Short Introduction to Git

Group Seminar

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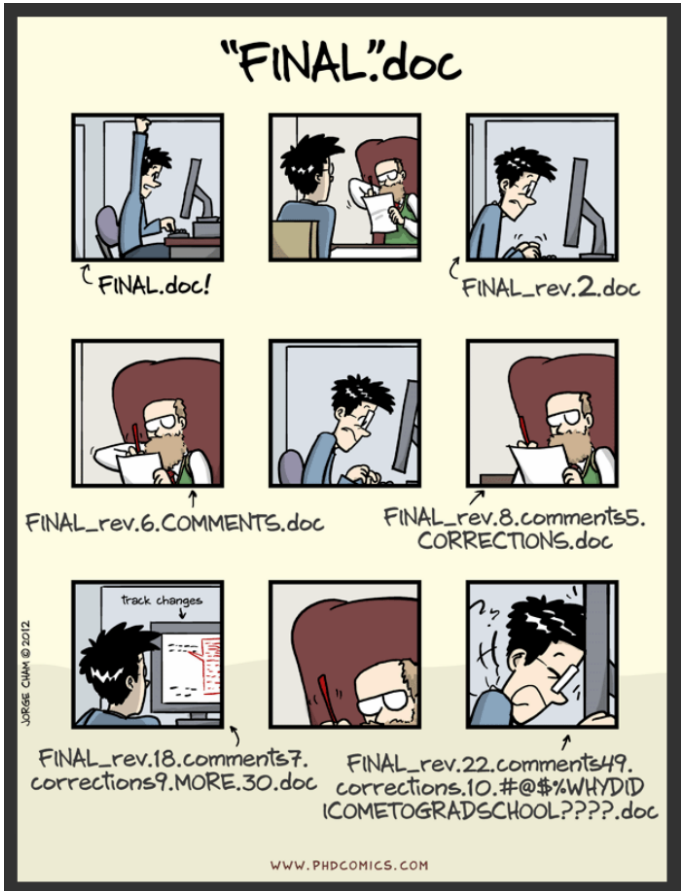
Content

Summary

Why use Version Control Systems?

- Version Control = Revision Control = Source Control
- Allows you to track your files over time on a standardized (foolproof) way.
- Ever get files like Final_rev.22.comments49 ... doc?



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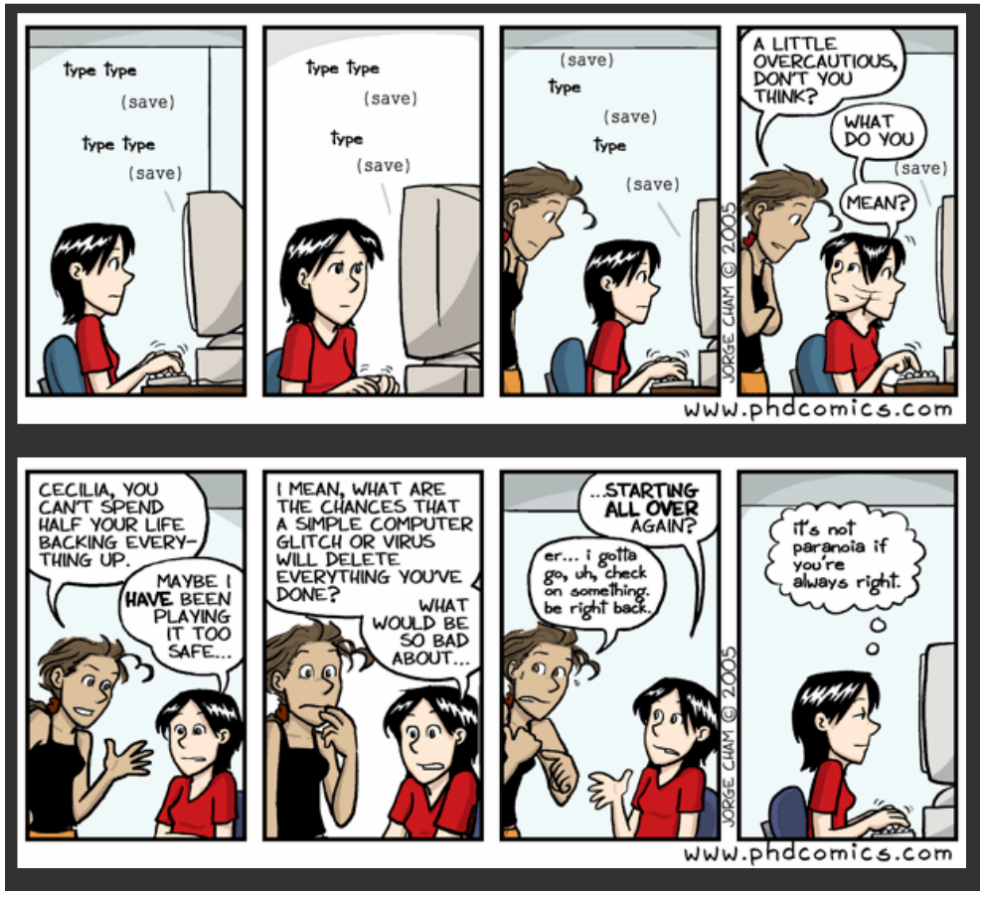
Why use Version Control Systems?

- Collaboration
  - Sharing files
  - Collaborative editing
  - Review changes, trace problems
  - Optimal team work-flow
- Backup & History
  - Ultimate ctrl-z (undo)
  - Remote / local storage
  - Logs: comments to all revisions
  - No more loosing your files



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What kind of data?

Version Control Systems

- Mainly **text** files
  - Source code, txt files, LaTeX source, etc ...
- No sophisticated difference for binary files
  - Word, Excel documents, pictures, pdfs ...
- For LaTeX collaborative editing you may want to try
  - sharelatex: https://www.sharelatex.com

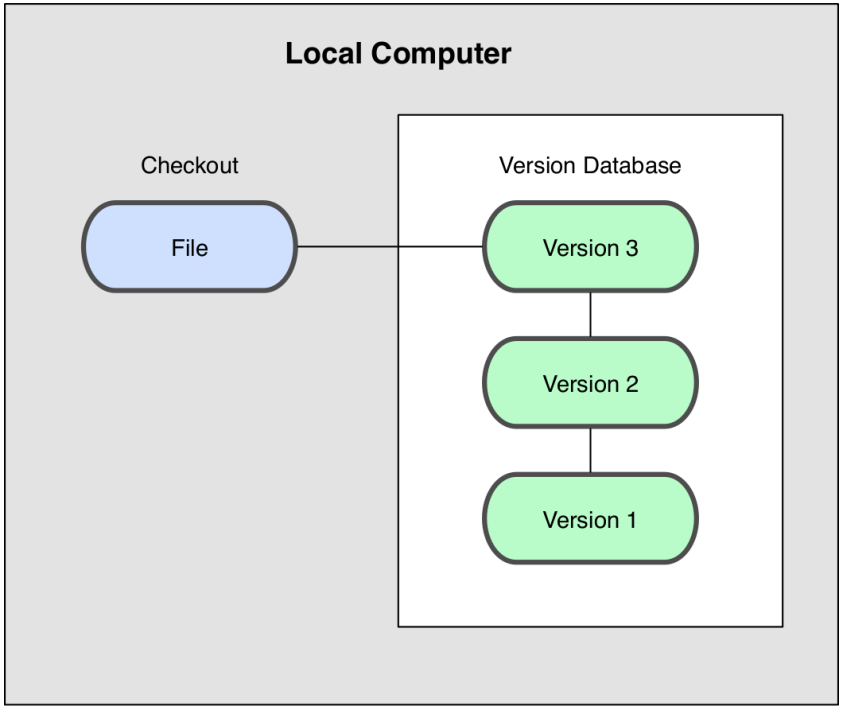
Why git?

- Decentralized / Distributed
- Fast
- Flexible
- Works offline

Summary

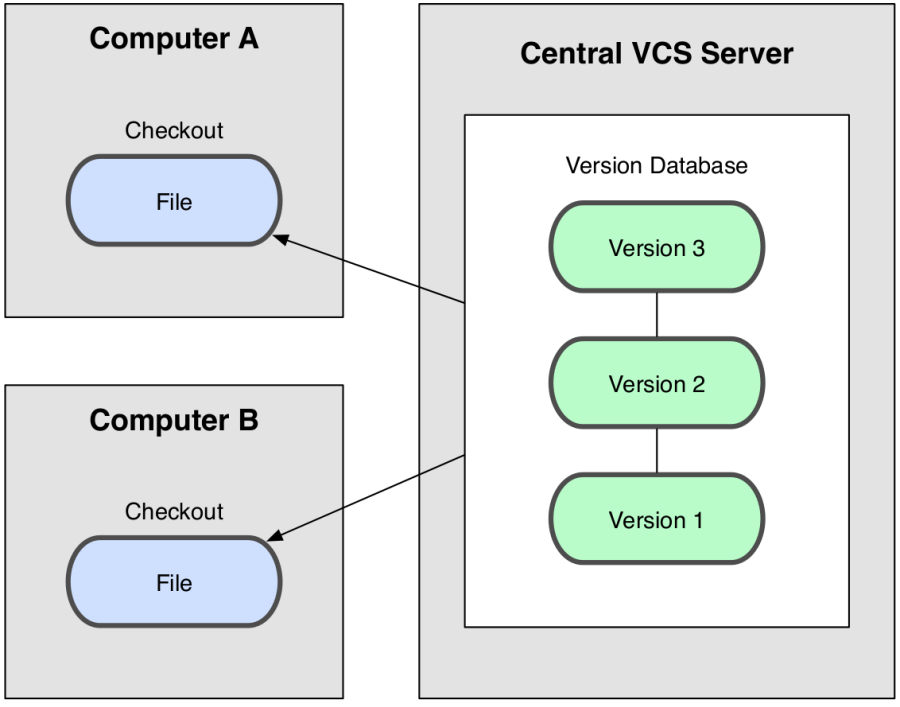
Local vs Centralized VCS

LOCAL



Not shared with anyone
e.g. on your own HDD

CENTRALIZED



Everybody sees the same version
on the server

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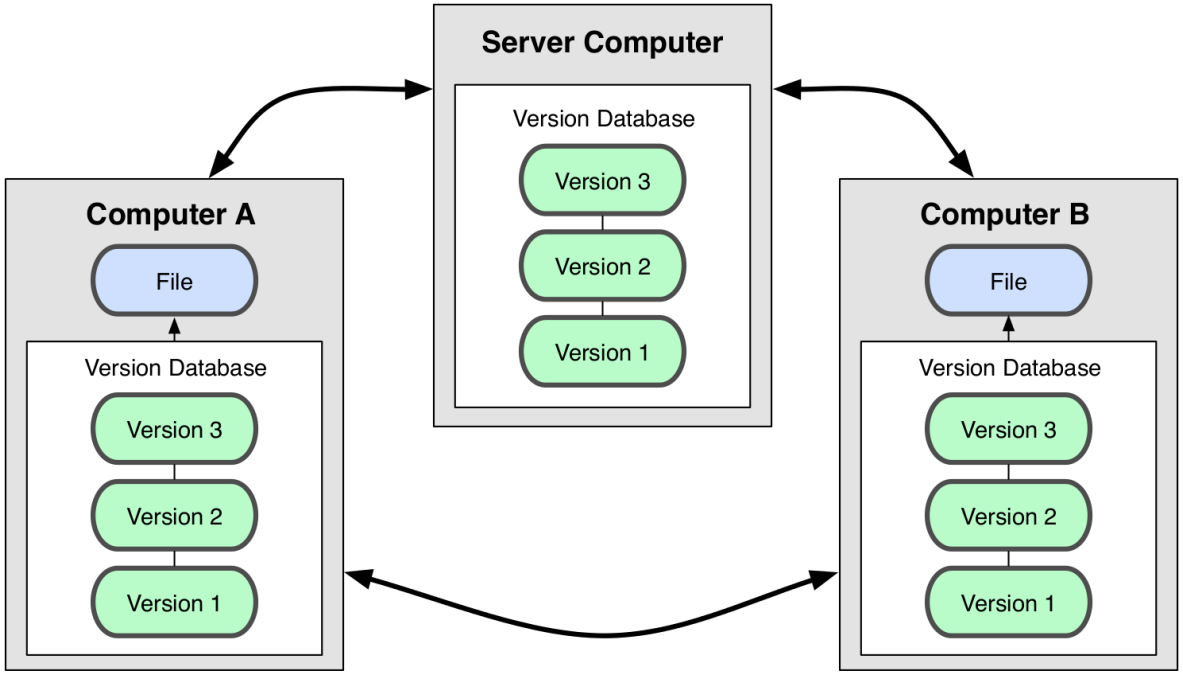
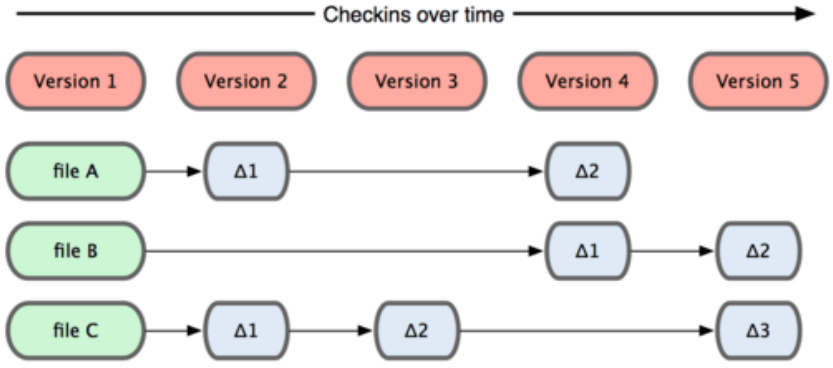
Distributed VCS

Git



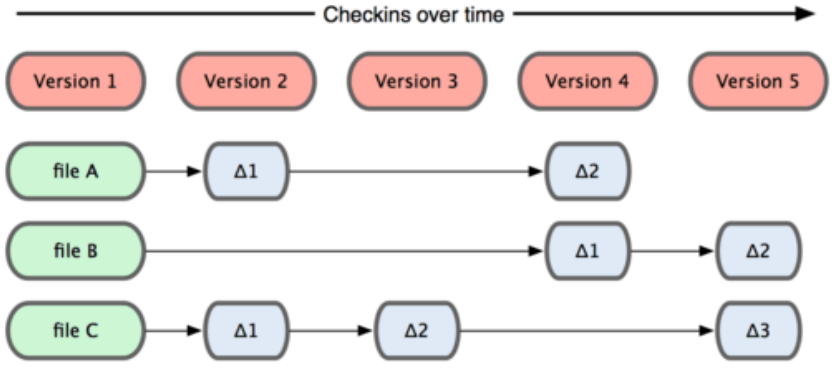
Both local AND global, but most operations are local
Everybody has the full history of commits

Most VCS

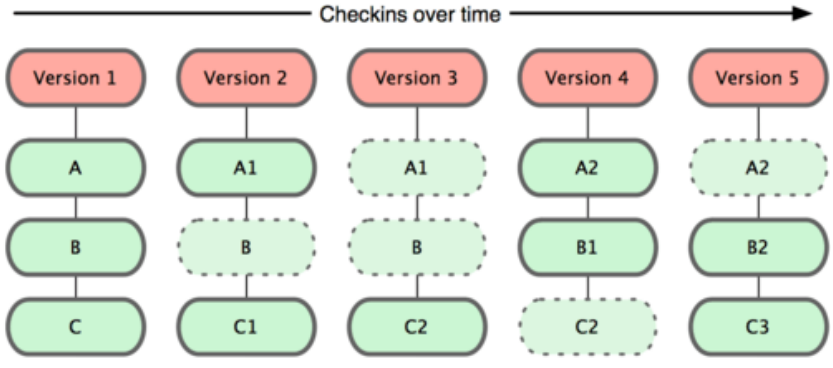

Checkins over time
Version 1
Version 2
Version 3
Version 4
Version 5
file A
Δ1
Δ2
file B
Δ1
Δ2
file C
Δ1
Δ2
Δ3

Tracking changes

Most VCS



Git



"Git thinks of its data more like a set of snapshots of a mini filesystem."

Install git

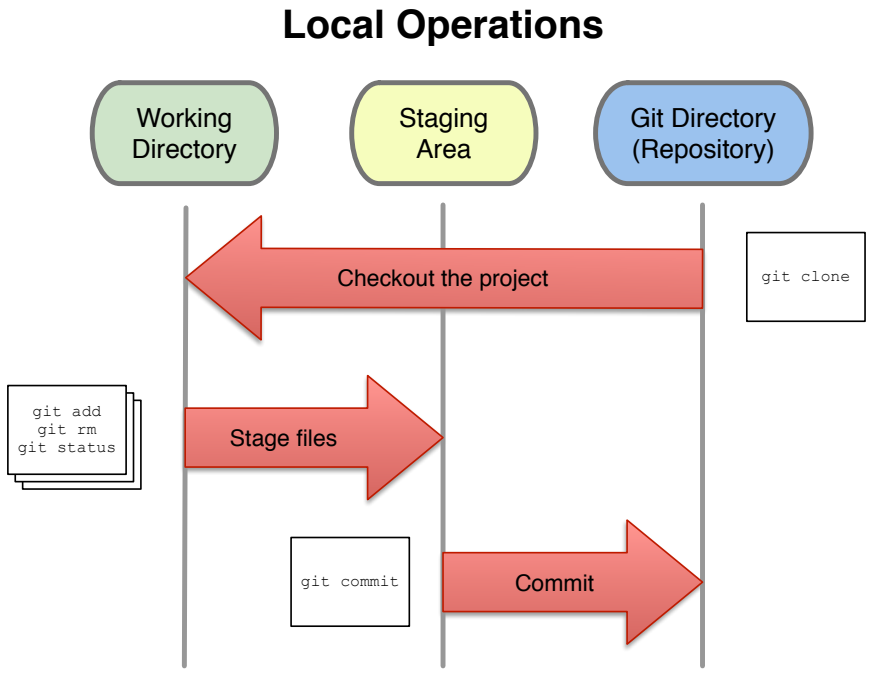
Linux / UNIX

- **OS X**
  $ brew install git
- **Ubuntu**
  $ aptitude install git
- **Arch**
  $ pacman -S git

Windows

- `https://git-for-windows.github.io/`

The three (local) Stages



- The **local repository** lives in the .git directory.
- The **staging area** tracks what will go into the next commit, kind of index

First steps

```
$ git init
```

Initializes a new git repository

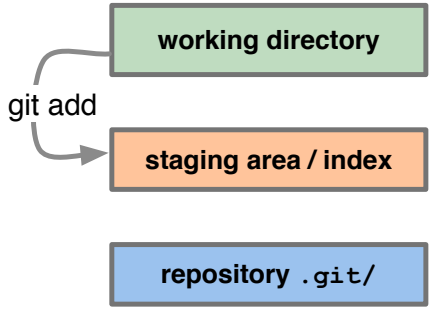
```
$ git clone [—recursive] <url> [<path>]
```

Clones a remote repository to access locally
url can be local /git / git+ssh / http(s), etc ...

Adding new files

```
$ git add [-f] [<pathspec> ...]
```

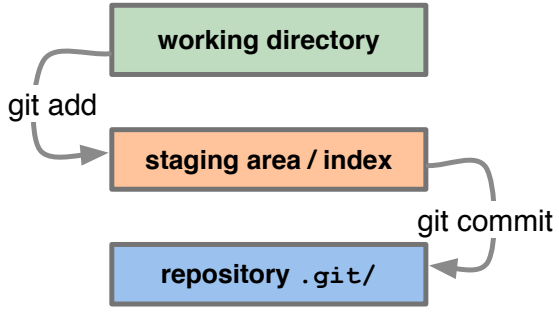
Adds new file(s) to the index



Committing changes

```
$ git commit [-a] [-m "msg"] [<pathspec> ...]
```

Commits the changes
-a: commits all, -m: write a message



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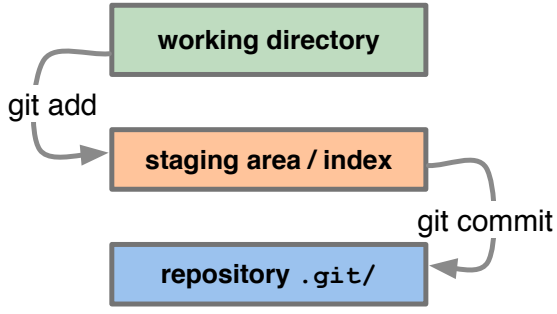


IMPORTANT:

- Always write a descriptive message to your commit!
- In the commit description list all files you changed, and describe why
- In general, try to commit often, commits are save points
- Do not commit code that does not run

Moving / deleting files

```
$ git rm [-rf] [– cached] [<pathspec> ...]
```

–cached : removes from Staging area
default: from index **and** file system

```
$ git mv <source> <destination>
```

Moves source to destination

Status / diff

```
$ git status
```

Show the working tree status: differences between the index file and current HEAD commit

```
$ git diff [–cached] [<ref>][<pathspec> ...]
```

Check un-staged changes (line by line)
– cached: check staged changes
Can be relative to a revision, like 1776b2, or HEAD

In general it is a good practice to check status and diff **before** commiting

log / blame

```
$ git log [–since="date"] [<pathspec> ...]
```

time-filtering: –since=2.weeks or
–since="2 years 1 day 3 minutes ago"

```
$ git blame <file>
```

Who was it?

Undo / ctrl-z

```
$ git commit —amend
```

Changes the last commit

```
$ git reset HEAD <file>
```

Unstage staged file

```
$ git checkout <file>
```

Restores file to last commit. DANGER: all the changes lost!

```
$ git revert <commit>
```

Reverts a <commit>: makes a new commit that undoes **all** the changes made in <commit>

.gitignore

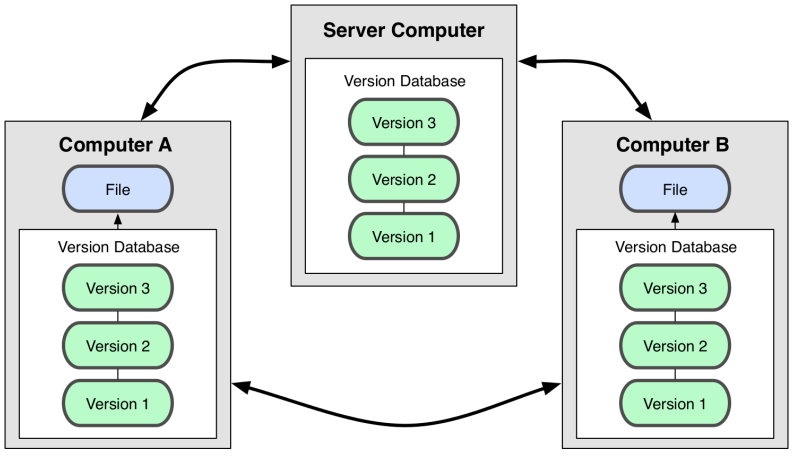
If present in a folder, tells git to ignore files

.gitignore example

```
*.pyc
*.swp
/build/
/doc/[abc]*.txt
.pypirc
*.egg-info
```

- Blank lines or lines starting with # are ignored (comments)
- Standard glob patterns work (wildcards)
- End pattern with slash (/) to specify a directory
- Negate pattern with exclamation point (!)

Remotes



- Other clones of the same repository
- Can be local (another checkout) or remote (coworker, central server)
- There are default remotes for push and pull

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

Remotes

```
$ git pull <remote> <rbranch>
```

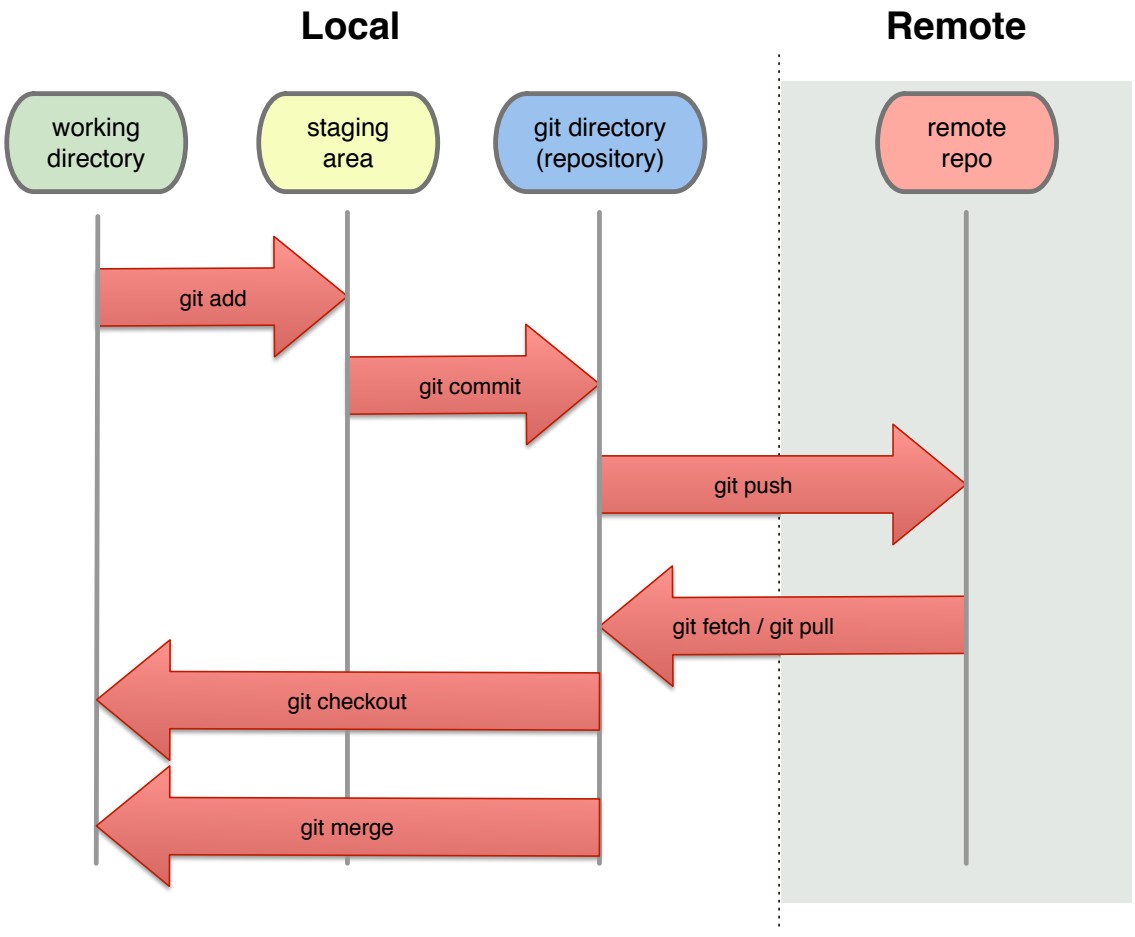
Or simply:
$ git pull
Pulls the commits from the remote

```
$ git push -u <remote> <rbranch>
```

Using defaults:
$ git push -u origin master
Pushes all the commits into the remote

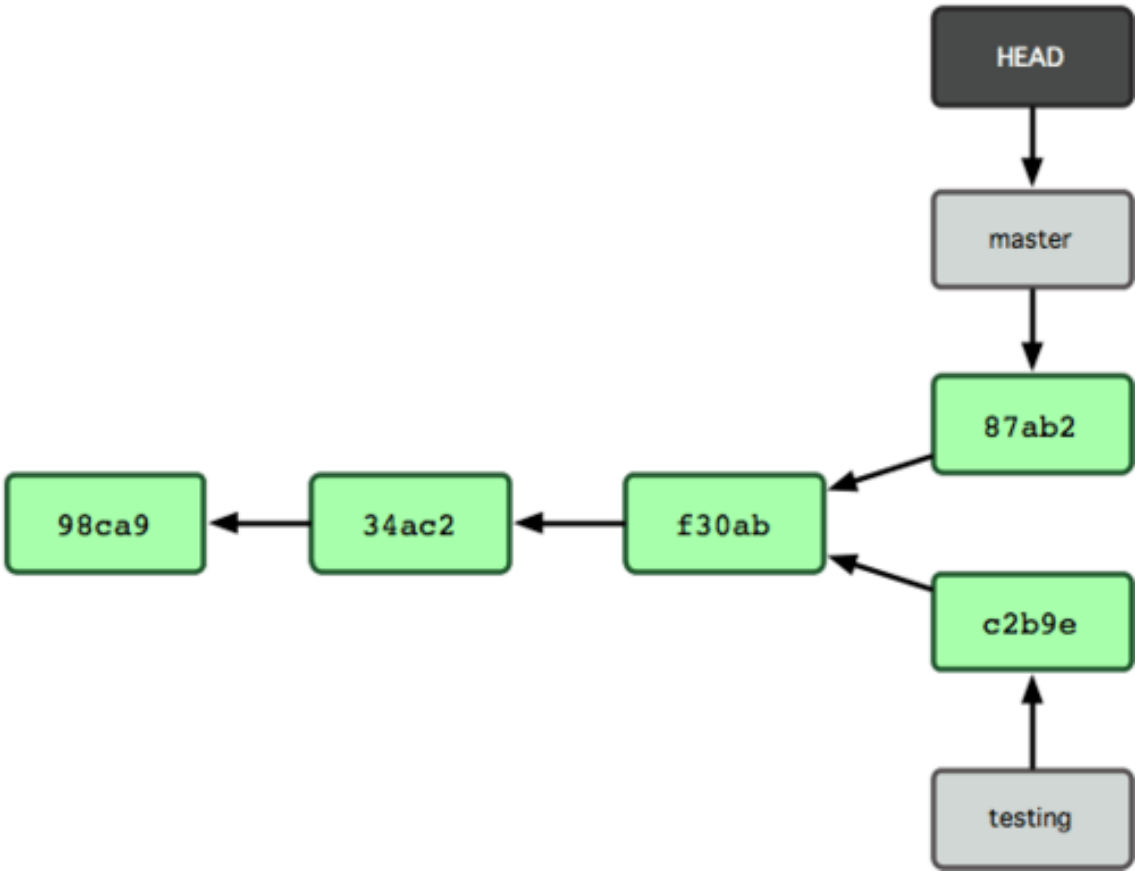
IMPORTANT: do not simply push to someone else's repository
create a pull request instead

Local vs Remote



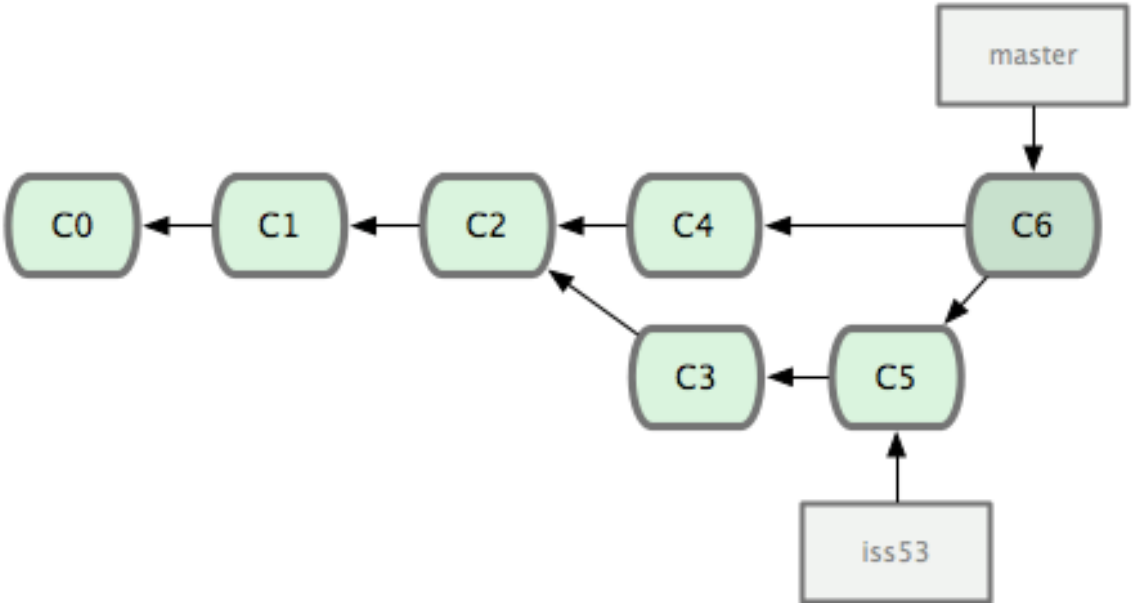
Branches

- Branches are “Pointers” to commits
- Branches can diverge during development

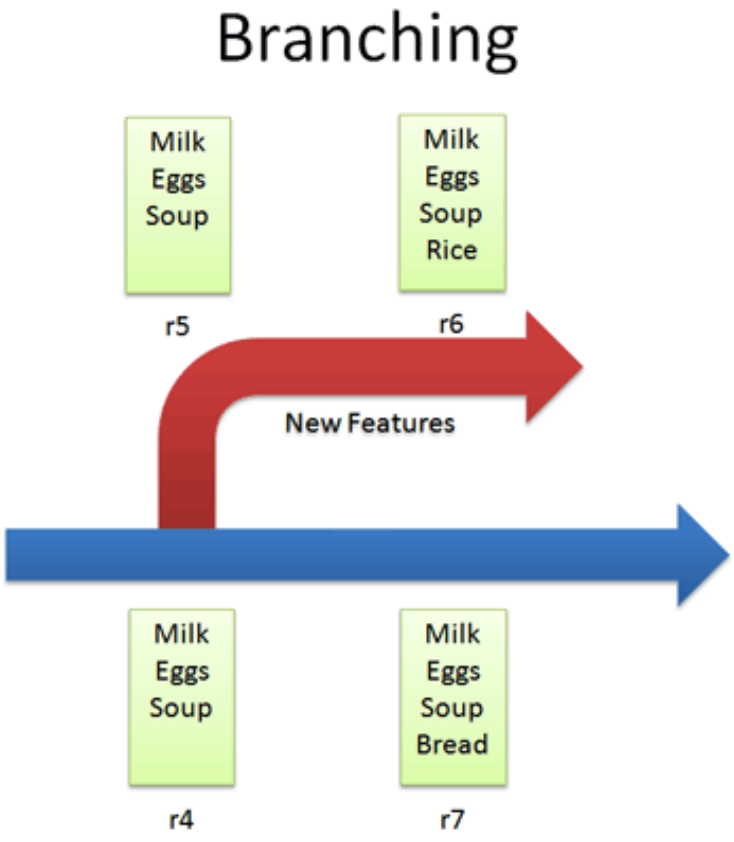


Merging

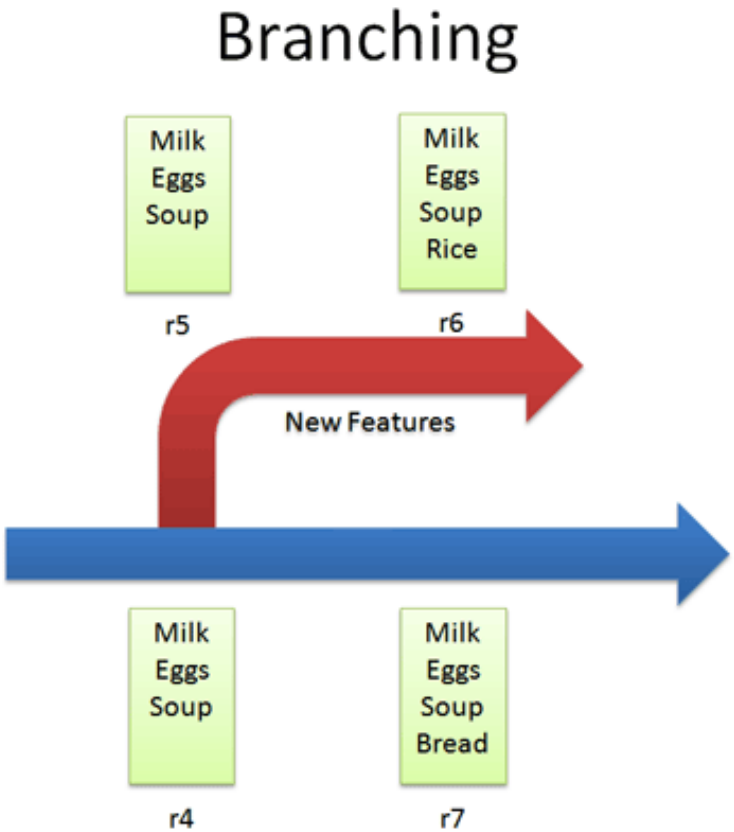
- Merge: "joining branches": usually painless
- Conflicts the same line has changed
  - Have to be resolved (manually / automatically)

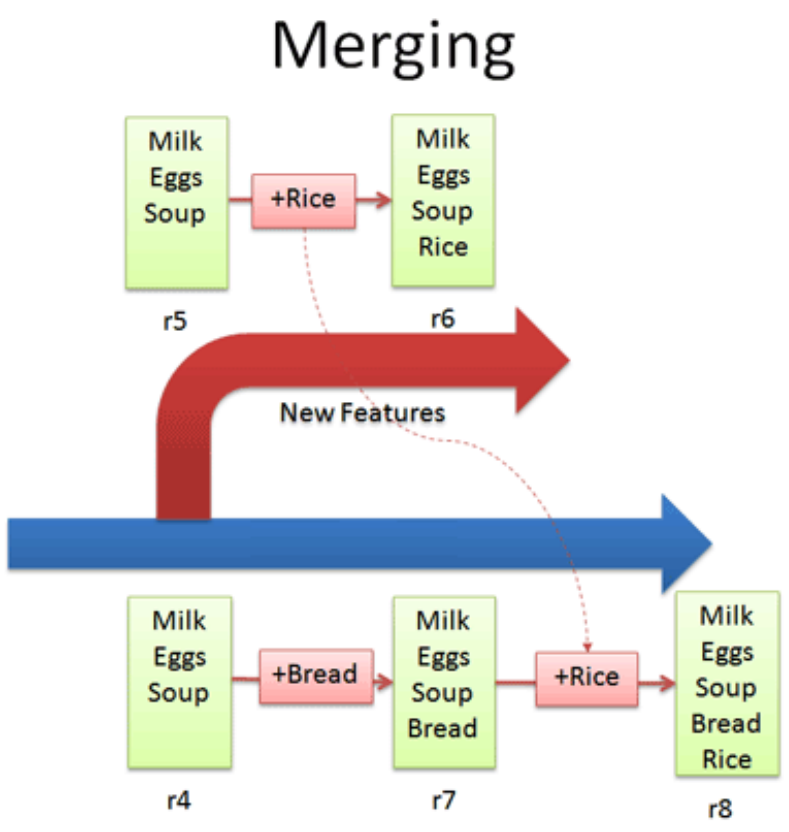


Typical VCS Workflows



Typical VCS Workflows





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Summary

GitLab

- GitLab is an online git interface (like github)
- Available at `https://git-r3lab.uni.lu`

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Summary

Further reading

- "Pro Git" Book by ...
  → `http://git-scm.com/book`
- Git reference
  → `http://git-scm.com/docs`
- Git cheatsheet
  → `https://www.git-tower.com/blog/git-cheat-sheet`
- This presentation is on github
  $ git clone `https://github.com/AndrasHartmann/gitprez.git`
- You can always check:
  $ help git [<command>]

Learning by doing

- Tutorials
  → `https://www.atlassian.com/git/tutorials`

- Learn Git on codecademy - Strongly recommended!
  → `https://www.codecademy.com/learn/learn-git`

- Most important: