Intermediate Git

Day 1: Understanding Git's Worldview

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https://github.com/ramanshah/intermediate_git

Some initial configuration

```
git config --list
```

If your user name and email are not set:

```
git config --global user.name \
  ”Raman A. Shah”
git config --global user.email \
  ”raman@uchicago.edu”
```

If you don’t like `vim` firing up in the middle of doing Git stuff:

```
git config --global core.editor ”nano”
```

Git is. . .

. . . a distributed
version control
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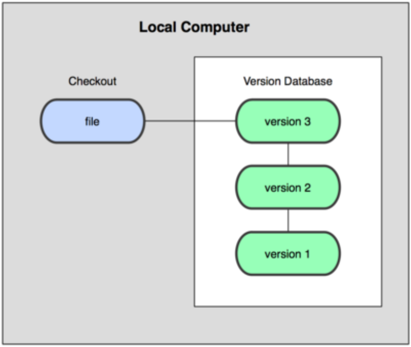
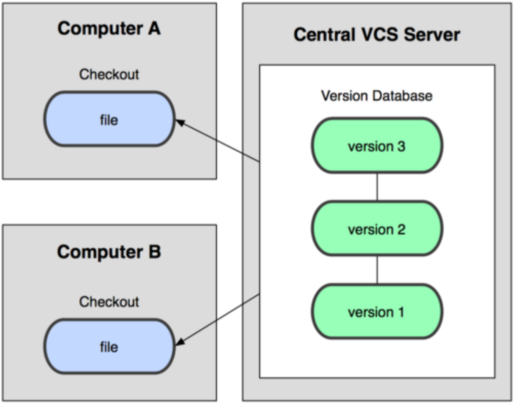


Local version control (*e.g.*, rcs).

Scott Chacon, *Pro Git*, Fig. 1-1. CC-BY-NC-SA.
https://progit.org/

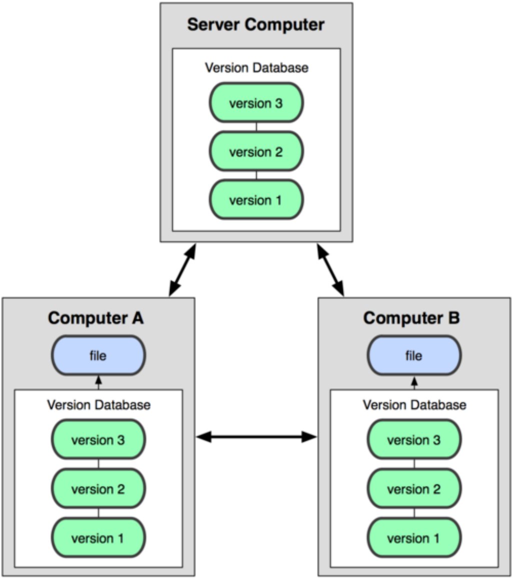
Git is. . .



Centralized version control (*e.g.*, CVS, Subversion (SVN), Perforce).

Scott Chacon, *Pro Git*, Fig. 1-2. CC-BY-NC-SA. https://progit.org/

Git is. . .



Distributed version control (*e.g.*, rcs).

Scott Chacon, *Pro Git*, Fig. 1-3. CC-BY-NC-SA.
https://progit.org/

Git is. . .

. . . a great way to collaborate on projects consisting of many code or text files.

Git is. . .

. . . meant for perfecting (software) *products*.

Git is. . .

. . . a content addressable filesystem.

Exploring repository internals

From a place where you wouldn't mind a new subdirectory:

```
git clone [URL]
```

```
cd [repo name]
```

```
git status
```

Exploring repository internals

Explore the contents of `.git` and `.gitignore`. To list a directory's contents including hidden "dotfiles":

```
ls -al
```

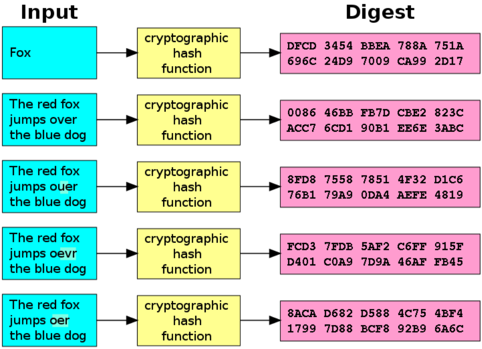
To write out the contents of a file to the terminal:

```
cat [filename]
```

Git is. . .

. . . safe because it tracks every single bit in your files and commits with hash functions.

Hashes (checksums)



Input

Digest

Fox → cryptographic hash function → DFCD 3454 BBEA 788A 751A 696C 24D9 7009 CA99 2D17

The red fox jumps over the blue dog → cryptographic hash function → 0086 46BB FB7D CBE2 823C ACC7 6CD1 90B1 EE6E 3ABC

The red fox jumps ouer the blue dog → cryptographic hash function → 8FD8 7558 7851 4F32 D1C6 76B1 79A9 0DA4 AEFE 4819

The red fox jumps oevr the blue dog → cryptographic hash function → FCD3 7FDB 5AF2 C6FF 915F D401 C0A9 7D9A 46AF FB45

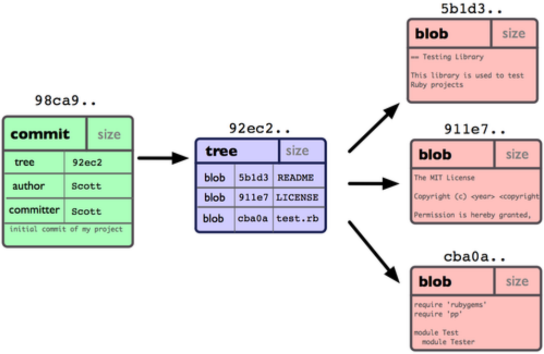
The red fox jumps oer the blue dog → cryptographic hash function → 8ACA D682 D588 4C75 4BF4 1799 7D88 BCF8 92B9 6A6C

SHA-1 maps a file or text to a 160-bit value in a scrambly way.

```
echo 'a' | sha1sum
```

```
sha1sum standup_snitch.py
```

Content addressability



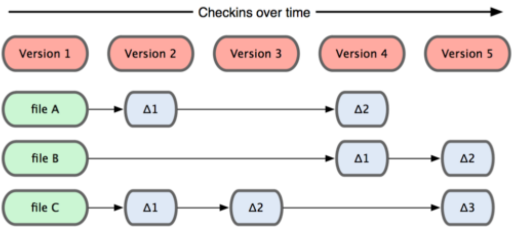
Content is snapshotted at the blob, tree, and commit levels.

Scott Chacon, *Pro Git*, Fig. 3-1. CC-BY-NC-SA.
https://progit.org/

Git is. . .

. . . fast because it stores a (compressed) copy of every version of every file locally.

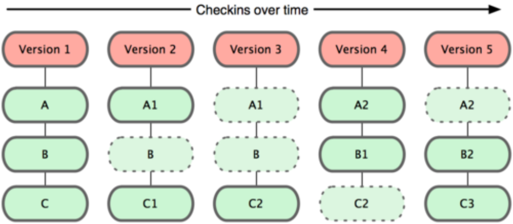
Git is. . .



Other version control systems require calculating versions of a file with diffs.

Scott Chacon, *Pro Git*, Fig. 1-4. CC-BY-NC-SA.
https://progit.org/

Git is. . .



Git just stores all (unique) versions.

Scott Chacon, *Pro Git*, Fig. 1-5. CC-BY-NC-SA.
https://progit.org/

Git is. . .

. . . hard because efficiently managing version control and collaboration is hard.*

Playing with the Past

```
git log
```

```
git diff
```

```
git blame
```

```
git show
```

```
git checkout
```

Reviewing history: git log

Default log; type q to quit:

```
git log
```

Limit the output to just the two most recent commits, and show some extra statistics:

```
git log --stat -2
```

A single line of output per commit:

```
git log --oneline
```

And much, much more.

```
git help log
```

Finding changes: git diff

HEAD is a “You Are Here” pointer. Tilde notation lets us walk back in history.

```
git diff HEAD~
```

Equivalently:

```
git diff HEAD~1
```

From three commits ago to one commit ago:

```
git diff HEAD~3 HEAD~1
```

You can specify with hashes, and single out specific files:

```
git diff [older hash] [newer hash] \
  [path]
```

Finding authors: git blame

```
git blame [path]
```

Good for:

- Blaming people for mistakes (as advertised)
- Figuring out whom to ask for guidance or code review

Seeing old versions: git show

To see the contents of an old version of a single file on the screen:

```
git show [commit]:[path]
```

You can redirect it to a file outside of the repo to recover an old version.

Time travel: git checkout

Rewrite the contents of the directory to reflect the repository one commit ago:

```
git checkout HEAD~1
```

Rewrite them back:

```
git checkout master
```

Git is not. . .

. . . a great system for documenting (experimental) *projects*.

Git is not. . .

. . . ideal for storing bulky data.*

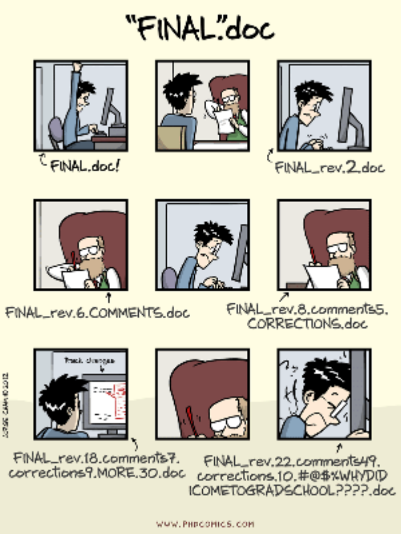
Git is not...

...quite as helpful for binary files as for text files.

Git is not. . .

. . . a silver bullet for collaborating on written works.

Git is. . .



. . . better than many alternatives!

“Piled Higher and Deeper” by Jorge Cham
www.phdcomics.com