Introduction to Git

GEO2020 - 15/12/2017

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Versioning and Collaboration

The general concept

It's useful because:

- It tracks history of our work
- It allows us to work as a team
- It can be used to extract statistics about a project

Is it really new?

Cloud already uses it

You have probably used it on documents if you use:

- Dropbox + MS Office
- Google Drive + Google Docs
- OneDrive + MS Office

Version Control System (VCS)

Definition

Definition

Version Control is the management of changes to documents, computer programs, large web sites, and other collections of information.[1]

[1] Wikipedia

Version Control System (VCS)

Benefits

A VCS:

- keeps revisions
- allows for true collaboration
- encapsulates workflow (e.g. track time, issues, project management)

VCS vs Cloud

Although not really a comparison

	VCS	Cloud
Revisions	Manual	Auto
Revision Information		
Author	✓	✓
Timestamp	✓	✓
Message	✓	✗
Collaboration		
Sharing	✓	✓
Concurrent working	✓	?
Branching	✓	✗

But don’t be confused… It can’t replace your cloud file storage!

VCS

Definitions

Repository

A storage location where all versions and information about them are stored.

Workspace

The actual working directory of the user.

Types of VCS

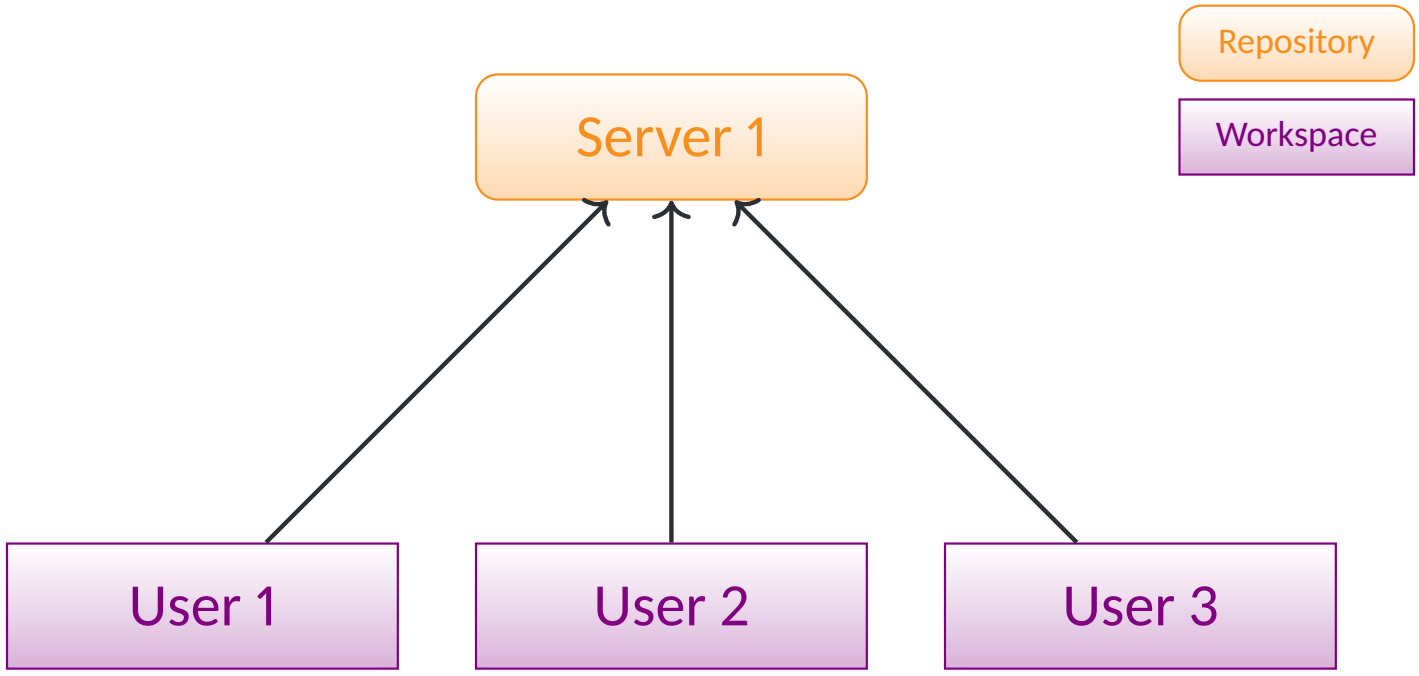
There are two types:

- Centralised
  - Subversion (SVN)
  - Microsoft Team Foundation Server (TFS)
  - Concurrent Versions System (CVS)
- Distributed
  - Git
  - Mercurial

Centralised

Architecture

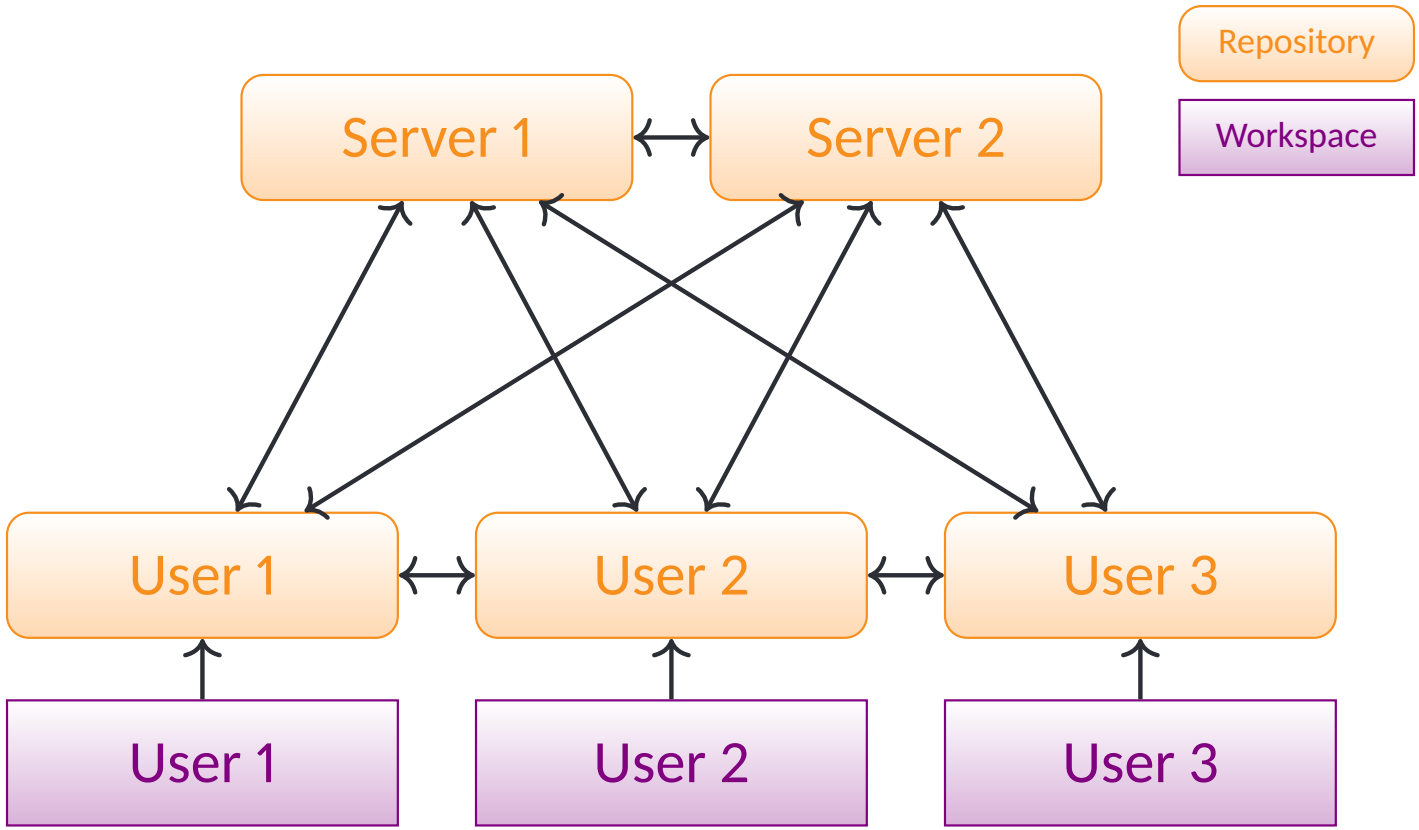
A server is the only repository and every user has a workspace.



Distributed

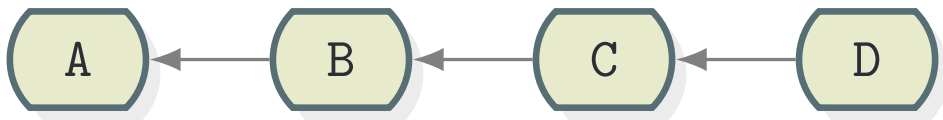
Architecture

No “master” server. Every user has a repository and a workspace.



Repository “internals”

It’s a graph



This nodes are called commits or revisions.

Commit or Revision

Information

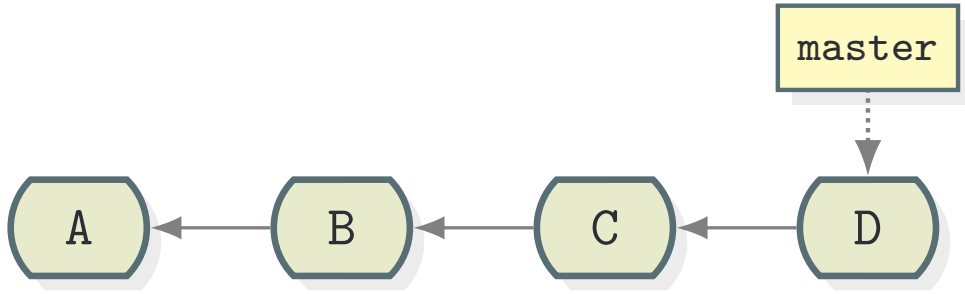
Every commit has:

- **ID**: some short of identifier
- **Author**: `name` and `email` of user who commits
- **Timestamp**: `time` of commit
- **Message**: `what` the commit contains

and, of course, the changes of the files that are submitted.

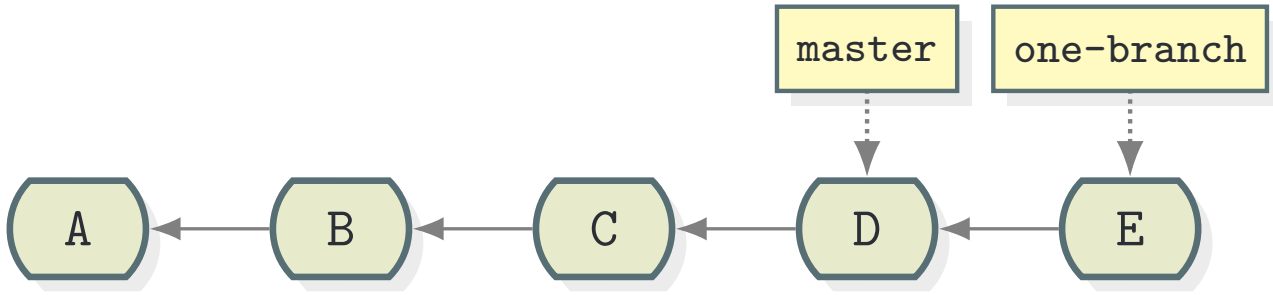
Repository “internals”

Branching



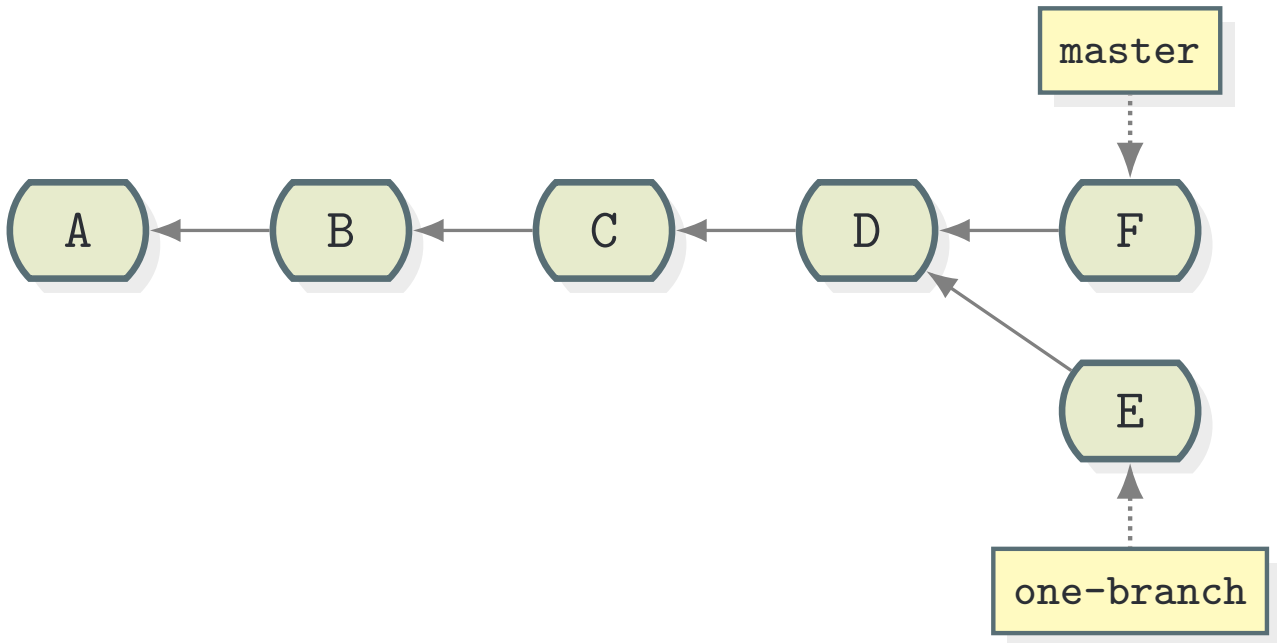
Repository “internals”

Branching



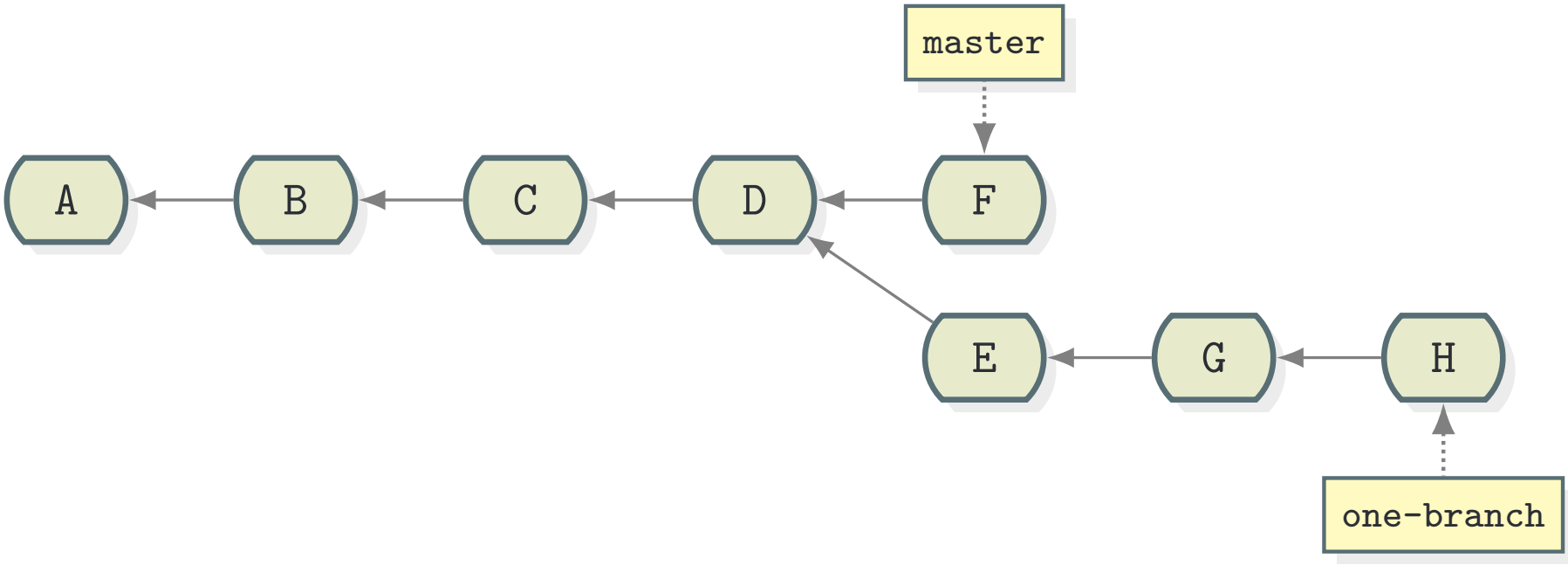
Repository “internals”

Branching



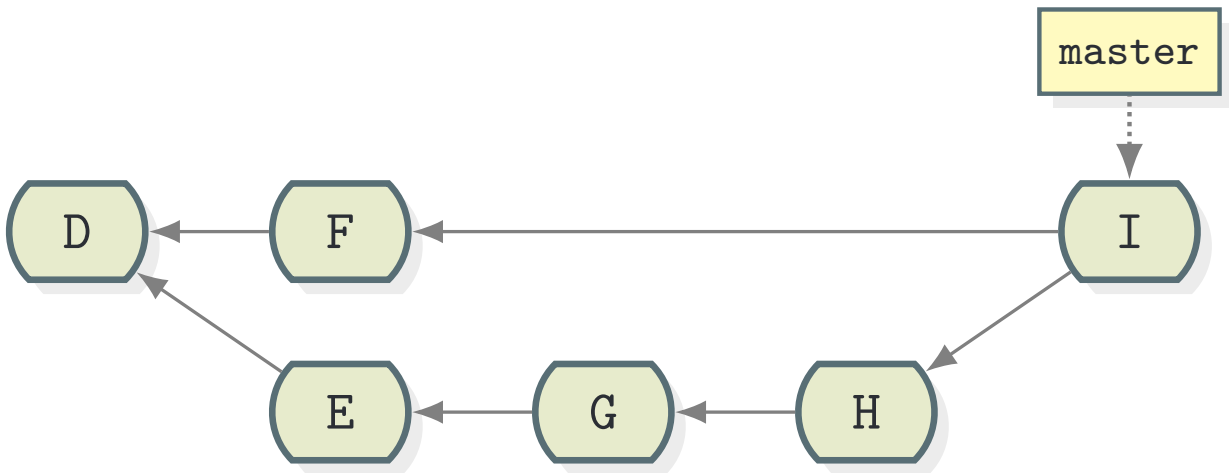
Repository “internals”

Branching



Repository “internals”

Merging



Git

Some History

Git was created by Linus Torvalds in 2005 because there was no decent version control system to maintain the Linux kernel.
He described the tool as "the stupid content tracker".

Git

Some History

He setup the following objectives:

- Performance
- Take CVS as an example of what not to do; if in doubt, make the exact opposite decision
- Support a distributed, BitKeeper-like workflow
- Include very strong safeguards against corruption, either accidental or malicious

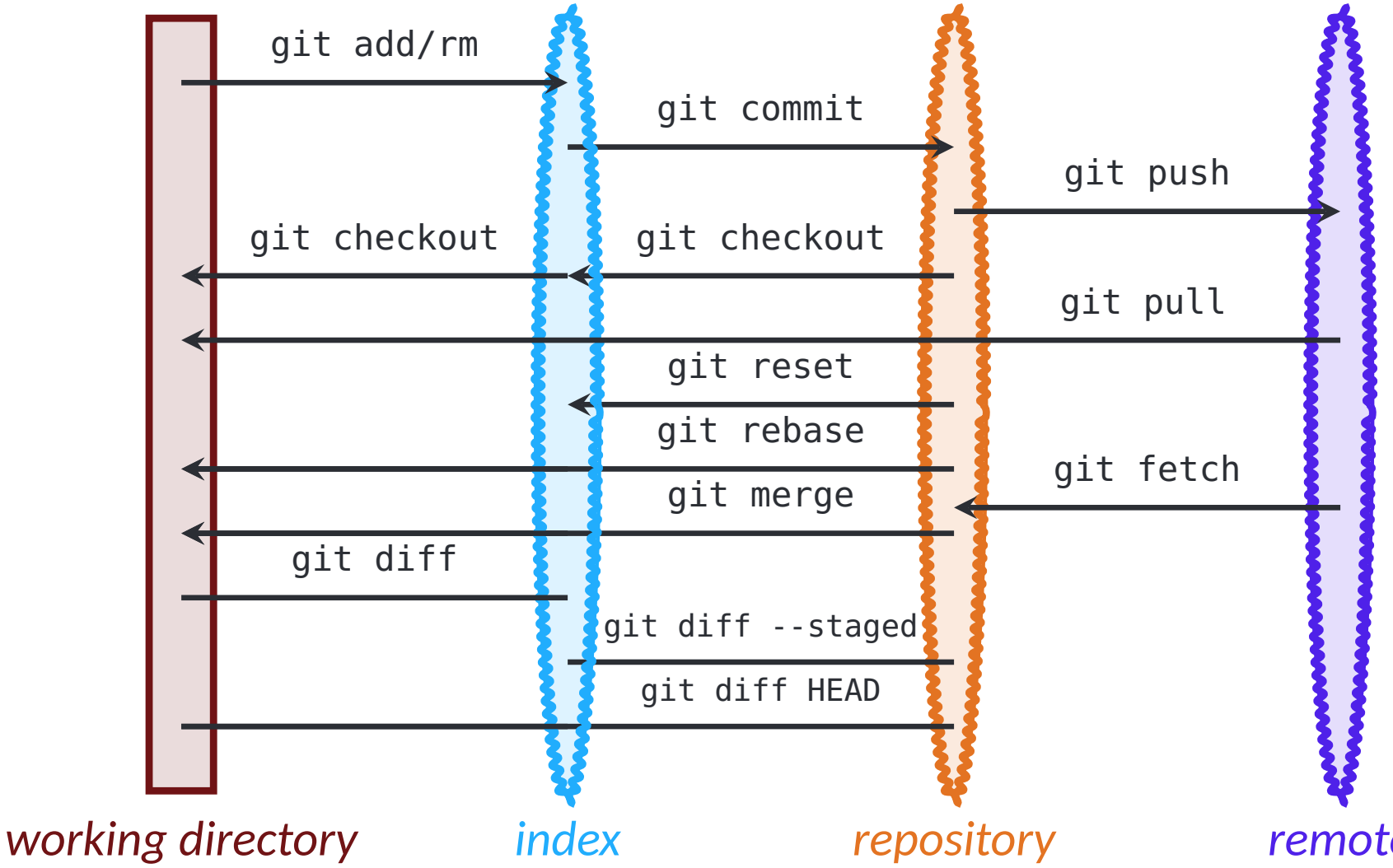
Git

Definitions

- Every commit has an ID which is it's hash. E.g.: `2c7ae1b9865e58797ba326d2f7a115bebb034fd7`
- We call the "current" commit as `HEAD`.

Git

Definitions



Create a repository

From scratch

```
git init
```

Creates a new empty repository.

The *working directory* is not affected, but an empty repository and index is created.

Create a repository

From a remote

```
git clone remote_address
```

Creates a copy of an existing online repository.

- A new folder is created.
- All commits/branches etc. are copied locally.
- The source repository is set as the *origin* remote.

Status

See where you stand

```
git status
```

Gives all information about the current state of repository and index.

- Shows current branch and difference with remote.
- Shows the staged files.
- Shows changed but not staged files.
- Shows untracked files.

Create a commit

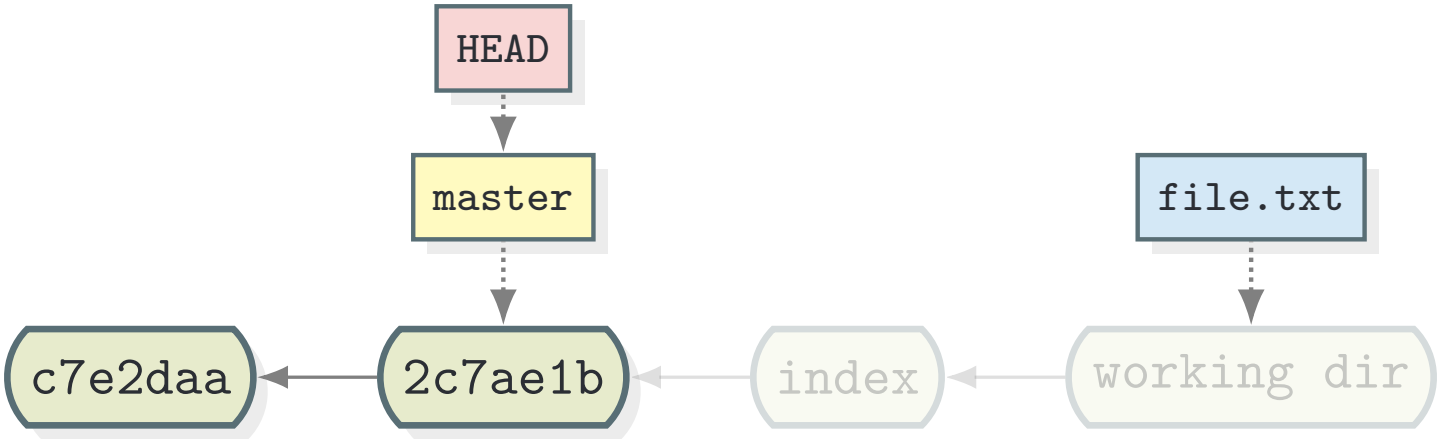
Add files to the index

`git add` *`filename`*

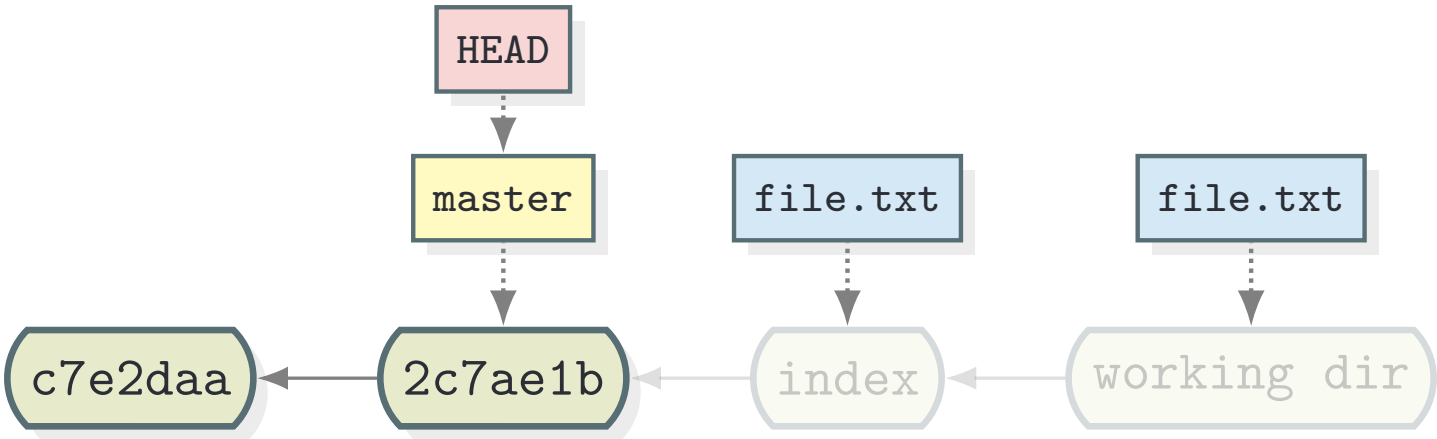
Adds the file to the index. We say it's staged.

- The current file from *working directory* is copied to the *index* only if it has changes compared to HEAD.
- The *filename* can be a pattern. Eg. "`git add .`" will add all files.
- Nothing has been committed yet.

git add file.txt



(a) Before…



(b) … and after

Create a commit

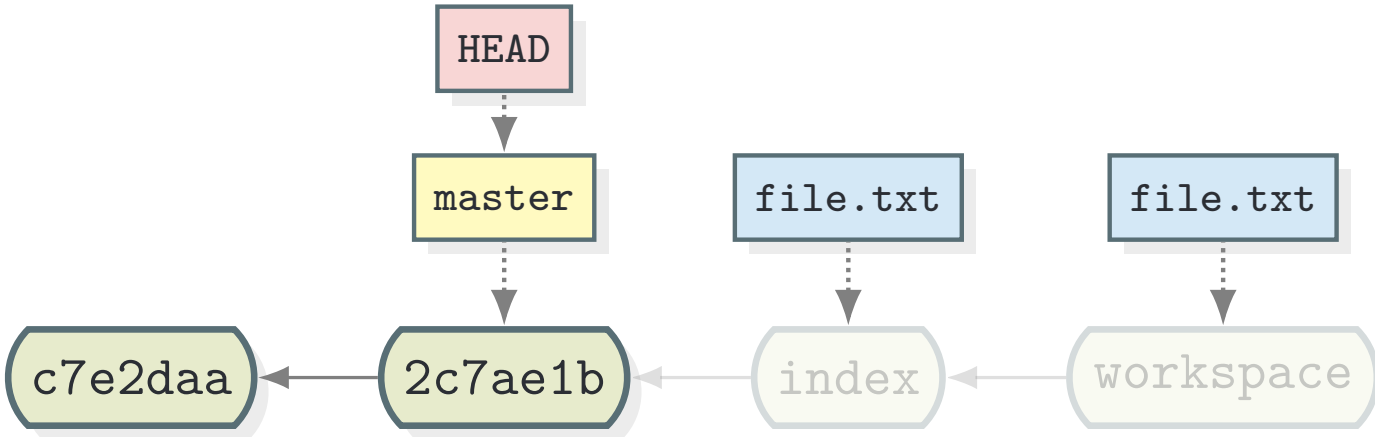
Commit staged files

```
git commit -m “message"
```

Creates a commit from a copy of the index.

- The new commit has the given message.
- After the commit, the index is cleared.
- The *HEAD* and the current *branch* tags are moved to the new commit.

```
git commit -m "Changes to file.txt"
```



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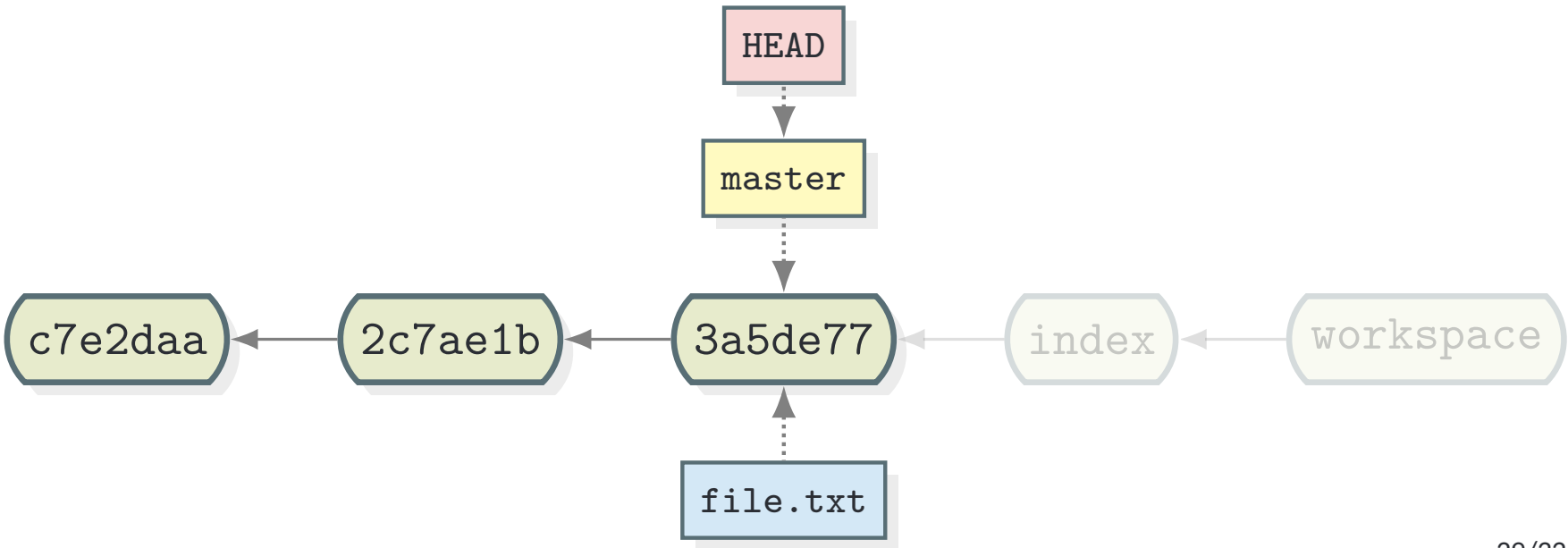


(b) … and after

Move to a commit

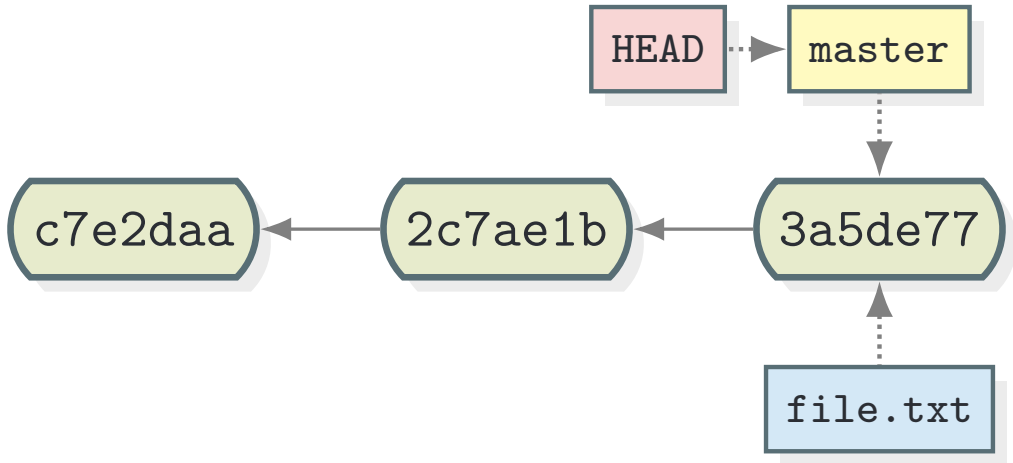
Change branch or version

`git checkout` *`ref`*

Moves to a branch/commit and changes the working directory accordingly.

- The *ref* can be a branch name, commit id or something else…
- The *HEAD* moves to the refered commit.
- The current branch changes (if a branch name is given).

`git checkout 2c7ae1b`



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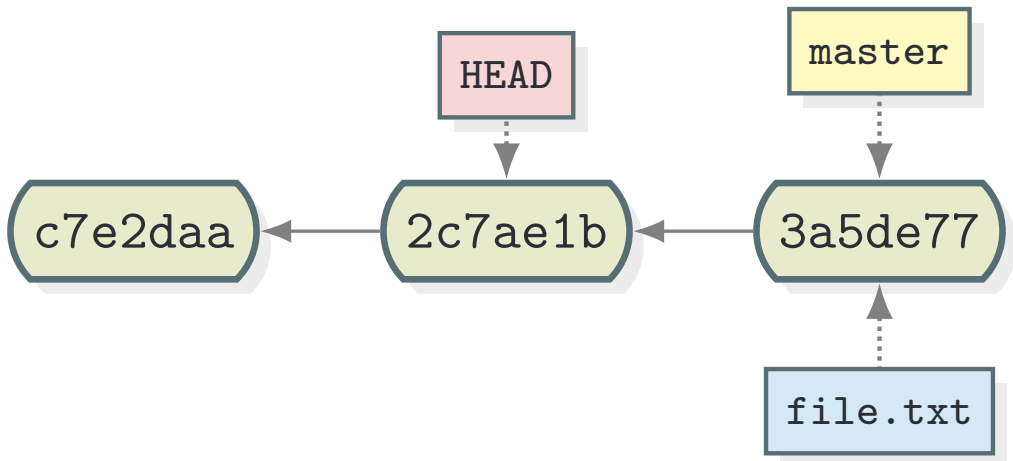

(b) … and after