

Git and Software Complexity

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<https://github.com/ontouchstart>

Software complexity

- Hard to understand
- Hard to use
- Hard to develop
- Hard to maintain

Point of view is worth 80 IQ points



What is git?

GIT - the stupid content tracker

"git" can mean anything, depending on your mood.

- random three-letter combination that is pronounceable, and not actually used by any common UNIX command. The fact that it is a mispronunciation of "get" may or may not be relevant.
- stupid. contemptible and despicable. simple. Take your pick from the dictionary of slang.
- "global information tracker": you're in a good mood, and it actually works for you. Angels sing, and a light suddenly fills the room.
- "goddamn idiotic truckload of sh*t": when it breaks

Git is a fast, scalable, distributed revision control system with an unusually rich command set that provides both high-level operations and full access to internals.

How do I use git?

```
bash-3.2$ git --help --all
usage: git [--version] [--exec-path[=<path>]] [--html-path] [--man-path] [--info-path]
           [-p|--paginate|--no-pager] [--no-replace-objects] [--bare]
           [--git-dir=<path>] [--work-tree=<path>] [--namespace=<name>]
           [-c name=value] [--help]
           <command> [<args>]
```

available git commands in '/usr/libexec/git-core'

add	credential-cache	grep	merge-recursive	remote-ext	stage
add--interactive	credential-cache--daemon	gui--askpass	merge-resolve	remote-fd	stash
am	credential-store	hash-object	merge-subtree	remote-ftp	status
annotate	cvsexportcommit	help	merge-tree	remote-ftps	stripspace
apply	cvsimport	http-backend	mergetool	remote-http	submodule
archimport	cvsserver	http-fetch	mktag	remote-https	svn
archive	daemon	http-push	mktree	remote-testgit	symbolic-ref
bisect	describe	imap-send	mv	repack	tag
bisect--helper	diff	index-pack	name-rev	replace	tar-tree
blame	diff-files	init	notes	repo-config	unpack-file
branch	diff-index	init-db	pack-objects	request-pull	unpack-objects
bundle	diff-tree	instaweb	pack-redundant	rerere	update-index
cat-file	difftool	log	pack-refs	reset	update-ref
check-attr	difftool--helper	lost-found	patch-id	rev-list	update-server-info
check-ref-format	fast-export	ls-files	peek-remote	rev-parse	upload-archive
checkout	fast-import	ls-remote	prune	revert	upload-pack
checkout-index	fetch	ls-tree	prune-packed	rm	var
cherry	fetch-pack	mailinfo	pull	send-email	verify-pack
cherry-pick	filter-branch	mailsplit	push	send-pack	verify-tag
citool	fmt-merge-msg	merge	quiltimport	sh-i18n--envsubst	web--browse
clean	for-each-ref	merge-base	read-tree	shell	whatchanged
clone	format-patch	merge-file	rebase	shortlog	write-tree
commit	fsck	merge-index	receive-pack	show	
commit-tree	fsck-objects	merge-octopus	reflog	show-branch	
config	gc	merge-one-file	relink	show-index	
count-objects	get-tar-commit-id	merge-ours	remote	show-ref	

See 'git help <command>' for more information on a specific command.

gitk: git

```

SHA1 ID: ad4813b3c2513c5dc7e84305ab8a393b32124977
Find next prev commit containing: Exact All fields
Search Diff Old version New version Lines of context: 3 Ignore space change Line diff
Author: Nguyễn Thái Ngọc Duy <pclouds@gmail.com> 2012-09-29 00:41:27
Committer: Junio C Hamano <gitster@pobox.com> 2012-09-29 14:40:58
Parent: 652398a88e7c3d18b6820a2ae369b05d26dc757f (Update draft release notes to 1.8.0)
Child: 72fd13f71c18b438ca3e482c126bcbaa2dac650 (revision: add --grep-reflog to filter commits by reflog message)
Branches: master, remotes/origin/master, remotes/origin/next, remotes/origin/pu
Follows: v1.7.12.1
Precedes:

grep: prepare for new header field filter

grep supports only author and committer headers, which have the same
special treatment that later headers may or may not have. Check for
field type and only strip_timestamp() when the field is either author
or committer.

GREP_HEADER_FIELD_MAX is put in the grep_header_field enum to be
calculated automatically, correctly, as long as it's at the end of the
enum.

Signed-off-by: Nguyễn Thái Ngọc Duy <pclouds@gmail.com>
Signed-off-by: Junio C Hamano <gitster@pobox.com>
```

Patch Tree

- Comments
- .gitattributes
- .gitignore
- .mailmap
- COPYING
- Documentation/GIT-VERSION-GEN
- INSTALL
- LGPL-2.1
- Makefile
- README
- RelNotes
- abspath.c
- aclocal.m4
- advice.c
- advice.h
- alias.c
- alloc.c
- archive-tar.c
- archive-zip.c
- archive.c
- archive.h
- argv-array.c
- argv-array.h
- attr.c
- attr.h
- base85.c
- bisect.c
- bisect.h
- blob.c
- blob.h
- block-sha1/
- branch.c
- branch.h
- builtin.h
- builtin/
- bulk-checkin.c
- bulk-checkin.h
- bundle.c
- bundle.h
- cache-tree.c
- cache-tree.h
- cache.h

git (branch: master)

Refresh

GIT Stage

All Local *master*

BRANCHES master

REMOTES origin

TAGS

OTHER

STASHES

SUBMODULES

Subject Author Date

Junio C Hamano October 3, 2012 12:18 AM

Merge branch 'nd/grep-reflog' Junio C Hamano October 3, 2012 12:13 AM

Merge branch 'lt/mailinfo-handle-attachment-more-safely' Junio C Hamano October 3, 2012 12:13 AM

Merge branch 'tu/gc-auto-quiet' Junio C Hamano October 3, 2012 12:13 AM

Merge branch 'maint' Junio C Hamano October 2, 2012 4:47 PM

origin/maint Start preparing for 1.7.12.3 Junio C Hamano October 2, 2012 4:44 PM

Merge branch 'rr/maint-submodule-unknown-cmd' into maint Junio C Hamano October 2, 2012 4:42 PM

Merge branch 'sp/maint-http-enable-gzip' into maint Junio C Hamano October 2, 2012 4:42 PM

Merge branch 'sp/maint-http-info-refs-no-retry' into maint Junio C Hamano October 2, 2012 4:41 PM

l10n: Fix to Swedish translation Peter Krefting October 2, 2012 3:25 AM

Documentation: mention 'push.default' in git-push.txt Ramkumar Ramach... October 2, 2012 11:38 AM

RelNotes/1.8.0: various typo and style fixes Michael J Gruber October 2, 2012 10:35 AM

v1.8.0-rc0 Junio C Hamano October 1, 2012 4:09 PM

Merge branch 'jk/completion-tests' Junio C Hamano October 1, 2012 3:59 PM

Merge branch 'ep/malloc-check-perturb' Junio C Hamano October 1, 2012 3:59 PM

Merge branch 'da/mergetool-custom' Junio C Hamano October 1, 2012 3:58 PM

Merge branch 'os/commit-submodule-ignore' Junio C Hamano October 1, 2012 3:58 PM

Merge branch 'jc/blame-follows-renames' Junio C Hamano October 1, 2012 3:58 PM

Merge branch 'jk/receive-pack-unpack-error-to-pusher' Junio C Hamano October 1, 2012 3:58 PM

Merge branch 'rt/maint-clone-single' Junio C Hamano October 1, 2012 3:58 PM

revision: make --grep search in notes too if shown Nguyễn Thái Ngọc... September 29, 2012 12:...
log --grep-reflog: reject the option without -g Nguyễn Thái Ngọc... September 29, 2012 2:5...
revision: add --grep-reflog to filter commits by reflog messages Nguyễn Thái Ngọc... September 29, 2012 12:...
grep: prepare for new header field filter Linus Torvalds September 30, 2012 6:1...
mailinfo: don't require "text" mime type for attachments Tobias Ulmer September 23, 2012 10:...
silence git gc --auto --quiet output Junio C Hamano September 30, 2012 2:2...
Merge git://github.com/git-l10n/git-po Jiang Xin September 27, 2012 7:0...
Merge git://github.com/gotgit/git-po-zh_CN Jiang Xin September 14, 2012 11:...
l10n: zh.CN.po: msgmerge git.po (1142t195f630u) Jiang Xin September 27, 2012 6:5...
Merge branch 'maint' Peter Krefting September 26, 2012 3:0...
l10n: Fixes to Swedish translation Peter Krefting September 21, 2012 10:...
Update Swedish translation (1967t0f0u) Jiang Xin September 14, 2012 10:...
l10n: Update git.po (825 new, 24 removed messages) Junio C Hamano September 30, 2012 1:5...
Update draft release notes to 1.8.0 Junio C Hamano September 30, 2012 2:2...
Sync with 1.7.12.2 Junio C Hamano September 30, 2012 1:3...
v1.7.12.2 Git 1.7.12.2 Junio C Hamano September 30, 2012 2:2...
Merge branch 'maint' of git://github.com/git-l10n/git-po into maint Junio C Hamano September 30, 2012 2:2...
Merge branch 'l10n-thynson' of git://github.com/thynson/git-po-zh_CN into maint Junio C Hamano September 30, 2012 2:2...
l10n: Improve many translation for zh_CN Thynson August 7, 2012 5:39 AM
l10n: Unify the translation for '(un)expected' Thynson August 7, 2012 5:25 AM
Merge branch 'maint' of https://github.com/ralfth/git-po-de into maint Jiang Xin September 27, 2012 6:3...
l10n: de.po: correct translation of a 'rebase' message Ralf Thielow September 24, 2012 1:1...
Merge branch 'jc/maint-log-grep-all-match-1' into maint Junio C Hamano September 30, 2012 1:3...
Merge branch 'jc/maint-mailinfo-mime-attr' into maint Junio C Hamano September 30, 2012 1:3...
Merge branch 'rr/maint-submodule-unknown-cmd' Junio C Hamano September 30, 2012 1:2...
Merge branch 'rt/maint-clone-single' Junio C Hamano September 30, 2012 1:2...

Source Blame History Diff Diff with: Local HEAD

.gitattributes * whitespace=!indent,trail,space
*.sh whitespace=indent,trail,space

30529 commits loaded

git.kernel.org - git/git.git/s: X

git.kernel.org/?p=git/git.git;a=summary

/pub/scm / git/git.git / summary

summary | shortlog | log | commit | commitdiff | tree

commit ↻ [?] search: re

+++ git

description The core git plumbing
owner kernel.org files owner
last change Wed, 3 Oct 2012 04:18:40 +0000
URL <git://git.kernel.org/pub/scm/git/git.git>
<http://git.kernel.org/pub/scm/git/git.git>
<https://git.kernel.org/pub/scm/git/git.git>

shortlog

39 hours ago Junio C Hamano	Update draft release notes to 1.8.0 master	commit commitdiff tree snapshot
40 hours ago Junio C Hamano	Merge branch 'nd/grep-reflog'	commit commitdiff tree snapshot
40 hours ago Junio C Hamano	Merge branch 'lt/mailinfo-handle-attachment-more-sensely'	commit commitdiff tree snapshot
40 hours ago Junio C Hamano	Merge branch 'tu/gc-auto-quiet'	commit commitdiff tree snapshot
47 hours ago Junio C Hamano	Merge branch 'maint'	commit commitdiff tree snapshot
47 hours ago Junio C Hamano	Start preparing for 1.7.12.3 maint	commit commitdiff tree snapshot
47 hours ago Junio C Hamano	Merge branch 'rr/maint-submodule-unknown-cmd' into...	commit commitdiff tree snapshot
47 hours ago Junio C Hamano	Merge branch 'sp/maint-http-enable-gzip' into maint	commit commitdiff tree snapshot
47 hours ago Junio C Hamano	Merge branch 'sp/maint-http-info-refs-no-retry' into...	commit commitdiff tree snapshot
2 days ago Peter Krefting	I10n: Fix to Swedish translation	commit commitdiff tree snapshot
2 days ago Ramkumar Ramachandra	Documentation: mention `push.default` in git-push.txt	commit commitdiff tree snapshot
2 days ago Michael J Gruber	RelNotes/1.8.0: various typo and style fixes	commit commitdiff tree snapshot
3 days ago Junio C Hamano	Git 1.8.0-rc0 v1.8.0-rc0	commit commitdiff tree snapshot
3 days ago Junio C Hamano	Merge branch 'jk/completion-tests'	commit commitdiff tree snapshot
3 days ago Junio C Hamano	Merge branch 'ep/malloc-check-perturb'	commit commitdiff tree snapshot
3 days ago Junio C Hamano	Merge branch 'da/mergetool-custom'	commit commitdiff tree snapshot
...		

tags

3 days ago v1.8.0-rc0	Git 1.8.0-rc0	tag commit shortlog log
4 days ago v1.7.12.2	Git 1.7.12.2	tag commit shortlog log

git/git - GitHub

GitHub, Inc. [US] https://github.com/git/git

github

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PUBLIC git / git

Code Network Pull Requests 0 Graphs

Git Source Code Mirror - This is a publish-only repository and all pull requests are ignored. Please follow Documentation/SubmittingPatches procedure for any of your improvements. — [Read more](#)

Clone in Mac ZIP HTTP Git Read-Only https://github.com/git/git.git Read-Only access

branch: master Files Commits Branches 5 Tags 430 Downloads

Latest commit to the master branch

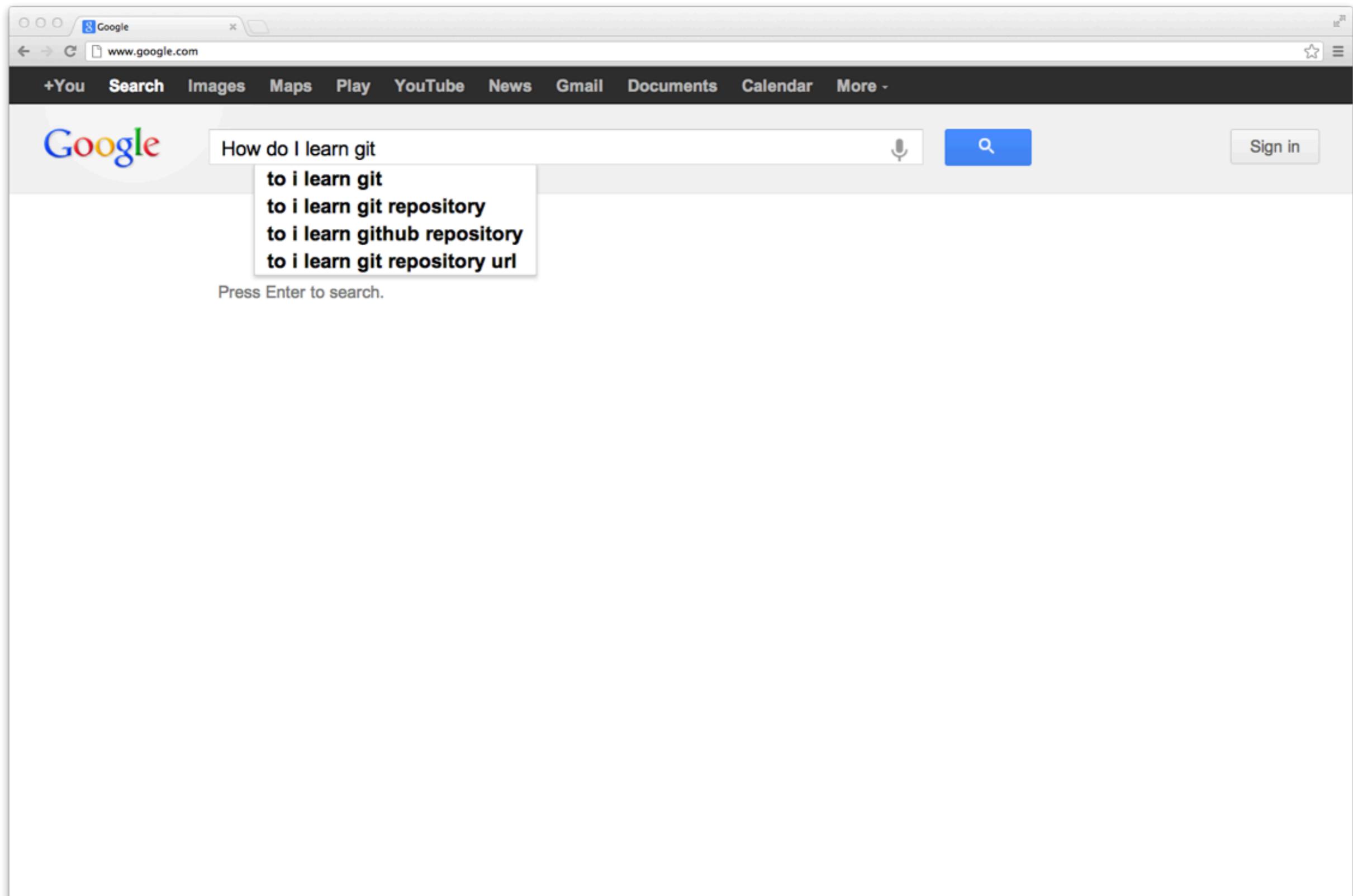
Update draft release notes to 1.8.0 ...

gitster authored 2 days ago commit f84667def2

git /

name	age	message	history
Documentation	2 days ago	Update draft release notes to 1.8.0 [gitster]	
block-sha1	2 months ago	Merge branch 'jn/block-sha1' [gitster]	
builtin	2 days ago	Merge branch 'lt/mailinfo-handle-attachment-more-sensely' [gitster]	
compat	17 days ago	make poll() work on platforms that can't recv() on a non-socket [Jojo-Schmitz]	
contrib	9 days ago	Merge branch 'maint' [gitster]	
git-gui	10 months ago	Merge branch 'master' of git://repo.or.cz/git-gui [gitster]	

How do I learn git?



Get git

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

The screenshot shows the homepage of the git-scm.com website. At the top, there is a banner for the 'Git User's Survey 2012' with a deadline of '26 September — 15 October 2012'. Below the banner, the Git logo is displayed with the tagline '--fast-version-control'. A search bar is located in the top right corner. The main content area features two columns of links: 'About', 'Downloads', 'Documentation', and 'Community'. To the right of these links is a large image of a computer monitor displaying the 'Latest stable release' information. At the bottom left, there is a thumbnail of the 'Pro Git' book. At the bottom right, there are links for 'Mac GUIs', 'Tarballs', 'Windows Build', and 'Source Code'.

The Git User's Survey 2012 is now up! 26 September — 15 October 2012
Please devote a few minutes of your time to [fill out the simple questionnaire](#). It'll help the Git community understand your needs, what you like about Git (and what you don't), and help us improve it in general. The results will be published at [GitSurvey2012](#).

git --fast-version-control

Search entire site...

Git is a [free and open source](#) distributed version control system designed to handle everything from small to very large projects with speed and efficiency.

Git is [easy to learn](#) and has a [tiny footprint with lightning fast performance](#). It outclasses SCM tools like Subversion, CVS, Perforce, and ClearCase with features like [cheap local branching](#), [convenient staging areas](#), and [multiple workflows](#).

About
The advantages of Git compared to other source control systems.

Downloads
GUI clients and binary releases for all major platforms.

Documentation
Command reference pages, Pro Git book content, videos and other material.

Community
Get involved! Mailing list, chat, development and more.

Latest stable release
1.7.12.2
Release Notes (2012-09-30)
[Download for Mac](#)

Pro Git by Scott Chacon is available to [read online for free](#). Dead tree versions are available on [Amazon.com](#).

[Mac GUIs](#) [Tarballs](#)
[Windows Build](#) [Source Code](#)

Git git

```
bash-3.2$ git clone git://git.kernel.org/pub/scm/git/git.git
Cloning into 'git'...
remote: Counting objects: 142157, done.
remote: Compressing objects: 100% (36735/36735), done.
remote: Total 142157 (delta 104031), reused 141518 (delta 103518)
Receiving objects: 100% (142157/142157), 32.28 MiB | 634 KiB/s, done.
Resolving deltas: 100% (104031/104031), done.
```

The origin of git

```
bash-3.2$ git log |tail -5
commit e83c5163316f89bfde7d9ab23ca2e25604af290
Author: Linus Torvalds <torvalds@ppc970.osdl.org>
Date:   Thu Apr 7 15:13:13 2005 -0700
```

Initial revision of "git", the information manager from hell

Time machine

```
bash-3.2$ git checkout e83c5163316f89bfde7d9ab23ca2e25604af290
HEAD is now at e83c516... Initial revision of "git", the information manager from hell
bash-3.2$ git log
commit e83c5163316f89bfde7d9ab23ca2e25604af290
Author: Linus Torvalds <torvalds@ppc970.osdl.org>
Date:   Thu Apr 7 15:13:13 2005 -0700
```

Initial revision of "git", the information manager from hell

```
bash-3.2$ wc *
    40      99     957 Makefile
   168    1415    8392 README
    93    350    2484 cache.h
    23     66    503 cat-file.c
   172    576   4103 commit-tree.c
    51    186   1198 init-db.c
   259    820   5681 read-cache.c
    43    133    986 read-tree.c
    81    245   2034 show-diff.c
   248    767   5395 update-cache.c
    66    223   1441 write-tree.c
 1244   4880  33174 total
```

Master

```
bash-3.2$ git checkout master
Previous HEAD position was e83c516... Initial revision of "git", the information manager
from hell
Switched to branch 'master'
bash-3.2$ find * -type f | wc -l
2488
bash-3.2$ wc $(find * -type f) | tail
 358    1511   10108 xdiff/xpatience.c
 482    1747   12267 xdiff/xprepare.c
   34     176    1123 xdiff/xprepare.h
   67     247    1594 xdiff/xtypes.h
 482    1860   11023 xdiff/xutils.c
   46     260    1784 xdiff/xutils.h
 319    1006   7182 xdiff-interface.c
   24     102    944 xdiff-interface.h
 258     720    5905 zlib.c
588215 2105563 15854059 total
```

How many commits?

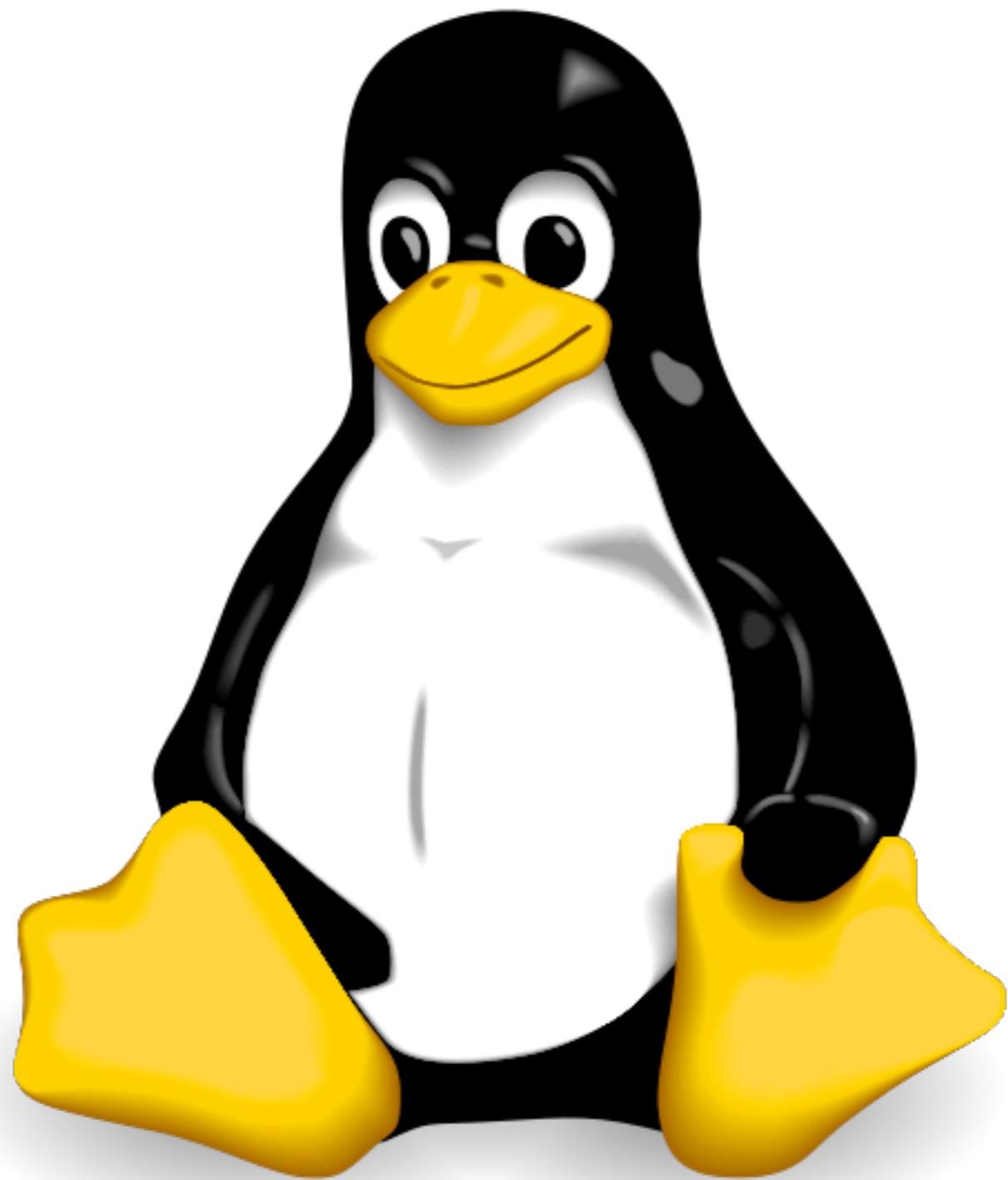
```
bash-3.2$ git log |grep "^\Author:" |wc -l  
30699
```

How many unique authors?

```
bash-3.2$ git log |grep "^\Author:" |cut -f1 -d'<' |sort |uniq |wc -l  
1065
```

Why git?

**Git is a tool to solve a
problem for a much
more complex project**



Linux Kernel

```
bash-3.2$ git clone git://git.kernel.org/pub/scm/linux/kernel/git/torvalds/linux.git
Cloning into 'linux'...
remote: Counting objects: 2679052, done.
remote: Compressing objects: 100% (407236/407236), done.
remote: Total 2679052 (delta 2246963), reused 2677522 (delta 2245440)
Receiving objects: 100% (2679052/2679052), 549.24 MiB | 1.02 MiB/s, done.
Resolving deltas: 100% (2246963/2246963), done.
bash-3.2$ find * -type f |wc -l
40307
bash-3.2$ du -ksc * |tail
2476mm
21792    net
180  samples
2492 scripts
2084 security
24980    sound
4156 tools
36   usr
180  virt
543700   total
```

The origin (with git)

```
bash-3.2$ git log |tail -15
```

```
commit 1da177e4c3f41524e886b7f1b8a0c1fc7321cac2
Author: Linus Torvalds <torvalds@ppc970.osdl.org>
Date:   Sat Apr 16 15:20:36 2005 -0700
```

Linux-2.6.12-rc2

Initial git repository build. I'm not bothering with the full history, even though we have it. We can create a separate "historical" git archive of that later if we want to, and in the meantime it's about 3.2GB when imported into git - space that would just make the early git days unnecessarily complicated, when we don't have a lot of good infrastructure for it.

Let it rip!

The origin of git (again)

```
bash-3.2$ git log |tail -5
commit e83c5163316f89bfbd7d9ab23ca2e25604af290
Author: Linus Torvalds <torvalds@ppc970.osdl.org>
Date:   Thu Apr 7 15:13:13 2005 -0700
```

Initial revision of "git", the information manager from hell

Linux kernel

```
bash-3.2$ git log |grep "^\Author:" |wc -l  
329694  
bash-3.2$ git log |grep "^\Author:" |cut -f1 -d'<' |sort |uniq |wc -l  
9886
```

What do these numbers mean?

- 329694 (number of commits)
- 9886 (number of unique authors)

A little bit of math

- 329694 (number of commits)
 - 5 minutes per commit: $329694 * 5 / 60 / 40 / 4 = 171$ months = 14 years
 - 30 minutes per commit: $329694 * 5 / 60 / 40 / 4 = 1030$ months = 86 years
- 9886 (number of unique authors)
 - about 3 infantry brigades



A U.S. infantry brigade of around 3,200 personnel, formed into eight **battalion-sized groups**



http://en.wikipedia.org/wiki/The_Mythical_Man-Month

The Mythical Man-Month - en.wikipedia.org/wiki/The_Mythical_Man-Month

Create account Log in

Article Talk Read Edit View history Search

The Mythical Man-Month

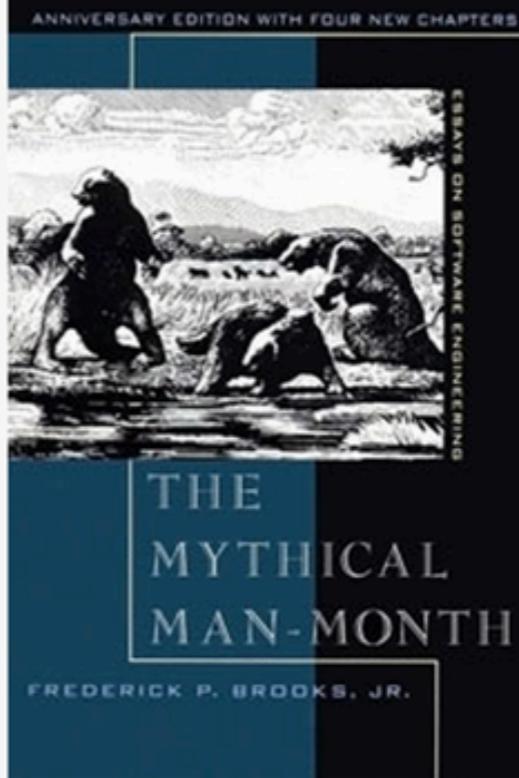
From Wikipedia, the free encyclopedia

The Mythical Man-Month: Essays on Software Engineering is a book on software engineering and project management by Fred Brooks, whose central theme is that "adding manpower to a late software project makes it later". This idea is known as Brooks' law, and is presented along with the second-system effect and advocacy of prototyping.

Brooks' observations are based on his experiences at IBM while managing the development of OS/360. He had added more programmers to a project falling behind schedule, a decision that he would later counter-intuitively conclude to have delayed the project even further. He also made the mistake of asserting that one project — writing an ALGOL compiler — would require six months, regardless of the number of workers involved (it required longer). The tendency for managers to repeat such errors in project development led Brooks to quip that his book is called "The Bible of Software Engineering", because "everybody quotes it, some people read it, and a few people go by it."^[1] The book is widely regarded as a classic on the human elements of software

The Mythical Man-Month

ANNIVERSARY EDITION WITH FOUR NEW CHAPTERS



ESSAYS ON SOFTWARE ENGINEERING

THE MYTHICAL MAN-MONTH

FREDERICK P. BROOKS, JR.

Author(s) Frederick Brooks

Subject(s) Software project management

How to manage complexity?

http://en.wikipedia.org/wiki/No_silver_bullet



The screenshot shows a web browser displaying the English Wikipedia article titled "No Silver Bullet". The page has a light blue header with the Wikipedia logo and the title. Below the header is a navigation bar with tabs: Article, Talk, Read, Edit, View history, and Search. The "Talk" tab is currently selected. On the left side, there is a sidebar with links to Main page, Contents, Featured content, Current events, Random article, Donate to Wikipedia, Wikipedia Shop, Interaction (Help, About Wikipedia, Community portal, Recent changes, Contact Wikipedia), and a Toolbox. The main content area starts with the heading "No Silver Bullet" and the subtext "From Wikipedia, the free encyclopedia (Redirected from No silver bullet)". The main text discusses Fred Brooks's paper "No Silver Bullet – Essence and Accidents of Software Engineering", which argues that there is no single development, in either technology or management technique, which by itself promises even one order of magnitude [tenfold] improvement within a decade in productivity, in reliability, in simplicity. It also mentions Brooks's distinction between accidental complexity and essential complexity.

WNo Silver Bullet – Wikipedia, the free encyclopedia

en.wikipedia.org/wiki/No_silver_bullet

Create account Log in

Article Talk Read Edit View history Search

No Silver Bullet

From Wikipedia, the free encyclopedia

(Redirected from [No silver bullet](#))

"**No Silver Bullet – Essence and Accidents of Software Engineering**" is a widely discussed paper on [software engineering](#) written by [Fred Brooks](#) in 1986.^[1] Brooks argues that "there is no single development, in either technology or management technique, which by itself promises even one [order of magnitude](#) [tenfold] improvement within a decade in productivity, in reliability, in simplicity." He also states that "we cannot expect ever to see two-fold gains every two years" in software development, like there is in hardware development.

Brooks makes a distinction between [accidental complexity](#) and [essential complexity](#), and asserts that most of what software engineers now do is devoted to the essential, so shrinking all the accidental activities to zero will not give an order-of-magnitude improvement. Brooks advocates addressing the essential parts of the software process. While Brooks insists that there is no one [silver bullet](#), he believes that a series of innovations attacking essential complexity could lead to significant (perhaps greater than tenfold in a ten-year period) improvements.

Essential complexity

situation where all reasonable solutions to a problem must be complicated (and possibly confusing) because the "simple" solutions would not adequately solve the problem.

Accidental complexity

caused by the approach chosen to solve the problem

Why git is complex

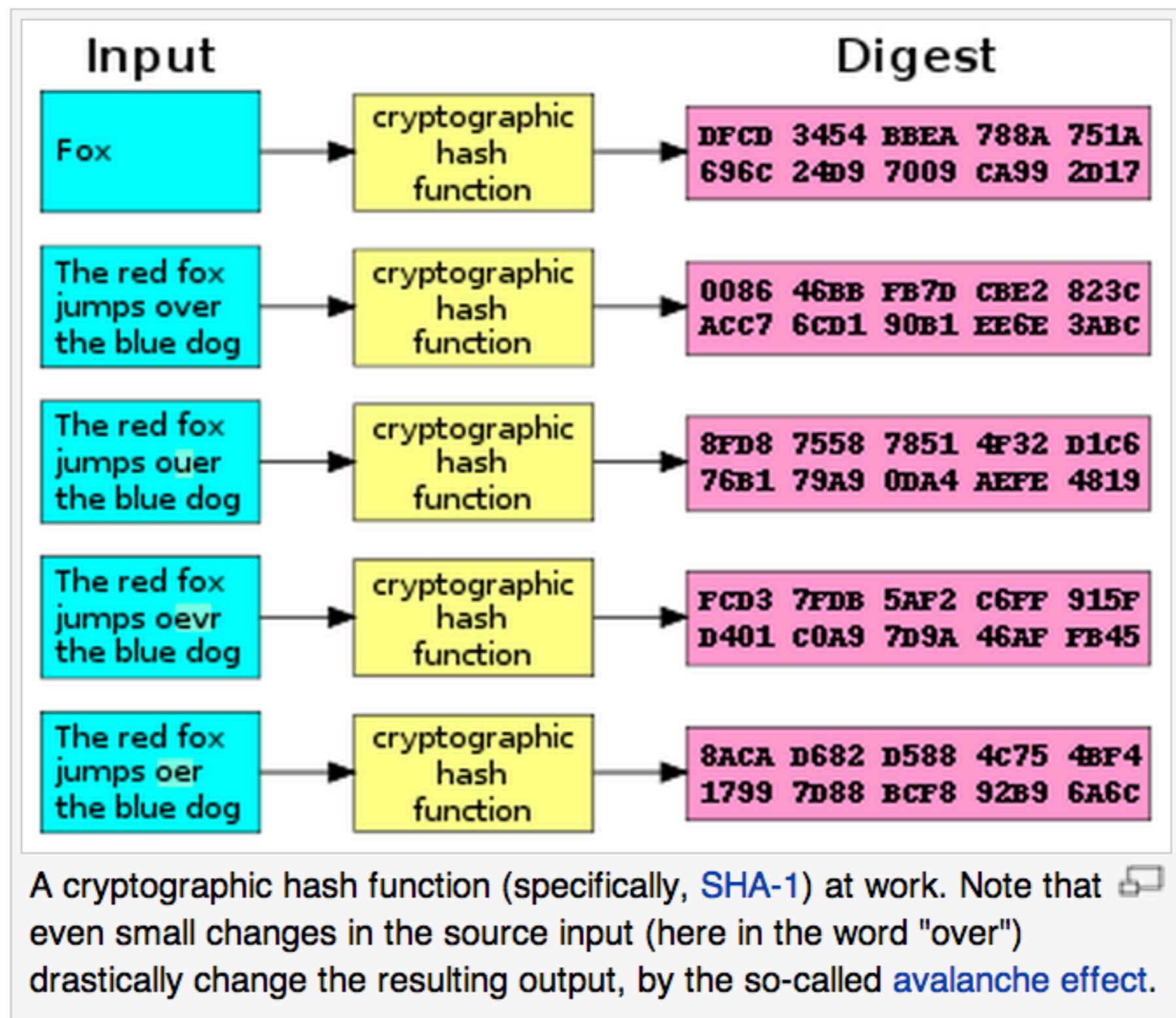
- Command Line Interface (CLI) or Graphic User Interface (GUI) are accidental complexity
- Distributed content tracking is a complex User Interface (UI) problem at a much deeper level (essential complexity)

Content vs. file

- Git tracks content, not files
- File is an implementation of content storage (same with file system)
- Content is about information itself

How to track something?

- With a key
- The key has to be unique
- Different files might have the same content
(bits) so file name/path can't be key



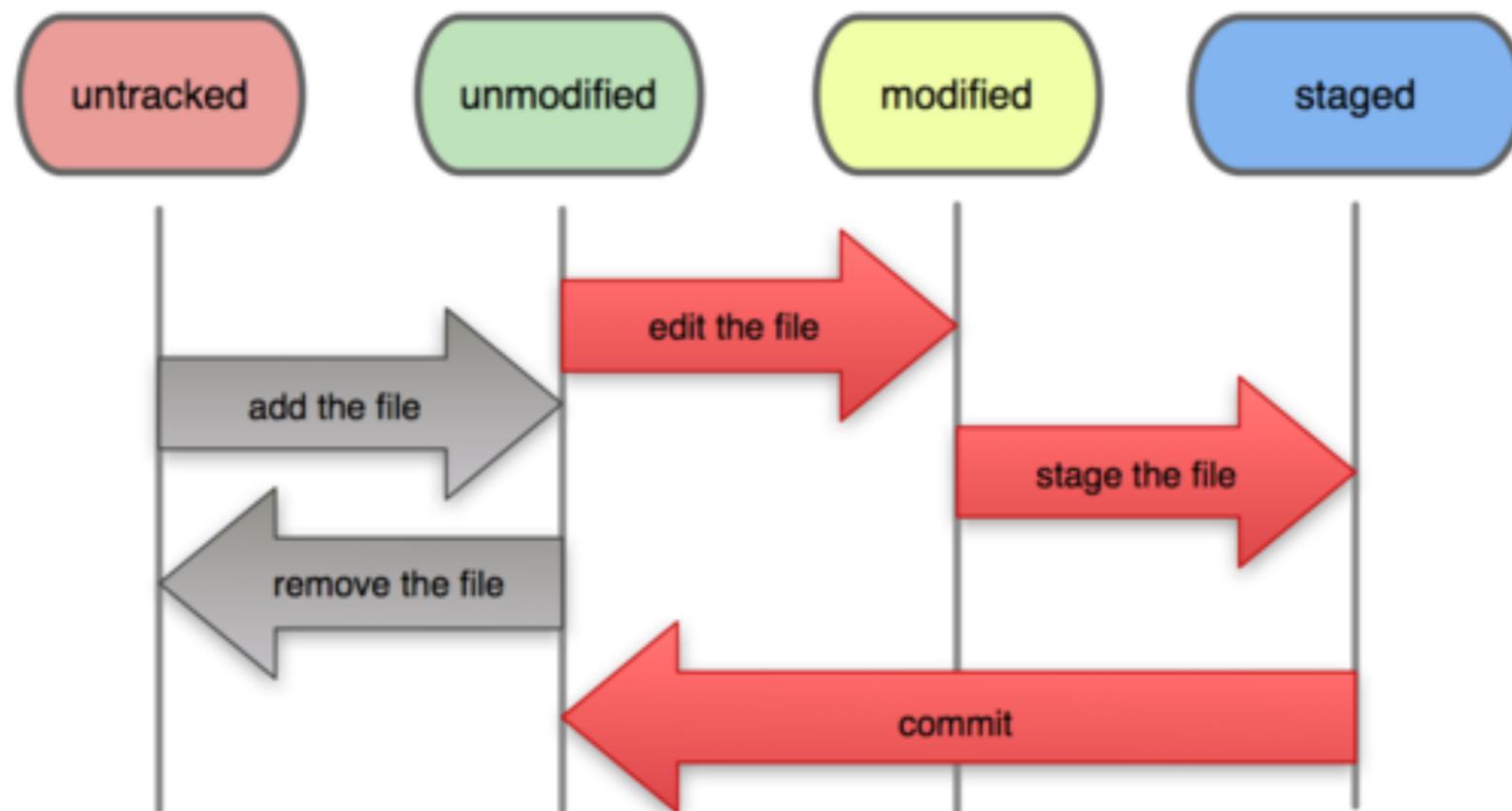
Data Integrity

The source control management system, [Git](#), uses SHA-1 not for security, but for ensuring that the data has not changed, Linus Torvalds says, "Git uses SHA-1 in a way which has nothing at all to do with security...It's just the best hash you can get...It's about the ability to trust your data. I guarantee you, if you put your data in Git, you can trust the fact that 5 years later, after it was converted from a hard disk to a DVD to whatever new technology and you copied it, 5 years later you can verify that the data that you get back out is the exact same data you put in."

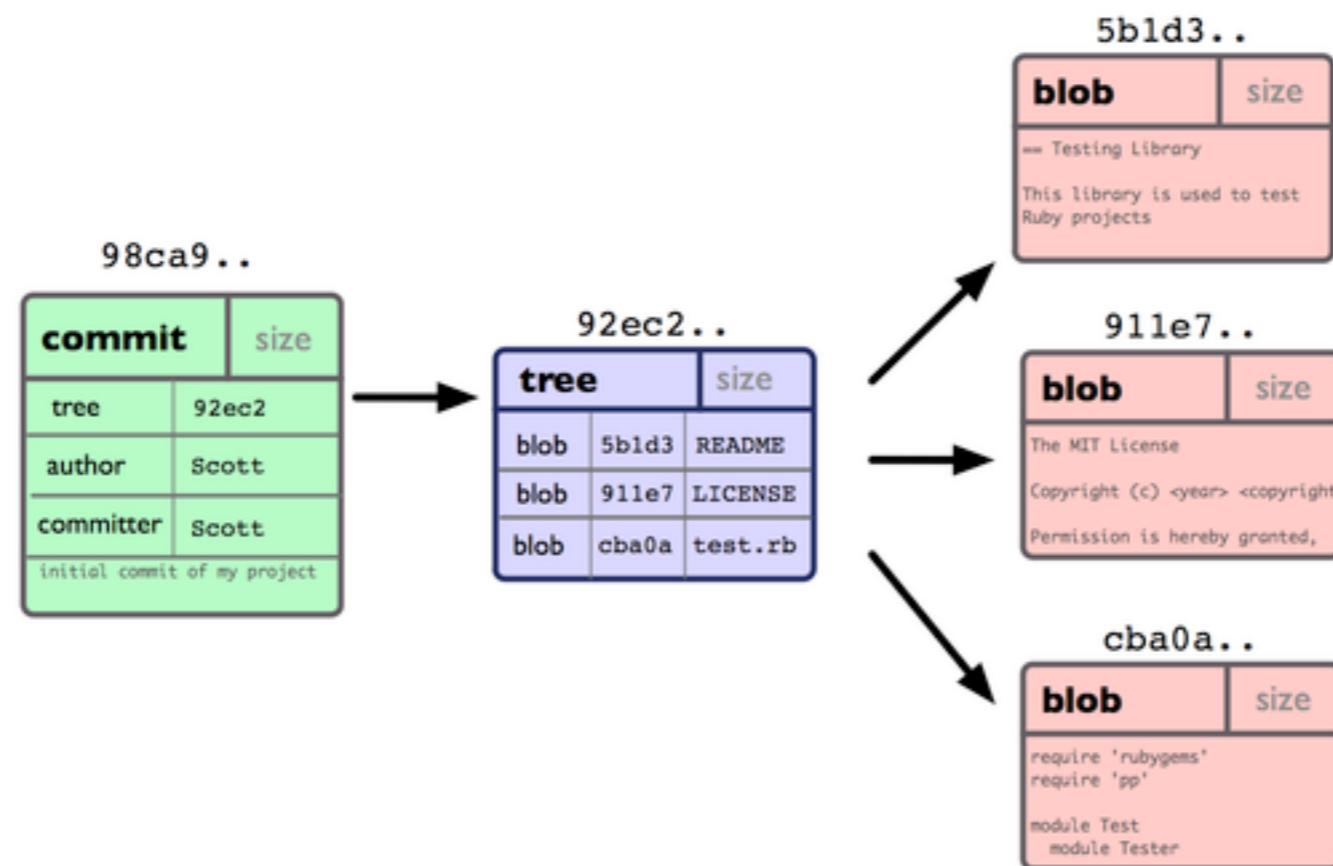
http://en.wikipedia.org/wiki/Sha-1#Data_Integrity

Commit

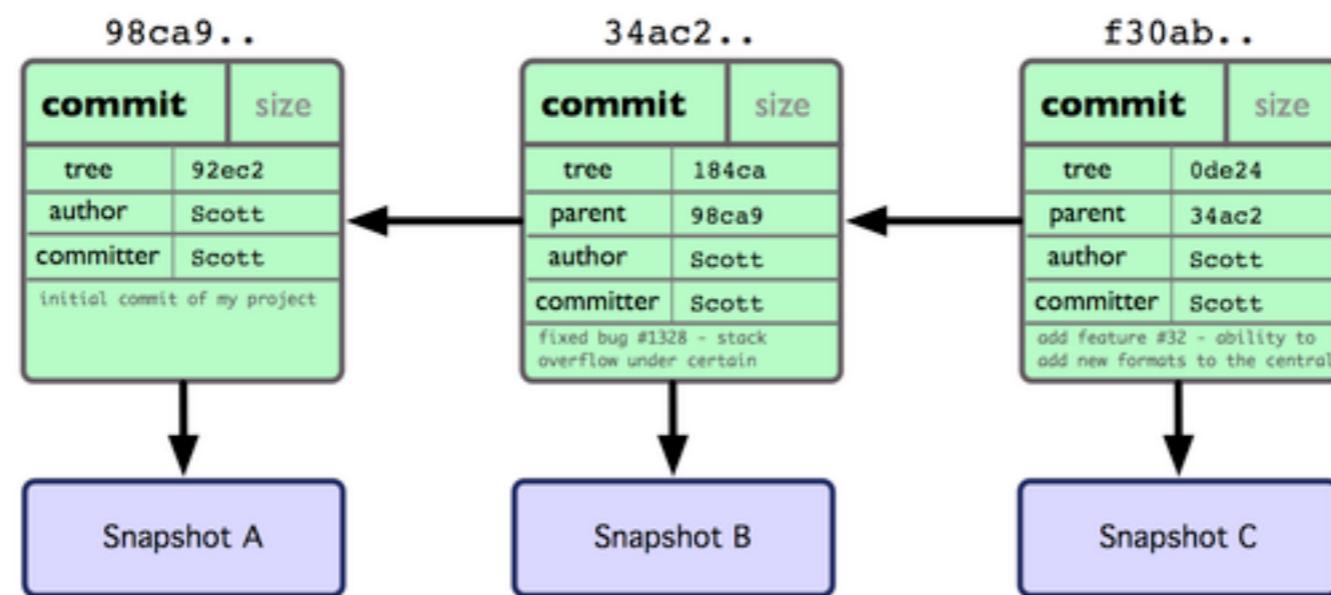
File Status Lifecycle



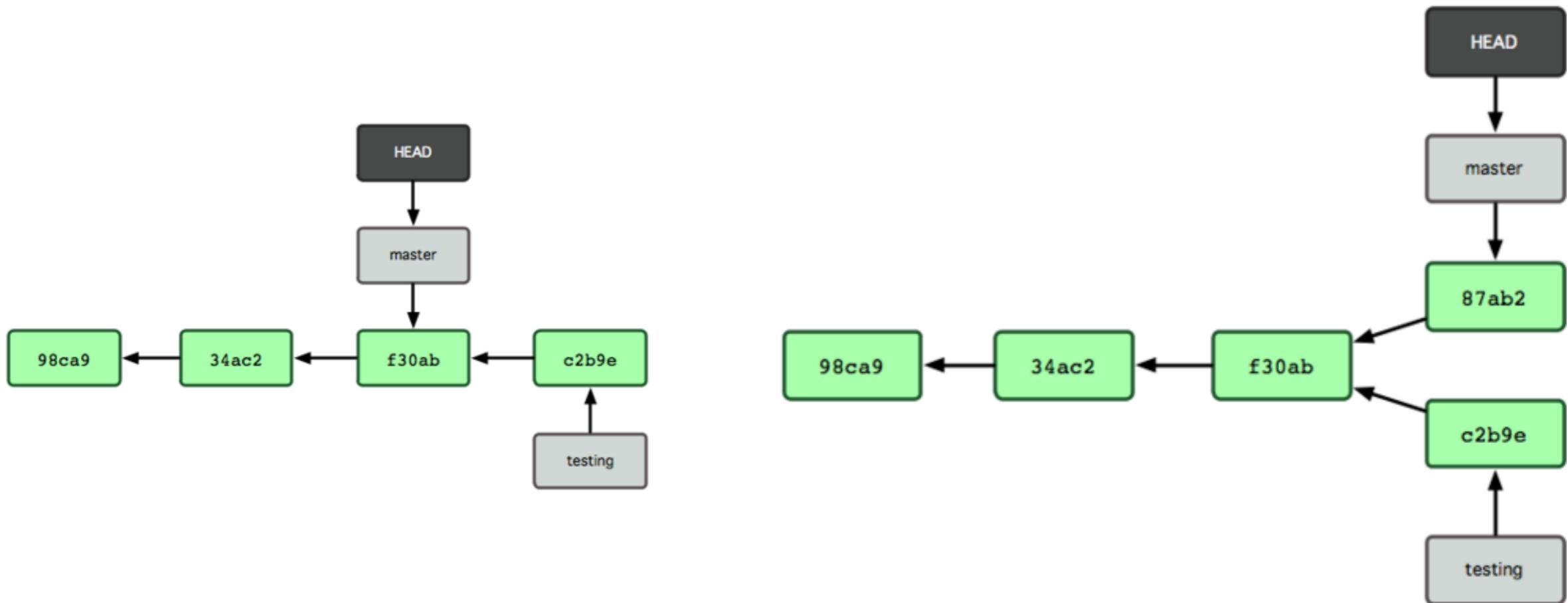
Objects



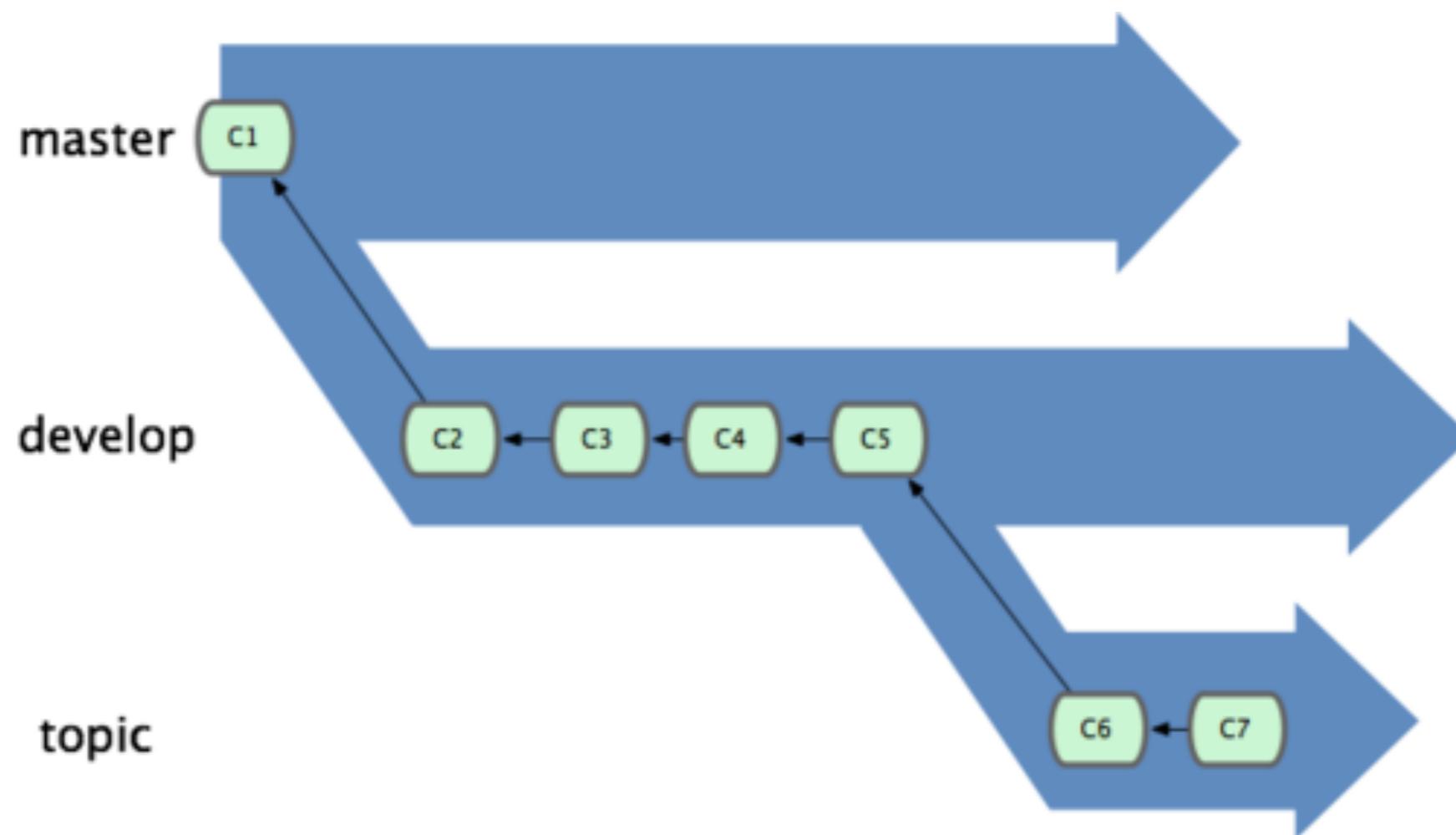
Snapshots



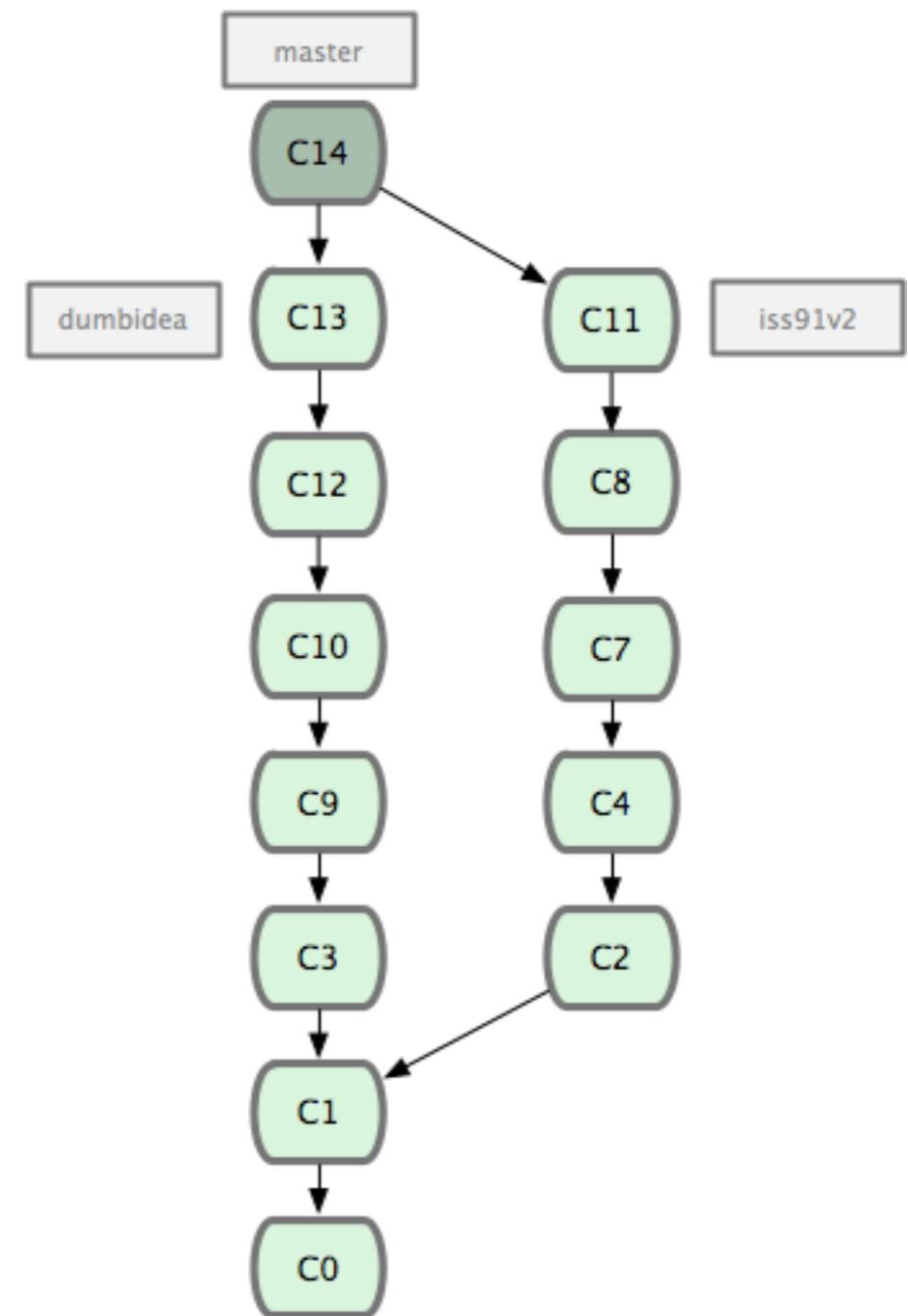
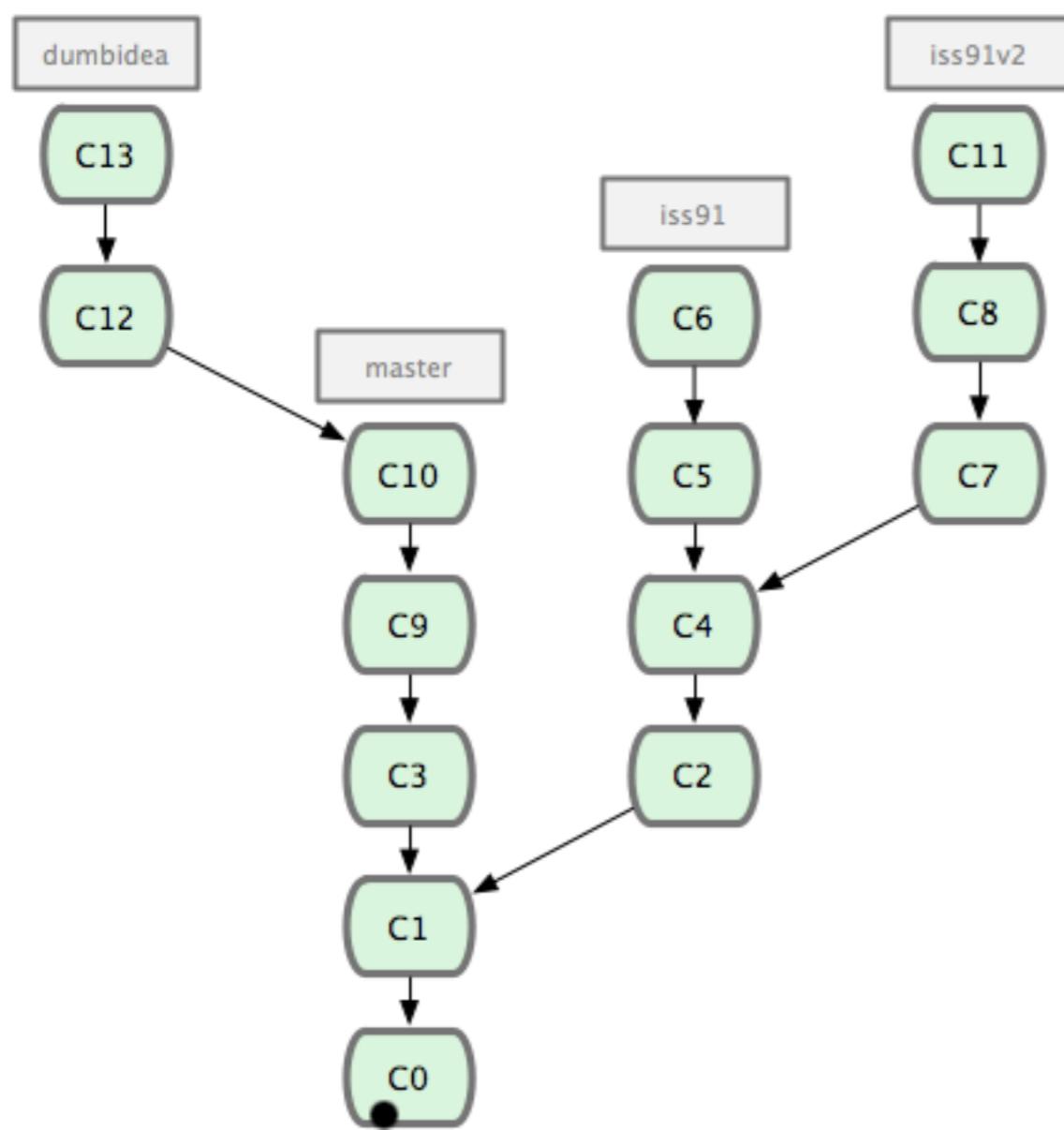
Branches



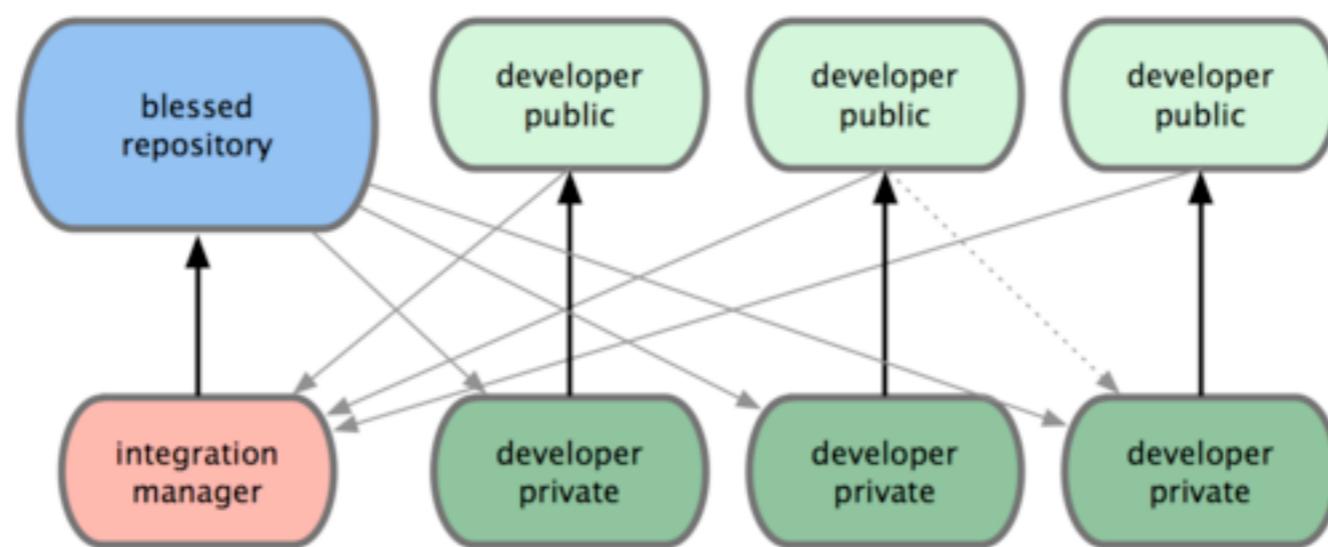
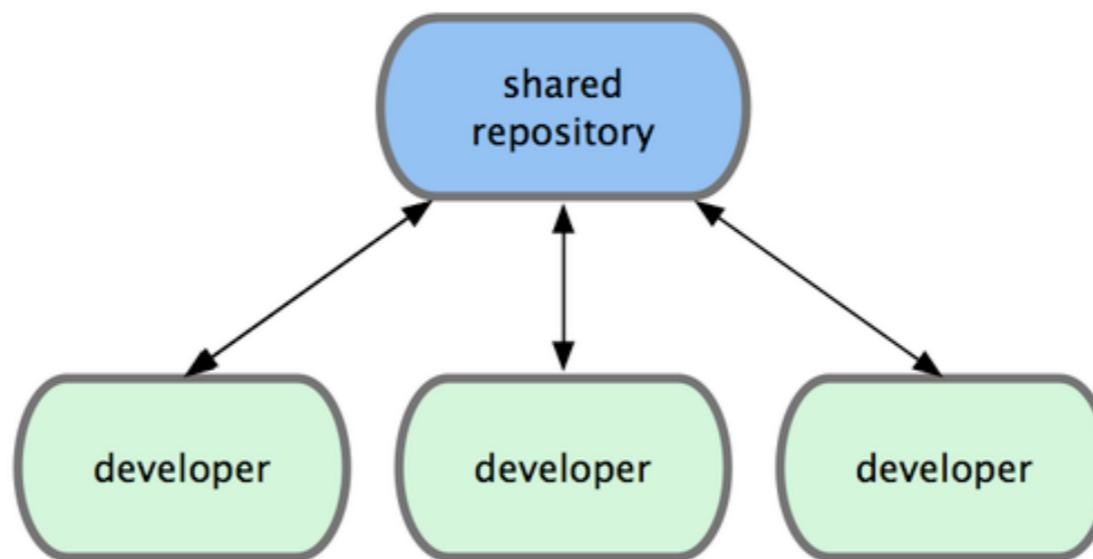
Development workflow



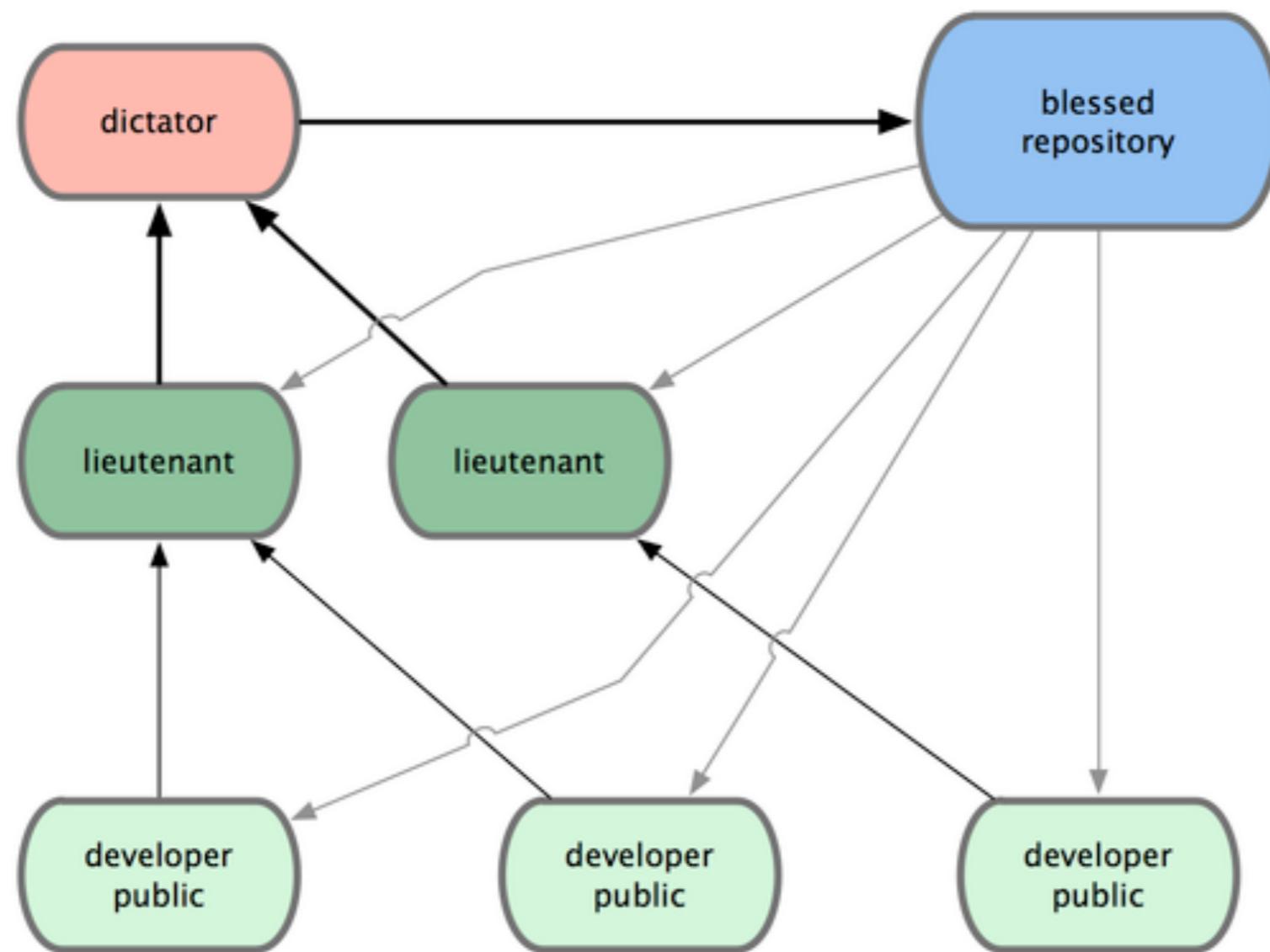
Merging



Two kinds of sharing



Network of trust

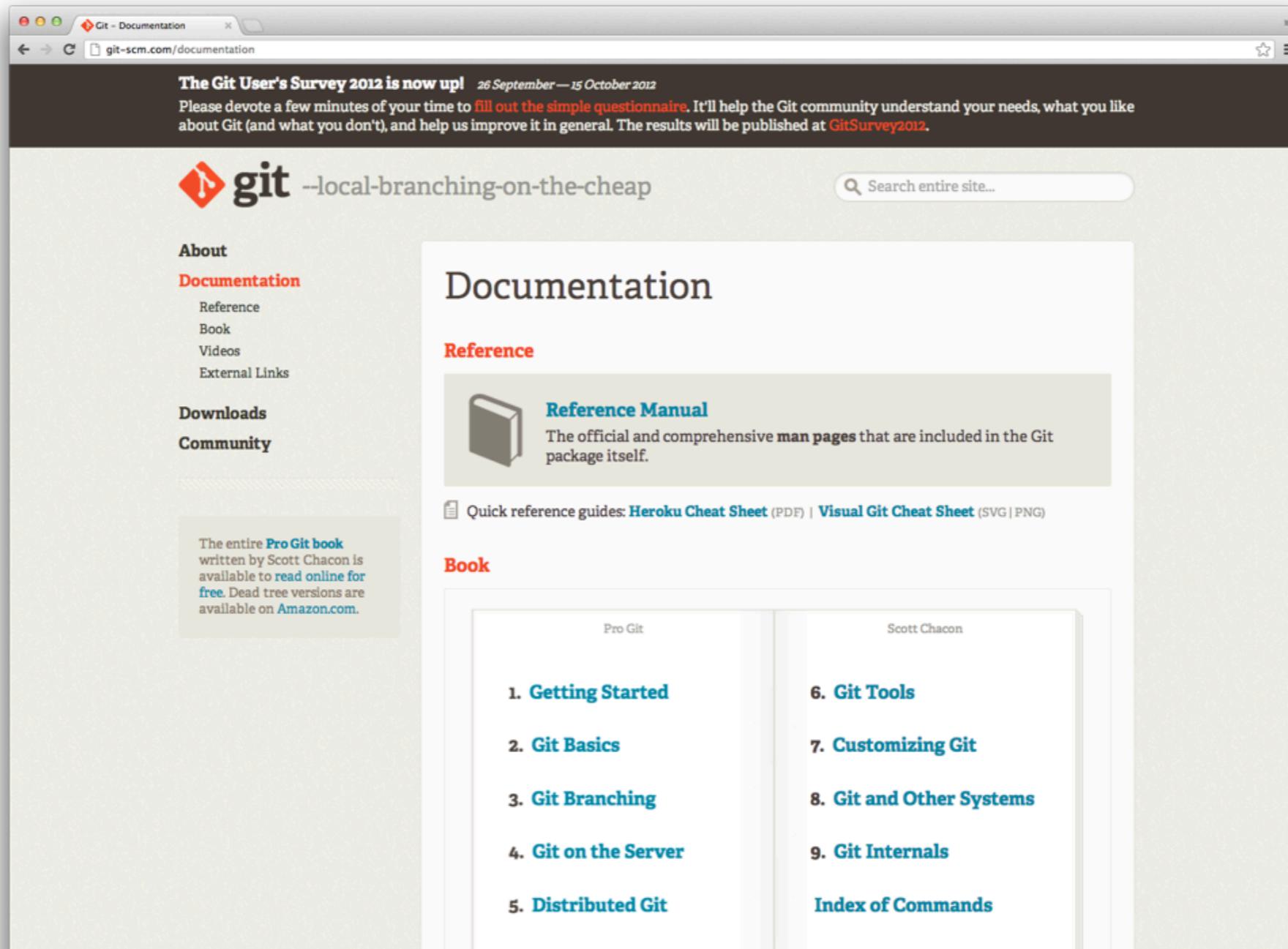


What is git about?

- Git is not about tracking code
- Git is about tracking activity
- Git is about tracking HUMAN activity

To learn more

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



The screenshot shows a web browser window displaying the official Git Documentation site at git-scm.com/documentation. The page features a dark header bar with a survey notice and a navigation sidebar on the left. The main content area is titled "Documentation" and includes sections for "Reference" and "Book".

Header: The Git User's Survey 2012 is now up! 26 September — 15 October 2012
Please devote a few minutes of your time to fill out the simple questionnaire. It'll help the Git community understand your needs, what you like about Git (and what you don't), and help us improve it in general. The results will be published at [GitSurvey2012](#).

Sidebar:

- About
- Documentation**
 - Reference
 - Book
 - Videos
 - External Links
- Downloads
- Community

Content Area:

Documentation

Reference

 **Reference Manual**
The official and comprehensive man pages that are included in the Git package itself.

Quick reference guides: [Heroku Cheat Sheet](#) (PDF) | [Visual Git Cheat Sheet](#) (SVG | PNG)

Book

Pro Git	Scott Chacon
<ul style="list-style-type: none">1. Getting Started2. Git Basics3. Git Branching4. Git on the Server5. Distributed Git	<ul style="list-style-type: none">6. Git Tools7. Customizing Git8. Git and Other Systems9. Git Internals
Index of Commands	

What about github?

- That is another story.
- <http://github.com>
- <http://en.wikipedia.org/wiki/Github>

