflicts and then commit the result.
Unable to merge 'c75e92a2b3855c9e5b66f915308390d9db204aca' in submodule path 'DbCo
```

发布子模块改动

```
$ git diff
Submodule DbConnector c87d55d..82d2ad3:
  > Merge from origin/stable
```

```
  > updated setup script
  > unicode support
  > remove unnecessary method
  > add new option for conn pooling
```

Git

`git push` “ check ” “ on-demand ” `--recurse-submodules`

“ check ” push

```
$ git push --recurse-submodules=check
The following submodule paths contain changes that can
not be found on any remote:
  DbConnector

Please try

        git push --recurse-submodules=on-demand

or cd to the path and use

        git push

to push them to a remote.
```

“ on-demand ”

```
$ git push --recurse-submodules=on-demand
Pushing submodule 'DbConnector'
Counting objects: 9, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (8/8), done.
Writing objects: 100% (9/9), 917 bytes | 0 bytes/s, done.
Total 9 (delta 3), reused 0 (delta 0)
To https://github.com/chaconinc/DbConnector
   c75e92a..82d2ad3  stable -> stable
Counting objects: 2, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (2/2), done.
```

```
Writing objects: 100% (2/2), 266 bytes | 0 bytes/s, done.
Total 2 (delta 1), reused 0 (delta 0)
To https://github.com/chaconinc/MainProject
   3d6d338..9a377d1  master -> master
```

Git DbConnector

合并子模块改动

Git

Git

```
$ git pull
remote: Counting objects: 2, done.
remote: Compressing objects: 100% (1/1), done.
remote: Total 2 (delta 1), reused 2 (delta 1)
Unpacking objects: 100% (2/2), done.
From https://github.com/chaconinc/MainProject
   9a377d1..eb974f8  master     -> origin/master
Fetching submodule DbConnector
warning: Failed to merge submodule DbConnector (merge following commits not found)
Auto-merging DbConnector
CONFLICT (submodule): Merge conflict in DbConnector
Automatic merge failed; fix conflicts and then commit the result.
```

Git

“ merge following commits not found ”

Git
SHA-1 `git diff`
SHA-1

```
$ git diff
diff --cc DbConnector
index eb41d76,c771610..0000000
```

```
--- a/DbConnector
+++ b/DbConnector
```

eb41d76

c771610

eb41d76

SHA-1

SHA-1

git diff SHA

```
$ cd DbConnector

$ git rev-parse HEAD
eb41d764bccf88be77aced643c13a7fa86714135

$ git branch try-merge c771610
(DbConnector) $ git merge try-merge
Auto-merging src/main.c
CONFLICT (content): Merge conflict in src/main.c
Recorded preimage for 'src/main.c'
Automatic merge failed; fix conflicts and then commit the result.
```

```
$ vim src/main.c ❶
$ git add src/main.c
$ git commit -am 'merged our changes'
Recorded resolution for 'src/main.c'.
[master 9fd905e] merged our changes

$ cd .. ❷
$ git diff ❸
diff --cc DbConnector
index eb41d76,c771610..0000000
--- a/DbConnector
+++ b/DbConnector
@@@ -1,1 -1,1 +1,1 @@@
- Subproject commit eb41d764bccf88be77aced643c13a7fa86714135
 -Subproject commit c77161012afbbe1f58b5053316ead08f4b7e6d1d
++Subproject commit 9fd905e5d7f45a0d4cbc43d1ee550f16a30e825a
$ git add DbConnector ❹
```

```
$ git commit -m "Merge Tom's Changes" ❺
[master 10d2c60] Merge Tom's Changes
```

❶

❷

❸ SHA-1

❹

❺

Git

Git

“ merge following commits not found ”

```
$ git merge origin/master
warning: Failed to merge submodule DbConnector (not fast-forward)
Found a possible merge resolution for the submodule:
 9fd905e5d7f45a0d4cbc43d1ee550f16a30e825a: > merged our changes
If this is correct simply add it to the index for example
by using:

  git update-index --cacheinfo 160000 9fd905e5d7f45a0d4cbc43d1ee550f16a30e825a "Db

which will accept this suggestion.
Auto-merging DbConnector
CONFLICT (submodule): Merge conflict in DbConnector
Automatic merge failed; fix conflicts and then commit the result.
```

git add

```
$ cd DbConnector/
$ git merge 9fd905e
```

```
Updating eb41d76..9fd905e
Fast-forward

$ cd ..
$ git add DbConnector
$ git commit -am 'Fast forwarded to a common submodule child'
```

子模块遍历

foreach

```
$ git submodule foreach 'git stash'
Entering 'CryptoLibrary'
No local changes to save
Entering 'DbConnector'
Saved working directory and index state WIP on stable: 82d2ad3 Merge from origin/stable
HEAD is now at 82d2ad3 Merge from origin/stable
```

```
$ git submodule foreach 'git checkout -b featureA'
Entering 'CryptoLibrary'
Switched to a new branch 'featureA'
Entering 'DbConnector'
Switched to a new branch 'featureA'
```

```
$ git diff; git submodule foreach 'git diff'
Submodule DbConnector contains modified content
diff --git a/src/main.c b/src/main.c
```

```
index 210f1ae..1f0acdc 100644
--- a/src/main.c
+++ b/src/main.c
@@ -245,6 +245,8 @@ static int handle_alias(int *argcp, const char ***argv)

      commit_pager_choice();

+     url = url_decode(url_orig);
+
      /* build alias_argv */
      alias_argv = xmalloc(sizeof(*alias_argv) * (argc + 1));
      alias_argv[0] = alias_string + 1;
Entering 'DbConnector'
diff --git a/src/db.c b/src/db.c
index 1aaefb6..5297645 100644
--- a/src/db.c
+++ b/src/db.c
@@ -93,6 +93,11 @@ char *url_decode_mem(const char *url, int len)
        return url_decode_internal(&url, len, NULL, &out, 0);
 }

+char *url_decode(const char *url)
+{
+       return url_decode_mem(url, strlen(url));
+}
+
 char *url_decode_parameter_name(const char **query)
 {
        struct strbuf out = STRBUF_INIT;
```

有用的别名

“ Git ” Git Git

```
$ git config alias.sdiff '!'"git diff && git submodule foreach 'git diff'"
$ git config alias.spush 'push --recurse-submodules=on-demand'
$ git config alias.supdate 'submodule update --remote --merge'
```

git supdate git spush

```
$ git checkout -b add-crypto
Switched to a new branch 'add-crypto'

$ git submodule add https://github.com/chaconinc/CryptoLibrary
Cloning into 'CryptoLibrary'...
...

$ git commit -am 'adding crypto library'
[add-crypto 4445836] adding crypto library
 2 files changed, 4 insertions(+)
 create mode 160000 CryptoLibrary

$ git checkout master
warning: unable to rmdir CryptoLibrary: Directory not empty
Switched to branch 'master'
Your branch is up-to-date with 'origin/master'.

$ git status
On branch master
Your branch is up-to-date with 'origin/master'.

Untracked files:
  (use "git add <file>..." to include in what will be committed)

        CryptoLibrary/

nothing added to commit but untracked files present (use "git add" to track)
```

submodule update --init

```
$ git clean -fdx
Removing CryptoLibrary/

$ git checkout add-crypto
Switched to branch 'add-crypto'

$ ls CryptoLibrary/
```

```
$ git submodule update --init
Submodule path 'CryptoLibrary': checked out 'b8dda6aa182ea4464f3f3264b11e026854517

$ ls CryptoLibrary/
Makefile        includes        scripts         src
```

Git

submodule

add Git

```
$ rm -Rf CryptoLibrary/
$ git submodule add https://github.com/chaconinc/CryptoLibrary
'CryptoLibrary' already exists in the index
```

CryptoLibrary

```
$ git rm -r CryptoLibrary
$ git submodule add https://github.com/chaconinc/CryptoLibrary
Cloning into 'CryptoLibrary'...
remote: Counting objects: 11, done.
remote: Compressing objects: 100% (10/10), done.
remote: Total 11 (delta 0), reused 11 (delta 0)
Unpacking objects: 100% (11/11), done.
Checking connectivity... done.
```

-

```
$ git checkout master
error: The following untracked working tree files would be overwritten by checkout
  CryptoLibrary/Makefile
  CryptoLibrary/includes/crypto.h
  ...
Please move or remove them before you can switch branches.
Aborting
```

check -f

```
$ git checkout -f master
warning: unable to rmdir CryptoLibrary: Directory not empty
Switched to branch 'master'
```

CryptoLibrary

git submodule update

git checkout . submodule foreach

Git

.git Git

打包

Git HTTP SSH

Git “ ”

format-patch 40

git bundle bundle git push

```
$ git log
commit 9a466c572fe88b195efd356c3f2bbeccdb504102
Author: Scott Chacon <schacon@gmail.com>
Date:   Wed Mar 10 07:34:10 2010 -0800

    second commit

commit b1ec3248f39900d2a406049d762aa68e9641be25
Author: Scott Chacon <schacon@gmail.com>
Date:   Wed Mar 10 07:34:01 2010 -0800

    first commit
```

git bundle create

```
$ git bundle create repo.bundle HEAD master
Counting objects: 6, done.
Delta compression using up to 2 threads.
Compressing objects: 100% (2/2), done.
Writing objects: 100% (6/6), 441 bytes, done.
Total 6 (delta 0), reused 0 (delta 0)
```

repo.bundle
master bundle

HEAD
repo.bundle U
repo.bundle
URL

```
$ git clone repo.bundle repo
Initialized empty Git repository in /private/tmp/bundle/repo/.git/
$ cd repo
$ git log --oneline
9a466c5 second commit
b1ec324 first commit
```

HEAD -b
master Git
3 U

```
$ git log --oneline
71b84da last commit - second repo
c99cf5b fourth commit - second repo
7011d3d third commit - second repo
9a466c5 second commit
b1ec324 first commit
```

—
3

“ ”

origin/

master..master master ^origin/master 3

master log

```
$ git log --oneline master ^origin/master
71b84da last commit - second repo
c99cf5b fourth commit - second repo
7011d3d third commit - second repo
```

git bundle create

```
$ git bundle create commits.bundle master ^9a466c5
Counting objects: 11, done.
Delta compression using up to 2 threads.
Compressing objects: 100% (3/3), done.
Writing objects: 100% (9/9), 775 bytes, done.
Total 9 (delta 0), reused 0 (delta 0)
```

commits.bundle

bundle verify Git

```
$ git bundle verify ../commits.bundle
The bundle contains 1 ref
71b84daaf49abed142a373b6e5c59a22dc6560dc refs/heads/master
The bundle requires these 1 ref
9a466c572fe88b195efd356c3f2bbeccdb504102 second commit
../commits.bundle is okay
```

verify

```
$ git bundle verify ../commits-bad.bundle
error: Repository lacks these prerequisite commits:
error: 7011d3d8fc200abe0ad561c011c3852a4b7bbe95 third commit - second repo
```

```
$ git bundle list-heads ../commits.bundle
71b84daaf49abed142a373b6e5c59a22dc6560dc refs/heads/master
```

verify

fetch pull

master *other-master*

```
$ git fetch ../commits.bundle master:other-master
From ../commits.bundle
 * [new branch]      master     -> other-master
```

other-master

master

```
$ git log --oneline --decorate --graph --all
* 8255d41 (HEAD, master) third commit - first repo
| * 71b84da (other-master) last commit - second repo
| * c99cf5b fourth commit - second repo
| * 7011d3d third commit - second repo
|/
* 9a466c5 second commit
* b1ec324 first commit
```

git bundle

替换

Git

Git

replace Git “
Git ”

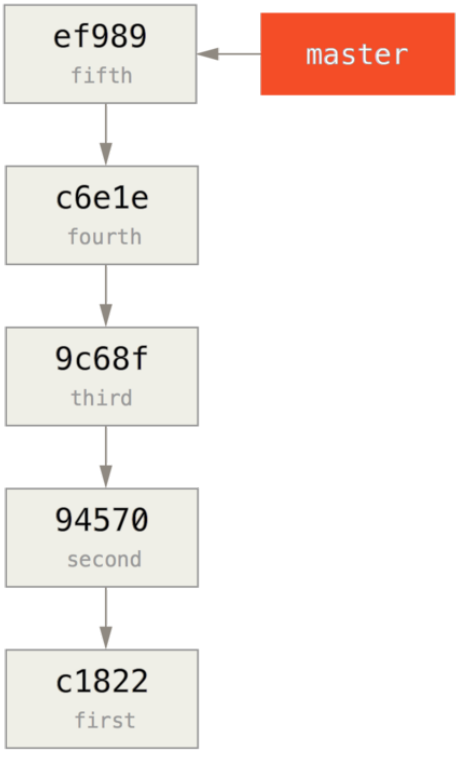
replace

SHA

SHA replace
5

```
$ git log --oneline
ef989d8 fifth commit
c6e1e95 fourth commit
9c68fdc third commit
945704c second commit
c1822cf first commit
```

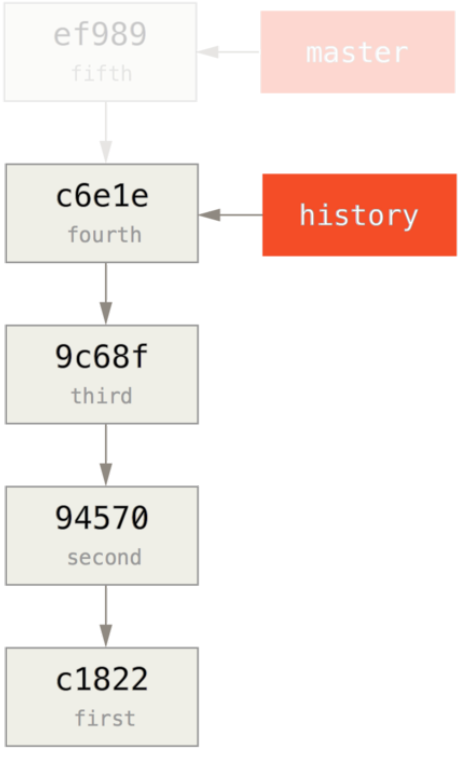
FIGURE 7-28



master

```
$ git branch history c6e1e95
$ git log --oneline --decorate
ef989d8 (HEAD, master) fifth commit
c6e1e95 (history) fourth commit
9c68fdc third commit
945704c second commit
c1822cf first commit
```

FIGURE 7-29



history master

```
$ git remote add project-history https://github.com/schacon/project-history
$ git push project-history history:master
Counting objects: 12, done.
Delta compression using up to 2 threads.
Compressing objects: 100% (4/4), done.
Writing objects: 100% (12/12), 907 bytes, done.
Total 12 (delta 0), reused 0 (delta 0)
Unpacking objects: 100% (12/12), done.
To git@github.com:schacon/project-history.git
 * [new branch]      history -> master
```

```
$ git log --oneline --decorate
ef989d8 (HEAD, master) fifth commit
c6e1e95 (history) fourth commit
9c68fdc third commit
945704c second commit
c1822cf first commit
```

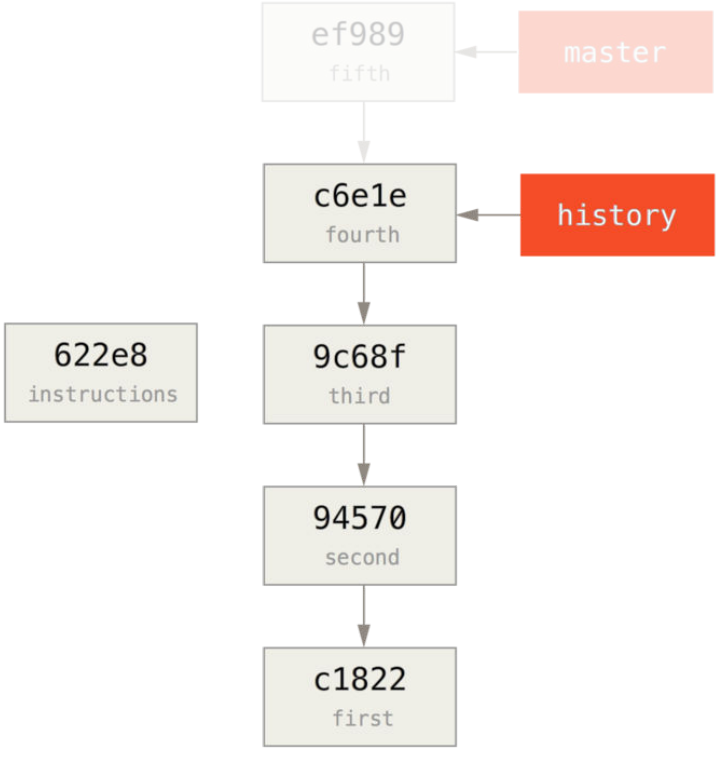
SHA 9c68fdc
commit-tree
SHA

```
$ echo 'get history from blah blah blah' | git commit-tree 9c68fdc^{tree}
622e88e9cbfbacfb75b5279245b9fb38dfea10cf
```

---

commit-tree 命令属于底层指令。有许多指令并非直接使用，而是被 **其他的** Git 命令用来做更小一些的工作。有时当我们做一些像这样的奇怪事情时，它们允许我们做一些不适用于日常使用但真正底层的东西。更多关于底层命令的内容请参见 “**底层命令和高层命令**”

FIGURE 7-30



`git rebase --onto`

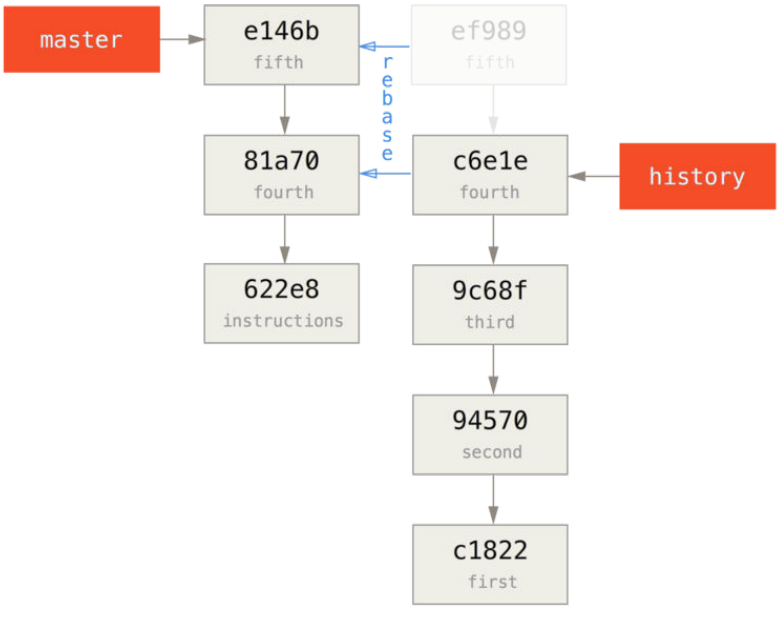
`--onto` `commit-tree`

SHA

9c68fdc

```
$ git rebase --onto 622e88 9c68fdc
First, rewinding head to replay your work on top of it...
Applying: fourth commit
Applying: fifth commit
```

FIGURE 7-31




```
$ git clone https://github.com/schacon/project
$ cd project

$ git log --oneline master
e146b5f fifth commit
81a708d fourth commit
622e88e get history from blah blah blah

$ git remote add project-history https://github.com/schacon/project-history
$ git fetch project-history
From https://github.com/schacon/project-history
 * [new branch]      master     -> project-history/master
```

master project-history/master

```
$ git log --oneline master
e146b5f fifth commit
81a708d fourth commit
622e88e get history from blah blah blah

$ git log --oneline project-history/master
c6e1e95 fourth commit
9c68fdc third commit
945704c second commit
c1822cf first commit
```

git replace master project-history/master “ ”

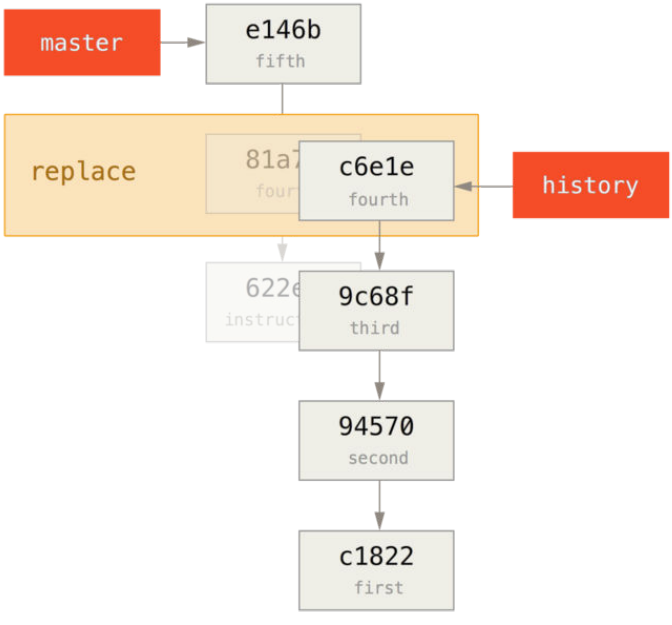
```
$ git replace 81a708d c6e1e95
```

master

```
$ git log --oneline master
e146b5f fifth commit
81a708d fourth commit
9c68fdc third commit
945704c second commit
c1822cf first commit
```

SHA-1 bisect blame

FIGURE 7-32



c6e1e95 SHA-1
81a708d cat-file

```
$ git cat-file -p 81a708d
tree 7bc544cf438903b65ca9104a1e30345eee6c083d
parent 9c68fdceee073230f19ebb8b5e7fc71b479c0252
author Scott Chacon <schacon@gmail.com> 1268712581 -0700
committer Scott Chacon <schacon@gmail.com> 1268712581 -0700

fourth commit
```

81a708d 622e882
9c68fdce

```
$ git for-each-ref
e146b5f14e79d4935160c0e83fb9ebe526b8da0d commit refs/heads/master
c6e1e95051d41771a649f3145423f8809d1a74d4 commit refs/remotes/history/master
```

```
e146b5f14e79d4935160c0e83fb9ebe526b8da0d commit refs/remotes/origin/HEAD
e146b5f14e79d4935160c0e83fb9ebe526b8da0d commit refs/remotes/origin/master
c6e1e95051d41771a649f3145423f8809d1a74d4 commit refs/replace/81a708dd0e167a3f691541c7a646334
```

凭证存储

SSH

HTTP —

token
Git Git

-
- “ cache ”
  15
- “ store ”
  Git

  home
- Mac Git “ osxkeychain ”

  HTTPS
  Safari
- Windows “ winstore ”
  “ osxkeychain ” Win -
  dows Credential Store *https://gitcreden - tialstore.codeplex.com*

Git

```
$ git config --global credential.helper cache
```

“ store ” `--file <path>`
`~/.git-credentials`
“ cache ” `--timeout <seconds>`
“ 900 ” 15 “ store ”

```
$ git config --global credential.helper store --file ~/.my-credentials
```

Git Git
Git

`.gitconfig`

```
[credential]
    helper = store --file /mnt/thumbdrive/.git-credentials
    helper = cache --timeout 30000
```

Git `git credential`

`mygithost` “ fll ”
Git

```
$ git credential fill ❶
protocol=https ❷
host=mygithost
❸
protocol=https ❹
host=mygithost
username=bob
password=s3cre7
$ git credential fill ❺
protocol=https
host=unknownhost

Username for 'https://unknownhost': bob
Password for 'https://bob@unknownhost':
protocol=https
host=unknownhost
```

```
username=bob
password=s3cre7
```

❶

❷ Git-credential

❸

❹ Git-credential

❺ Git

Git
credential.helper

---

foo	git-credential-foo
foo -a --opt=bcd	git-credential-foo -a --opt=bcd
/absolute/path/foo -xyz	/absolute/path/foo -xyz
!f() { echo "password=s3cre7"; }; f	! shell

git-credential-cache git-credential-store

“ git-credential-foo [args] <action>. ” / git-credential

- get
- store
- erase

store erase Git
get Git

Git

git-credential

git-credential-store:

```
$ git credential-store --file ~/git.store store ❶
protocol=https
host=mygithost
username=bob
password=s3cre7
$ git credential-store --file ~/git.store get ❷
protocol=https
host=mygithost

username=bob ❸
password=s3cre7
```

❶ git-credential-store https://mygithost “ bob ” “ s3cre7 ”

❷ https://mygithost

❸ git-credential-store

~/git.store

```
https://bob:s3cre7@mygithost
```

URL osxkeychain winstore cache

git-credential-store Git Git Git

1. get store erase

2. git-credential-store
3.

Ruby Git

```
#!/usr/bin/env ruby

require 'optparse'

path = File.expand_path '~/.git-credentials' ❶
OptionParser.new do |opts|
    opts.banner = 'USAGE: git-credential-read-only [options] <action>'
    opts.on('-f', '--file PATH', 'Specify path for backing store') do |argpath|
        path = File.expand_path argpath
    end
end.parse!

exit(0) unless ARGV[0].downcase == 'get' ❷
exit(0) unless File.exists? path

known = {} ❸
while line = STDIN.gets
    break if line.strip == ''
    k,v = line.strip.split '=', 2
    known[k] = v
end

File.readlines(path).each do |fileline| ❹
    prot,user,pass,host = fileline.scan(/^(.*?):\/\/(.*?):(.*?)@(.*)$/).first
    if prot == known['protocol'] and host == known['host'] then
        puts "protocol=#{prot}"
        puts "host=#{host}"
        puts "username=#{user}"
        puts "password=#{pass}"
        exit(0)
    end
end
```

❶ ~/.git-credentials.

❷ get

❸
known

❹ known

git-credential-read-only
PATH

```
$ git credential-read-only --file=/mnt/shared/creds get
protocol=https
host=mygithost

protocol=https
host=mygithost
username=bob
password=s3cre7
```

“ git- ”

```
$ git config --global credential.helper read-only --file /mnt/shared/creds
```

总结

Git

8 自定义 Git

Git

Git

Git

配置 Git

Chapter 1 git config Git

```
$ git config --global user.name "John Doe"
$ git config --global user.email johndoe@example.com
```

Git

Git

/etc/gitconfig

--system git config

Git ~/.gitconfig

~/.config/git/config --global Git

Git Git

.git/config

.git/config /etc/gitconfig

> Git 的配置文件是纯文本的，所以你可以直接手动编辑这些配置文件，输入合乎语法的值。 但是运行 git config 命令会更简单些。

Git

— Git

Git

```
$ man git-config
```

http://git-scm.com/docs/git-config.html

CORE.EDITOR

Git $VISUAL $EDITOR
vi
core.editor

```
$ git config --global core.editor emacs
```

Git Emacs

COMMIT.TEMPLATE

Git

~/.gitmessage.txt

```
subject line

what happened

[ticket: X]
```

Git git commit
commit.template

```
$ git config --global commit.template ~/.gitmessage.txt
$ git commit
```

```
subject line

what happened

[ticket: X]
# Please enter the commit message for your changes. Lines starting
# with '#' will be ignored, and an empty message aborts the commit.
# On branch master
# Changes to be committed:
#   (use "git reset HEAD <file>..." to unstage)
#
# modified:   lib/test.rb
#
~
~
".git/COMMIT_EDITMSG" 14L, 297C
```

Git

CORE.PAGER

Git log diff
more less

```
$ git config --global core.pager ''
```

Git

USER.SIGNINGKEY

“ ”

GPG ID

```
$ git config --global user.signingkey <gpg-key-id>
```

git tag

```
$ git tag -s <tag-name>
```

CORE.EXCLUDESFILE

“ ” .gitignore
Git
git add

OS X .DS_Store Emacs Vim
~
.gitignore
~/.gitignore_global

```
*~
.DS_Store
```

… … git config --global core.excludesfile ~/.gitignore_global Git

HELP.AUTOCORRECT

```
$ git chekcout master
git：'chekcout' 不是一个 git 命令。参见 'git --help'。

您指的是这个么？
  checkout
```

Git help.autocorrect 1 Git

```
$ git chekcout master
警告：您运行一个不存在的 Git 命令 'chekcout'。继续执行假定您要要运行的是 'checkout'
在 0.1 秒钟后自动运行...
```

“ 0.1 ” help.autocorrect
50, Git 5

Git

Git

COLOR.UI

Git
Git

```
$ git config --global color.ui false
```

auto

always

--color Git

COLOR.*

true false always

```
color.branch
color.diff
color.interactive
color.status
```

diff

```
$ git config --global color.diff.meta "blue black bold"
```

normal black red green yellow blue magenta cyan white
bold dim ul blink reverse

Git diff

— Perforce P4Merge —

P4Merge
Mac Linux
Windows /usr/local/bin

http://www.perforce.com/downloads/Perforce/
P4Merge
Mac p4merge
extMerge merge
p4merge

```
$ cat /usr/local/bin/extMerge
#!/bin/sh
/Applications/p4merge.app/Contents/MacOS/p4merge $*
```

dif
merge Git diff

```
path old-file old-hex old-mode new-file new-hex new-mode
```

old-file new-file dif

```
$ cat /usr/local/bin/extDiff
#!/bin/sh
[ $# -eq 7 ] && /usr/local/bin/extMerge "$2" "$5"
```

```
$ sudo chmod +x /usr/local/bin/extMerge
$ sudo chmod +x /usr/local/bin/extDiff
```

merge.tool Git merge-
tool.<tool>.cmd mergetool.<tool>.trustExit-

Code Git diff.external
Git

```
$ git config --global merge.tool extMerge
$ git config --global mergetool.extMerge.cmd \
  'extMerge \"$BASE\" \"$LOCAL\" \"$REMOTE\" \"$MERGED\"'
$ git config --global mergetool.extMerge.trustExitCode false
$ git config --global diff.external extDiff
```

~/.gitconfig

```
[merge]
  tool = extMerge
[mergetool "extMerge"]
  cmd = extMerge "$BASE" "$LOCAL" "$REMOTE" "$MERGED"
  trustExitCode = false
[diff]
  external = extDiff
```

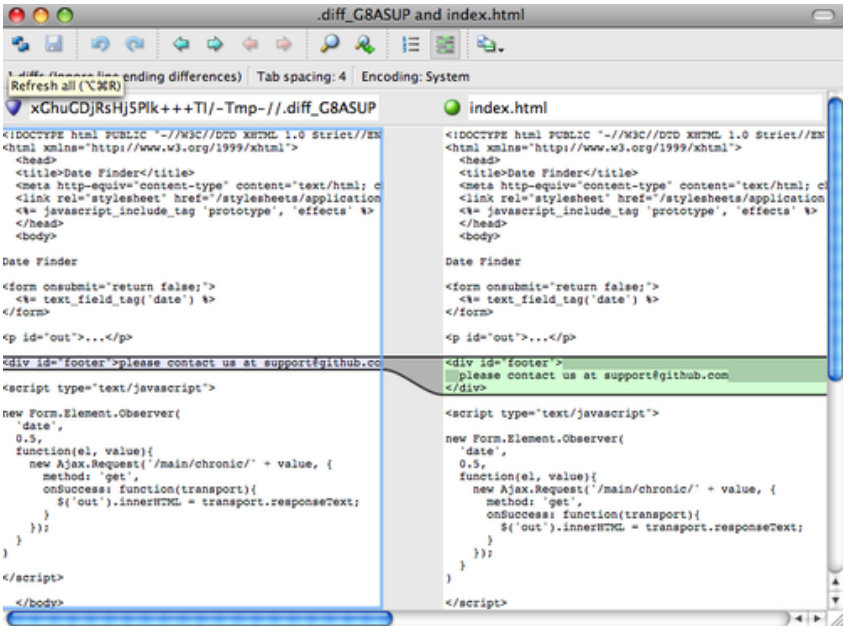
dif

```
$ git diff 32d1776b1^ 32d1776b1
```

Git P4Merge

FIGURE 8-1

P4Merge.



`git mergetool` Git P4Merge

dif merge

`extDiff` `extMerge` KDif3

`extMerge`

```
$ cat /usr/local/bin/extMerge
#!/bin/sh
/Applications/kdiff3.app/Contents/MacOS/kdiff3 $*
```

Git KDif3

Git

```
$ git mergetool --tool-help
'git mergetool --tool=<tool>' may be set to one of the following:
        emerge
        gvimdiff
        gvimdiff2
        opendiff
        p4merge
```

```
        vimdiff
        vimdiff2

The following tools are valid, but not currently available:
        araxis
        bc3
        codecompare
        deltawalker
        diffmerge
        diffuse
        ecmerge
        kdiff3
        meld
        tkdiff
        tortoisemerge
        xxdiff

Some of the tools listed above only work in a windowed
environment. If run in a terminal-only session, they will fail.
```

KDif3 kdif3

```
$ git config --global merge.tool kdiff3
```

extMerge extDiff Git
KDif3 diff

Windows
Git

CORE.AUTOCRLF

Windows
CRLF Windows CR
LF Mac Linux LF
Windows

Enter

Git

core.autocrlf

Windows true

```
$ git config --global core.autocrlf true
```

Linux Mac Git

Git core.autocrlf input

Git

```
$ git config --global core.autocrlf input
```

Windows Mac Linux

Windows Windows

false

```
$ git config --global core.autocrlf false
```

CORE.WHITESPACE

Git

—

blank-at-eol blank-at-eof space-before-tab tab

indent-with-non-tab tab

tabwidth tab-in-indent

tab cr-at-eol Git

core.whitespace Git

- cr-at-eol

```
$ git config --global core.whitespace \
    trailing-space,space-before-tab,indent-with-non-tab
```

git diff Git
git apply
Git

```
$ git apply --whitespace=warn <patch>
```

Git

```
$ git apply --whitespace=fix <patch>
```

git rebase
git rebase --whitespace=fix Git

Git

RECEIVE.FSCKOBJECTS

Git SHA-1 Git

Git receive.fsckObjects true

```
$ git config --system receive.fsckObjects true
```

Git

RECEIVE.DENYNONFASTFORWARDS

push -f force-update

force-pushes receive.denyNonFastForwards

```
$ git config --system receive.denyNonFastForwards true
```

non-fast-forwards

RECEIVE.DENYDELETES

denyNonFastForwards

receive.denyDeletes true

```
$ git config --system receive.denyDeletes true
```

—

ACL

“

”

Git 属性

Git

Git

.gitattributes

.git/info/attributes

Git Git

Git Git

Git

识别二进制文件

Mac
Xcode .pbxproj
JSON Javascript
IDE UTF-8
—
dif

Git pbxproj .gitattributes

```
*.pbxproj binary
```

Git CRLF
git show git diff Git

比较二进制文件

Git Git
dif

Microsoft
Word Microsoft Word
Word
Git
git diff

```
$ git diff
diff --git a/chapter1.docx b/chapter1.docx
index 88839c4..4afcb7c 100644
Binary files a/chapter1.docx and b/chapter1.docx differ
```

Word Git
.gitattributes

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

Git .docx
“ word ” “ word ”
Git docx2txt Word

docx2txt *http://docx2txt.sourceforge.net*
INSTALL
Git
docx2txt

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

chmod a+x
Git

```
$ git config diff.word.textconv docx2txt
```

Git .docx
“ word ” docx2txt Word

Word Git
git diff

```
$ git diff
diff --git a/chapter1.docx b/chapter1.docx
index 0b013ca..ba25db5 100644
--- a/chapter1.docx
+++ b/chapter1.docx
@@ -2,6 +2,7 @@
 This chapter will be about getting started with Git. We will begin at the beginni
 1.1. About Version Control
 What is "version control", and why should you care? Version control is a system t
+Testing: 1, 2, 3.
 If you are a graphic or web designer and want to keep every version of an image o
 1.1.1. Local Version Control Systems
 Many people's version-control method of choice is to copy files into another dire
```

Git “ Testing: 1, 2, 3. ”
— —

EXIF —
exiftool

```
$ echo '*.png diff=exif' >> .gitattributes
$ git config diff.exif.textconv exiftool
```

git diff

```
diff --git a/image.png b/image.png
index 88839c4..4afcb7c 100644
--- a/image.png
+++ b/image.png
@@ -1,12 +1,12 @@
 ExifTool Version Number         : 7.74
-File Size                       : 70 kB
-File Modification Date/Time     : 2009:04:21 07:02:45-07:00
+File Size                       : 94 kB
+File Modification Date/Time     : 2009:04:21 07:02:43-07:00
 File Type                       : PNG
 MIME Type                       : image/png
-Image Width                     : 1058
-Image Height                    : 889
+Image Width                     : 1056
+Image Height                    : 827
 Bit Depth                       : 8
 Color Type                      : RGB with Alpha
```

SVN CVS keyword expansion
Git
Git
Git Git
Git
Git

SHA-1

Id

Git SHA-1

SHA-1

```
$ echo '*.txt ident' >> .gitattributes
$ echo '$Id$' > test.txt
```

Git SHA-1

```
$ rm test.txt
$ git checkout -- test.txt
$ cat test.txt
$Id: 42812b7653c7b88933f8a9d6cad0ca16714b9bb3 $
```

CVS Subversion

— SHA-1

SHA-1

Git

“ clean ” “ smudge ”

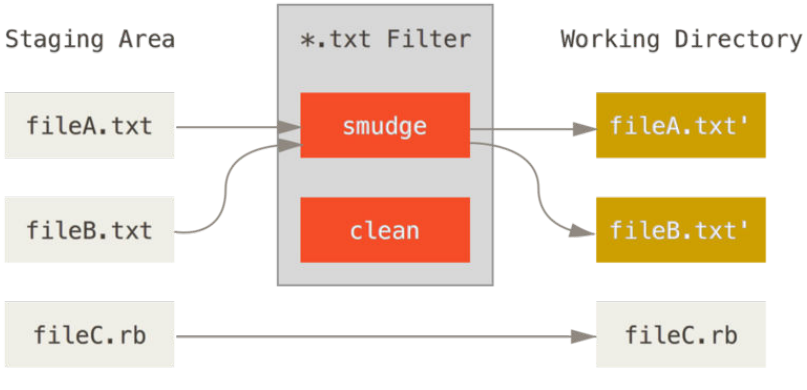
.gitattributes

“ smudge ” Figure 8-2

“ clean ” Figure 8-3

FIGURE 8-2

“smudge”过滤器会在文件被检出时触发



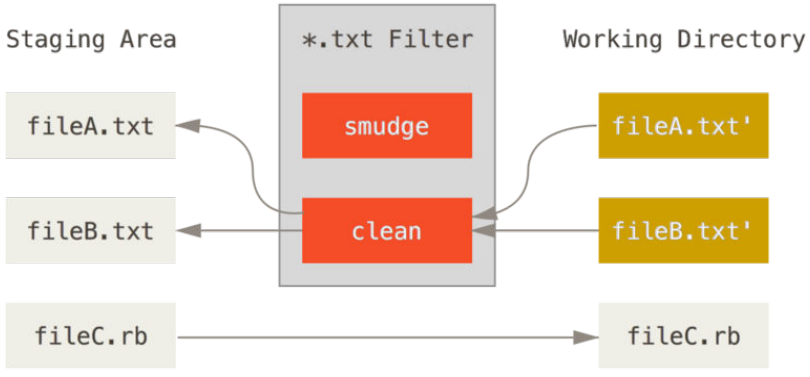


FIGURE 8-3

“clean”过滤器会在文件被暂存时触发

Git

indent C .gitattributes filter “ indent ” *.c

```
*.c filter=indent
```

Git “ indent ” smudge clean

```
$ git config --global filter.indent.clean indent
$ git config --global filter.indent.smudge cat
```

*.c indent

cat cat

indent

C

RCS $Date$

Ruby

```
#! /usr/bin/env ruby
data = STDIN.read
last_date = `git log --pretty=format:"%ad" -1`
puts data.gsub('$Date$', '$Date: ' + last_date.to_s + '$')
```

git log

$Date$ —

expand_date
Git dater
expand_date smudge
clean Perl

```
$ git config filter.dater.smudge expand_date
$ git config filter.dater.clean 'perl -pe "s/\\\$Date[^\\\$]*\\\$/\\\$Date\\\$/"'
```

Perl $Date$
$Date$
Git

```
$ echo '# $Date$' > date_test.txt
$ echo 'date*.txt filter=dater' >> .gitattributes
```

```
$ git add date_test.txt .gitattributes
$ git commit -m "Testing date expansion in Git"
$ rm date_test.txt
$ git checkout date_test.txt
$ cat date_test.txt
# $Date: Tue Apr 21 07:26:52 2009 -0700$
```

.gitattri-
butes dater
—

Git archive

EXPORT-IGNORE

Git

export-ignore
test/
tarball Git

test/ export-ignore

git archive

EXPORT-SUBST

git log

export-subst

LAST_COMMIT

git archive

```
$ echo 'Last commit date: $Format:%cd by %aN$' > LAST_COMMIT
$ echo "LAST_COMMIT export-subst" >> .gitattributes
$ git add LAST_COMMIT .gitattributes
$ git commit -am 'adding LAST_COMMIT file for archives'
```

git archive

```
$ git archive HEAD | tar xCf ../deployment-testing -
$ cat ../deployment-testing/LAST_COMMIT
Last commit date: Tue Apr 21 08:38:48 2009 -0700 by Scott Chacon
```

git git log

```
$ echo '$Format:Last commit: %h by %aN at %cd%n%+w(76,6,9)%B$' > LAST_COMMIT
$ git commit -am 'export-subst 使用 git log 的自定义格式化工具

git archive 直接使用 git log 的 `pretty=format:`
处理器，并在输出中移除两侧的 `$Format:` 和 `$`
标记。
'
$ git archive @ | tar xfO - LAST_COMMIT
Last commit: 312ccc8 by Jim Hill at Fri May 8 09:14:04 2015 -0700
       export-subst 使用 git log 的自定义格式化工具

         git archive 直接使用 git log 的 `pretty=format:` 处理器，并
         在输出中移除两侧的 `$Format:` 和 `$` 标记。
```

Git

Git

database.xml

```
database.xml merge=ours
```

ours

```
$ git config --global merge.ours.driver true
```

database.xml

```
$ git merge topic
Auto-merging database.xml
Merge made by recursive.
```

database.xml

Git 钩子

Git

Git hooks
.git/hooks git init Git

shell
Perl —

Ruby Python
.sample
Git hooks
Git

> 需要注意的是，克隆某个版本库时，它的客户端钩子 **并不** 随同复制。 如果需要靠这些脚本来强制维持某种策略，建议你在服务器端实现这一功能。（请参照 **“使用强制策略的一个例子”** 中的例子。）

提交工作流钩子

pre-commit

Git git commit --no-verify
lint

prepare-commit-msg

SHA-1

commit-msg
Git

post-commit
git log -1 HEAD

电子邮件工作流钩子

git am

git format-patch

applypatch-msg
Git

git am pre-applypatch

git am

post-applypatch git am

其它客户端钩子

pre-rebase
Git pre-rebase

post-rewrite git com-
mit --amend git rebase git filter-branch

post-checkout post-merge

git checkout post-checkout

git merge post-merge
Git
Git

pre-push git push

Git git gc --auto
pre-auto-gc

PRE-RECEIVE

pre-receive

non-fast-forward

UPDATE

update pre-receive
pre-receive update

SHA-1
SHA-1 update

POST-RECEIVE

post-receive
pre-receive
continous integration
ticket-tracking system —
ticket

使用强制策略的一个例子

Git

Ruby

Ruby

Git Perl Bash

hooks update up-
date

-
- revision
- revision

SSH

“ git ”

shell

$USER

update

```ruby
#!/usr/bin/env ruby

$refname = ARGV[0]
$oldrev  = ARGV[1]
$newrev  = ARGV[2]
$user    = ENV['USER']

puts "Enforcing Policies..."
puts "(#{$refname}) (#{$oldrev[0,6]}) (#{$newrev[0,6]})"
```

—

指定特殊的提交信息格式

“ ref: 1234 ”

ticketing system

`$newrev` `$oldrev` `git rev-list` Git SHA-1 `git rev-list` `git log` SHA-1 SHA-1

```
$ git rev-list 538c33..d14fc7
d14fc7c847ab946ec39590d87783c69b031bdfb7
9f585da4401b0a3999e84113824d15245c13f0be
234071a1be950e2a8d078e6141f5cd20c1e61ad3
dfa04c9ef3d5197182f13fb5b9b1fb7717d2222a
17716ec0f1ff5c77eff40b7fe912f9f6cfd0e475
```

SHA-1 `git cat-file` Chapter 10

```
$ git cat-file commit ca82a6
tree cfda3bf379e4f8dba8717dee55aab78aef7f4daf
parent 085bb3bcb608e1e8451d4b2432f8ecbe6306e7e7
author Scott Chacon <schacon@gmail.com> 1205815931 -0700
committer Scott Chacon <schacon@gmail.com> 1240030591 -0700

changed the version number
```

SHA-1 Unix `sed`

```
$ git cat-file commit ca82a6 | sed '1,/^$/d'
changed the version number
```

```
$regex = /\[ref: (\d+)\]/

# 指定自定义的提交信息格式
def check_message_format
  missed_revs = `git rev-list #{$oldrev}..#{$newrev}`.split("\n")
  missed_revs.each do |rev|
    message = `git cat-file commit #{rev} | sed '1,/^$/d'`
    if !$regex.match(message)
      puts "[POLICY] Your message is not formatted correctly"
      exit 1
    end
  end
end
check_message_format
```

update

指定基于用户的访问权限控制列表（ACL）系统

Git acl update

ACL CVS ACL
avail unavail

|
doc
lib tests ACL

```
avail|nickh,pjhyett,defunkt,tpw
avail|usinclair,cdickens,ebronte|doc
avail|schacon|lib
avail|schacon|tests
```

avail

```
def get_acl_access_data(acl_file)
  # 读取 ACL 数据
  acl_file = File.read(acl_file).split("\n").reject { |line| line == '' }
```

```
  access = {}
  acl_file.each do |line|
    avail, users, path = line.split('|')
    next unless avail == 'avail'
    users.split(',').each do |user|
      access[user] ||= []
      access[user] << path
    end
  end
  access
end
```

ACL get_acl_access_data

```
{"defunkt"=>[nil],
 "tpw"=>[nil],
 "nickh"=>[nil],
 "pjhyett"=>[nil],
 "schacon"=>["lib", "tests"],
 "cdickens"=>["doc"],
 "usinclair"=>["doc"],
 "ebronte"=>["doc"]}
```

git log --name-only

```
$ git log -1 --name-only --pretty=format:'' 9f585d

README
lib/test.rb
```

get_acl_access_data ACL

:

```
# 仅允许特定用户修改项目中的特定子目录
def check_directory_perms
  access = get_acl_access_data('acl')

  # 检查是否有人在向他没有权限的地方推送内容
  new_commits = `git rev-list #{$oldrev}..#{$newrev}`.split("\n")
  new_commits.each do |rev|
    files_modified = `git log -1 --name-only --pretty=format:'' #{rev}`.split("\n")
    files_modified.each do |path|
```

```
        next if path.size == 0
        has_file_access = false
        access[$user].each do |access_path|
          if !access_path  # 用户拥有完全访问权限
             || (path.start_with? access_path) # 或者对此路径有访问权限
            has_file_access = true
          end
        end
        if !has_file_access
          puts "[POLICY] You do not have access to push to #{path}"
          exit 1
        end
      end
    end
  end

  check_directory_perms
```

```
    git rev-list
```

测试一下

.git/hooks/update chmod u +x .git/hooks/update

```
$ git push -f origin master
Counting objects: 5, done.
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 323 bytes, done.
Total 3 (delta 1), reused 0 (delta 0)
Unpacking objects: 100% (3/3), done.
Enforcing Policies...
(refs/heads/master) (8338c5) (c5b616)
[POLICY] Your message is not formatted correctly
error: hooks/update exited with error code 1
error: hook declined to update refs/heads/master
To git@gitserver:project.git
 ! [remote rejected] master -> master (hook declined)
error: failed to push some refs to 'git@gitserver:project.git'
```

```
Enforcing Policies...
(refs/heads/master) (fb8c72) (c56860)
```

update

```
[POLICY] Your message is not formatted correctly
error: hooks/update exited with error code 1
error: hook declined to update refs/heads/master
```

Git update

```
To git@gitserver:project.git
 ! [remote rejected] master -> master (hook declined)
error: failed to push some refs to 'git@gitserver:project.git'
```

remote rejected

lib

```
[POLICY] You do not have access to push to lib/test.rb
```

update

.git/hooks

Git

commit-msg

Git

```
#!/usr/bin/env ruby
message_file = ARGV[0]
message = File.read(message_file)

$regex = /\[ref: (\d+)\]/

if !$regex.match(message)
  puts "[POLICY] Your message is not formatted correctly"
  exit 1
end
```

(.git/hooks/commit-msg)

```
$ git commit -am 'test'
[POLICY] Your message is not formatted correctly
```

Git

```
$ git commit -am 'test [ref: 132]'
[master e05c914] test [ref: 132]
 1 file changed, 1 insertions(+), 0 deletions(-)
```

ACL .git
ACL pre-commit

```
#!/usr/bin/env ruby

$user    = ENV['USER']

# [ 插入上文中的 get_acl_access_data 方法 ]

# 仅允许特定用户修改项目中的特定子目录
def check_directory_perms
  access = get_acl_access_data('.git/acl')

  files_modified = `git diff-index --cached --name-only HEAD`.split("\n")
  files_modified.each do |path|
    next if path.size == 0
    has_file_access = false
```

```
    access[$user].each do |access_path|
    if !access_path || (path.index(access_path) == 0)
      has_file_access = true
    end
    if !has_file_access
      puts "[POLICY] You do not have access to push to #{path}"
      exit 1
    end
  end
end

check_directory_perms
```

ACL

.git ACL

```
access = get_acl_access_data('acl')
```

```
access = get_acl_access_data('.git/acl')
```

```
files_modified = `git log -1 --name-only --pretty=format:'' #{ref}`
```

```
files_modified = `git diff-index --cached --name-only HEAD`
```

—

$user

non-fast-forward

fast-forward

receive.denyDeletes receive.denyNonFastForwards

pre-rebase

reachable

```ruby
#!/usr/bin/env ruby

base_branch = ARGV[0]
if ARGV[1]
  topic_branch = ARGV[1]
else
  topic_branch = "HEAD"
end

target_shas = `git rev-list #{base_branch}..#{topic_branch}`.split("\n")
remote_refs = `git branch -r`.split("\n").map { |r| r.strip }

target_shas.each do |sha|
  remote_refs.each do |remote_ref|
    shas_pushed = `git rev-list ^#{sha}^@ refs/remotes/#{remote_ref}`
    if shas_pushed.split("\n").include?(sha)
      puts "[POLICY] Commit #{sha} has already been pushed to #{remote_ref}"
      exit 1
    end
  end
end
```

“ ”

```
`git rev-list ^#{sha}^@ refs/remotes/#{remote_ref}`
```

SHA^@

SHA-1

—

—

-f

总结

Git

Git

9 Git 与其他系统

Git VCS Git

Git

Git

Git

作为客户端的 Git

Git

Git VCS

“ ”

Git Subversion

Subversion

VCS

CVS

Git Subversion `git svn` Git Subversion

Git Subversion

Subversion

Git

Git

Subversion DVCS

GIT SVN

Git Subversion git svn

git svn Subversion
Git

Git

Git
Git Subversion
SVN
Git SVN -

设置

SVN

Subversion svnsync
Google Code protobuf Subversion
protobuf
Subversion

```
$ mkdir /tmp/test-svn
$ svnadmin create /tmp/test-svn
```

- 0
pre-revprop-change

```
$ cat /tmp/test-svn/hooks/pre-revprop-change
#!/bin/sh
exit 0;
$ chmod +x /tmp/test-svn/hooks/pre-revprop-change
```

svnsync init

```
$ svnsync init file:///tmp/test-svn \
  http://progit-example.googlecode.com/svn/
```

```
$ svnsync sync file:///tmp/test-svn
Committed revision 1.
Copied properties for revision 1.
Transmitting file data .............................[...]
Committed revision 2.
Copied properties for revision 2.
[…]
```

100

Subversion

-

开始

Subversion

`git svn clone` Subversion

Git

Subversion `file:///tmp/test-svn`

Subversion URL

```
$ git svn clone file:///tmp/test-svn -T trunk -b branches -t tags
Initialized empty Git repository in /private/tmp/progit/test-svn/.git/
r1 = dcbfb5891860124cc2e8cc616cded42624897125 (refs/remotes/origin/trunk)
    A   m4/acx_pthread.m4
    A   m4/stl_hash.m4
    A   java/src/test/java/com/google/protobuf/UnknownFieldSetTest.java
    A   java/src/test/java/com/google/protobuf/WireFormatTest.java
…
r75 = 556a3e1e7ad1fde0a32823fc7e4d046bcfd86dae (refs/remotes/origin/trunk)
Found possible branch point: file:///tmp/test-svn/trunk => file:///tmp/test-svn/branches/my-
Found branch parent: (refs/remotes/origin/my-calc-branch) 556a3e1e7ad1fde0a32823fc7e4d046bcf
Following parent with do_switch
Successfully followed parent
r76 = 0fb585761df569eaecd8146c71e58d70147460a2 (refs/remotes/origin/my-calc-branch)
Checked out HEAD:
  file:///tmp/test-svn/trunk r75
```

-`git svn init` `git svn fetch`

- URL 75

Git

`-T trunk -b branches -t tags` Git Subversion

`-s`

```
$ git svn clone file:///tmp/test-svn -s
```

Git

```
$ git branch -a
* master
  remotes/origin/my-calc-branch
  remotes/origin/tags/2.0.2
  remotes/origin/tags/release-2.0.1
  remotes/origin/tags/release-2.0.2
  remotes/origin/tags/release-2.0.2rc1
  remotes/origin/trunk
```

Subversion
Git `show-ref`

```
$ git show-ref
556a3e1e7ad1fde0a32823fc7e4d046bcfd86dae refs/heads/master
0fb585761df569eaecd8146c71e58d70147460a2 refs/remotes/origin/my-calc-branch
bfd2d79303166789fc73af4046651a4b35c12f0b refs/remotes/origin/tags/2.0.2
285c2b2e36e467dd4d91c8e3c0c0e1750b3fe8ca refs/remotes/origin/tags/release-2.0.1
cbda99cb45d9abcb9793db1d4f70ae562a969f1e refs/remotes/origin/tags/release-2.0.2
a9f074aa89e826d6f9d30808ce5ae3ffe711feda refs/remotes/origin/tags/release-2.0.2rc1
556a3e1e7ad1fde0a32823fc7e4d046bcfd86dae refs/remotes/origin/trunk
```

Git Git

```
$ git show-ref
c3dcbe8488c6240392e8a5d7553bbffcb0f94ef0 refs/remotes/origin/master
32ef1d1c7cc8c603ab78416262cc421b80a8c2df refs/remotes/origin/branch-1
75f703a3580a9b81ead89fe1138e6da858c5ba18 refs/remotes/origin/branch-2
23f8588dde934e8f33c263c6d8359b2ae095f863 refs/tags/v0.1.0
7064938bd5e7ef47bfd79a685a62c1e2649e2ce7 refs/tags/v0.2.0
6dcb09b5b57875f334f61aebed695e2e4193db5e refs/tags/v1.0.0
```

Git refs/tags

提交回 SUBVERSION

Git SVN
Git Subversion

```
$ git commit -am 'Adding git-svn instructions to the README'
[master 4af61fd] Adding git-svn instructions to the README
 1 file changed, 5 insertions(+)
```

Subver -
sion - Subversion
Subversion git svn dcommit

```
$ git svn dcommit
Committing to file:///tmp/test-svn/trunk ...
    M   README.txt
Committed r77
    M   README.txt
r77 = 95e0222ba6399739834380eb10afcd73e0670bc5 (refs/remotes/origin/trunk)
No changes between 4af61fd05045e07598c553167e0f31c84fd6ffe1 and refs/remotes/origin/trunk
Resetting to the latest refs/remotes/origin/trunk
```

Subversion
Subversion Git
SHA-1
Git Subversion
git-svn-id

```
$ git log -1
commit 95e0222ba6399739834380eb10afcd73e0670bc5
Author: ben <ben@0b684db3-b064-4277-89d1-21af03df0a68>
Date:   Thu Jul 24 03:08:36 2014 +0000

    Adding git-svn instructions to the README

    git-svn-id: file:///tmp/test-svn/trunk@77 0b684db3-b064-4277-89d1-21af03df0a68
```

SHA-1 4af61fd
95e0222 Git Subver -
sion dcommit Subversion

拉取新改动

git svn

```
$ git svn dcommit
Committing to file:///tmp/test-svn/trunk ...

ERROR from SVN:
Transaction is out of date: File '/trunk/README.txt' is out of date
W: d5837c4b461b7c0e018b49d12398769d2bfc240a and refs/remotes/origin/trunk differ,
:100644 100644 f414c433af0fd6734428cf9d2a9fd8ba00ada145 c80b6127dd04f5fcda218730dc
Current branch master is up to date.
ERROR: Not all changes have been committed into SVN, however the committed
ones (if any) seem to be successfully integrated into the working tree.
Please see the above messages for details.
```

git svn rebase

```
$ git svn rebase
Committing to file:///tmp/test-svn/trunk ...

ERROR from SVN:
Transaction is out of date: File '/trunk/README.txt' is out of date
W: eaa029d99f87c5c822c5c29039d19111ff32ef46 and refs/remotes/origin/trunk differ,
:100644 100644 65536c6e30d263495c17d781962cfff12422693a b34372b25ccf4945fe5658fa38
First, rewinding head to replay your work on top of it...
Applying: update foo
Using index info to reconstruct a base tree...
M       README.txt
Falling back to patching base and 3-way merge...
Auto-merging README.txt
ERROR: Not all changes have been committed into SVN, however the committed
ones (if any) seem to be successfully integrated into the working tree.
Please see the above messages for details.
```

Subversion

`dcommit`

```
$ git svn dcommit
Committing to file:///tmp/test-svn/trunk ...
    M   README.txt
Committed r85
    M   README.txt
r85 = 9c29704cc0bbbed7bd58160cfb66cb9191835cd8 (refs/remotes/origin/trunk)
No changes between 5762f56732a958d6cfda681b661d2a239cc53ef5 and refs/remotes/origin/trunk
Resetting to the latest refs/remotes/origin/trunk
```

Git `git svn` Subversion

`dcommit`

```
$ git svn dcommit
Committing to file:///tmp/test-svn/trunk ...
    M   configure.ac
Committed r87
    M   autogen.sh
r86 = d8450bab8a77228a644b7dc0e95977ffc61adff7 (refs/remotes/origin/trunk)
    M   configure.ac
r87 = f3653ea40cb4e26b6281cec102e35dcba1fe17c4 (refs/remotes/origin/trunk)
W: a0253d06732169107aa020390d9fefd2b1d92806 and refs/remotes/origin/trunk differ, using reba
:100755 100755 efa5a59965fbbb5b2b0a12890f1b351bb5493c18 e757b59a9439312d80d5d43bb65d4a7d0389
First, rewinding head to replay your work on top of it...
```

Git - Git SVN

Subversion `git svn fetch` `git svn rebase`

```
$ git svn rebase
    M   autogen.sh
r88 = c9c5f83c64bd755368784b444bc7a0216cc1e17b (refs/remotes/origin/trunk)
First, rewinding head to replay your work on top of it...
Fast-forwarded master to refs/remotes/origin/trunk.
```

git svn rebase

git svn rebase

GIT 分支问题

Git

git svn Sub -
version

Subversion

Git git svn Sub -
version

experiment

master dcommit

```
$ git svn dcommit
Committing to file:///tmp/test-svn/trunk ...
    M   CHANGES.txt
Committed r89
    M   CHANGES.txt
r89 = 89d492c884ea7c834353563d5d913c6adf933981 (refs/remotes/origin/trunk)
    M   COPYING.txt
    M   INSTALL.txt
Committed r90
    M   INSTALL.txt
    M   COPYING.txt
r90 = cb522197870e61467473391799148f6721bcf9a0 (refs/remotes/origin/trunk)
No changes between 71af502c214ba13123992338569f4669877f55fd and refs/remotes/origi
Resetting to the latest refs/remotes/origin/trunk
```

dcommit

Git experiment
- SVN

git merge --squash

SUBVERSION 分支

Subversion Git

git svn Subversion

创建一个新的 SVN 分支

Subversion git svn branch [branch-name]

```
$ git svn branch opera
Copying file:///tmp/test-svn/trunk at r90 to file:///tmp/test-svn/branches/opera...
Found possible branch point: file:///tmp/test-svn/trunk => file:///tmp/test-svn/branches/ope
Found branch parent: (refs/remotes/origin/opera) cb522197870e61467473391799148f6721bcf9a0
Following parent with do_switch
Successfully followed parent
r91 = f1b64a3855d3c8dd84ee0ef10fa89d27f1584302 (refs/remotes/origin/opera)
```

Subversion svn copy trunk branches/opera Subversion Subversion trunk opera

切换活动分支

Git Subversion - git-svn-id

Subversion dcommit Subversion opera

```
$ git branch opera remotes/origin/opera
```

opera trunk master git merge -m “ Merge branch opera ” git merge Subversion Git Git Subversion Subversion

Git dcommit - dcommit git merge git merge --squash

- Subversion

opera

SUBVERSION 命令

git svn Subversion
Git Subversion

SVN
Subversion SVN
git svn log SVN

```
$ git svn log
------------------------------------------------------------------------
r87 | schacon | 2014-05-02 16:07:37 -0700 (Sat, 02 May 2014) | 2 lines

autogen change

------------------------------------------------------------------------
r86 | schacon | 2014-05-02 16:00:21 -0700 (Sat, 02 May 2014) | 2 lines

Merge branch 'experiment'

------------------------------------------------------------------------
r85 | schacon | 2014-05-02 16:00:09 -0700 (Sat, 02 May 2014) | 2 lines

updated the changelog
```

git svn log
svn log Subversion
Subversion dcommit
Git
Subversion Subversion

SVN
git svn log svn log git svn
blame [FILE] svn annotate

```
$ git svn blame README.txt
 2   temporal Protocol Buffers - Google's data interchange format
 2   temporal Copyright 2008 Google Inc.
 2   temporal http://code.google.com/apis/protocolbuffers/
 2   temporal
```

```
22   temporal C++ Installation - Unix
22   temporal ======================
 2   temporal
79    schacon Committing in git-svn.
78    schacon
 2   temporal To build and install the C++ Protocol Buffer runtime and the Protocol
 2   temporal Buffer compiler (protoc) execute the following:
 2   temporal
```

Git

Subversion
SVN

`git svn info` `svn info`

```
$ git svn info
Path: .
URL: https://schacon-test.googlecode.com/svn/trunk
Repository Root: https://schacon-test.googlecode.com/svn
Repository UUID: 4c93b258-373f-11de-be05-5f7a86268029
Revision: 87
Node Kind: directory
Schedule: normal
Last Changed Author: schacon
Last Changed Rev: 87
Last Changed Date: 2009-05-02 16:07:37 -0700 (Sat, 02 May 2009)
```

Subversion

`blame` `log`
Subversion

`svn:ignore` Subversion
`.gitignore`

`git svn` `git svn create-ignore` `.gitignore`

`git svn show-ignore` `.gitignore`

```
$ git svn show-ignore > .git/info/exclude
```

`.gitignore` Subversion Git
`.gitignore`

GIT-SVN 总结

Subversion Subversion
`git svn`
Git

- Git `git merge`

- Git Git
Git
`git-svn-id` `pre-receive` `git-svn-id`

Subversion
Git

Git Mercurial

DVCS Git

Git Mercurial
Git Mercurial
Git Mercurial
Git
git-remote-hg
https://github.com/felipec/git-remote-hg

GIT-REMOTE-HG

git-remote-hg PATH

```
$ curl -o ~/bin/git-remote-hg \
  https://raw.githubusercontent.com/felipec/git-remote-hg/master/git-remote-hg
$ chmod +x ~/bin/git-remote-hg
```

`~/bin` `$PATH` Git-remote-hg `mercurial` Python
Python

```
$ pip install mercurial
```

Python *https://www.python.org/*
Mercurial
http://mercurial.selenic.com/

Mer -
curial Mercurial
Mercurial “ hello world ”

```
$ hg clone http://selenic.com/repo/hello /tmp/hello
```

开始

“ server-side ”

Git

```
$ git clone hg::/tmp/hello /tmp/hello-git
$ cd /tmp/hello-git
$ git log --oneline --graph --decorate
* ac7955c (HEAD, origin/master, origin/branches/default, origin/HEAD, refs/hg/origin/branche
* 65bb417 Create a standard "hello, world" program
```

Mercurial `git clone`
git-remote-hg Git HTTP/S
Git Mercurial

log
`.git`

```
$ tree .git/refs
.git/refs
├── heads
│   └── master
├── hg
│   └── origin
│       ├── bookmarks
│       │   └── master
│       └── branches
│           └── default
```

```
├── notes
│   └── hg
├── remotes
│   └── origin
│       └── HEAD
└── tags

9 directories, 5 files
```

Git-remote-hg Git refs/hg refs/hg/origin/branches/default “ ac7955c ” SHA-1 Git master refs/hg refs/remotes/origin

notes/hg git-remote-hg Git Mercurial ID

```
$ cat notes/hg
d4c10386...

$ git cat-file -p d4c10386...
tree 1781c96...
author remote-hg <> 1408066400 -0800
committer remote-hg <> 1408066400 -0800

Notes for master

$ git ls-tree 1781c96...
100644 blob ac9117f...  65bb417...
100644 blob 485e178...  ac7955c...

$ git cat-file -p ac9117f
0a04b987be5ae354b710cefeba0e2d9de7ad41a9
```

refs/notes/hg Git git ls-tree tree tree “ ac9117f ” blob master SHA-1 “ 0a04b98 ” default Mer - curial ID

Git

Mercurial
Git
.gitignore Mercurial Git
Mercurial Git

```
$ cp .hgignore .git/info/exclude
```

.git/info/exclude .gitignore

工作流程

master

```
$ git log --oneline --graph --decorate
* ba04a2a (HEAD, master) Update makefile
* d25d16f Goodbye
* ac7955c (origin/master, origin/branches/default, origin/HEAD, refs/hg/origin/branches/defa
* 65bb417 Create a standard "hello, world" program
```

master origin/master

```
$ git fetch
From hg::/tmp/hello
   ac7955c..df85e87  master     -> origin/master
   ac7955c..df85e87  branches/default -> origin/branches/default
$ git log --oneline --graph --decorate --all
* 7b07969 (refs/notes/hg) Notes for default
* d4c1038 Notes for master
* df85e87 (origin/master, origin/branches/default, origin/HEAD, refs/hg/origin/branches/defa
| * ba04a2a (HEAD, master) Update makefile
| * d25d16f Goodbye
|/
* ac7955c Create a makefile
* 65bb417 Create a standard "hello, world" program
```

--all git-remote-hg
“ notes ” origin/

`master` Mercurial

```
$ git merge origin/master
Auto-merging hello.c
Merge made by the 'recursive' strategy.
 hello.c | 2 +-
 1 file changed, 1 insertion(+), 1 deletion(-)
$ git log --oneline --graph --decorate
*   0c64627 (HEAD, master) Merge remote-tracking branch 'origin/master'
|\
| * df85e87 (origin/master, origin/branches/default, origin/HEAD, refs/hg/origin/b
* | ba04a2a Update makefile
* | d25d16f Goodbye
|/
* ac7955c Create a makefile
* 65bb417 Create a standard "hello, world" program
```

```
$ git push
To hg::/tmp/hello
   df85e87..0c64627  master -> master
```

Mercurial

```
$ hg log -G --style compact
o    5[tip]:4,2   dc8fa4f932b8   2014-08-14 19:33 -0700   ben
|\     Merge remote-tracking branch 'origin/master'
| |
| o  4   64f27bcefc35   2014-08-14 19:27 -0700   ben
| |    Update makefile
| |
| o  3:1   4256fc29598f   2014-08-14 19:27 -0700   ben
| |    Goodbye
| |
@ |  2   7db0b4848b3c   2014-08-14 19:30 -0700   ben
|/     Add some documentation
|
o  1   82e55d328c8c   2005-08-26 01:21 -0700   mpm
|    Create a makefile
|
```

```
o  0   0a04b987be5a   2005-08-26 01:20 -0700   mpm
     Create a standard "hello, world" program
```

2 Mercurial *3* *4* git-remote-hg Git

分支与书签

Git Mercurial “ bookmark ” Git Mercurial “ branch ”

`develop`

```
$ hg log -l 1
changeset:   6:8f65e5e02793
branch:      develop
tag:         tip
user:        Ben Straub <ben@straub.cc>
date:        Thu Aug 14 20:06:38 2014 -0700
summary:     More documentation
```

“ branch ” Git Git git-remote-hg Mercurial Mercurial Git Git

```
$ git checkout -b featureA
Switched to a new branch 'featureA'
$ git push origin featureA
To hg::/tmp/hello
 * [new branch]      featureA -> featureA
```

Mercurial

```
$ hg bookmarks
   featureA                  5:bd5ac26f11f9
$ hg log --style compact -G
@  6[tip]   8f65e5e02793   2014-08-14 20:06 -0700   ben
|    More documentation
|
o    5[featureA]:4,2   bd5ac26f11f9   2014-08-14 20:02 -0700   ben
|\     Merge remote-tracking branch 'origin/master'
```

```
| |
| o  4   0434aaa6b91f   2014-08-14 20:01 -0700   ben
| |    update makefile
| |
| o  3:1   318914536c86   2014-08-14 20:00 -0700   ben
| |    goodbye
| |
o |  2   f098c7f45c4f   2014-08-14 20:01 -0700   ben
|/     Add some documentation
|
o  1   82e55d328c8c   2005-08-26 01:21 -0700   mpm
|    Create a makefile
|
o  0   0a04b987be5a   2005-08-26 01:20 -0700   mpm
     Create a standard "hello, world" program
```

5 [featureA] Git
Git Git

“ ” Mercurial branch
branches

```
$ git checkout -b branches/permanent
Switched to a new branch 'branches/permanent'
$ vi Makefile
$ git commit -am 'A permanent change'
$ git push origin branches/permanent
To hg::/tmp/hello
 * [new branch]      branches/permanent -> branches/permanent
```

Mercurial

```
$ hg branches
permanent                      7:a4529d07aad4
develop                        6:8f65e5e02793
default                        5:bd5ac26f11f9 (inactive)
$ hg log -G
o  changeset:   7:a4529d07aad4
|  branch:      permanent
|  tag:         tip
|  parent:      5:bd5ac26f11f9
|  user:        Ben Straub <ben@straub.cc>
|  date:        Thu Aug 14 20:21:09 2014 -0700
|  summary:     A permanent change
|
| @  changeset:   6:8f65e5e02793
```

```
|/   branch:      develop
|    user:        Ben Straub <ben@straub.cc>
|    date:        Thu Aug 14 20:06:38 2014 -0700
|    summary:     More documentation
|
o    changeset:   5:bd5ac26f11f9
|\   bookmark:    featureA
| |  parent:      4:0434aaa6b91f
| |  parent:      2:f098c7f45c4f
| |  user:        Ben Straub <ben@straub.cc>
| |  date:        Thu Aug 14 20:02:21 2014 -0700
| |  summary:     Merge remote-tracking branch 'origin/master'
[...]
```

“ permanent ” *7*
Git

Mercurial Mercurial

```
$ hg log --style compact -G
o  10[tip]   99611176cbc9   2014-08-14 20:21 -0700   ben
|    A permanent change
|
o  9   f23e12f939c3   2014-08-14 20:01 -0700   ben
|    Add some documentation
|
o  8:1   c16971d33922   2014-08-14 20:00 -0700   ben
|    goodbye
|
| o  7:5   a4529d07aad4   2014-08-14 20:21 -0700   ben
| |    A permanent change
| |
| | @  6   8f65e5e02793   2014-08-14 20:06 -0700   ben
| |/     More documentation
| |
| o    5[featureA]:4,2   bd5ac26f11f9   2014-08-14 20:02 -0700   ben
| |\     Merge remote-tracking branch 'origin/master'
| | |
| | o  4   0434aaa6b91f   2014-08-14 20:01 -0700   ben
| | |    update makefile
| | |
+---o  3:1   318914536c86   2014-08-14 20:00 -0700   ben
| |      goodbye
| |
| o  2   f098c7f45c4f   2014-08-14 20:01 -0700   ben
|/     Add some documentation
```

```
|
o  1   82e55d328c8c   2005-08-26 01:21 -0700   mpm
|    Create a makefile
|
o  0   0a04b987be5a   2005-08-26 01:20 -0700   mpm
     Create a standard "hello, world" program
```

8 9 10 permanent

Mercurial

MERCURIAL 总结

Git Mercurial

Mercurial

Git Perforce

Perforce 1995

Perforce Git

Perforce Git

Perforce “ Git Fusion ” Perforce

Git git-p4

Git Perforce Perforce

GIT FUSION

Perforce Git Fusion *http://www.perforce.com/git-fusion* Perforce

Git

Git Fusion

Perforce Git Fusion *http://www.perforce.com/downloads/Perforce/20-User*

VirtualBox

Linux root per-
force git

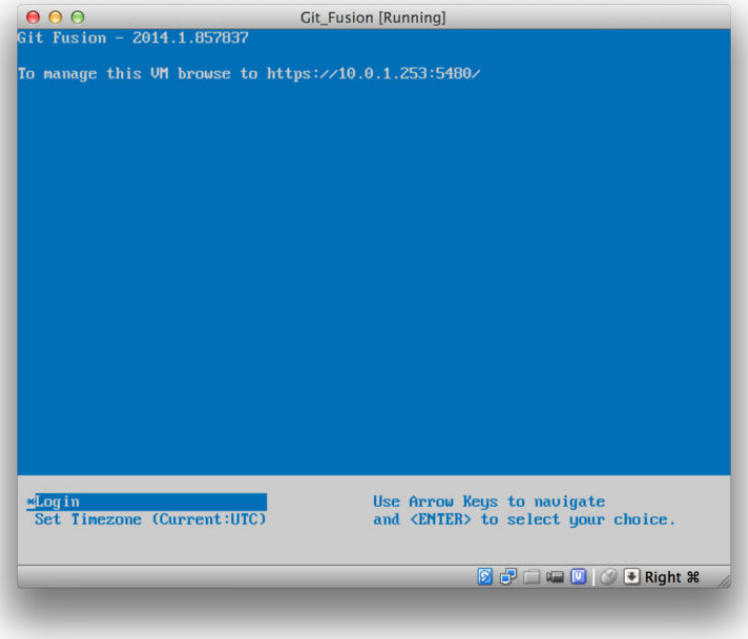


FIGURE 9-1

Git Fusion 虚拟机启动屏幕。

IP
Perforce “ Login ”
SSH root

```
$ p4 -p localhost:1666 -u super user -f john
$ p4 -p localhost:1666 -u john passwd
$ exit
```

VI

```
:wq
```

Git SSL Git Fusion
IP Git
HTTPS Perforce Git Fusion

```
$ export GIT_SSL_NO_VERIFY=true
```

```
$ git clone https://10.0.1.254/Talkhouse
Cloning into 'Talkhouse'...
Username for 'https://10.0.1.254': john
Password for 'https://john@10.0.1.254':
remote: Counting objects: 630, done.
remote: Compressing objects: 100% (581/581), done.
remote: Total 630 (delta 172), reused 0 (delta 0)
Receiving objects: 100% (630/630), 1.22 MiB | 0 bytes/s, done.
Resolving deltas: 100% (172/172), done.
Checking connectivity... done.
```

`john` HTTPS Git

Fusion
Git Fusion Perforce
Perforce `//.git-fusion`

```
$ tree
.
├── objects
│   ├── repos
│   │   └── [...]
│   └── trees
│       └── [...]
│
├── p4gf_config
├── repos
│   └── Talkhouse
│       └── p4gf_config
└── users
    └── p4gf_usermap
```

```
498 directories, 287 files
```

objects Git Fusion Perforce Git
p4gf_config
- Git Fusion

```
[repo-creation]
charset = utf8

[git-to-perforce]
change-owner = author
enable-git-branch-creation = yes
enable-swarm-reviews = yes
enable-git-merge-commits = yes
enable-git-submodules = yes
preflight-commit = none
ignore-author-permissions = no
read-permission-check = none
git-merge-avoidance-after-change-num = 12107

[perforce-to-git]
http-url = none
ssh-url = none

[@features]
imports = False
chunked-push = False
matrix2 = False
parallel-push = False

[authentication]
email-case-sensitivity = no
```

INI
Git
repos/Talkhouse/p4gf_config
[@repo]

```
[Talkhouse-master]
git-branch-name = master
view = //depot/Talkhouse/main-dev/... ...
```

Perforce Git
git-branch-name

Git view
Perforce Git

```
[multi-project-mapping]
git-branch-name = master
view = //depot/project1/main/... project1/...
       //depot/project2/mainline/... project2/...
```

Git
users/p4gf_usermap Perforce
Git Perforce
Git Git Fusion Perforce
Git author/commiter
Git author Perforce

```
john john@example.com "John Doe"
john johnny@appleseed.net "John Doe"
bob employeeX@example.com "Anon X. Mouse"
joe employeeY@example.com "Anon Y. Mouse"
```

<user> <email> "<full name>"
Perforce
Git
Perforce Perforce
Git Perforce Git
Git Bob Joe

Git

Perforce Git Fusion Perforce Git
Git “ Jam ”

```
$ git clone https://10.0.1.254/Jam
Cloning into 'Jam'...
Username for 'https://10.0.1.254': john
Password for 'https://ben@10.0.1.254':
remote: Counting objects: 2070, done.
remote: Compressing objects: 100% (1704/1704), done.
```

```
Receiving objects: 100% (2070/2070), 1.21 MiB | 0 bytes/s, done.
remote: Total 2070 (delta 1242), reused 0 (delta 0)
Resolving deltas: 100% (1242/1242), done.
Checking connectivity... done.
$ git branch -a
* master
  remotes/origin/HEAD -> origin/master
  remotes/origin/master
  remotes/origin/rel2.1
$ git log --oneline --decorate --graph --all
* 0a38c33 (origin/rel2.1) Create Jam 2.1 release branch.
| * d254865 (HEAD, origin/master, origin/HEAD, master) Upgrade to latest metrowerks on Beos
| * bd2f54a Put in fix for jam's NT handle leak.
| * c0f29e7 Fix URL in a jam doc
| * cc644ac Radstone's lynx port.
[...]
```

Git Fusion

Perforce Git

Git

Git

Git origin/master mas-

ter

```
# ...
$ git log --oneline --decorate --graph --all
* cfd46ab (HEAD, master) Add documentation for new feature
* a730d77 Whitespace
* d254865 (origin/master, origin/HEAD) Upgrade to latest metrowerks on Beos -- the Intel one
* bd2f54a Put in fix for jam's NT handle leak.
[...]
```

```
$ git fetch
remote: Counting objects: 5, done.
remote: Compressing objects: 100% (3/3), done.
remote: Total 3 (delta 2), reused 0 (delta 0)
Unpacking objects: 100% (3/3), done.
From https://10.0.1.254/Jam
   d254865..6afeb15  master     -> origin/master
$ git log --oneline --decorate --graph --all
* 6afeb15 (origin/master, origin/HEAD) Update copyright
| * cfd46ab (HEAD, master) Add documentation for new feature
```

```
| * a730d77 Whitespace
|/
* d254865 Upgrade to latest metrowerks on Beos -- the Intel one.
* bd2f54a Put in fix for jam's NT handle leak.
[...]
```

6afeb15

Perforce Git
Perforce

```
$ git merge origin/master
Auto-merging README
Merge made by the 'recursive' strategy.
 README | 2 +-
 1 file changed, 1 insertion(+), 1 deletion(-)
$ git push
Counting objects: 9, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (9/9), done.
Writing objects: 100% (9/9), 917 bytes | 0 bytes/s, done.
Total 9 (delta 6), reused 0 (delta 0)
remote: Perforce: 100% (3/3) Loading commit tree into memory...
remote: Perforce: 100% (5/5) Finding child commits...
remote: Perforce: Running git fast-export...
remote: Perforce: 100% (3/3) Checking commits...
remote: Processing will continue even if connection is closed.
remote: Perforce: 100% (3/3) Copying changelists...
remote: Perforce: Submitting new Git commit objects to Perforce: 4
To https://10.0.1.254/Jam
   6afeb15..89cba2b  master -> master
```

Git Perforce README
p4v

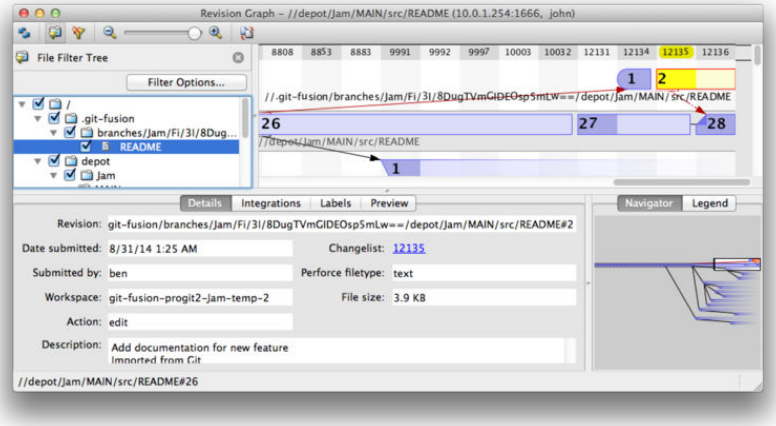


FIGURE 9-2

Git 推送后的 Perforce 版本图

Git README

2

Git Perforce

1 2 .git-fusion

“ anonymous ” Git Perforce

Perforce

Git

Perforce

Git-Fusion

Perforce Git

Fusion Git Perforce

Git Perforce -

Git Fusion - Git Fusion

Git Perforce

Perforce

Git Fusion

GIT-P4

Git-p4 Git Perforce Git
Perforce Git-
p4 Git Fusion

> 为了与 git-p4 一起工作需要在你的 PATH 环境变量中的某个目录中有 p4 工具。 在写这篇文章的时候，它可以在 *http://www.perforce.com/downloads/Perforce/20-User* 免费获得。

Git Fusion OVA Perforce
Git Fusion Perforce

p4 git-p4

```
$ export P4PORT=10.0.1.254:1666
$ export P4USER=john
```

Git

```
$ git p4 clone //depot/www/live www-shallow
Importing from //depot/www/live into www-shallow
Initialized empty Git repository in /private/tmp/www-shallow/.git/
Doing initial import of //depot/www/live/ from revision #head into refs/remotes/p4
```

Git “ shallow ”
Perforce Git Perforce
Git Perforce

Git

```
$ cd myproject
$ git log --oneline --all --graph --decorate
* 70eaf78 (HEAD, p4/master, p4/HEAD, master) Initial import of //depot/www/live/ f
```

“ p4 ” Perforce

```
$ git remote -v
```

Git-p4

git log

Git

```
$ git log --oneline --all --graph --decorate
* 018467c (HEAD, master) Change page title
* c0fb617 Update link
* 70eaf78 (p4/master, p4/HEAD) Initial import of //depot/www/live/ from the state at revisio
```

Perforce

```
$ git p4 sync
git p4 sync
Performing incremental import into refs/remotes/p4/master git branch
Depot paths: //depot/www/live/
Import destination: refs/remotes/p4/master
Importing revision 12142 (100%)
$ git log --oneline --all --graph --decorate
* 75cd059 (p4/master, p4/HEAD) Update copyright
| * 018467c (HEAD, master) Change page title
| * c0fb617 Update link
|/
* 70eaf78 Initial import of //depot/www/live/ from the state at revision #head
```

master p4/master Perforce

Git Git-p4

```
$ git p4 rebase
Performing incremental import into refs/remotes/p4/master git branch
Depot paths: //depot/www/live/
No changes to import!
Rebasing the current branch onto remotes/p4/master
First, rewinding head to replay your work on top of it...
Applying: Update link
Applying: Change page title
```

```
 index.html | 2 +-
 1 file changed, 1 insertion(+), 1 deletion(-)
```

git p4 rebase git p4 sync git rebase p4/master

Per - force git p4 submit p4/master master Git Perforce

```
# A Perforce Change Specification.
#
#  Change:      The change number. 'new' on a new changelist.
#  Date:        The date this specification was last modified.
#  Client:      The client on which the changelist was created.  Read-only.
#  User:        The user who created the changelist.
#  Status:      Either 'pending' or 'submitted'. Read-only.
#  Type:        Either 'public' or 'restricted'. Default is 'public'.
#  Description: Comments about the changelist.  Required.
#  Jobs:        What opened jobs are to be closed by this changelist.
#               You may delete jobs from this list.  (New changelists only.)
#  Files:       What opened files from the default changelist are to be added
#               to this changelist.  You may delete files from this list.
#               (New changelists only.)

Change:  new

Client:  john_bens-mbp_8487

User: john

Status:  new

Description:
   Update link

Files:
   //depot/www/live/index.html   # edit


######## git author ben@straub.cc does not match your p4 account.
######## Use option --preserve-user to modify authorship.
######## Variable git-p4.skipUserNameCheck hides this message.
######## everything below this line is just the diff #######
--- //depot/www/live/index.html  2014-08-31 18:26:05.000000000 0000
+++ /Users/ben/john_bens-mbp_8487/john_bens-mbp_8487/depot/www/live/index.html   2
```

```
@@ -60,7 +60,7 @@
 </td>
 <td valign=top>
 Source and documentation for
-<a href="http://www.perforce.com/jam/jam.html">
+<a href="jam.html">
 Jam/MR</a>,
 a software build tool.
 </td>
```

git-p4 p4 submit
git-p4
Git Perforce
Perforce

Git-p4 Git Perforce
shell

```
$ git p4 submit
Perforce checkout for depot path //depot/www/live/ located at /Users/ben/john_bens-mbp_8487/
Synchronizing p4 checkout...
... - file(s) up-to-date.
Applying dbac45b Update link
//depot/www/live/index.html#4 - opened for edit
Change 12143 created with 1 open file(s).
Submitting change 12143.
Locking 1 files ...
edit //depot/www/live/index.html#5
Change 12143 submitted.
Applying 905ec6a Change page title
//depot/www/live/index.html#5 - opened for edit
Change 12144 created with 1 open file(s).
Submitting change 12144.
Locking 1 files ...
edit //depot/www/live/index.html#6
Change 12144 submitted.
All commits applied!
Performing incremental import into refs/remotes/p4/master git branch
Depot paths: //depot/www/live/
Import destination: refs/remotes/p4/master
Importing revision 12144 (100%)
Rebasing the current branch onto remotes/p4/master
First, rewinding head to replay your work on top of it...
$ git log --oneline --all --graph --decorate
* 775a46f (HEAD, p4/master, p4/HEAD, master) Change page title
* 05f1ade Update link
```

```
* 75cd059 Update copyright
* 70eaf78 Initial import of //depot/www/live/ from the state at revision #head
```

`git push`

Git Perforce
`git p4 submit`
SHA-1
git-p4

```
$ git log -1
commit 775a46f630d8b46535fc9983cf3ebe6b9aa53145
Author: John Doe <john@example.com>
Date:   Sun Aug 31 10:31:44 2014 -0800

    Change page title

    [git-p4: depot-paths = "//depot/www/live/": change = 12144]
```

```
$ git log --oneline --all --graph --decorate
* 3be6fd8 (HEAD, master) Correct email address
*   1dcbf21 Merge remote-tracking branch 'p4/master'
|\
| * c4689fc (p4/master, p4/HEAD) Grammar fix
* | cbacd0a Table borders: yes please
* | b4959b6 Trademark
|/
* 775a46f Change page title
* 05f1ade Update link
* 75cd059 Update copyright
* 70eaf78 Initial import of //depot/www/live/ from the state at revision #head
```

Git Perforce 775a46f Git
Perforce
Perforce

```
$ git p4 submit -n
Perforce checkout for depot path //depot/www/live/ located at /Users/ben/john_bens
```

```
Would synchronize p4 checkout in /Users/ben/john_bens-mbp_8487/john_bens-mbp_8487/depot/www/
Would apply
  b4959b6 Trademark
  cbacd0a Table borders: yes please
  3be6fd8 Correct email address
```

`-n` `--dry-run`

Perforce

Perforce

```
$ git p4 submit
[…]
$ git log --oneline --all --graph --decorate
* dadbd89 (HEAD, p4/master, p4/HEAD, master) Correct email address
* 1b79a80 Table borders: yes please
* 0097235 Trademark
* c4689fc Grammar fix
* 775a46f Change page title
* 05f1ade Update link
* 75cd059 Update copyright
* 70eaf78 Initial import of //depot/www/live/ from the state at revision #head
```

Git

Perforce

Perforce

Perforce git-p4

Git Perforce

```
//depot
  └── project
      ├── main
      └── dev
```

dev

```
//depot/project/main/... //depot/project/dev/...
```

Git-p4

```
$ git p4 clone --detect-branches //depot/project@all
Importing from //depot/project@all into project
Initialized empty Git repository in /private/tmp/project/.git/
Importing revision 20 (50%)
    Importing new branch project/dev

    Resuming with change 20
Importing revision 22 (100%)
Updated branches: main dev
$ cd project; git log --oneline --all --graph --decorate
* eae77ae (HEAD, p4/master, p4/HEAD, master) main
| * 10d55fb (p4/project/dev) dev
| * a43cfae Populate //depot/project/main/... //depot/project/dev/....
|/
* 2b83451 Project init
```

“ @all ” git-p4

Git

`--detect-branches` git-p4 Perforce Git Perforce Perforce git-p4

```
$ git init project
Initialized empty Git repository in /tmp/project/.git/
$ cd project
$ git config git-p4.branchList main:dev
$ git clone --detect-branches //depot/project@all .
```

`git-p4.branchList` `main:dev` git-p4 “ main ” “ dev ”

`git checkout -b dev p4/project/dev`

`git p4 submit` git-p4 git-p4 shallow

`git p4 clone`

Perforce Git-p4 Git

GIT 与 PERFORCE 总结

Git-p4 Perforce Git
Perforce
Git Git
Perforce
Perforce Git
Git Fusion Git Fusion Git Perforce

Git TFS

Git Windows Windows
Microsoft Team Foundation Server (TFS)
TFS Scrum
TFS
Git VCS **TFVC**
Team Foundation Version Control Git TFS 2013
“ TFS ”
TFVC
TFVC Git

选择哪个工具

git-tf git-tfs
Git-tfs *https://github.com/git-tfs/git-tfs* .NET
Windows Git
libgit2 .NET Git
Libgit2 Git git-tfs
Git Git
Visual Studio
TFVC
Visual Studio 2010
2012 Express Visual Studio SDK
Git-tf *https://gittf.codeplex.com* Java
Java JGit Git
JVM Git Git
git-tfs TFVC -

> 你需要有一个基于 TFVC 的仓库来执行后续的指令。 现实中它们并没有 Git 或 Subversion 仓库那样多，所以你可能需要创建一个你自己的仓库。 Codeplex (*https://www.codeplex.com*) 或 Visual Studio Online (*http://www.visualstudio.com*) 都是非常好的选择。

使用：GIT-TF

Git git-tf

```
$ git tf clone https://tfs.codeplex.com:443/tfs/TFS13 $/myproject/Main project_git
```

TFVC URL $/project/branch Git Git-tf TFVC Git

```
$ cd project_git
$ git log --all --oneline --decorate
512e75a (HEAD, tag: TFS_C35190, origin_tfs/tfs, master) Checkin message
```

TFVC git-tf

--deep

```
$ git tf clone https://tfs.codeplex.com:443/tfs/TFS13 $/myproject/Main \
  project_git --deep
Username: domain\user
Password:
Connecting to TFS...
Cloning $/myproject into /tmp/project_git: 100%, done.
Cloned 4 changesets. Cloned last changeset 35190 as d44b17a
$ cd project_git
$ git log --all --oneline --decorate
d44b17a (HEAD, tag: TFS_C35190, origin_tfs/tfs, master) Goodbye
126aa7b (tag: TFS_C35189)
8f77431 (tag: TFS_C35178) FIRST
```

```
0745a25 (tag: TFS_C35177) Created team project folder $/tfvctest via the \
        Team Project Creation Wizard
```

TFS_C35189 Git
TFVC
log TFVC
git config git-tf.tag false
- git-tf .git/git-tf

使用：GIT-TFS

Git-tfs

```
PS> git tfs clone --with-branches \
    https://username.visualstudio.com/DefaultCollection \
    $/project/Trunk project_git
Initialized empty Git repository in C:/Users/ben/project_git/.git/
C15 = b75da1aba1ffb359d00e85c52acb261e4586b0c9
C16 = c403405f4989d73a2c3c119e79021cb2104ce44a
Tfs branches found:
- $/tfvc-test/featureA
The name of the local branch will be : featureA
C17 = d202b53f67bde32171d5078968c644e562f1c439
C18 = 44cd729d8df868a8be20438fdeeefb961958b674
```

--with-branches Git-tfs TFVC Git
TFVC Git
TFS
TFS 2010 - “ ”
git-tfs
Git

```
PS> git log --oneline --graph --decorate --all
* 44cd729 (tfs/featureA, featureA) Goodbye
* d202b53 Branched from $/tfvc-test/Trunk
* c403405 (HEAD, tfs/default, master) Hello
* b75da1a New project
PS> git log -1
commit c403405f4989d73a2c3c119e79021cb2104ce44a
Author: Ben Straub <ben@straub.cc>
Date:   Fri Aug 1 03:41:59 2014 +0000

    Hello

    git-tfs-id: [https://username.visualstudio.com/DefaultCollection]$/myproject/Trunk;C16
```

master featureA TFVC
Trunk TFVC featureA tfs
“ remote ” default featureA TFVC Git-
tfs tfs/default
git-tfs-id: Git-tfs
TFVC Git
Git TFVC SHA-1

GIT-TF[S] 工作流程

无论你使用哪个工具，都需要先设置几个 Git 配置选项来避免一些问题。

```
$ git config set --local core.ignorecase=true
$ git config set --local core.autocrlf=false
```

TFVC TFS

1. TFVC
TFVC Git
2. TFVC “ ”

TFVC
3. TFS “ ” TFS -
TFVC “ shelve ”
git-tf git-tfs
checkintool

工作流程：GIT-TF

master Git
Git

```
$ git log --oneline --graph --decorate --all
* 4178a82 (HEAD, master) update code
* 9df2ae3 update readme
* d44b17a (tag: TFS_C35190, origin_tfs/tfs) Goodbye
* 126aa7b (tag: TFS_C35189)
* 8f77431 (tag: TFS_C35178) FIRST
```

```
* 0745a25 (tag: TFS_C35177) Created team project folder $/tfvctest via the \
          Team Project Creation Wizard
```

4178a82 TFVC

```
$ git tf fetch
Username: domain\user
Password:
Connecting to TFS...
Fetching $/myproject at latest changeset: 100%, done.
Downloaded changeset 35320 as commit 8ef06a8. Updated FETCH_HEAD.
$ git log --oneline --graph --decorate --all
* 8ef06a8 (tag: TFS_C35320, origin_tfs/tfs) just some text
| * 4178a82 (HEAD, master) update code
| * 9df2ae3 update readme
|/
* d44b17a (tag: TFS_C35190) Goodbye
* 126aa7b (tag: TFS_C35189)
* 8f77431 (tag: TFS_C35178) FIRST
* 0745a25 (tag: TFS_C35177) Created team project folder $/tfvctest via the \
          Team Project Creation Wizard
```

Git

1. Git git pull git-tf git tf pull TFVC

2. Git TFVC git-tf git tf pull --rebase

```
$ git rebase FETCH_HEAD
First, rewinding head to replay your work on top of it...
Applying: update readme
Applying: update code
$ git log --oneline --graph --decorate --all
* 5a0e25e (HEAD, master) update code
* 6eb3eb5 update readme
```

```
* 8ef06a8 (tag: TFS_C35320, origin_tfs/tfs) just some text
* d44b17a (tag: TFS_C35190) Goodbye
* 126aa7b (tag: TFS_C35189)
* 8f77431 (tag: TFS_C35178) FIRST
* 0745a25 (tag: TFS_C35177) Created team project folder $/tfvctest via the \
          Team Project Creation Wizard
```

TFVC Git-tf
`--shallow`
Git `--deep`

```
$ git tf checkin -m 'Updating readme and code'
Username: domain\user
Password:
Connecting to TFS...
Checking in to $/myproject: 100%, done.
Checked commit 5a0e25e in as changeset 35348
$ git log --oneline --graph --decorate --all
* 5a0e25e (HEAD, tag: TFS_C35348, origin_tfs/tfs, master) update code
* 6eb3eb5 update readme
* 8ef06a8 (tag: TFS_C35320) just some text
* d44b17a (tag: TFS_C35190) Goodbye
* 126aa7b (tag: TFS_C35189)
* 8f77431 (tag: TFS_C35178) FIRST
* 0745a25 (tag: TFS_C35177) Created team project folder $/tfvctest via the \
          Team Project Creation Wizard
```

TFS_C35348 TFVC
`5a0e25e` Git
TFVC `6eb3eb5`

- Git-tf TFVC Git
- TFVC Git TFVC
  git-tf SHA-1
- Git TFVC
  Git TFVC

工作流程：GIT-TFS

git-tfs Git `master`

```
PS> git log --oneline --graph --all --decorate
* c3bd3ae (HEAD, master) update code
* d85e5a2 update readme
| * 44cd729 (tfs/featureA, featureA) Goodbye
| * d202b53 Branched from $/tfvc-test/Trunk
|/
* c403405 (tfs/default) Hello
* b75da1a New project
```

```
PS> git tfs fetch
C19 = aea74a0313de0a391940c999e51c5c15c381d91d
PS> git log --all --oneline --graph --decorate
* aea74a0 (tfs/default) update documentation
| * c3bd3ae (HEAD, master) update code
| * d85e5a2 update readme
|/
| * 44cd729 (tfs/featureA, featureA) Goodbye
| * d202b53 Branched from $/tfvc-test/Trunk
|/
* c403405 Hello
* b75da1a New project
```

TFVC

aea74a0 tfs/default

git-tf

1.
2.

“ ” Git

TFVC

```
PS> git rebase tfs/default
First, rewinding head to replay your work on top of it...
Applying: update readme
Applying: update code
PS> git log --all --oneline --graph --decorate
* 10a75ac (HEAD, master) update code
* 5cec4ab update readme
* aea74a0 (tfs/default) update documentation
| * 44cd729 (tfs/featureA, featureA) Goodbye
| * d202b53 Branched from $/tfvc-test/Trunk
|/
* c403405 Hello
* b75da1a New project
```

TFVC
rcheckin HEAD tfs
Git TFVC checkin
Git

```
PS> git tfs rcheckin
Working with tfs remote: default
Fetching changes from TFS to minimize possibility of late conflict...
Starting checkin of 5cec4ab4 'update readme'
 add README.md
C20 = 71a5ddce274c19f8fdc322b4f165d93d89121017
Done with 5cec4ab4b213c354341f66c80cd650ab98dcf1ed, rebasing tail onto new TFS-commi
Rebase done successfully.
Starting checkin of b1bf0f99 'update code'
 edit .git\tfs\default\workspace\ConsoleApplication1/ConsoleApplication1/Program.cs
C21 = ff04e7c35dfbe6a8f94e782bf5e0031cee8d103b
Done with b1bf0f9977b2d48bad611ed4a03d3738df05ea5d, rebasing tail onto new TFS-commi
Rebase done successfully.
No more to rcheckin.
PS> git log --all --oneline --graph --decorate
* ff04e7c (HEAD, tfs/default, master) update code
* 71a5ddc update readme
* aea74a0 update documentation
| * 44cd729 (tfs/featureA, featureA) Goodbye
| * d202b53 Branched from $/tfvc-test/Trunk
|/
* c403405 Hello
* b75da1a New project
```

TFVC git-tfs
git-tfs-id
SHA-1
Git
TFS

git-tfs

```
PS> git tfs checkintool
PS> git tfs ct
```

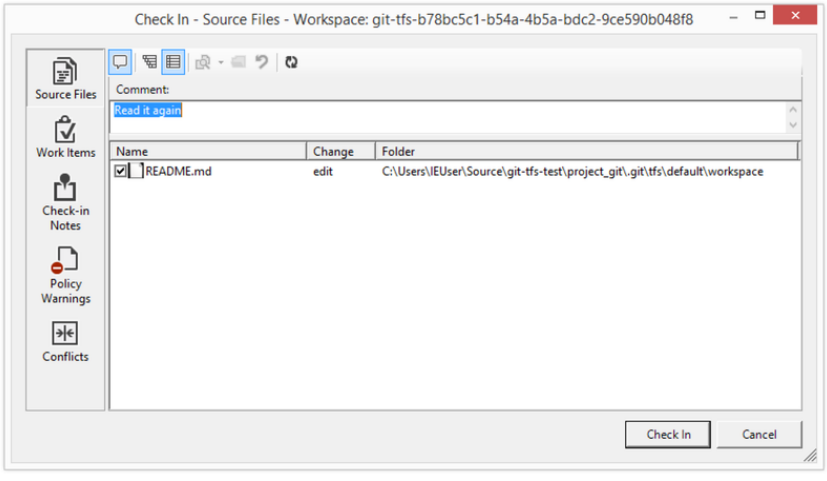


FIGURE 9-3

git-tfs 检入工具。

TFS Visual Studio

Git-tfs Git TFVC

```
PS> git tfs branch $/tfvc-test/featureBee
The name of the local branch will be : featureBee
C26 = 1d54865c397608c004a2cadce7296f5edc22a7e5
PS> git log --oneline --graph --decorate --all
* 1d54865 (tfs/featureBee) Creation branch $/myproject/featureBee
* ff04e7c (HEAD, tfs/default, master) update code
* 71a5ddc update readme
* aea74a0 update documentation
| * 44cd729 (tfs/featureA, featureA) Goodbye
| * d202b53 Branched from $/tfvc-test/Trunk
|/
* c403405 Hello
* b75da1a New project
```

TFVC

Git git-tfs tfs/featureBee

HEAD master

1d54865

GIT 与 TFS 总结

Git-tf Git-tfs TFVC
Git TFVC
Git Windows
TFS git-tfs
git-
tf
- Git TFVC

迁移到 Git

VCS
Git Git

SCM

Subversion

`git svn` `git`
`svn clone` Subversion Git
Subversion

Subversion

`schacon` `blame` `git svn`
`log` Subversion Git
Subversion Git `users.txt`

```
schacon = Scott Chacon <schacon@geemail.com>
selse = Someo Nelse <selse@geemail.com>
```

SVN

```
$ svn log --xml | grep author | sort -u | \
  perl -pe 's/.*>(.*?)<.*/$1 = /'
```

XML
XML grep sort perl
users.txt
Git
git svn
--no-metadata clone init git svn
Subversion import

```
$ git svn clone http://my-project.googlecode.com/svn/ \
      --authors-file=users.txt --no-metadata -s my_project
```

my_project Subversion

```
commit 37efa680e8473b615de980fa935944215428a35a
Author: schacon <schacon@4c93b258-373f-11de-be05-5f7a86268029>
Date:   Sun May 3 00:12:22 2009 +0000

    fixed install - go to trunk

    git-svn-id: https://my-project.googlecode.com/svn/trunk@94 4c93b258-373f-11de-
    be05-5f7a86268029



commit 03a8785f44c8ea5cdb0e8834b7c8e6c469be2ff2
Author: Scott Chacon <schacon@geemail.com>
Date:   Sun May 3 00:12:22 2009 +0000

    fixed install - go to trunk
```

Author git-svn-id
git svn

Git

```
$ cp -Rf .git/refs/remotes/origin/tags/* .git/refs/tags/
$ rm -Rf .git/refs/remotes/origin/tags
```

remotes/origin/tags/

refs/remotes

```
$ cp -Rf .git/refs/remotes/* .git/refs/heads/
$ rm -Rf .git/refs/remotes
```

Git

Git Git

```
$ git remote add origin git@my-git-server:myrepository.git
```

```
$ git push origin --all
```

Git

Mercurial

Mercurial Git Git

Mercurial Git

“ hg-fast-export ”

```
$ git clone http://repo.or.cz/r/fast-export.git /tmp/fast-export
```

Mercurial

```
$ hg clone <remote repo URL> /tmp/hg-repo
```

Mercurial

Git bash

```
$ cd /tmp/hg-repo
$ hg log | grep user: | sort | uniq | sed 's/user: *//' > ../authors
```

/tmp/authors

```
bob
bob@localhost
bob <bob@company.com>
bob jones <bob <AT> company <DOT> com>
Bob Jones <bob@company.com>
Joe Smith <joe@company.com>
```

Bob
Git Hg-fast-export
={new name and email address}

```
bob=Bob Jones <bob@company.com>
bob@localhost=Bob Jones <bob@company.com>
bob jones <bob <AT> company <DOT> com>=Bob Jones <bob@company.com>
bob <bob@company.com>=Bob Jones <bob@company.com>
```

Git

```
$ git init /tmp/converted
$ cd /tmp/converted
$ /tmp/fast-export/hg-fast-export.sh -r /tmp/hg-repo -A /tmp/authors
```

-r hg-fast-export Mercurial
-A Mercurial
Git “ fast-import ”

```
$ /tmp/fast-export/hg-fast-export.sh -r /tmp/hg-repo -A /tmp/authors
Loaded 4 authors
master: Exporting full revision 1/22208 with 13/0/0 added/changed/removed files
master: Exporting simple delta revision 2/22208 with 1/1/0 added/changed/removed files
master: Exporting simple delta revision 3/22208 with 0/1/0 added/changed/removed files
[…]
master: Exporting simple delta revision 22206/22208 with 0/4/0 added/changed/removed files
master: Exporting simple delta revision 22207/22208 with 0/2/0 added/changed/removed files
master: Exporting thorough delta revision 22208/22208 with 3/213/0 added/changed/removed fil
Exporting tag [0.4c] at [hg r9] [git :10]
```

```
Exporting tag [0.4d] at [hg r16] [git :17]
[…]
Exporting tag [3.1-rc] at [hg r21926] [git :21927]
Exporting tag [3.1] at [hg r21973] [git :21974]
Issued 22315 commands
git-fast-import statistics:
---------------------------------------------------------------------
Alloc'd objects:     120000
Total objects:       115032 (    208171 duplicates                  )
      blobs  :        40504 (    205320 duplicates      26117 deltas of      39602
      trees  :        52320 (      2851 duplicates      47467 deltas of      47599
      commits:        22208 (         0 duplicates          0 deltas of          0
      tags   :            0 (         0 duplicates          0 deltas of          0
Total branches:         109 (         2 loads     )
      marks:        1048576 (     22208 unique    )
      atoms:           1952
Memory total:          7860 KiB
       pools:          2235 KiB
     objects:          5625 KiB
---------------------------------------------------------------------
pack_report: getpagesize()            =       4096
pack_report: core.packedGitWindowSize = 1073741824
pack_report: core.packedGitLimit      = 8589934592
pack_report: pack_used_ctr            =      90430
pack_report: pack_mmap_calls          =      46771
pack_report: pack_open_windows        =          1 /          1
pack_report: pack_mapped              =  340852700 /  340852700
---------------------------------------------------------------------

$ git shortlog -sn
   369  Bob Jones
   365  Joe Smith
```

Mercurial Git Mercurial Git

```
$ git remote add origin git@my-git-server:myrepository.git
$ git push origin --all
```

Perforce

Perforce Git Perforce git-p4 Perforce Git Fusion

PERFORCE GIT FUSION

Git Fusion “ Git Fusion ”
Git
Fusion Git
Git
Perforce Git

GIT-P4

Git-p4 Perforce
Jam P4PORT
Perforce

```
$ export P4PORT=public.perforce.com:1666
```

为了继续后续步骤，需要连接到 Perforce 仓库。 在我们的例子中将会使用在 public.perforce.com 的公开仓库，但是你可以使用任何你有权限的仓库。

`git p4 clone` Perforce Jam

```
$ git-p4 clone //guest/perforce_software/jam@all p4import
Importing from //guest/perforce_software/jam@all into p4import
Initialized empty Git repository in /private/tmp/p4import/.git/
Import destination: refs/remotes/p4/master
Importing revision 9957 (100%)
```

`--detect-branches` `git p4 clone`
“ ”

`p4import` `git log`

```
$ git log -2
commit e5da1c909e5db3036475419f6379f2c73710c4e6
Author: giles <giles@giles@perforce.com>
Date:   Wed Feb 8 03:13:27 2012 -0800

    Correction to line 355; change </UL> to </OL>.
```

```
    [git-p4: depot-paths = "//public/jam/src/": change = 8068]

commit aa21359a0a135dda85c50a7f7cf249e4f7b8fd98
Author: kwirth <kwirth@perforce.com>
Date:   Tue Jul 7 01:35:51 2009 -0800

    Fix spelling error on Jam doc page (cummulative -> cumulative).

    [git-p4: depot-paths = "//public/jam/src/": change = 7304]
```

git-p4
Perforce
-
git filter-branch

```
$ git filter-branch --msg-filter 'sed -e "/^\[git-p4:/d"'
Rewrite e5da1c909e5db3036475419f6379f2c73710c4e6 (125/125)
Ref 'refs/heads/master' was rewritten
```

git log SHA-1
git-p4

```
$ git log -2
commit b17341801ed838d97f7800a54a6f9b95750839b7
Author: giles <giles@giles@perforce.com>
Date:   Wed Feb 8 03:13:27 2012 -0800

    Correction to line 355; change </UL> to </OL>.

commit 3e68c2e26cd89cb983eb52c024ecdfba1d6b3fff
Author: kwirth <kwirth@perforce.com>
Date:   Tue Jul 7 01:35:51 2009 -0800

    Fix spelling error on Jam doc page (cummulative -> cumulative).
```

Git

TFS

TFVC Git
git-tfs

git-tf git-tfs git-tfs
git-tf

> 这是一个单向转换。 这意味着 Git 仓库无法连接到原始的 TFVC 项目。

TFVC
Git tf

```
PS> tf history $/myproject -recursive > AUTHORS_TMP
```

AUTHORS_TMP
User
cut 11-20

```
PS> cat AUTHORS_TMP | cut -b 11-20 | tail -n+3 | uniq | sort > AUTHORS
```

cut 11 22 tail
ASCII
uniq AUTOHRS
git-tfs

```
DOMAIN\username = User Name <email@address.com>
```

TFVC “ User ” Git

TFVC

```
PS> git tfs clone --with-branches --authors=AUTHORS https://username.visualstudio.com/Default
```

git-tfs-id

```
PS> git filter-branch -f --msg-filter 'sed "s/^git-tfs-id:.*$//g"' -- --all
```

Git sed “ git-tfs-id: ”
Git

Git

-
CVS Clear Case Visual Source
Safe
git fast-
import Git
Git Git
Chapter 10

git fast-import
current
back_YYYY_MM_DD
Git

```
$ ls /opt/import_from
back_2014_01_02
back_2014_01_04
back_2014_01_14
back_2014_02_03
current
```

Git Git
Git
fast-import

“ ” Ruby

- 标
准输出 Windows
- git fast-import LF Win -
dows CRLF

```
last_mark = nil

# loop through the directories
Dir.chdir(ARGV[0]) do
  Dir.glob("*").each do |dir|
    next if File.file?(dir)
```

```
    # move into the target directory
    Dir.chdir(dir) do
      last_mark = print_export(dir, last_mark)
    end
  end
end
```

print_export

“ ” fast-import

print_export

```
mark = convert_dir_to_mark(dir)
```

```
$marks = []
def convert_dir_to_mark(dir)
  if !$marks.include?(dir)
    $marks << dir
  end
  ($marks.index(dir) + 1).to_s
end
```

print_export

```
date = convert_dir_to_date(dir)
```

convert_dir_to_date

```
def convert_dir_to_date(dir)
  if dir == 'current'
    return Time.now().to_i
  else
    dir = dir.gsub('back_', '')
    (year, month, day) = dir.split('_')
    return Time.local(year, month, day).to_i
  end
end
```

```
$author = 'John Doe <john@example.com>'
```

```
# print the import information
puts 'commit refs/heads/master'
puts 'mark :' + mark
puts "committer #{$author} #{date} -0700"
export_data('imported from ' + dir)
puts 'from :' + last_mark if last_mark
```

-0700

```
data (size)\n(contents)
```

export_data

```
def export_data(string)
  print "data #{string.size}\n#{string}"
end
```

- deleteall
Git

```
puts 'deleteall'
Dir.glob("**/*").each do |file|
  next if !File.file?(file)
  inline_data(file)
end
```

fast-import

- Git
fast-import man

```
M 644 inline path/to/file
data (size)
(file contents)
```

644
755 inline inline_data

```
def inline_data(file, code = 'M', mode = '644')
  content = File.read(file)
  puts "#{code} #{mode} inline #{file}"
  export_data(content)
end
```

export_data

```
return mark
```

如果在 Windows 上还需要确保增加一个额外步骤。 正如之前提到的，Windows 使用 CRLF 作为换行符而 git fast-import 只接受 LF。 为了修正这个问题使 git fast-import 正常工作，你需要告诉 ruby 使用 LF 代替 CRLF：

```
$stdout.binmode
```

```
#!/usr/bin/env ruby

$stdout.binmode
$author = "John Doe <john@example.com>"

$marks = []
def convert_dir_to_mark(dir)
    if !$marks.include?(dir)
        $marks << dir
    end
    ($marks.index(dir)+1).to_s
end


def convert_dir_to_date(dir)
    if dir == 'current'
        return Time.now().to_i
    else
        dir = dir.gsub('back_', '')
```

```
        (year, month, day) = dir.split('_')
        return Time.local(year, month, day).to_i
    end
end

def export_data(string)
    print "data #{string.size}\n#{string}"
end

def inline_data(file, code='M', mode='644')
    content = File.read(file)
    puts "#{code} #{mode} inline #{file}"
    export_data(content)
end

def print_export(dir, last_mark)
    date = convert_dir_to_date(dir)
    mark = convert_dir_to_mark(dir)

    puts 'commit refs/heads/master'
    puts "mark :#{mark}"
    puts "committer #{$author} #{date} -0700"
    export_data("imported from #{dir}")
    puts "from :#{last_mark}" if last_mark

    puts 'deleteall'
    Dir.glob("**/*").each do |file|
        next if !File.file?(file)
        inline_data(file)
    end
    mark
end


# Loop through the directories
last_mark = nil
Dir.chdir(ARGV[0]) do
    Dir.glob("*").each do |dir|
        next if File.file?(dir)

        # move into the target directory
        Dir.chdir(dir) do
            last_mark = print_export(dir, last_mark)
        end
    end
end
```

```
$ ruby import.rb /opt/import_from
commit refs/heads/master
mark :1
committer John Doe <john@example.com> 1388649600 -0700
data 29
imported from back_2014_01_02deleteall
M 644 inline README.md
data 28
# Hello

This is my readme.
commit refs/heads/master
mark :2
committer John Doe <john@example.com> 1388822400 -0700
data 29
imported from back_2014_01_04from :1
deleteall
M 644 inline main.rb
data 34
#!/bin/env ruby

puts "Hey there"
M 644 inline README.md
(...)
```

Git

`git fast-import` `git init`

```
$ git init
Initialized empty Git repository in /opt/import_to/.git/
$ ruby import.rb /opt/import_from | git fast-import
git-fast-import statistics:
---------------------------------------------------------------------
Alloc'd objects:       5000
Total objects:           13 (         6 duplicates                  )
      blobs  :            5 (         4 duplicates          3 deltas of          5 attempts)
      trees  :            4 (         1 duplicates          0 deltas of          4 attempts)
      commits:            4 (         1 duplicates          0 deltas of          0 attempts)
      tags   :            0 (         0 duplicates          0 deltas of          0 attempts)
Total branches:           1 (         1 loads     )
      marks:           1024 (         5 unique    )
      atoms:              2
Memory total:          2344 KiB
       pools:          2110 KiB
     objects:           234 KiB
---------------------------------------------------------------------
```

```
pack_report: getpagesize()            =       4096
pack_report: core.packedGitWindowSize = 1073741824
pack_report: core.packedGitLimit      = 8589934592
pack_report: pack_used_ctr            =         10
pack_report: pack_mmap_calls          =          5
pack_report: pack_open_windows        =          2 /          2
pack_report: pack_mapped              =       1457 /       1457
------------------------------------------------------------------------
```

13 4 1

git log

```
$ git log -2
commit 3caa046d4aac682a55867132ccdfbe0d3fdee498
Author: John Doe <john@example.com>
Date:   Tue Jul 29 19:39:04 2014 -0700

    imported from current

commit 4afc2b945d0d3c8cd00556fbe2e8224569dc9def
Author: John Doe <john@example.com>
Date:   Mon Feb 3 01:00:00 2014 -0700

    imported from back_2014_02_03
```

- Git

-

master

```
$ ls
$ git reset --hard master
HEAD is now at 3caa046 imported from current
$ ls
README.md main.rb
```

fast-import -

Git contrib/fast-import

总结

Git

Git

Git

Git 内部原理 10

—

Git

Git

Git content-addressable

Git 1.5

Git

—

底层命令和高层命令

checkout branch remote 30
Git Git

UNIX

“ plumbing ” “ por -
celain ”

Git Git

`git init` Git `.git` Git

```
$ ls -F1
HEAD
config*
description
hooks/
info/
objects/
refs/
```

`git init` `description` GitWeb `config` `info` global exclude .gi - tignore ignored patterns `hooks` hook scripts “ Git ”

`HEAD` `index` `objects` `refs` Git `objects` `refs` `HEAD` `index` Git

Git 对象

Git Git key-value data store

retrieve `hash-object` — `.git` Git `objects`

```
$ git init test
Initialized empty Git repository in /tmp/test/.git/
$ cd test
$ find .git/objects
.git/objects
```

```
.git/objects/info
.git/objects/pack
$ find .git/objects -type f
```

Git objects pack info
Git

```
$ echo 'test content' | git hash-object -w --stdin
d670460b4b4aece5915caf5c68d12f560a9fe3e4
```

-w hash-object
--stdin

40 SHA-1 —
header SHA-1
Git

```
$ find .git/objects -type f
.git/objects/d6/70460b4b4aece5915caf5c68d12f560a9fe3e4
```

objects Git
— SHA-1
38

cat-file Git
Git cat-file -p

```
$ git cat-file -p d670460b4b4aece5915caf5c68d12f560a9fe3e4
test content
```

Git

```
$ echo 'version 1' > test.txt
$ git hash-object -w test.txt
83baae61804e65cc73a7201a7252750c76066a30
```

```
$ echo 'version 2' > test.txt
$ git hash-object -w test.txt
1f7a7a472abf3dd9643fd615f6da379c4acb3e3a
```

```
$ find .git/objects -type f
.git/objects/1f/7a7a472abf3dd9643fd615f6da379c4acb3e3a
.git/objects/83/baae61804e65cc73a7201a7252750c76066a30
.git/objects/d6/70460b4b4aece5915caf5c68d12f560a9fe3e4
```

```
$ git cat-file -p 83baae61804e65cc73a7201a7252750c76066a30 > test.txt
$ cat test.txt
version 1
```

```
$ git cat-file -p 1f7a7a472abf3dd9643fd615f6da379c4acb3e3a > test.txt
$ cat test.txt
version 2
```

SHA-1

—

blob object

`cat-file -t` Git

SHA-1

```
$ git cat-file -t 1f7a7a472abf3dd9643fd615f6da379c4acb3e3a
blob
```

tree object

Git UNIX

UNIX
inodes tree en -
try SHA-1

```
$ git cat-file -p master^{tree}
100644 blob a906cb2a4a904a152e80877d4088654daad0c859      README
100644 blob 8f94139338f9404f26296befa88755fc2598c289      Rakefile
040000 tree 99f1a6d12cb4b6f19c8655fca46c3ecf317074e0      lib
```

`master^{tree}` `master`
`lib`

```
$ git cat-file -p 99f1a6d12cb4b6f19c8655fca46c3ecf317074e0
100644 blob 47c6340d6459e05787f644c2447d2595f5d3a54b      simplegit.rb
```

Git

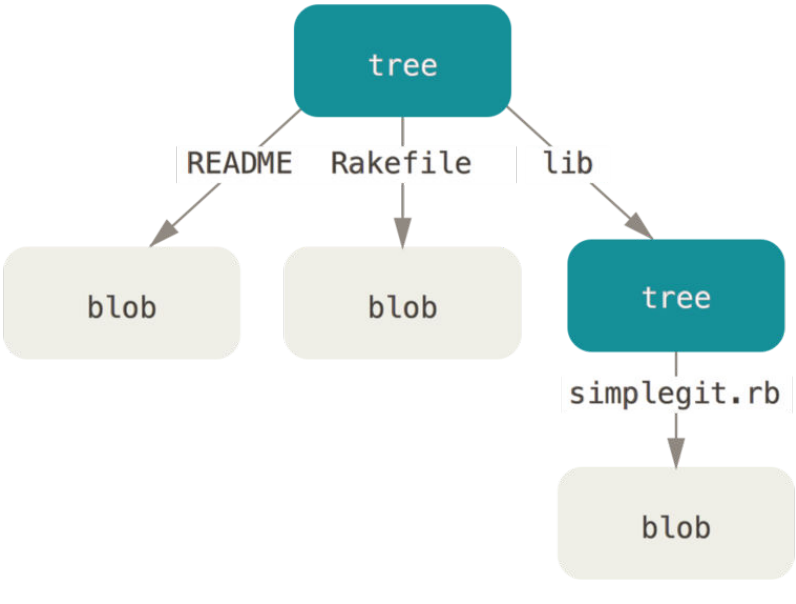


FIGURE 10-1

简化版的 Git 数据模型。

Git in -
dex

update-index — test.txt —
test.txt
--add
--
cacheinfo Git
SHA-1

```
$ git update-index --add --cacheinfo 100644 \
  83baae61804e65cc73a7201a7252750c76066a30 test.txt
```

100644
100755 120000
UNIX —
Git

write-tree
-w — write-
tree

```
$ git write-tree
d8329fc1cc938780ffdd9f94e0d364e0ea74f579
$ git cat-file -p d8329fc1cc938780ffdd9f94e0d364e0ea74f579
100644 blob 83baae61804e65cc73a7201a7252750c76066a30      test.txt
```

```
$ git cat-file -t d8329fc1cc938780ffdd9f94e0d364e0ea74f579
tree
```

test.txt

```
$ echo 'new file' > new.txt
$ git update-index test.txt
$ git update-index --add new.txt
```

test.txt new.txt

```
$ git write-tree
0155eb4229851634a0f03eb265b69f5a2d56f341
$ git cat-file -p 0155eb4229851634a0f03eb265b69f5a2d56f341
100644 blob fa49b077972391ad58037050f2a75f74e3671e92      new.txt
100644 blob 1f7a7a472abf3dd9643fd615f6da379c4acb3e3a      test.txt
```

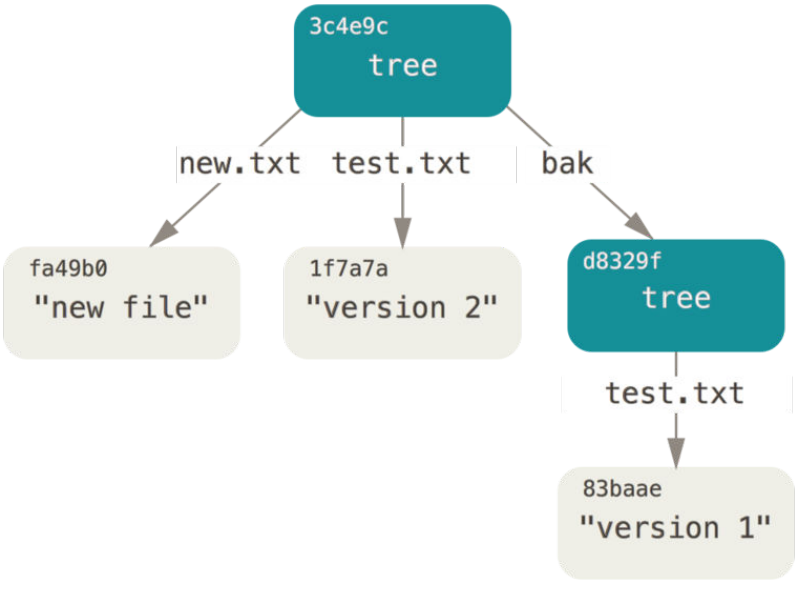
test.txt SHA-1
1f7a7a “ ”
read-
tree read-tree
--prefix

```
$ git read-tree --prefix=bak d8329fc1cc938780ffdd9f94e0d364e0ea74f579
$ git write-tree
3c4e9cd789d88d8d89c1073707c3585e41b0e614
$ git cat-file -p 3c4e9cd789d88d8d89c1073707c3585e41b0e614
040000 tree d8329fc1cc938780ffdd9f94e0d364e0ea74f579      bak
100644 blob fa49b077972391ad58037050f2a75f74e3671e92      new.txt
100644 blob 1f7a7a472abf3dd9643fd615f6da379c4acb3e3a      test.txt
```

bak test.txt
Git

FIGURE 10-2

当前 Git 的数据内容结构。



SHA-1

commit object

commit-tree

SHA-1

```
$ echo 'first commit' | git commit-tree d8329f
fdf4fc3344e67ab068f836878b6c4951e3b15f3d
```

cat-file

```
$ git cat-file -p fdf4fc3
tree d8329fc1cc938780ffdd9f94e0d364e0ea74f579
author Scott Chacon <schacon@gmail.com> 1243040974 -0700
committer Scott Chacon <schacon@gmail.com> 1243040974 -0700
```

```
first commit
```

/ user.name user.email

```
$ echo 'second commit' | git commit-tree 0155eb -p fdf4fc3
cac0cab538b970a37ea1e769cbbde608743bc96d
$ echo 'third commit'  | git commit-tree 3c4e9c -p cac0cab
1a410efbd13591db07496601ebc7a059dd55cfe9
```

SHA-1 git log
git log Git

```
$ git log --stat 1a410e
commit 1a410efbd13591db07496601ebc7a059dd55cfe9
Author: Scott Chacon <schacon@gmail.com>
Date:   Fri May 22 18:15:24 2009 -0700

        third commit

 bak/test.txt | 1 +
 1 file changed, 1 insertion(+)

commit cac0cab538b970a37ea1e769cbbde608743bc96d
Author: Scott Chacon <schacon@gmail.com>
Date:   Fri May 22 18:14:29 2009 -0700

        second commit

 new.txt  | 1 +
 test.txt | 2 +-
 2 files changed, 2 insertions(+), 1 deletion(-)

commit fdf4fc3344e67ab068f836878b6c4951e3b15f3d
Author: Scott Chacon <schacon@gmail.com>
Date:   Fri May 22 18:09:34 2009 -0700

    first commit
```

```
 test.txt | 1 +
 1 file changed, 1 insertion(+)
```

Git git add git commit Git —

Git — — .git/objects

```
$ find .git/objects -type f
.git/objects/01/55eb4229851634a0f03eb265b69f5a2d56f341 # tree 2
.git/objects/1a/410efbd13591db07496601ebc7a059dd55cfe9 # commit 3
.git/objects/1f/7a7a472abf3dd9643fd615f6da379c4acb3e3a # test.txt v2
.git/objects/3c/4e9cd789d88d8d89c1073707c3585e41b0e614 # tree 3
.git/objects/83/baae61804e65cc73a7201a7252750c76066a30 # test.txt v1
.git/objects/ca/c0cab538b970a37ea1e769cbbde608743bc96d # commit 2
.git/objects/d6/70460b4b4aece5915caf5c68d12f560a9fe3e4 # 'test content'
.git/objects/d8/329fc1cc938780ffdd9f94e0d364e0ea74f579 # tree 1
.git/objects/fa/49b077972391ad58037050f2a75f74e3671e92 # new.txt
.git/objects/fd/f4fc3344e67ab068f836878b6c4951e3b15f3d # commit 1
```

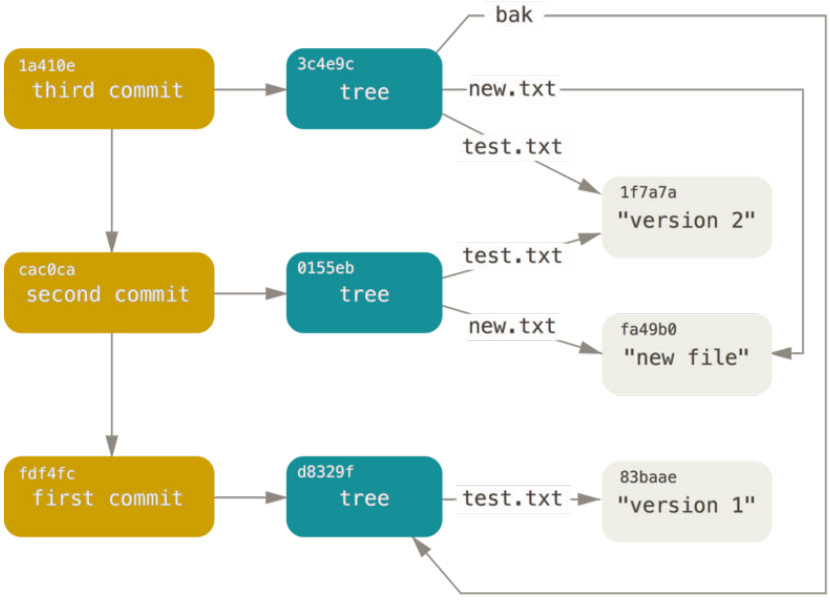


FIGURE 10-3

你的 Git 目录下的所有对象。

Git Ruby — “ what is up, doc? ” —

`irb` Ruby

```
$ irb
>> content = "what is up, doc?"
=> "what is up, doc?"
```

Git “ blob ”

Git

null byte

```
>> header = "blob #{content.length}\0"
=> "blob 16\u0000"
```

Git
SHA-1 Ruby SHA-1 — require
SHA-1 digest Digest::SHA1.hexdi-
gest()

```
>> store = header + content
=> "blob 16\u0000what is up, doc?"
>> require 'digest/sha1'
=> true
>> sha1 = Digest::SHA1.hexdigest(store)
=> "bd9dbf5aae1a3862dd1526723246b20206e5fc37"
```

Git zlib Ruby zlib
Zlib::Deflate.deflate()

```
>> require 'zlib'
=> true
>> zlib_content = Zlib::Deflate.deflate(store)
=> "x\x9CK\xCA\xC9OR04c(\xCFH,Q\xC8,V(-\xD0QH\xC9O\xB6\a\x00_\x1C\a\x9D"
```

zlib
SHA-1 38
Ruby
FileUtils.mkdir_p() File.open()
write()
zlib

```
>> path = '.git/objects/' + sha1[0,2] + '/' + sha1[2,38]
=> ".git/objects/bd/9dbf5aae1a3862dd1526723246b20206e5fc37"
>> require 'fileutils'
=> true
>> FileUtils.mkdir_p(File.dirname(path))
=> ".git/objects/bd"
>> File.open(path, 'w') { |f| f.write zlib_content }
=> 32
```

— Git Git
—
“ commit ” “ tree ” “ blob ”

Git 引用

git log 1a410e

1a410e

SHA-1

SHA-1

Git “ references refs ”

.git/refs SHA-1

```
$ find .git/refs
.git/refs
.git/refs/heads
.git/refs/tags
$ find .git/refs -type f
```

```
$ echo "1a410efbd13591db07496601ebc7a059dd55cfe9" > .git/refs/heads/master
```

Git SHA-1

```
$ git log --pretty=oneline  master
1a410efbd13591db07496601ebc7a059dd55cfe9 third commit
cac0cab538b970a37ea1e769cbbde608743bc96d second commit
fdf4fc3344e67ab068f836878b6c4951e3b15f3d first commit
```

Git

update-ref

```
$ git update-ref refs/heads/master 1a410efbd13591db07496601ebc7a059dd55cfe9
```

Git

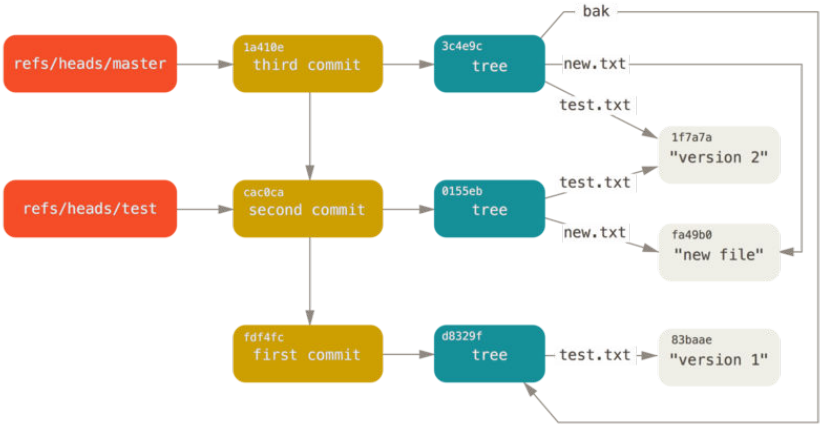
```
$ git update-ref refs/heads/test cac0ca
```

```
$ git log --pretty=oneline test
cac0cab538b970a37ea1e769cbbde608743bc96d second commit
fdf4fc3344e67ab068f836878b6c4951e3b15f3d first commit
```

Git

FIGURE 10-4

包含分支引用的 Git 目录对象。



`git branch (branchname)` Git `update-ref` SHA-1

HEAD

`git branch (branchname)` Git SHA-1 HEAD HEAD symbolic reference SHA-1 — HEAD

```
$ cat .git/HEAD
ref: refs/heads/master
```

`git checkout test` Git HEAD

```
$ cat .git/HEAD
ref: refs/heads/test
```

`git commit` HEAD
SHA-1

`symbolic-ref` HEAD

```
$ git symbolic-ref HEAD
refs/heads/master
```

HEAD

```
$ git symbolic-ref HEAD refs/heads/test
$ cat .git/HEAD
ref: refs/heads/test
```

```
$ git symbolic-ref HEAD test
fatal: Refusing to point HEAD outside of refs/
```

Git
tag object —

—

Chapter 2

```
$ git update-ref refs/tags/v1.0 cac0cab538b970a37ea1e769cbbde608743bc96d
```

—

Git

-a

```
$ git tag -a v1.1 1a410efbd13591db07496601ebc7a059dd55cfe9 -m 'test tag'
```

SHA-1

```
$ cat .git/refs/tags/v1.1
9585191f37f7b0fb9444f35a9bf50de191beadc2
```

SHA-1 cat-file

```
$ git cat-file -p 9585191f37f7b0fb9444f35a9bf50de191beadc2
object 1a410efbd13591db07496601ebc7a059dd55cfe9
type commit
tag v1.1
tagger Scott Chacon <schacon@gmail.com> Sat May 23 16:48:58 2009 -0700

test tag
```

object SHA-1

Git Git GPG

Git

```
$ git cat-file blob junio-gpg-pub
```

Linux —

remote reference

Git

refs/remotes

origin master

```
$ git remote add origin git@github.com:schacon/simplegit-progit.git
$ git push origin master
Counting objects: 11, done.
Compressing objects: 100% (5/5), done.
Writing objects: 100% (7/7), 716 bytes, done.
Total 7 (delta 2), reused 4 (delta 1)
To git@github.com:schacon/simplegit-progit.git
  a11bef0..ca82a6d  master -> master
```

refs/remotes/origin/master origin master SHA-1 master SHA-1

```
$ cat .git/refs/remotes/origin/master
ca82a6dff817ec66f44342007202690a93763949
```

refs/heads git checkout Git HEAD commit Git

包文件

Git 11 — 4 3 3 1

```
$ find .git/objects -type f
.git/objects/01/55eb4229851634a0f03eb265b69f5a2d56f341 # tree 2
.git/objects/1a/410efbd13591db07496601ebc7a059dd55cfe9 # commit 3
.git/objects/1f/7a7a472abf3dd9643fd615f6da379c4acb3e3a # test.txt v2
.git/objects/3c/4e9cd789d88d8d89c1073707c3585e41b0e614 # tree 3
.git/objects/83/baae61804e65cc73a7201a7252750c76066a30 # test.txt v1
.git/objects/95/85191f37f7b0fb9444f35a9bf50de191beadc2 # tag
.git/objects/ca/c0cab538b970a37ea1e769cbbde608743bc96d # commit 2
.git/objects/d6/70460b4b4aece5915caf5c68d12f560a9fe3e4 # 'test content'
.git/objects/d8/329fc1cc938780ffdd9f94e0d364e0ea74f579 # tree 1
.git/objects/fa/49b077972391ad58037050f2a75f74e3671e92 # new.txt
.git/objects/fd/f4fc3344e67ab068f836878b6c4951e3b15f3d # commit 1
```

Git zlib 925

Git
Grit repo.rb —
22K

```
$ curl https://raw.githubusercontent.com/mojombo/grit/master/lib/grit/repo.rb > re
$ git add repo.rb
$ git commit -m 'added repo.rb'
[master 484a592] added repo.rb
 3 files changed, 709 insertions(+), 2 deletions(-)
 delete mode 100644 bak/test.txt
 create mode 100644 repo.rb
 rewrite test.txt (100%)
```

repo.rb
SHA-1

```
$ git cat-file -p master^{tree}
100644 blob fa49b077972391ad58037050f2a75f74e3671e92      new.txt
100644 blob 033b4468fa6b2a9547a70d88d1bbe8bf3f9ed0d5      repo.rb
100644 blob e3f094f522629ae358806b17daf78246c27c007b      test.txt
```

git cat-file

```
$ git cat-file -s 033b4468fa6b2a9547a70d88d1bbe8bf3f9ed0d5
22044
```

```
$ echo '# testing' >> repo.rb
$ git commit -am 'modified repo a bit'
[master 2431da6] modified repo.rb a bit
 1 file changed, 1 insertion(+)
```

```
$ git cat-file -p master^{tree}
100644 blob fa49b077972391ad58037050f2a75f74e3671e92      new.txt
100644 blob b042a60ef7dff760008df33cee372b945b6e884e      repo.rb
100644 blob e3f094f522629ae358806b17daf78246c27c007b      test.txt
```

repo.rb
400 Git

```
$ git cat-file -s b042a60ef7dff760008df33cee372b945b6e884e
22054
```

22K Git

Git Git
“ loose ” Git
“ packfle ”
git gc
Git
git gc Git

```
$ git gc
Counting objects: 18, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (14/14), done.
Writing objects: 100% (18/18), done.
Total 18 (delta 3), reused 0 (delta 0)
```

objects

```
$ find .git/objects -type f
.git/objects/bd/9dbf5aae1a3862dd1526723246b20206e5fc37
.git/objects/d6/70460b4b4aece5915caf5c68d12f560a9fe3e4
.git/objects/info/packs
.git/objects/pack/pack-978e03944f5c581011e6998cd0e9e30000905586.idx
.git/objects/pack/pack-978e03944f5c581011e6998cd0e9e30000905586.pack
```

—
“ what is up, doc? ” “ test content ”
Git
dangling

gc

22K 7K

⅔

Git Git

git verify-pack

```
$ git verify-pack -v .git/objects/pack/pack-978e03944f5c581011e6998cd0e9e300009055
2431da676938450a4d72e260db3bf7b0f587bbc1 commit 223 155 12
69bcdaff5328278ab1c0812ce0e07fa7d26a96d7 commit 214 152 167
80d02664cb23ed55b226516648c7ad5d0a3deb90 commit 214 145 319
43168a18b7613d1281e5560855a83eb8fde3d687 commit 213 146 464
092917823486a802e94d727c820a9024e14a1fc2 commit 214 146 610
702470739ce72005e2edff522fde85d52a65df9b commit 165 118 756
d368d0ac0678cbe6cce505be58126d3526706e54 tag    130 122 874
fe879577cb8cffcdf25441725141e310dd7d239b tree   136 136 996
d8329fc1cc938780ffdd9f94e0d364e0ea74f579 tree   36 46 1132
deef2e1b793907545e50a2ea2ddb5ba6c58c4506 tree   136 136 1178
d982c7cb2c2a972ee391a85da481fc1f9127a01d tree   6 17 1314 1 \
  deef2e1b793907545e50a2ea2ddb5ba6c58c4506
3c4e9cd789d88d8d89c1073707c3585e41b0e614 tree   8 19 1331 1 \
  deef2e1b793907545e50a2ea2ddb5ba6c58c4506
0155eb4229851634a0f03eb265b69f5a2d56f341 tree   71 76 1350
83baae61804e65cc73a7201a7252750c76066a30 blob   10 19 1426
fa49b077972391ad58037050f2a75f74e3671e92 blob   9 18 1445
b042a60ef7dff760008df33cee372b945b6e884e blob   22054 5799 1463
033b4468fa6b2a9547a70d88d1bbe8bf3f9ed0d5 blob   9 20 7262 1 \
  b042a60ef7dff760008df33cee372b945b6e884e
1f7a7a472abf3dd9643fd615f6da379c4acb3e3a blob   10 19 7282
non delta: 15 objects
chain length = 1: 3 objects
.git/objects/pack/pack-978e03944f5c581011e6998cd0e9e30000905586.pack: ok
```

033b4 repo.rb

b042a

b042a 22K

033b4 9

—

Git

git gc

引用规格

```
$ git remote add origin https://github.com/schacon/simplegit-progit
```

.git/config
origin URL re -
fspec

```
[remote "origin"]
        url = https://github.com/schacon/simplegit-progit
        fetch = +refs/heads/*:refs/remotes/origin/*
```

\+ <src>:<dst>
<src> pattern <dst>
\+ Git

git remote add Git
refs/heads/ refs/remotes/
origin/ master

```
$ git log origin/master
$ git log remotes/origin/master
$ git log refs/remotes/origin/master
```

Git refs/remotes/
origin/master
Git master

```
fetch = +refs/heads/master:refs/remotes/origin/master
```

git fetch

master origin/mymaster

```
$ git fetch origin master:refs/remotes/origin/mymaster
```

```
$ git fetch origin master:refs/remotes/origin/mymaster \
        topic:refs/remotes/origin/topic
From git@github.com:schacon/simplegit
 ! [rejected]        master     -> origin/mymaster  (non fast forward)
 * [new branch]      topic      -> origin/topic
```

master

+

master experiment

```
[remote "origin"]
        url = https://github.com/schacon/simplegit-progit
        fetch = +refs/heads/master:refs/remotes/origin/master
        fetch = +refs/heads/experiment:refs/remotes/origin/experiment
```

```
fetch = +refs/heads/qa*:refs/remotes/origin/qa*
```

QA

master QA

```
[remote "origin"]
        url = https://github.com/schacon/simplegit-progit
        fetch = +refs/heads/master:refs/remotes/origin/master
        fetch = +refs/heads/qa/*:refs/remotes/origin/qa/*
```

QA

QA

qa/

QA master qa/master

```
$ git push origin master:refs/heads/qa/master
```

Git git push origin
push

```
[remote "origin"]
        url = https://github.com/schacon/simplegit-progit
        fetch = +refs/heads/*:refs/remotes/origin/*
        push = refs/heads/master:refs/heads/qa/master
```

git push origin master
qa/master

```
$ git push origin :topic
```

<src>:<dst> <src>
topic

传输协议

Git “ dumb ”
“ smart ”

HTTP
“ ”
Git HTTP GET
Git

> 现在已经很少使用哑协议了。 使用哑协议的版本库很难保证安全性和私有化，所以大多数 Git 服务器宿主（包括云端和本地）都会拒绝使用它。 一般情况下都建议使用智能协议，我们会在后面进行介绍。

simplegit http-fetch

```
$ git clone http://server/simplegit-progit.git
```

info/refs update-server-info HTTP post-receive

```
=> GET info/refs
ca82a6dff817ec66f44342007202690a93763949     refs/heads/master
```

SHA-1 HEAD

```
=> GET HEAD
ref: refs/heads/master
```

master info/refs ca82a6

```
=> GET objects/ca/82a6dff817ec66f44342007202690a93763949
(179 bytes of binary data)
```

—

HTTP GET zlib

```
$ git cat-file -p ca82a6dff817ec66f44342007202690a93763949
tree cfda3bf379e4f8dba8717dee55aab78aef7f4daf
parent 085bb3bcb608e1e8451d4b2432f8ecbe6306e7e7
author Scott Chacon <schacon@gmail.com> 1205815931 -0700
committer Scott Chacon <schacon@gmail.com> 1240030591 -0700

changed the version number
```

cfda3b 085bb3

```
=> GET objects/08/5bb3bcb608e1e8451d4b2432f8ecbe6306e7e7
(179 bytes of data)
```

```
=> GET objects/cf/da3bf379e4f8dba8717dee55aab78aef7f4daf
(404 - Not Found)
```

—

404 HTTP

— Git

```
=> GET objects/info/http-alternates
(empty file)
```

URL Git

—

objects/info/packs

update-server-info

```
=> GET objects/info/packs
P pack-816a9b2334da9953e530f27bcac22082a9f5b835.pack
```

```
=> GET objects/pack/pack-816a9b2334da9953e530f27bcac22082a9f5b835.idx
(4k of binary data)
```

—

SHA-1

```
=> GET objects/pack/pack-816a9b2334da9953e530f27bcac22082a9f5b835.pack
(13k of binary data)
```

Git HEAD master

Git —

上传数据

Git send-pack receive-pack
send-pack receive-pack
SSH
git push origin master , origin
SSH URL Git send-pack
SSH SSH

```
$ ssh -x git@server "git-receive-pack 'simplegit-progit.git'"
00a5ca82a6dff817ec66f4437202690a93763949 refs/heads/master report-status \
        delete-refs side-band-64k quiet ofs-delta \
        agent=git/2:2.1.1+github-607-gfba4028 delete-refs
0000
```

git-receive-pack
— master SHA-1
report-status delete-refs

005b 91 91
003e 62 62
0000
send-pack
send-pack receive-pack
master
experiment send-pack

```
0076ca82a6dff817ec66f44342007202690a93763949 15027957951b64cf874c3557a0f3547bd83b3f
        refs/heads/master report-status
006c0000000000000000000000000000000000000000 cdfdb42577e2506715f8cfeacdbabc092bf63e
        refs/heads/experiment
0000
```

Git SHA-1
SHA-1
0 SHA-1 — ex -
periment SHA-1
0

```
000eunpack ok
```

HTTP(S)
HTTPS HTTP “ ”

```
=> GET http://server/simplegit-progit.git/info/refs?service=git-receive-pack
001f# service=git-receive-pack
00ab6c5f0e45abd7832bf23074a333f739977c9e8188 refs/heads/master report-status \
        delete-refs side-band-64k quiet ofs-delta \
        agent=git/2:2.1.1~vmg-bitmaps-bugaloo-608-g116744e
0000
```

POST git-upload-pack

```
=> POST http://server/simplegit-progit.git/git-receive-pack
```

POST send-pack
HTTP

下载数据

fetch-pack upload-pack
fetch-pack upload-pack

SSH
SSH fetch-pack

```
$ ssh -x git@server "git-upload-pack 'simplegit-progit.git'"
```

fetch-pack upload-pack

```
00dfca82a6dff817ec66f44342007202690a93763949 HEAD multi_ack thin-pack \
        side-band side-band-64k ofs-delta shallow no-progress include-tag \
        multi_ack_detailed symref=HEAD:refs/heads/master \
        agent=git/2:2.1.1+github-607-gfba4028
003fe2409a098dc3e53539a9028a94b6224db9d6a6b6 refs/heads/master
0000
```

receive-pack HEAD symref=HEAD:refs/heads/master fetch-pack “want” SHA-1 “have” SHA-1 “done” upload-pack

```
003cwant ca82a6dff817ec66f44342007202690a93763949 ofs-delta
0032have 085bb3bcb608e1e8451d4b2432f8ecbe6306e7e7
0009done
0000
```

HTTP(S)

HTTP GET

```
=> GET $GIT_URL/info/refs?service=git-upload-pack
001e# service=git-upload-pack
00e7ca82a6dff817ec66f44342007202690a93763949 HEAD multi_ack thin-pack \
        side-band side-band-64k ofs-delta shallow no-progress include-tag \
        multi_ack_detailed no-done symref=HEAD:refs/heads/master \
        agent=git/2:2.1.1+github-607-gfba4028
003fca82a6dff817ec66f44342007202690a93763949 refs/heads/master
0000
```

SSH git-upload-pack

```
=> POST $GIT_URL/git-upload-pack HTTP/1.0
0032want 0a53e9ddeaddad63ad106860237bbf53411d11a7
0032have 441b40d833fdfa93eb2908e52742248faf0ee993
0000
```

multi_ack side-band

Git

维护与数据恢复

-

Git “ auto gc ”

Git git gc “ gc ”

```
$ git gc --auto
```

7000
50 Git gc
gc.auto gc.autopacklimit
gc

```
$ find .git/refs -type f
.git/refs/heads/experiment
.git/refs/heads/master
.git/refs/tags/v1.0
.git/refs/tags/v1.1
```

git gc refs
Git .git/packed-refs

```
$ cat .git/packed-refs
# pack-refs with: peeled fully-peeled
cac0cab538b970a37ea1e769cbbde608743bc96d refs/heads/experiment
ab1afef80fac8e34258ff41fc1b867c702daa24b refs/heads/master
cac0cab538b970a37ea1e769cbbde608743bc96d refs/tags/v1.0
9585191f37f7b0fb9444f35a9bf50de191beadc2 refs/tags/v1.1
^1a410efbd13591db07496601ebc7a059dd55cfe9
```

Git refs/heads SHA-1 Git refs packed-refs refs packed-refs ^

Git

master

```
$ git log --pretty=oneline
ab1afef80fac8e34258ff41fc1b867c702daa24b modified repo a bit
484a59275031909e19aadb7c92262719cfcdf19a added repo.rb
1a410efbd13591db07496601ebc7a059dd55cfe9 third commit
cac0cab538b970a37ea1e769cbbde608743bc96d second commit
fdf4fc3344e67ab068f836878b6c4951e3b15f3d first commit
```

master

```
$ git reset --hard 1a410efbd13591db07496601ebc7a059dd55cfe9
HEAD is now at 1a410ef third commit
$ git log --pretty=oneline
1a410efbd13591db07496601ebc7a059dd55cfe9 third commit
cac0cab538b970a37ea1e769cbbde608743bc96d second commit
fdf4fc3344e67ab068f836878b6c4951e3b15f3d first commit
```

-

SHA-1

SHA-1 -

git reflog

Git HEAD

refog

git update-ref “ Git ”

SHA-1

git reflog

```
$ git reflog
1a410ef HEAD@{0}: reset: moving to 1a410ef
ab1afef HEAD@{1}: commit: modified repo.rb a bit
484a592 HEAD@{2}: commit: added repo.rb
```

git log -g

```
$ git log -g
commit 1a410efbd13591db07496601ebc7a059dd55cfe9
Reflog: HEAD@{0} (Scott Chacon <schacon@gmail.com>)
Reflog message: updating HEAD
Author: Scott Chacon <schacon@gmail.com>
Date:   Fri May 22 18:22:37 2009 -0700

               third commit

commit ab1afef80fac8e34258ff41fc1b867c702daa24b
Reflog: HEAD@{1} (Scott Chacon <schacon@gmail.com>)
Reflog message: updating HEAD
Author: Scott Chacon <schacon@gmail.com>
Date:   Fri May 22 18:15:24 2009 -0700

       modified repo.rb a bit
```

recover-branch

ab1afef

```
$ git branch recover-branch ab1afef
$ git log --pretty=oneline recover-branch
ab1afef80fac8e34258ff41fc1b867c702daa24b modified repo a bit
```

```
484a59275031909e19aadb7c92262719cfcdf19a added repo.rb
1a410efbd13591db07496601ebc7a059dd55cfe9 third commit
cac0cab538b970a37ea1e769cbbde608743bc96d second commit
fdf4fc3344e67ab068f836878b6c4951e3b15f3d first commit
```

recover-branch master

- recover-branch

```
$ git branch -D recover-branch
$ rm -Rf .git/logs/
```

.git/logs/

git fsck

--full

```
$ git fsck --full
Checking object directories: 100% (256/256), done.
Checking objects: 100% (18/18), done.
dangling blob d670460b4b4aece5915caf5c68d12f560a9fe3e4
dangling commit ab1afef80fac8e34258ff41fc1b867c702daa24b
dangling tree aea790b9a58f6cf6f2804eeac9f0abbe9631e4c9
dangling blob 7108f7ecb345ee9d0084193f147cdad4d2998293
```

“ dangling commit ”

Git git clone

Git

Subversion Perforce Git

Git

-

```
$ curl https://www.kernel.org/pub/software/scm/git/git-2.1.0.tar.gz > git.tgz
$ git add git.tgz
$ git commit -m 'add git tarball'
[master 7b30847] add git tarball
 1 file changed, 0 insertions(+), 0 deletions(-)
 create mode 100644 git.tgz
```

-

```
$ git rm git.tgz
rm 'git.tgz'
$ git commit -m 'oops - removed large tarball'
[master dadf725] oops - removed large tarball
 1 file changed, 0 insertions(+), 0 deletions(-)
 delete mode 100644 git.tgz
```

gc

```
$ git gc
Counting objects: 17, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (13/13), done.
Writing objects: 100% (17/17), done.
Total 17 (delta 1), reused 10 (delta 0)
```

count-objects

```
$ git count-objects -v
count: 7
size: 32
```

```
in-pack: 17
packs: 1
size-pack: 4868
prune-packable: 0
garbage: 0
size-garbage: 0
```

size-pack KB
5MB 2KB -

5MB

git gc git
verify-pack
tail

```
$ git verify-pack -v .git/objects/pack/pack-29…69.idx \
  | sort -k 3 -n \
  | tail -3
dadf7258d699da2c8d89b09ef6670edb7d5f91b4 commit 229 159 12
033b4468fa6b2a9547a70d88d1bbe8bf3f9ed0d5 blob   22044 5792 4977696
82c99a3e86bb1267b236a4b6eff7868d97489af1 blob   4975916 4976258 1438
```

5MB
rev-list “
” --objects rev-list
SHA-1 SHA-1

```
$ git rev-list --objects --all | grep 82c99a3
82c99a3e86bb1267b236a4b6eff7868d97489af1 git.tgz
```

```
$ git log --oneline --branches -- git.tgz
dadf725 oops - removed large tarball
7b30847 add git tarball
```

7b30847 Git
filter-branch
“ ”

```
$ git filter-branch --index-filter \
  'git rm --ignore-unmatch --cached git.tgz' -- 7b30847^..
Rewrite 7b30847d080183a1ab7d18fb202473b3096e9f34 (1/2)rm 'git.tgz'
Rewrite dadf7258d699da2c8d89b09ef6670edb7d5f91b4 (2/2)
Ref 'refs/heads/master' was rewritten
```

--index-filter “ ” --tree-filter

git rm --cached rm file -

- Git

--tree-filter

git rm --ignore-unmatch

filter-branch

7b30847

.git/refs/original filter-branch

```
$ rm -Rf .git/refs/original
$ rm -Rf .git/logs/
$ git gc
Counting objects: 15, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (11/11), done.
Writing objects: 100% (15/15), done.
Total 15 (delta 1), reused 12 (delta 0)
```

```
$ git count-objects -v
count: 11
size: 4904
in-pack: 15
packs: 1
```

```
size-pack: 8
prune-packable: 0
garbage: 0
size-garbage: 0
```

8K 5MB size

--expire git prune

```
$ git prune --expire now
$ git count-objects -v
count: 0
size: 0
in-pack: 15
packs: 1
size-pack: 8
prune-packable: 0
garbage: 0
size-garbage: 0
```

环境变量

Git bash shell shell
Git
Git

Git
GIT_EXEC_PATH Git git-commit, git-diff
git --exec-path .
HOME Git

Git Git shell HOME
PREFIX Git $PREFIX/etc/gitconfig .
GIT_CONFIG_NOSYSTEM

GIT_PAGER
PAGER .
GIT_EDITOR Git
EDITOR

Git
GIT_DIR .git . Git
.git ~ /
GIT_CEILING_DIRECTORIES .git

Git shell Git
GIT_WORK_TREE
$GIT_DIR
GIT_INDEX_FILE
GIT_OBJECT_DIRECTORY .git/objects
GIT_ALTERNATE_OBJECT_DIRECTORIES (
/dir/one:/dir/two:…) Git GIT_OBJECT_DI-
RECTORY .

" pathspec " Git
.gitignore git add *.c
GIT_GLOB_PATHSPECS and GIT_NOGLOB_PATHSPECS
GIT_GLOB_PATHSPECS 1,
; GIT_NOGLOB_PATHSPECS 1,
*.c " *.c " .c
:(glob) :(literal)
:(glob)*.c
GIT_LITERAL_PATHSPECS

GIT_ICASE_PATHSPECS

Git git-commit-tree git-commit-
tree

GIT_AUTHOR_NAME “ author ”
GIT_AUTHOR_EMAIL “ author ”
GIT_AUTHOR_DATE “ author ”
GIT_COMMITTER_NAME “ committer ”
GIT_COMMITTER_EMAIL “ committer ”
GIT_COMMITTER_DATE “ committer ”
user.email **EMAIL**
Git

Git curl HTTP **GIT_CURL_VERBOSE**
Git curl -v
GIT_SSL_NO_VERIFY Git SSL
HTTPS Git
Git
Git **GIT_HTTP_LOW_SPEED_LIMIT**
GIT_HTTP_LOW_SPEED_TIME Git
http.lowSpeedLimit http.lowSpeedTime
GIT_HTTP_USER_AGENT Git HTTP user-agent git/2.0.0

GIT_DIFF_OPTS -u<n> --unified=<n> git diff
GIT_EXTERNAL_DIFF diff.external
Git git diff Git
GIT_DIFF_PATH_COUNTER **GIT_DIFF_PATH_TOTAL** GIT_EXTERNAL_DIFF diff.external
1
GIT_MERGE_VERBOSITY

- 0
- 1
- 2
- 3
- 4
- 5

2.

Git ? Git

- “ true ” , “ 1 ” , “ 2 ” – .
- / –

GIT_TRACE

```
$ GIT_TRACE=true git lga
20:12:49.877982 git.c:554               trace: exec: 'git-lga'
20:12:49.878369 run-command.c:341       trace: run_command: 'git-lga'
20:12:49.879529 git.c:282               trace: alias expansion: lga => 'log' '--graph' '--pr
20:12:49.879885 git.c:349               trace: built-in: git 'log' '--graph' '--pretty=oneli
20:12:49.899217 run-command.c:341       trace: run_command: 'less'
20:12:49.899675 run-command.c:192       trace: exec: 'less'
```

GIT_TRACE_PACK_ACCESS

```
$ GIT_TRACE_PACK_ACCESS=true git status
20:10:12.081397 sha1_file.c:2088        .git/objects/pack/pack-c3fa...291e.pack 12
20:10:12.081886 sha1_file.c:2088        .git/objects/pack/pack-c3fa...291e.pack 34662
20:10:12.082115 sha1_file.c:2088        .git/objects/pack/pack-c3fa...291e.pack 35175
# […]
20:10:12.087398 sha1_file.c:2088        .git/objects/pack/pack-e80e...e3d2.pack 56914983
20:10:12.087419 sha1_file.c:2088        .git/objects/pack/pack-e80e...e3d2.pack 14303666
On branch master
Your branch is up-to-date with 'origin/master'.
nothing to commit, working directory clean
```

GIT_TRACE_PACKET

```
$ GIT_TRACE_PACKET=true git ls-remote origin
20:15:14.867043 pkt-line.c:46           packet:          git< # service=git-upload-pack
20:15:14.867071 pkt-line.c:46           packet:          git< 0000
20:15:14.867079 pkt-line.c:46           packet:          git< 97b8860c071898d9e162678ea1035a
20:15:14.867088 pkt-line.c:46           packet:          git< 0f20ae29889d61f2e93ae00fd34f1c
```

```
20:15:14.867094 pkt-line.c:46          packet:          git< 36dc827bc9d17f80ed4f
# […]
```

GIT_TRACE_PERFORMANCE
Git

```
$ GIT_TRACE_PERFORMANCE=true git gc
20:18:19.499676 trace.c:414            performance: 0.374835000 s: git command: '
20:18:19.845585 trace.c:414            performance: 0.343020000 s: git command: '
Counting objects: 170994, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (43413/43413), done.
Writing objects: 100% (170994/170994), done.
Total 170994 (delta 126176), reused 170524 (delta 125706)
20:18:23.567927 trace.c:414            performance: 3.715349000 s: git command: '
20:18:23.584728 trace.c:414            performance: 0.000910000 s: git command: '
20:18:23.605218 trace.c:414            performance: 0.017972000 s: git command: '
20:18:23.606342 trace.c:414            performance: 3.756312000 s: git command: '
Checking connectivity: 170994, done.
20:18:25.225424 trace.c:414            performance: 1.616423000 s: git command: '
20:18:25.232403 trace.c:414            performance: 0.001051000 s: git command: '
20:18:25.233159 trace.c:414            performance: 6.112217000 s: git command: '
```

GIT_TRACE_SETUP Git

```
$ GIT_TRACE_SETUP=true git status
20:19:47.086765 trace.c:315            setup: git_dir: .git
20:19:47.087184 trace.c:316            setup: worktree: /Users/ben/src/git
20:19:47.087191 trace.c:317            setup: cwd: /Users/ben/src/git
20:19:47.087194 trace.c:318            setup: prefix: (null)
On branch master
Your branch is up-to-date with 'origin/master'.
nothing to commit, working directory clean
```

GIT_SSH Git SSH ssh
$GIT_SSH [username@]host [-p <port>] <command>
ssh ;
GIT_SSH
~/.ssh/config

GIT_ASKPASS core.askpass Git
stdout
(“ ”_)
GIT_NAMESPACE --namespace
.
fork,
GIT_FLUSH Git I/O
1 Git 0

GIT_REFLOG_ACTION refog

```
$ GIT_REFLOG_ACTION="my action" git commit --allow-empty -m 'my message'
[master 9e3d55a] my message
$ git reflog -1
9e3d55a HEAD@{0}: my action: my message
```

总结

Git
Git
Git
Git
Git
Git

Git

A 其它环境中的 Git

Git

Git

Git Git

图形界面

Git

Git

Git

“ ”

gitk git-gui

Git gitk git-gui

gitk git log

git grep

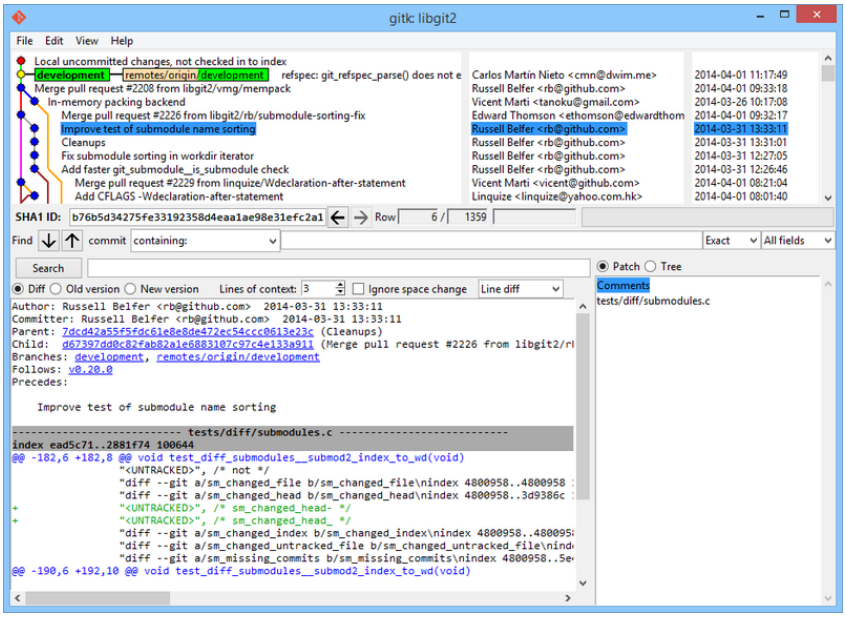
Gitk cd Git

```
$ gitk [git log options]
```

Gitk git log --all , gitk HEAD Gitk

Figure 1-1.

gitk 历史查看器。



`git log --graph`

HEAD

`git-gui`

```
$ git gui
```

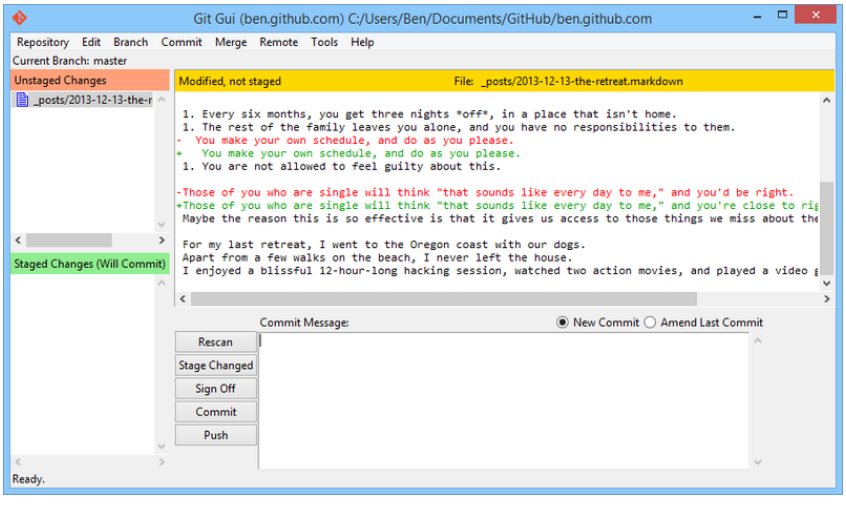


Figure 1-2.

git-gui 提交工具。

dif

“ ” git commit

“ ” “

, ”

“ ”

gitk git-gui

Mac Windows GitHub

GitHub Git Windows Mac

—

Git .

Figure 1-3.

GitHub Mac 客户端。

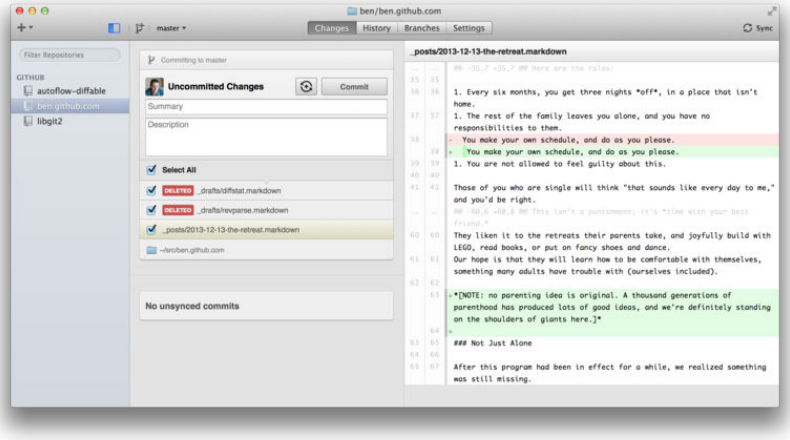
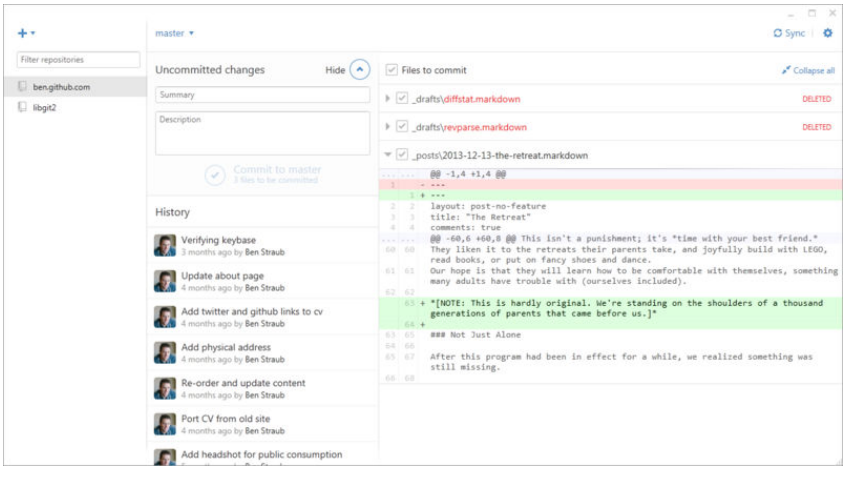


Figure 1-4.

GitHub Windows 客户端。



“ ”

- “ + ”

clone

- -
  Windows
  Mac
-
- “ Sync ”

你不需要注册 GitHub 账号也可以使用这些工具。 尽管它们是按照 GitHub 推荐的工作流程来设计的，并突出提升了一些 GitHub 的服务体验，但它们可以在任何 Git 仓库上工作良好，也可以通过网络连接到任意 Git 主机。

安装

GitHub Windows *https://windows.github.com* Mac
https://mac.github.com

CRLF
“ ” —
Git
Windows
Posh-git Powershell

GitHub

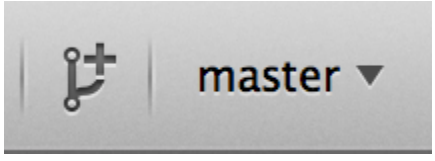
Finder Windows GitHub

推荐的工作流程

GitHub Git
“ GitHub ”
“ GitHub ” (a)
(b)
Mac

Figure 1-5.

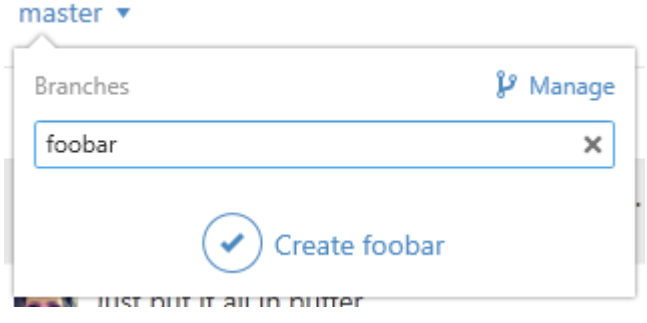
Mac 上的“创建分支”按钮。



Windows

Figure 1-6.

在 Windows 上创建分支。



GitHub

“ ” ctrl-enter -enter
“ ” push
fetch merge rebase Git , GitHub

1. `git pull --rebase`
   `git pull --no-rebase`
2. `git push`

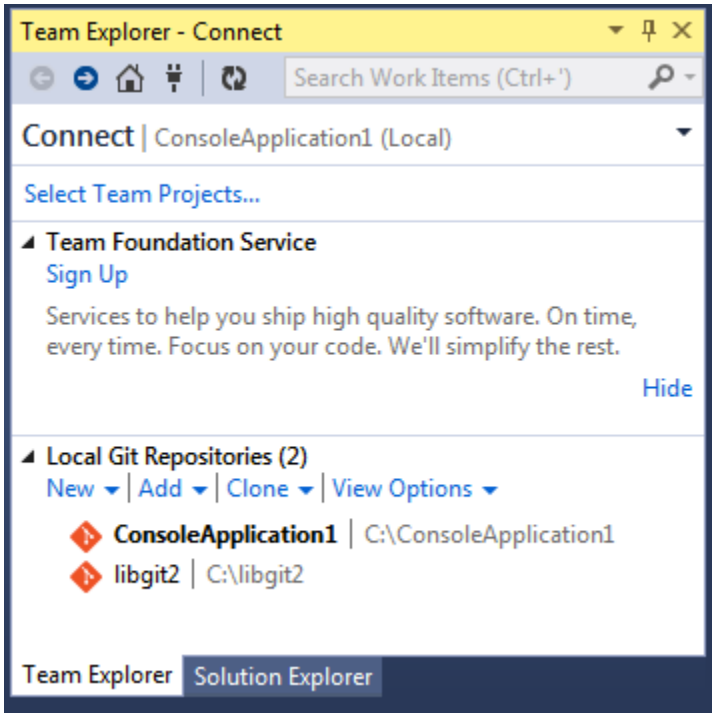
Git
Git Git
http://git-scm.com/downloads/guis Git
https://git.wiki.kernel.org/index.php/Interfaces,_frontends,_and_tools#Graphical_Interfaces.

Visual Studio 中的 Git

Visual Studio 2013 Update 1 Visual Studio
IDE Git Visual Studio
Git
Visual Studio 2013 Git
Visual Studio Git
Visual Studio Git
`git init` View > Team Explorer
“ Connect ”

Figure 1-7.

从 Team Explorer 中连接 Git 仓库。



Visual Studio Git
“ Add ”
Git “ Home ”
Figure A-8 Git
“ Changes ”
“ Unsynced Commits ” “ Branches ”

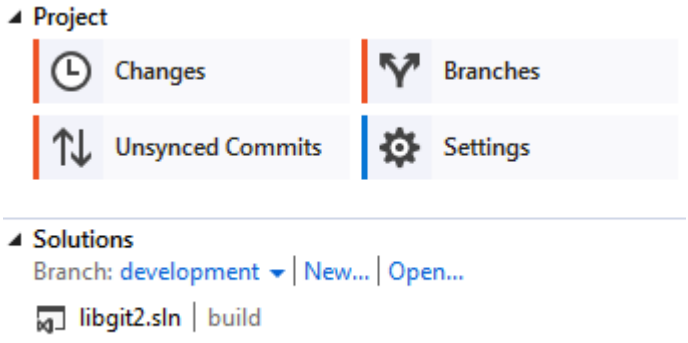


Figure 1-8.

Visual Studio 中的 Git 仓库的“Home”视图。

Visual Studio Git

dif

http://msdn.microsoft.com/en-us/library/hh850437.aspx

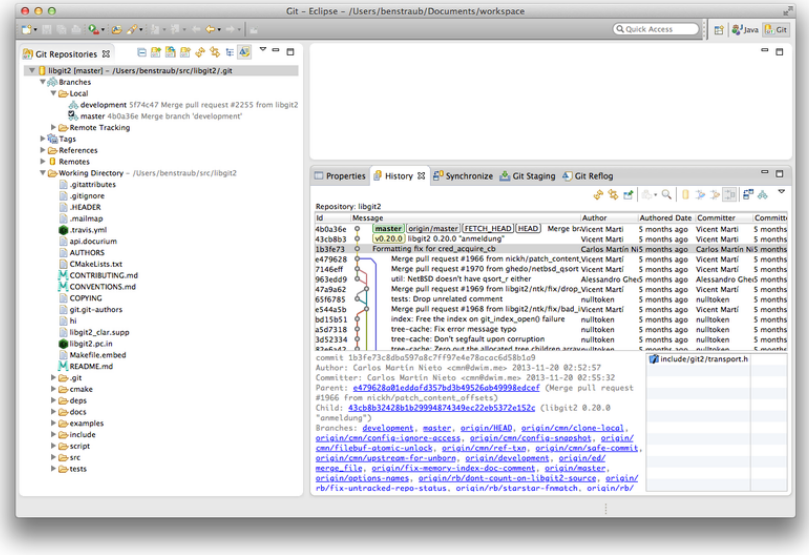
Eclipse 中的 Git

Eclipse Egit Git

Git (Window > Open Perspective > Other… “ Git ”

Figure 1-9.

Eclipse 中 EGit 的界面环境。



EGit

Help > Help Contents “ EGit Documentation ”

Bash 中的 Git

Bash Shell
Git Git Shell

Git `contrib/completion/git-completion.bash`
Home `.bashrc`

```
. ~/git-completion.bash
```

Git

```
$ git chec<tab>
```

…… Bash git checkout Git

prompt Git

prompt Git contrib/completion/git-prompt.sh Home ( ) .bashrc

```
. ~/git-prompt.sh
export GIT_PS1_SHOWDIRTYSTATE=1
export PS1='\w$(__git_ps1 " (%s)")\$ '
```

\w \$ $ prompt __git_ps1 " (%s)" %s git-prompt.sh Bash prompt Git

Figure 1-10.

自定义的 bash 提示符（prompt）.

git-completion.bash git-prompt.sh

Zsh 中的 Git

Git Zsh Tab contrib/completion/git-completion.zsh home .zshrc source Bash Zsh

```
$ git che<Tab>
check-attr          -- 显示 gitattributes 信息
check-ref-format    -- 检查引用名称是否符合规范
checkout            -- 从工作区中检出分支或路径
checkout-index      -- 从暂存区拷贝文件至工作目录
cherry              -- 查找没有被合并至上游的提交
cherry-pick         -- 从一些已存在的提交中应用更改
```

Tab

Tab Git

refs remotes

Zsh

Zsh Bash

~/.zshrc

```
setopt prompt_subst
. ~/git-prompt.sh
export RPROMPT=$'$(__git_ps1 "%s")'
```

Git

Figure 1-11.

自定义 zsh 提示符.

Zsh

“ oh-my-zsh" *https://github.com/robbyr - ussell/oh-my-zsh* oh-my-zsh Git Tab “ ” Figure A-12

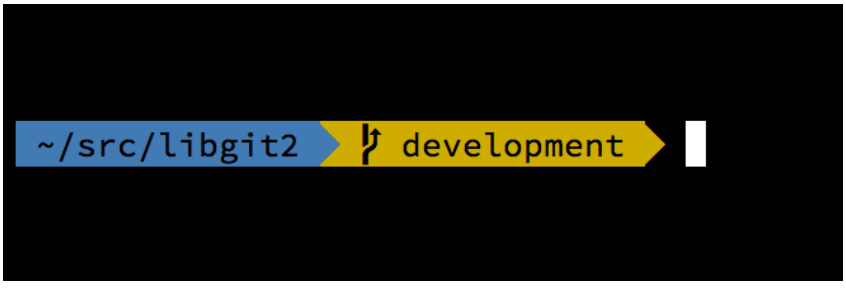


Figure 1-12.

一个 oh-my-zsh 主题的示例.

Powershell 中的 Git

Windows (cmd.exe) Git Powershell Posh-Git (*https://github.com/dahlbyk/posh-git*) tab

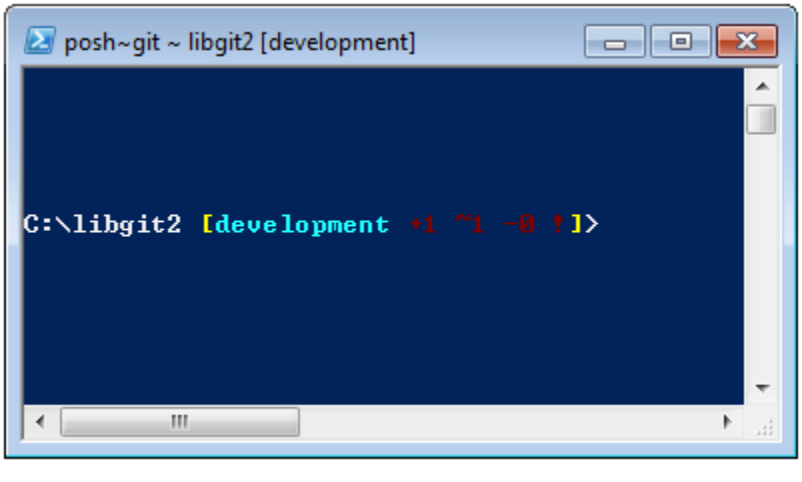


Figure 1-13.

附带了 Posh-Git 扩展包的 Powershell。

Windows GitHub Posh-Git
profile.ps1 (C:\Users\<user-name>\Documents\WindowsPowerShell):

```
. (Resolve-Path "$env:LOCALAPPDATA\GitHub\shell.ps1")
. $env:github_posh_git\profile.example.ps1
```

Windows GitHub (*https://github.com/dahlbyk/posh-git*) Posh-Git WindowsPower-shell Powershell

```
> Set-ExecutionPolicy RemoteSigned -Scope CurrentUser -Confirm
> cd ~\Documents\WindowsPowerShell\posh-git
> .\install.ps1
```

profile.ps1 Posh-Git

总结

Git

Git

将 Git 嵌入你的应用 B

Git

Git
shell Git Libgit2
JGit

命令行 Git 方式

shell Git

Git

Git

Git

Git
shell

Libgit2

© Libgit2 Libgit2 Git Git API *http://libgit2.github.com*

C API

```
// 打开一个版本库
git_repository *repo;
int error = git_repository_open(&repo, "/path/to/repository");

// 逆向引用 HEAD 到一个提交
git_object *head_commit;
error = git_revparse_single(&head_commit, repo, "HEAD^{commit}");
git_commit *commit = (git_commit*)head_commit;

// 显示这个提交的一些详情
printf("%s", git_commit_message(commit));
const git_signature *author = git_commit_author(commit);
printf("%s <%s>\n", author->name, author->email);
const git_oid *tree_id = git_commit_tree_id(commit);

// 清理现场
git_commit_free(commit);
git_repository_free(repo);
```

Git git_repository

.git git_repository_open_ext git_clone git_repository_init

rev-parse “ ” HEAD git_object Git git_object “ ” “ ” git_object

git_object_type(commit) GIT_OBJ_COMMIT git_commit

git_oid Libgit2 SHA-1

- Libgit2
  int 0
- Libgit2
- Libgit2 const
- C

  Libgit2 C

  Git Libgit2 Ruby
  Rugged *https://github.com/libgit2/rugged*

```
repo = Rugged::Repository.new('path/to/repository')
commit = repo.head.target
puts commit.message
puts "#{commit.author[:name]} <#{commit.author[:email]}>"
tree = commit.tree
```

Rugged
ConfigError ObjectError
Ruby

```
blob_id = repo.write("Blob contents", :blob) ❶

index = repo.index
index.read_tree(repo.head.target.tree)
index.add(:path => 'newfile.txt', :oid => blob_id) ❷

sig = {
    :email => "bob@example.com",
    :name => "Bob User",
    :time => Time.now,
}

commit_id = Rugged::Commit.create(repo,
    :tree => index.write_tree(repo), ❸
    :author => sig,
    :committer => sig, ❹
    :message => "Add newfile.txt", ❺
    :parents => repo.empty? ? [] : [ repo.head.target ].compact, ❻
    :update_ref => 'HEAD', ❼
)
commit = repo.lookup(commit_id) ❽
```

❶ blob

❷ HEAD newfile.txt

❸ ODB

❹ author committer

❺

❻ HEAD

❼ Rugged Libgit2

❽ SHA-1 Commit

Ruby Libgit2 Ruby “ ”

Libgit2 Git Libgit2 “ ” Git Libgit2

Libgit2 *https://github.com/libgit2/libgit2-backends*

```
git_odb *odb;
int error = git_odb_new(&odb); ❶

git_odb_backend *my_backend;
error = git_odb_backend_mine(&my_backend, /*…*/); ❷

error = git_odb_add_backend(odb, my_backend, 1); ❸

git_repository *repo;
error = git_repository_open(&repo, "some-path");
error = git_repository_set_odb(odb); ❹
```

(
)

❶ ODB “ ”
“ ”

❷ ODB

❸

❹ ODB

git_odb_backend_mine
ODB
git_odb_backend

```c
typedef struct {
    git_odb_backend parent;

    // 其它的一些东西
    void *custom_context;
} my_backend_struct;

int git_odb_backend_mine(git_odb_backend **backend_out, /*…*/)
{
    my_backend_struct *backend;

    backend = calloc(1, sizeof (my_backend_struct));

    backend->custom_context = …;

    backend->parent.read = &my_backend__read;
    backend->parent.read_prefix = &my_backend__read_prefix;
    backend->parent.read_header = &my_backend__read_header;
    // ……

    *backend_out = (git_odb_backend *) backend;

    return GIT_SUCCESS;
}
```

my_backend_struct git_odb_backend
Libgit2

parent Libgit2 include/git2/sys/

odb_backend.h

Libgit2

C++

Go Node.js Erlang JVM

https://github.com/libgit2[]

HEAD (git log -1)

LIBGIT2SHARP

.NET Mono LibGit2Sharp (*https://github.com/libgit2/libgit2sharp*) C#

CLR API Lib - git2

```
new Repository(@"C:\path\to\repo").Head.Tip.Message;
```

Windows NuGet

OBJECTIVE-GIT

Apple Objective-C

Objective-Git (*https://github.com/libgit2/objective-git*)

Libgit2

```
GTRepository *repo =
    [[GTRepository alloc] initWithURL:[NSURL fileURLWithPath: @"/path/to/repo"] err
NSString *msg = [[[repo headReferenceWithError:NULL] resolvedTarget] message];
```

Objective-git Swift Objective-C

PYGIT2

Python Libgit2 Pygit2 *http://www.pygit2.org/*

```
pygit2.Repository("/path/to/repo") # 打开版本库
    .head                          # get the current branch
    .peel(pygit2.Commit)           # walk down to the commit
    .message                       # read the message
```

Libgit2
Libgit2 API *https://libgit2.github.com/libgit2*, *https://libgit2.github.com/docs*.
README

JGit

Java Git Git
JGit JGit Java Git Java
JGit Eclipse *http://www.eclipse.org/jgit*

JGit
Maven pom.xml <dependencies>

```
<dependency>
    <groupId>org.eclipse.jgit</groupId>
    <artifactId>org.eclipse.jgit</artifactId>
    <version>3.5.0.201409260305-r</version>
</dependency>
```

version *http://mvnrepository.com/artifact/org.eclipse.jgit/org.eclipse.jgit*
Maven
JGit
http://www.eclipse.org/jgit/download JGit

```
javac -cp .:org.eclipse.jgit-3.5.0.201409260305-r.jar App.java
java -cp .:org.eclipse.jgit-3.5.0.201409260305-r.jar App
```

JGit API
Git JGit API
Git
API
JGit Repository
JGit
FileRepositoryBuilder

```
// 创建一个新仓库
Repository newlyCreatedRepo = FileRepositoryBuilder.create(
    new File("/tmp/new_repo/.git"));
newlyCreatedRepo.create();

// 打开一个存在的仓库
Repository existingRepo = new FileRepositoryBuilder()
    .setGitDir(new File("my_repo/.git"))
    .build();
```

builder API
.readEnvironment() .setWorkTree(…).findGitDir() , .git

Repository

```
// 获取引用
Ref master = repo.getRef("master");

// 获取该引用所指向的对象
ObjectId masterTip = master.getObjectId();

// Rev-parse
ObjectId obj = repo.resolve("HEAD^{tree}");

// 装载对象原始内容
ObjectLoader loader = repo.open(masterTip);
loader.copyTo(System.out);

// 创建分支
RefUpdate createBranch1 = repo.updateRef("refs/heads/branch1");
createBranch1.setNewObjectId(masterTip);
createBranch1.update();

// 删除分支
```

```
RefUpdate deleteBranch1 = repo.updateRef("refs/heads/branch1");
deleteBranch1.setForceUpdate(true);
deleteBranch1.delete();

// 配置
Config cfg = repo.getConfig();
String name = cfg.getString("user", null, "name");
```

master JGit refs/heads/master master .getName() .getObjectId() .getTarget() “ ”

master ObjectId Git ObjectId SHA-1 JGit rev-parse “ ” Git JGit ObjectId null

ObjectLoader.copyTo() ObjectLoader .isLarge() true .openStream() InputStream

RefUpdate .update() .setForceUpdate(true) .delete() REJECTED Git user.name Confg

API JGit JGit API Java IOException JGit NoRemoteRepositoryException CorruptObjectException NoMergeBaseException

API

JGit API API Git

```
Repository repo;
// 构建仓库。。。
Git git = new Git(repo);
```

Git

— git ls-remote

```
CredentialsProvider cp = new UsernamePasswordCredentialsProvider("username", "p4ssw
Collection<Ref> remoteRefs = git.lsRemote()
    .setCredentialsProvider(cp)
    .setRemote("origin")
    .setTags(true)
    .setHeads(false)
    .call();
for (Ref ref : remoteRefs) {
    System.out.println(ref.getName() + " -> " + ref.getObjectId().name());
}
```

Git

.call()

origin

CredentialsProvider

Git add blame commit clean push rebase revert reset

JGit

- JGit API *http://download.eclipse.org/jgit/docs/latest/apidocs* Javadoc JVM IDE
- JGit Cookbook *https://github.com/centic9/jgit-cookbook* JGit
- *http://stackoverflow.com/questions/6861881*

C Git 命令

Git

设置与配置

Git
config help

git config

Git
Git
Git

git config
“ Git ” Git

“ Git ”

“ ” git pull --rebase

“ ” HTTP

“ ” Git
smudge clean

“ Git ”

git help

`git help` Git

`git help <command>`
“ ” `git help` “
” `git shell`

获取与创建项目

Git

git init

`git init` Git

“ Git ”

“ ”
“ ”

“ ”

git clone

`git clone`
`git init` Git
URL `origin` `git remote add` `git fetch` `git checkout`

`git clone`
“ ”
“ Git ” `--bare`
Git
“ ” Git

“ ” --
recursive

快照基础

git add

git add index
git commit
git add
Git

“ ” git add
“ ”

“ ”

“ ”

git status

git status

“ ” status
git
status

git dif

git diff
git diff
git diff --staged
git diff master branchB

“ ” git diff

“ ” , --check

“ ” , git diff A...B

“ ” -b
--theirs --ours --base

“ ” , --submodule

git difftool

git diff git difftool

“ ”

git commit

git commit git add

“ ”
-a git add
-m
“ ” --amend

“ ” git commit
“ ” -S

“ ” git commit

git reset

git reset
HEAD index --hard

“ ” git reset
git add
“ ”

“ ” git reset --hard
git merge --abort git reset

git rm

git rm Git
git add
“ ” git rm
--cached

“ ” git rm
git filter-branch --ignore-unmatch

git mv

git mv git
add git rm
“ ”

git clean

git clean

“ ” clean

分支与合并

Git

git branch

git branch

Chapter 3 branch

“ ” “ ”

“ ” git branch -u

“ Git ”

git checkout

git checkout

“ ” git branch

“ ” --track

“ ” --conflict=diff3

“ ” git reset

“ HEAD ”

git merge

git merge

“ ” git merge

merge git

merge <branch>

“ ” squashed merge

Git

“ ” -

Xignore-space-change --abort

“ ”

GPG

“ ”

git mergetool

Git git mergetool

“ ” “
”

git log

```
git log
```

“ ”
-p --stat --pretty
--online
“ ” --decorate
--graph

“ ” “ ” git
log branchA..branchB ,
“ ”
<_merge_log>> “ ” bran-
chA...branchB --left-right
“ ” --merge
--cc
“ ” -g
Git reflog
“ ” -S -L

“ ” --show-signature
git log

git stash

```
git stash
```

“ ”

git tag

`git tag`

“ ” “
”
“ ” `-s` GPG
`-v`

项目分享与更新

Git

git fetch

`git fetch`

“ ”
“ ”
“ ”
“ ”
“ ”
“ ” `refspec` `git fetch`

git pull

`git pull` `git fetch` `git merge` Git

“ ”
“ ”
“ ”

“ ” URL

“ ” `--verify-signatures` GPG

git push

```
git push
```

```
              “                ”              git push
                                                  “      ”
                                          “          ”
                                          “              ”
    --delete       git push
     “                ”                                  git push
     “          ”                                        --tags
     “                ”                  --recurse-submodules
     “                ”                    pre-push       hook
          “              ”                                refspec
```

git remote

```
git remote
  URL                          origin
                                 git remote
            “                 ”
                                                        git remote
add <name> <url>
```

git archive

```
git archive
         “              ”             git archive
```

git submodule

git submodule
submodule , add update sync
“ ”

检查与比较

git show

git show Git
“ ”
“ ”

git show “ ”

git shortlog

git shortlog git log
git log

“ ”
changelog

git describe

git describe

SHA-1
“ ” “ ” git describe

调试

Git

git bisect

`git bisect`

bug

“ ”

git blame

`git blame`

“ ”

git grep

`git grep`

“ Git Grep ”

补丁

Git

git cherry-pick

`git cherry-pick`

“ ” Cherry picking

git rebase

`git rebase` cherry-pick

cherry-picks

“ ”

“ ”

`--onto`

“ Rerere ”
“ ” -i

git revert

git revert git cherry-pick

“ ”

邮件

Git Git
,Git

git apply

git apply git diff GNU dif

“ ”

git am

git am mbox

“ am ”
--resolved -i -3
“ ” hooks
git am
“ ” GitHub

git format-patch

git format-patch mbox

“ ” git format-patch

git imap-send

git imap-send git format-patch IMAP “ ” git imap-send

git send-email

git send-mail git format-patch “ ” git send-email

git request-pull

git request-pull

“ ” git request-pull

外部系统

Git

git svn

git svn Git Subversion Git Subversion “Git Subversion”

git fast-import

git fast-import Git “ ”

管理

Git

Git

git gc

`git gc` “ garbage collection ”

-

“ ”

git fsck

`git fsck`

“ ”

dangling object

git refog

`git reflog`

“ ”

`git log -g` `git log`

“ ”

git flter-branch

`git filter-branch`

“ ”

`--commit-filter` `--subdirectory-filter` `--tree-filter`

“ Git-p4 ” “ TFS ”

底层命令

“ ” ls-remote

“ ” “ Rerere ” “ ” ls-
files

“ ” rev-parse

SHA-1

Chapter 10

Index

H

I

J

K

L

X

Z