Git & version control

not only for software engineers

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Intro

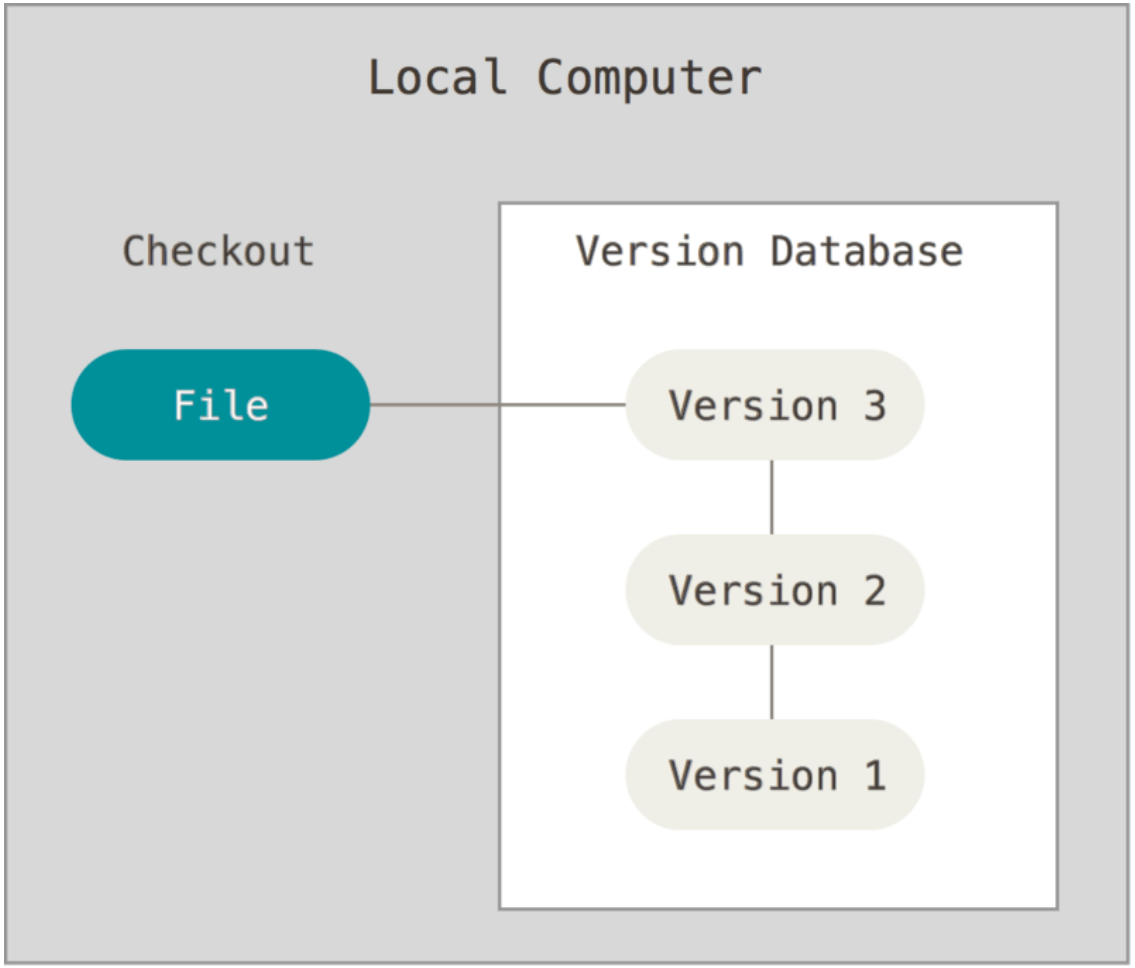
Version Control Systems

Version control is a system in which changes to a file or group of files are tracked over time so that later a specific version can be retrieved.

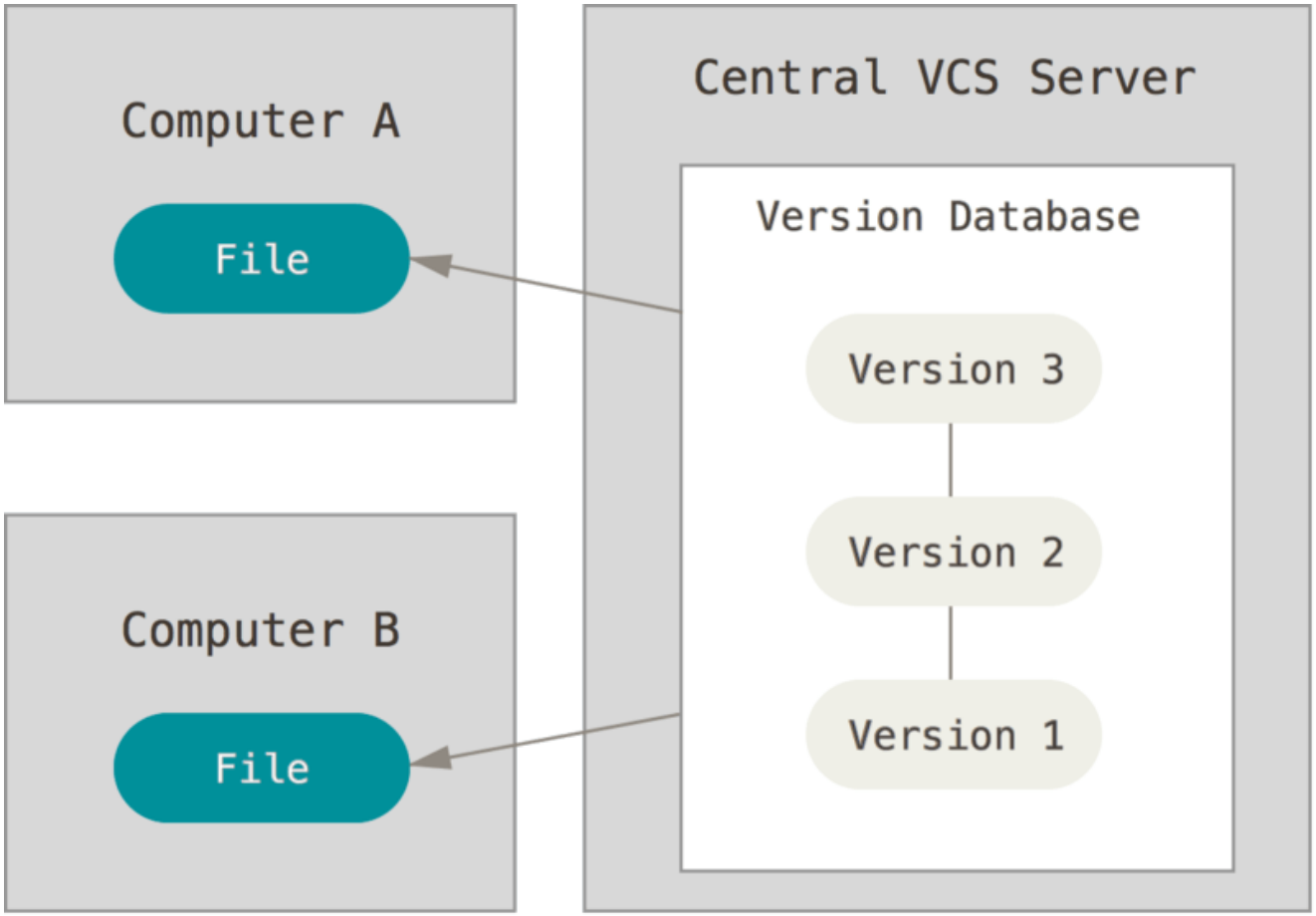
Why version control?

- Retrieve previous versions of files or the whole project
- View changes between two points in time
- Tracking who changed what

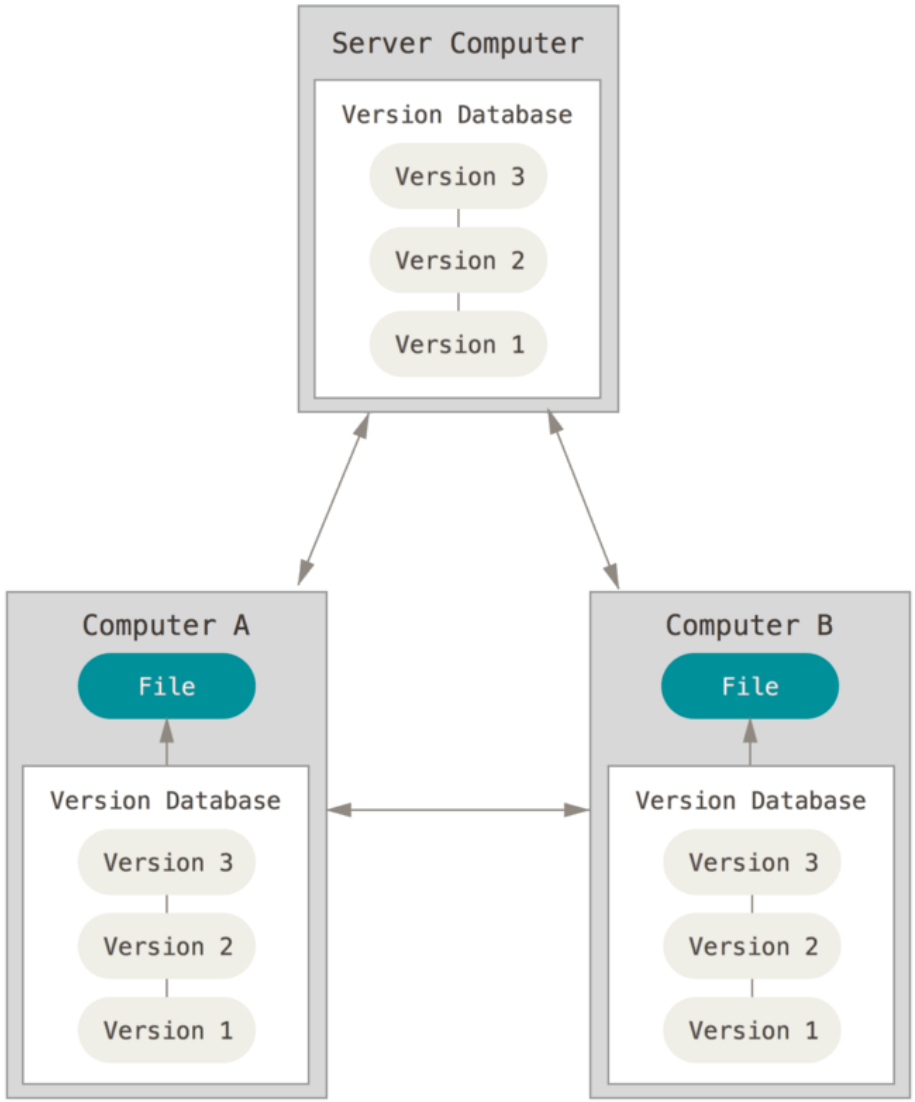
Local version control



Centralized version control



Distributed version control



What is git

Git is a *distributed* version control system

- Each team member can work independently
- Almost all operations are local
- Everyone has a local copy of the database (repository)

Before we start

- Git client: http://git-scm.com/download/
  - Get the right version for your system
  - Including *Git Bash* (only Windows)
- GUI tool: http://git-scm.com/downloads/guis
  - For example Github Desktop

Info

We will (try) not to use GUI tools.

Getting started - a few settings

```
$ git config --global user.name "Dawid Zalewski"
$ git config --global user.email "d.r.zalewski@saxion.nl"
```

Getting started - text editor

You can also change the default text editor:

For Notepad++:

```
$ git config --global core.editor
"'notepad++.exe' -multiInst -nosession"
```

For Visual Studio Code:

```
$ git config --global core.editor "code --wait"
```

Getting started - check the settings

```
$ git config --list
```

Local version control

Initialize a repository

```
$ mkdir my_project
$ cd my_project/
$ git init
Initialized empty Git repository in ...
$ git status
On branch master

Initial commit

nothing to commit (create/copy files
 and use "git add" to track)
```

Three states

There are three states that files can be in:

- 'modified'
- 'staged' (prepared for a `commit`)
- 'commited'

Three states

Modified

A file has been modified but not yet commited to the database

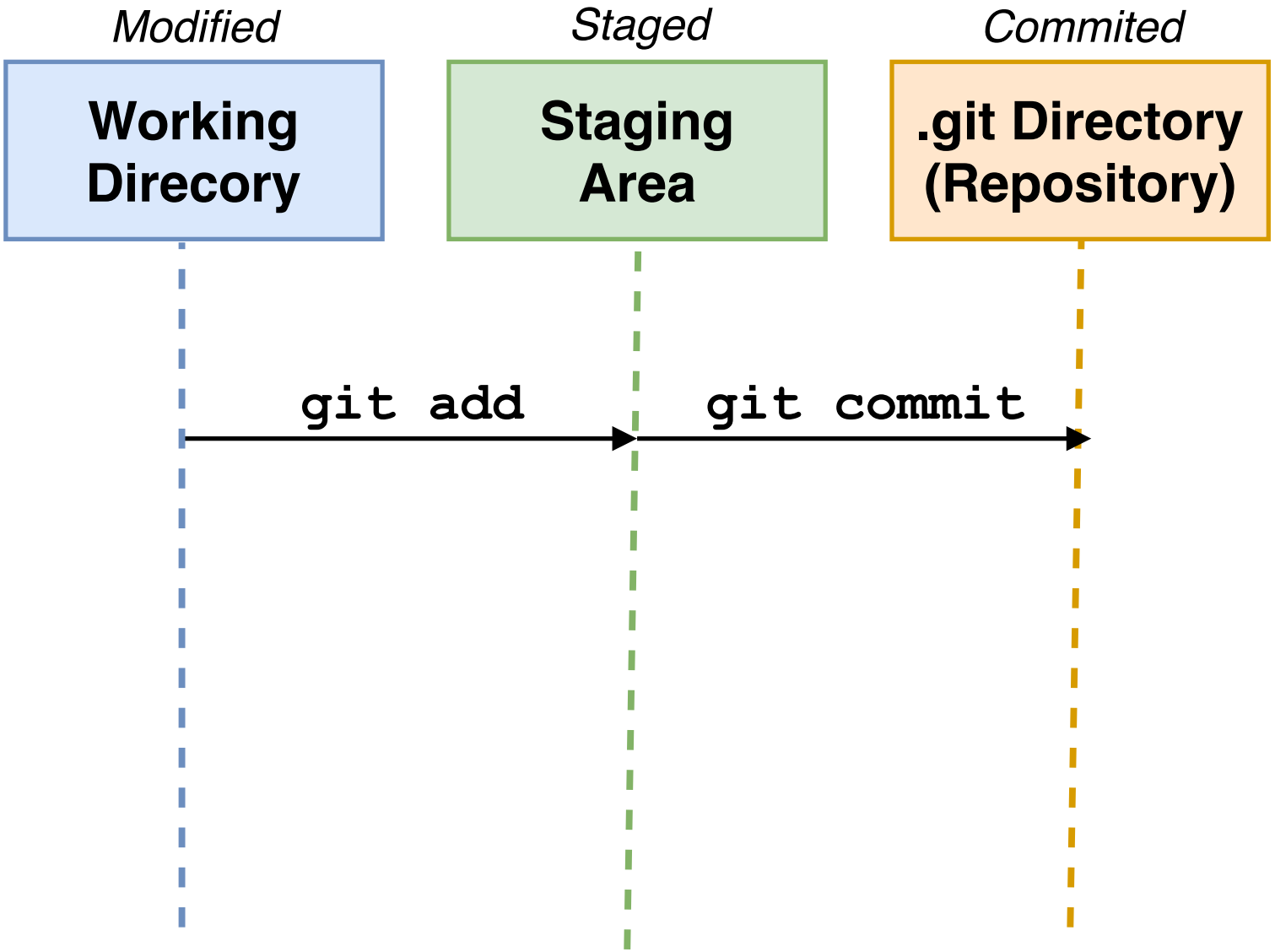
Staged

A modified file is included in the next commit

Committed

All data is safe in the local database

Git workflow & environment



Environment

Working directory

The directory structure and files in which you make changes

Staging Area

An *Intermediate station* between the **working directory** and the **repository**
Allows for selective *committing* of changes

Repository

Collection (backup database) of all commits, branches, tags, ...

First commit

Create a new file (readme.txt) in the `my_project` folder

For VS Code users:

```
$ code readme.txt
```

- Type in some text and save.

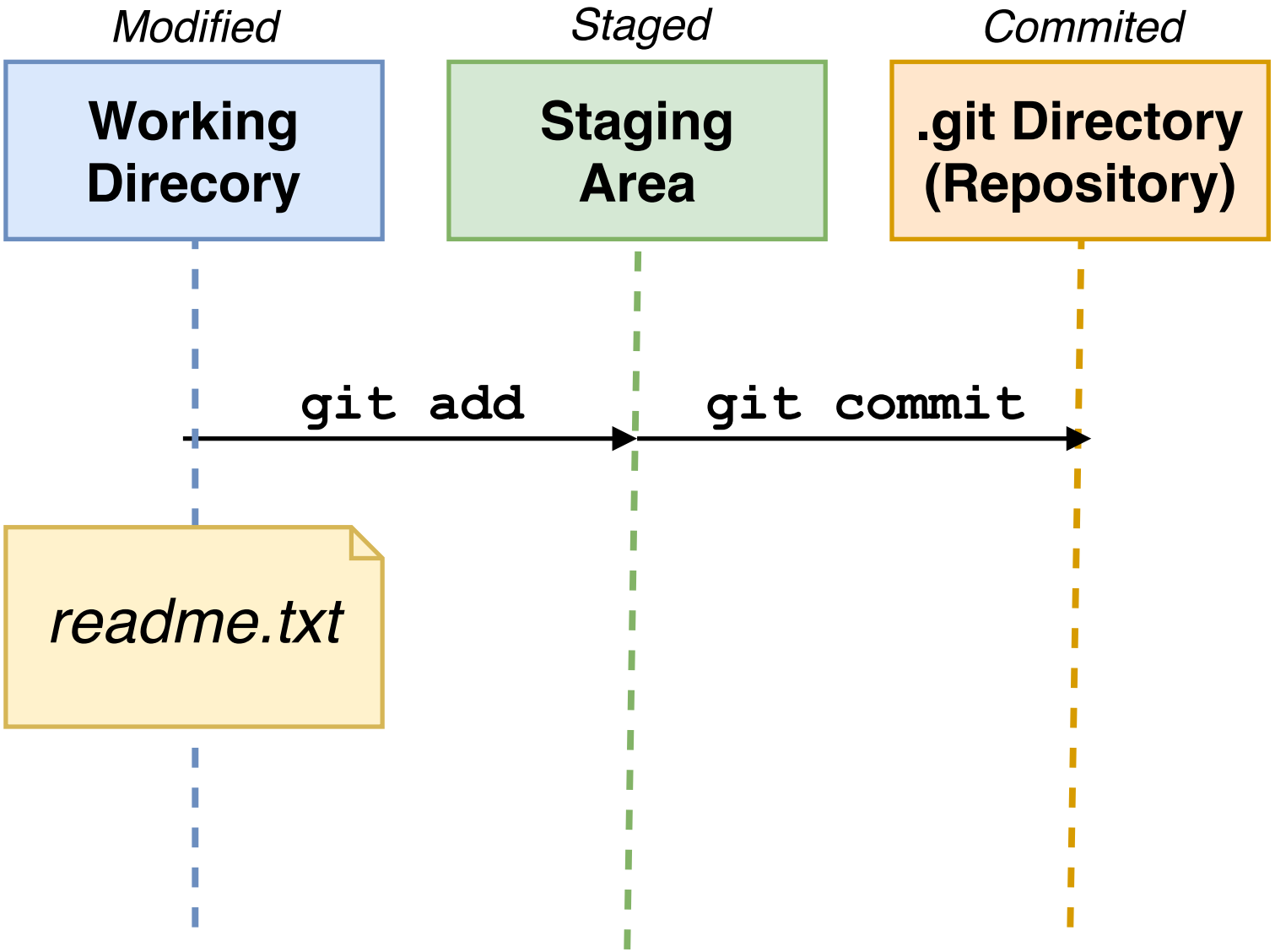
Check

```
$ ls -l

total 1
-rw-r--r-- 1 zalda 197609 7 Apr 11 12:55 readme.txt
```

Git status

```
$ git status
On branch master

No commits yet

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

        readme.txt

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

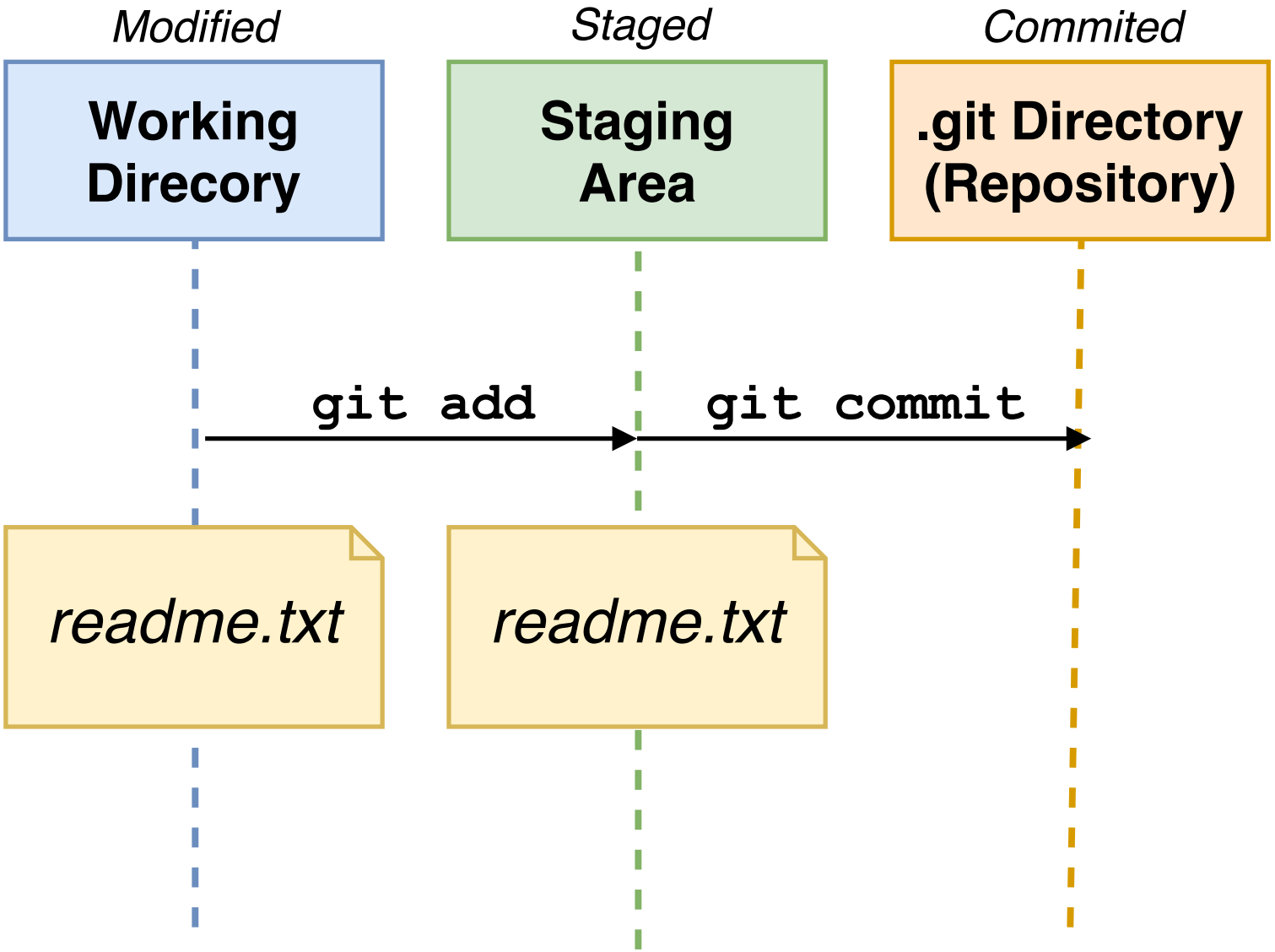
Where is `readme.txt`



To the *Staging Area*: `git add`

```
$ git add readme.txt
$ git status
On branch master

Initial commit

Changes to be committed:
  (use "git rm --cached <file>..." to unstage)

  new file:   readme.txt
```

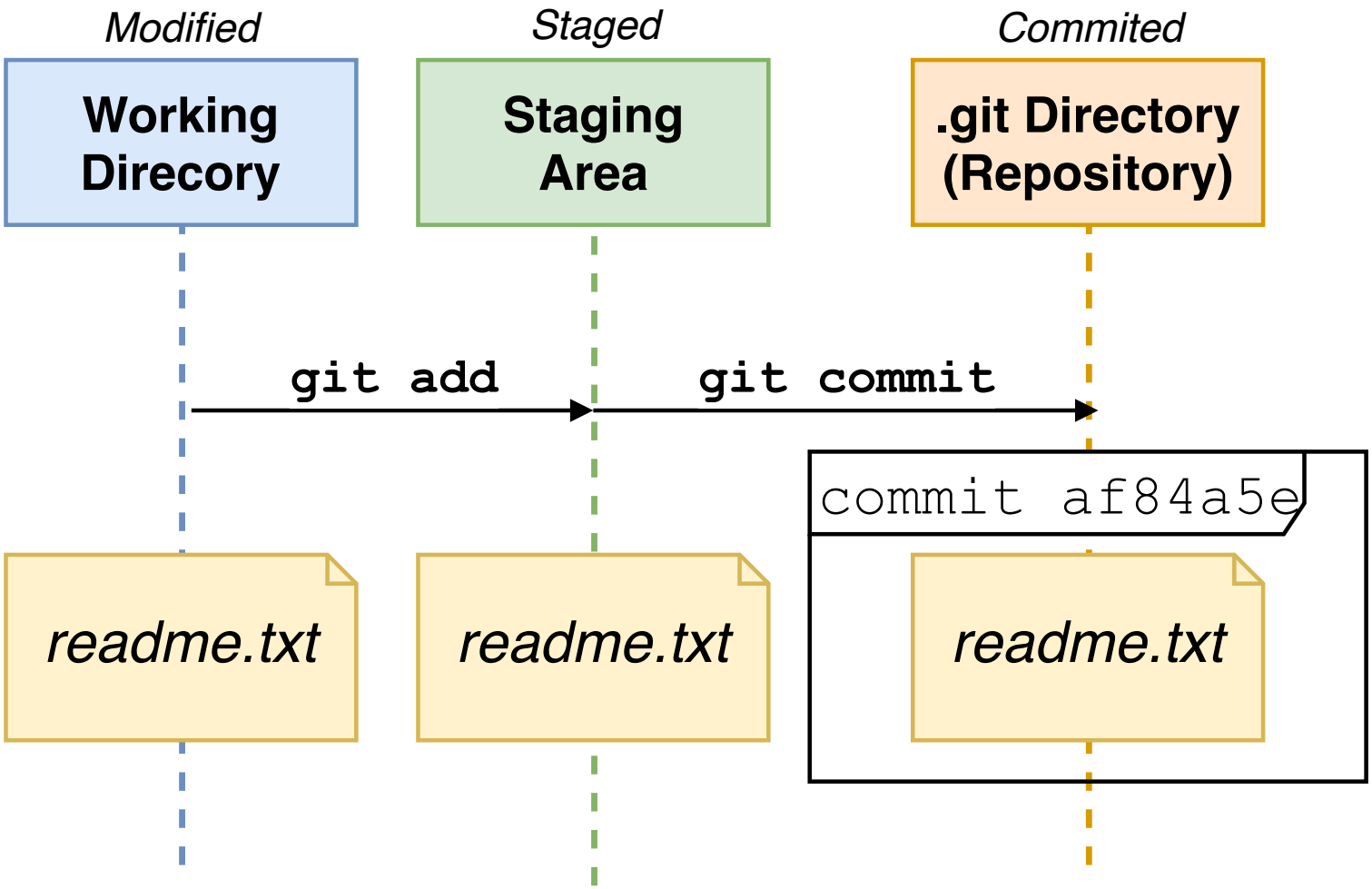
Where is `readme.txt`



Adding a commit: `git commit`

```
$ git commit -m "readme.txt added"
[master (root-commit) af84a5e] readme.txt added
 1 file changed, 1 insertion(+)
 create mode 100644 readme.txt

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

Where is `readme.txt`



One more check

```
$ git log
commit af84a5e... (HEAD -> master)
Author: Dawid Zalewski <d.r.zalewski@saxion.nl>
Date:   Wed Aug 11 14:56:28 2021 +0200

    readme.txt added
```

The original file remains in the folder.

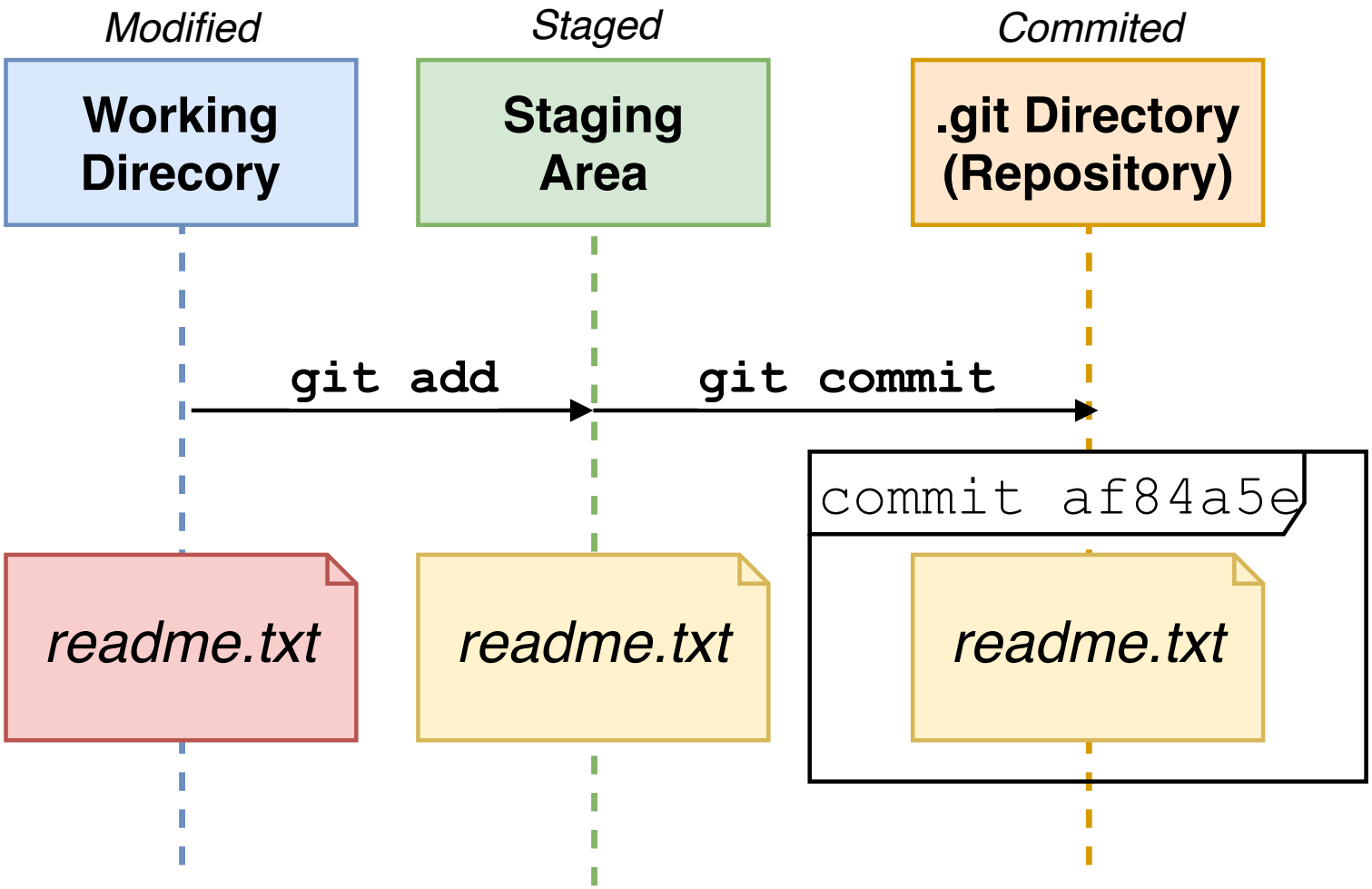
By the way, it's in the *Staging Area* as well.

Let's modify something

Open `readme.txt` and add some text / modify something.

```
$ 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:   readme.txt

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

Git recognizes the changes



Back to the Staging Area

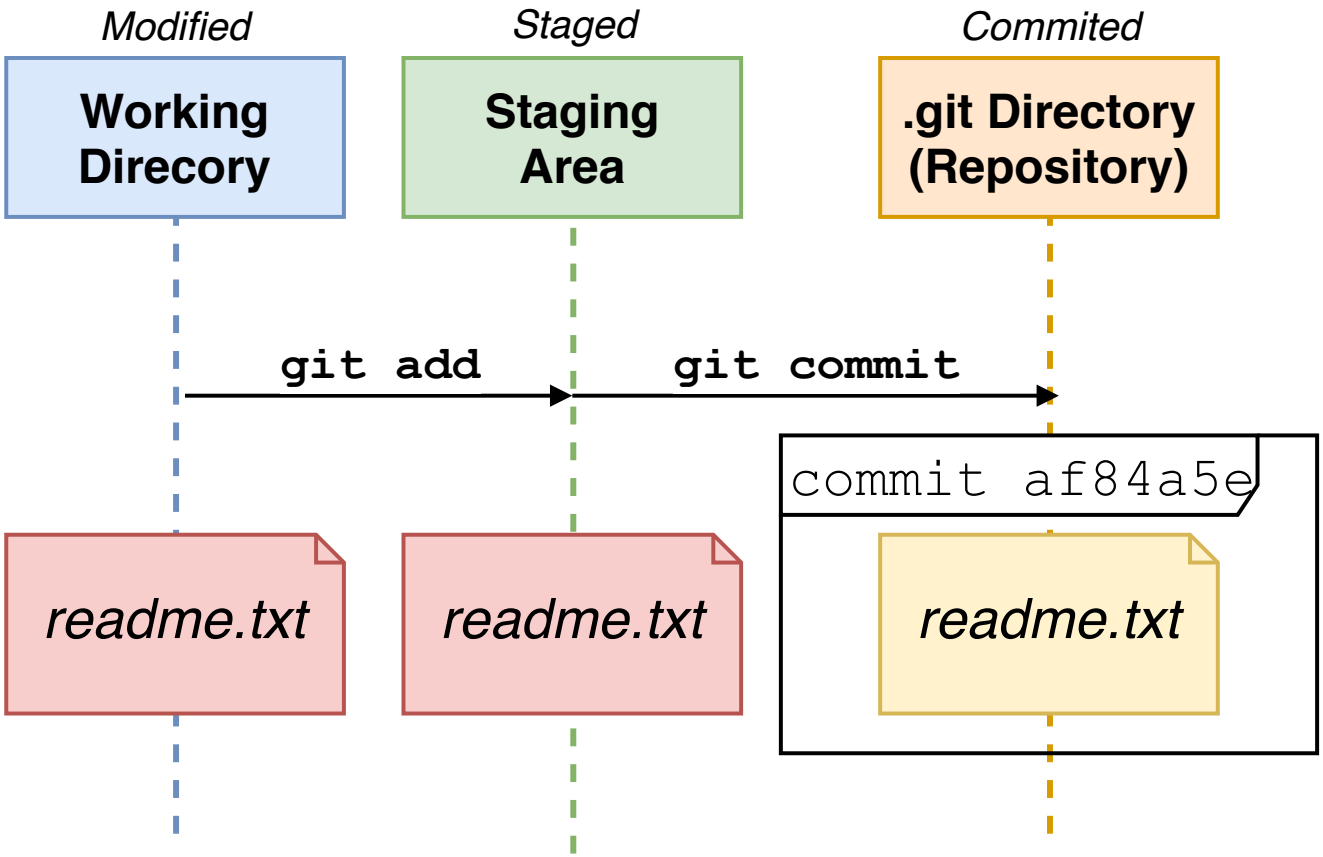
```
$ git add .
$ git status
On branch master
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

        modified:   readme.txt
```

`git add .`

```
$ git add .
```

- `.` is de current directory (incl. sub-dirs)
- You can also add files individually (by mentioning their names)
- **Please note!** Works only *within* the directory containing repository

Staging area after `git add .`



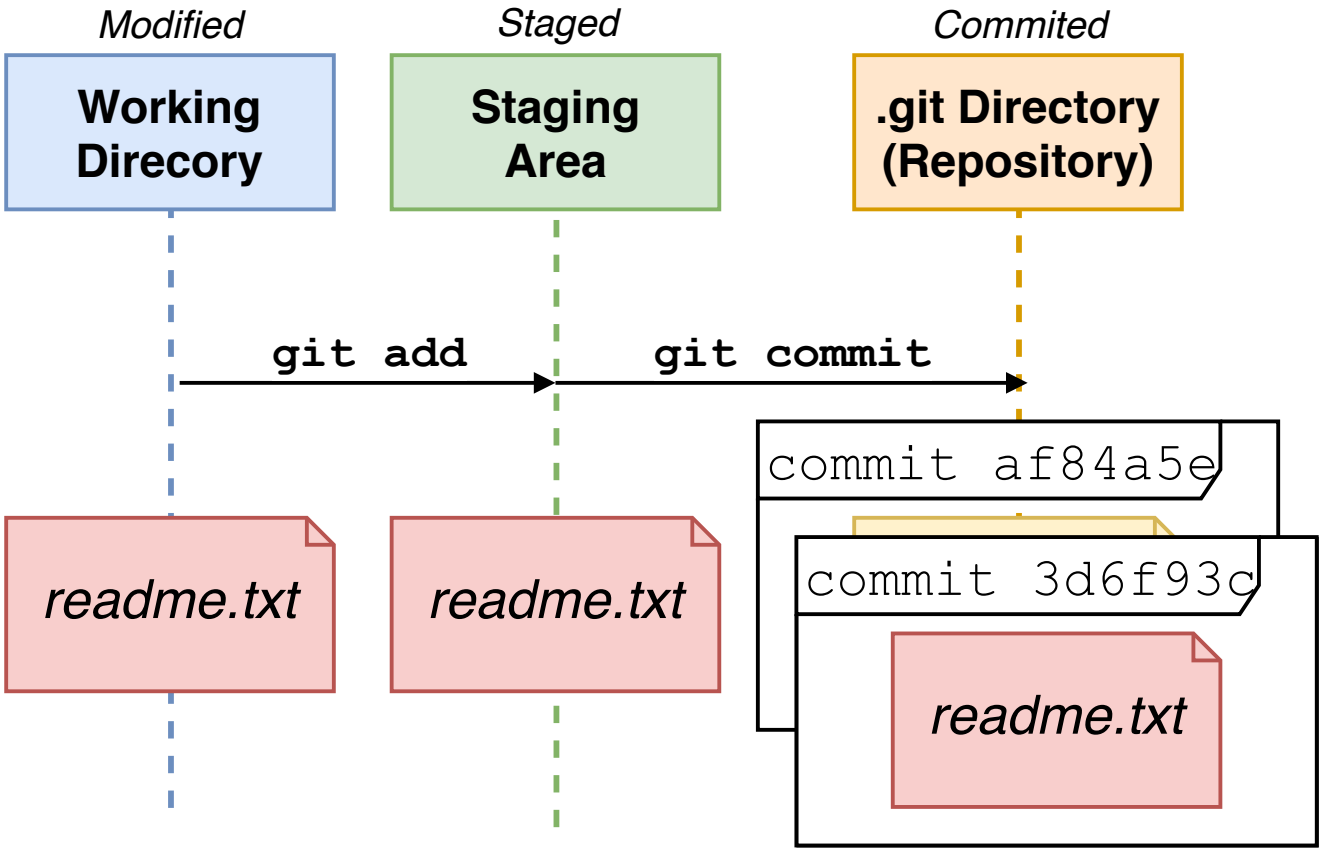
Note that `readme.txt` is still in the directory.

git only acknowledges that it is ready for committing as well.

Committing changes

```
$ git commit -m "added a line to readme.txt"
[master 3d6f93c] added a line to readme.txt
 1 file changed, 1 insertions(+), 0 deletion(-)
```

The situation after the commit



We have now commits!

One more file (try it yourself)

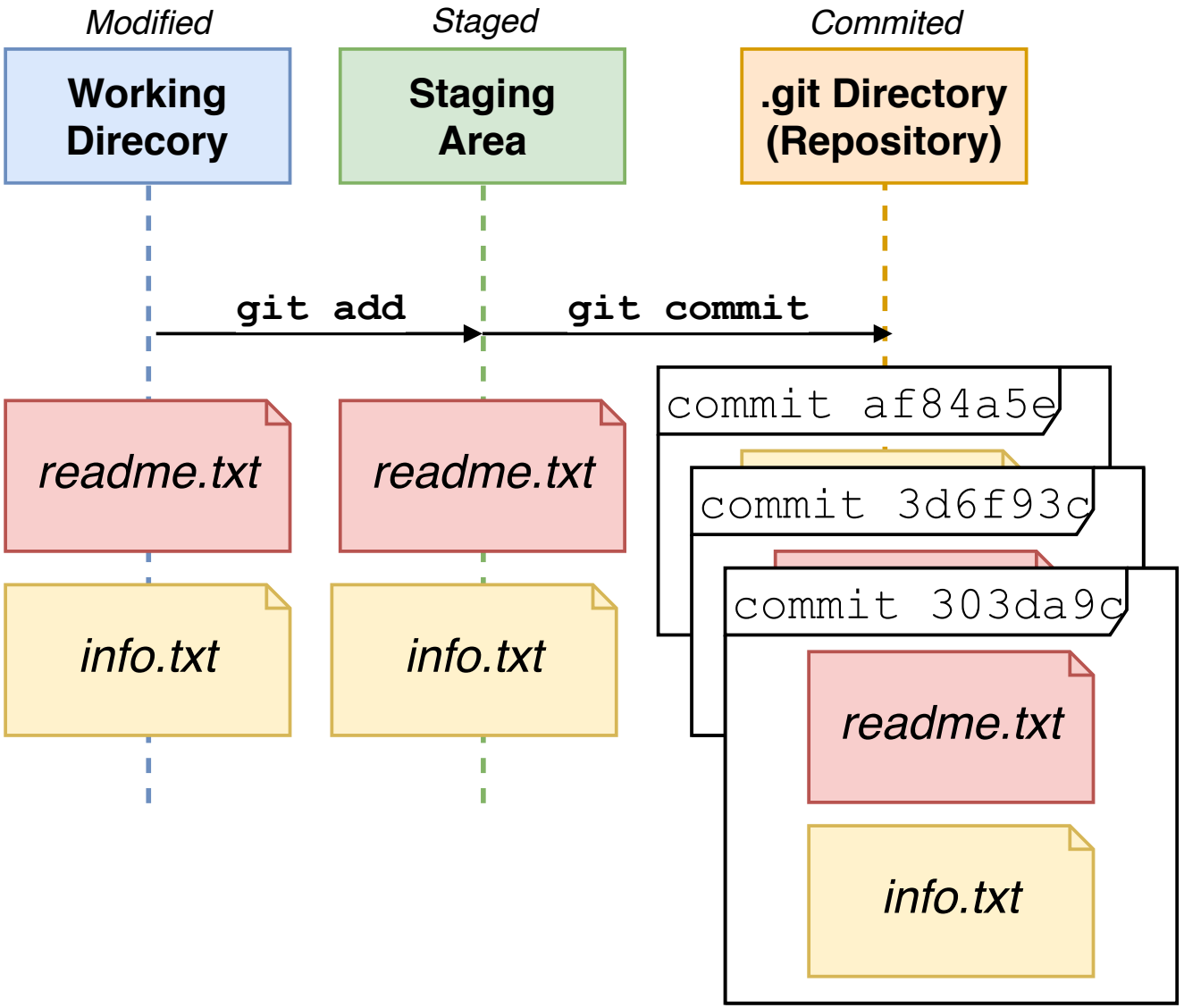
Create a new file (e.g. info.txt) and:

- Add it to the *Staging Area*.
- Commit it.

One more file (code)

```
$ touch info.txt
$ code info.txt
$ git add .
$ git commit -m "info.txt added"
$ git log --oneline
```

We now have two files



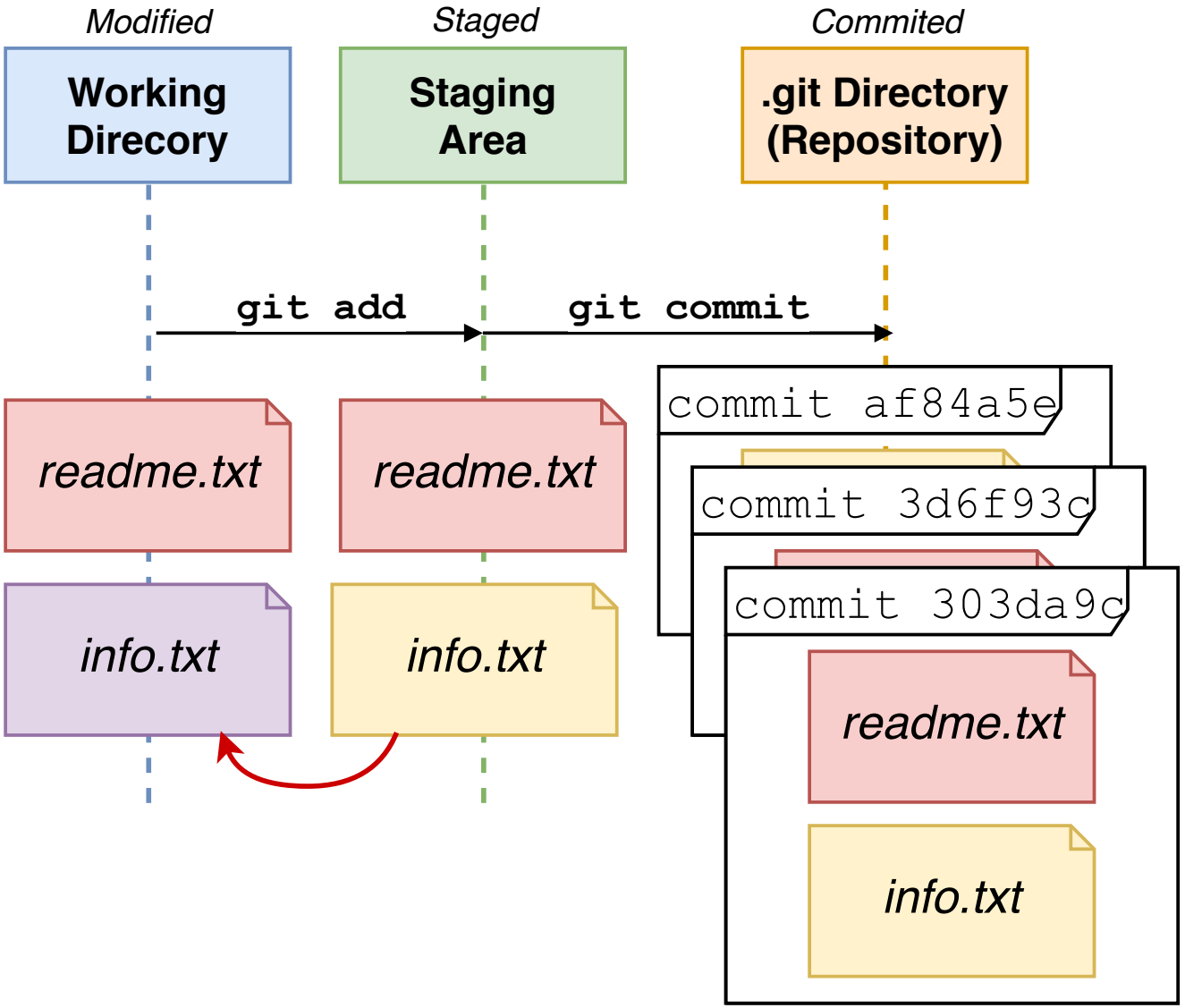
Git time machine

Undoing local changes

There are changes in a file (e.g. `info.txt`) that you want to undo.

```
$ 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:   info.txt
```

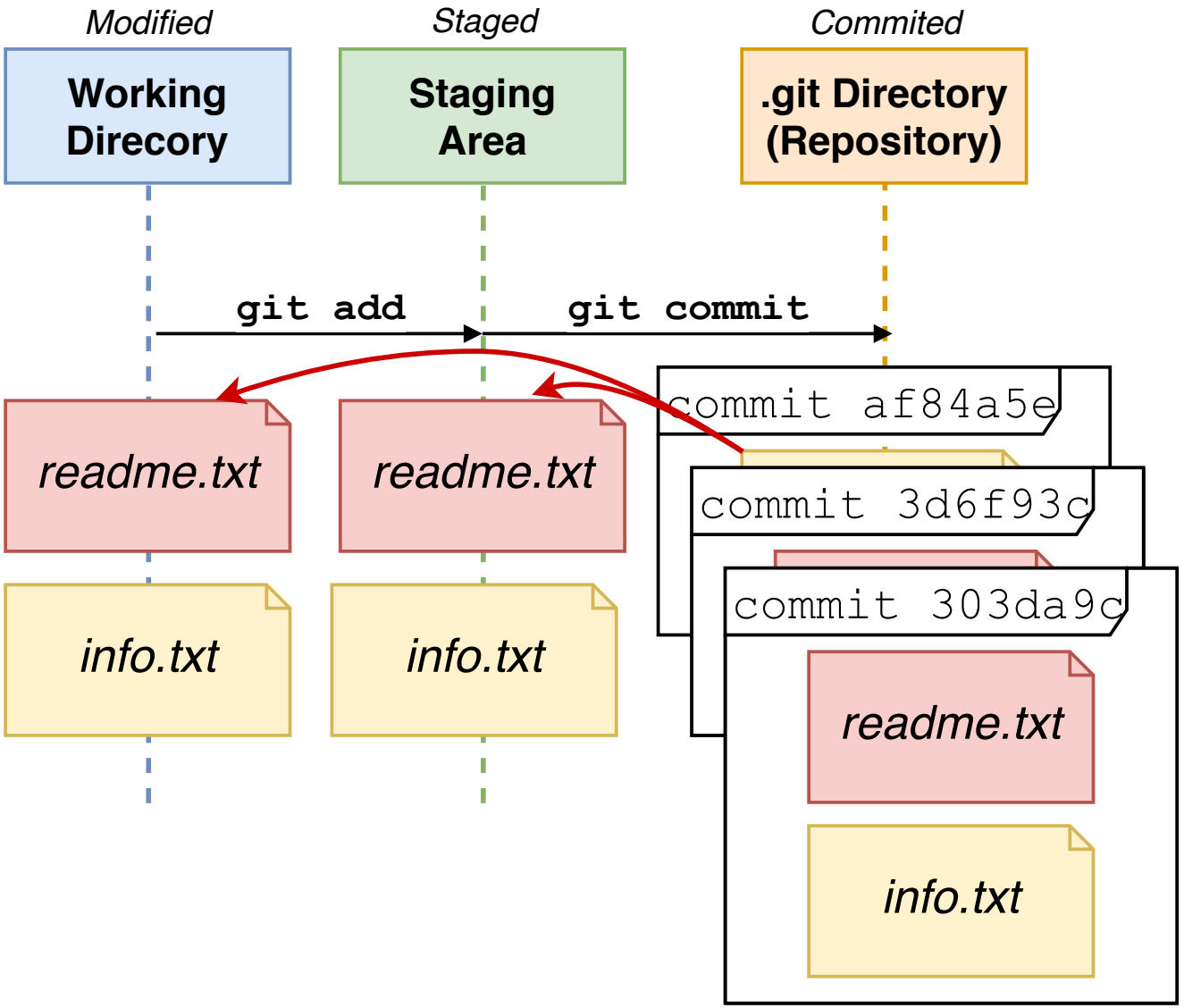
Undoing local changes



Undoing local changes

```
$ git checkout -- info.txt

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

Restoring a file to a previous revision



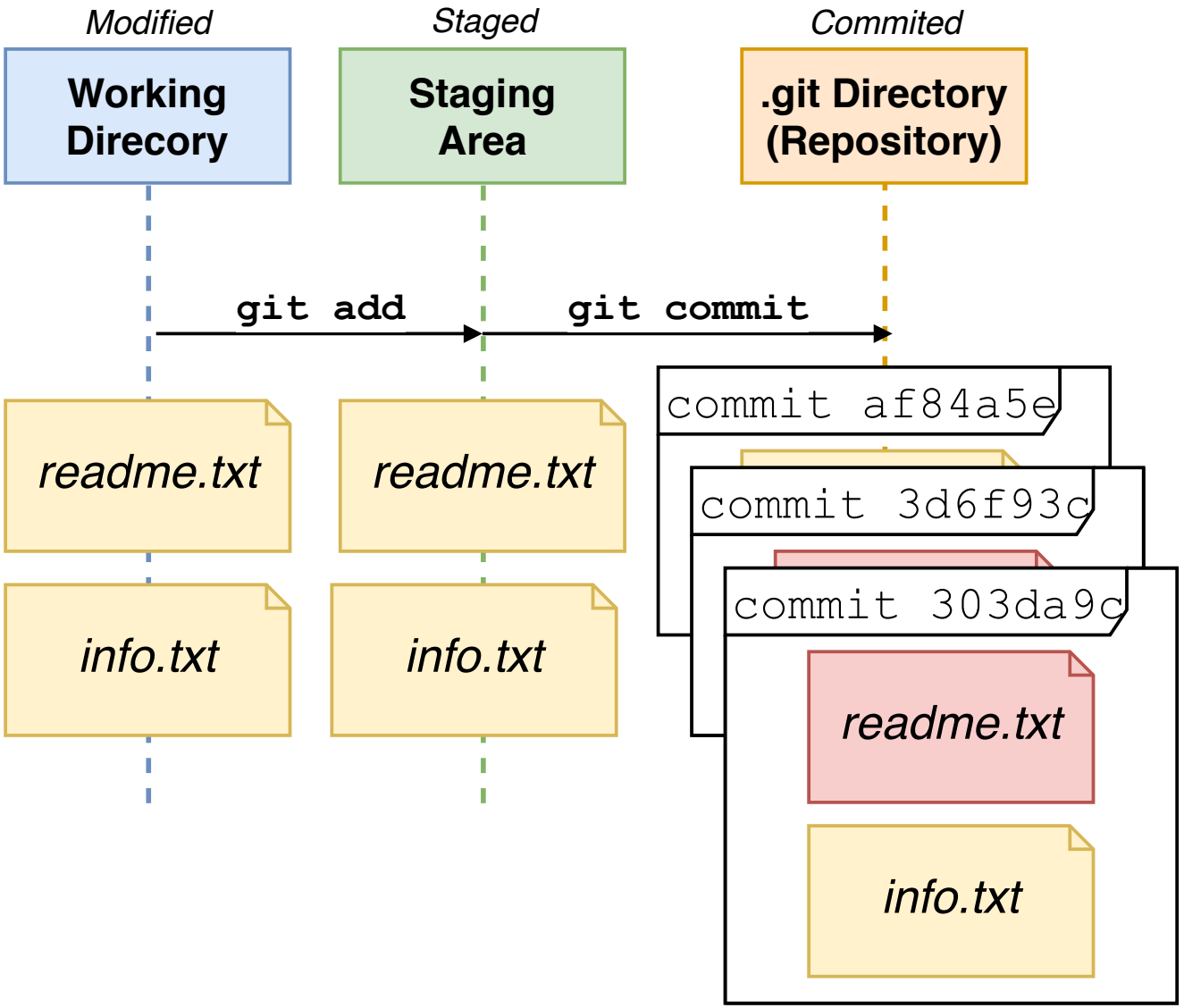
Restoring a file to a previous revision

```
$ git log --oneline
303da9c (HEAD -> master) info.txt added
3d6f93c readme updated
af84a5e readme.txt added

$ git checkout af84a5e -- readme.txt
```

The situation after checkout

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

        modified:   readme.txt
```

The situation after checkout



The situation after checkout: what now?

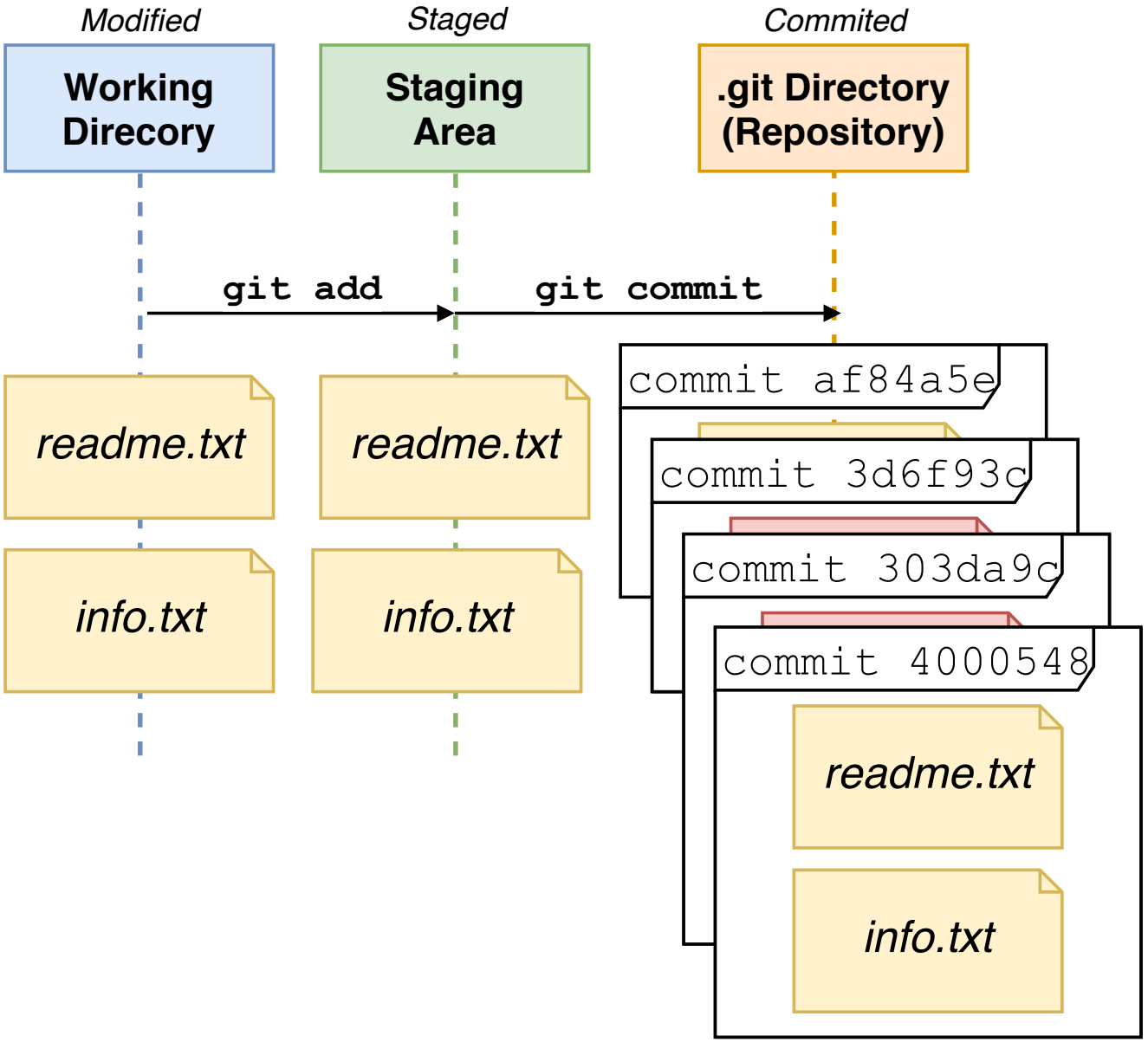
Or: make new changes,

followed by `git add .` & `git commit`

Or: commit directly

```
$ git commit -m "readme.txt back to original revision"
[master 4000548] readme.txt back to original revision
 1 file changed, 1 deletion(-)
```

The situation after checkout and commit

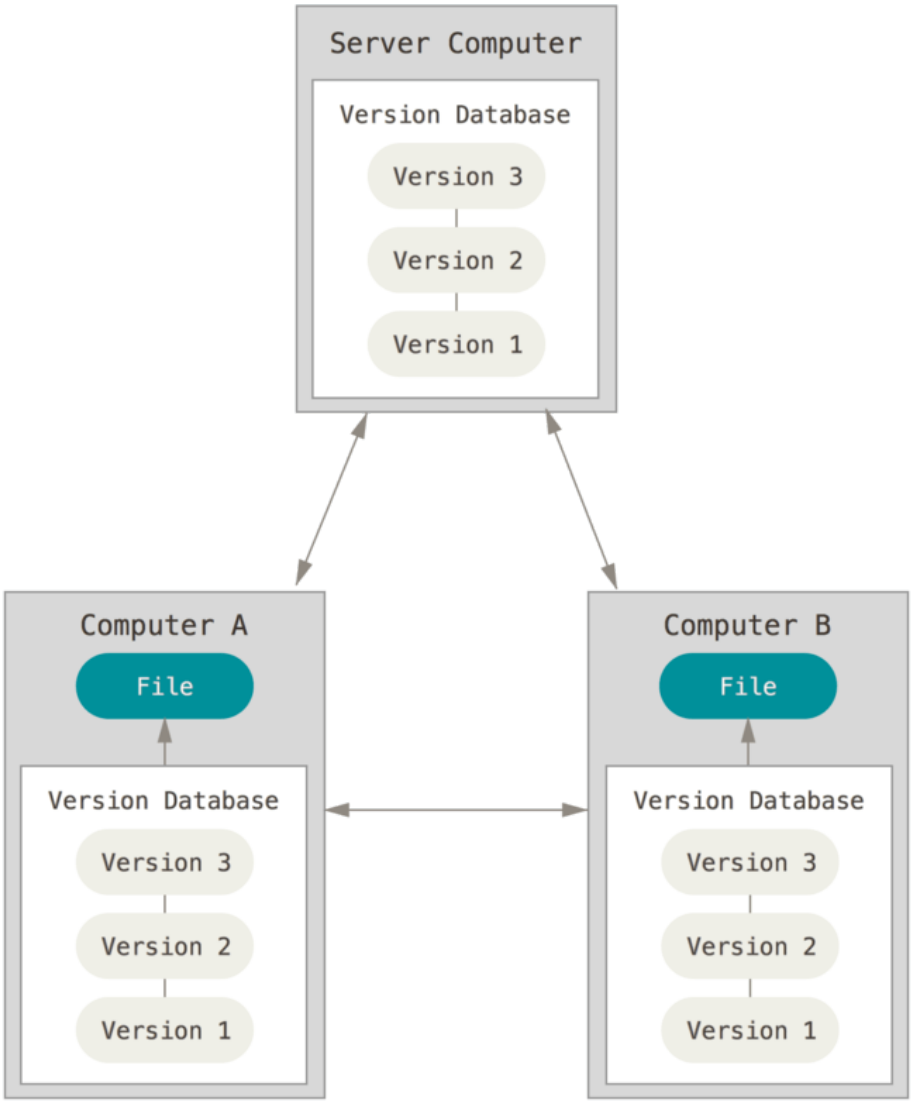


Just checking...

```
$ git log --oneline
4000548 (HEAD -> master) readme.txt back to original revision
303da9c info.txt added
3d6f93c readme updated
af84a5e readme.txt added
```

Git remote

Why remote

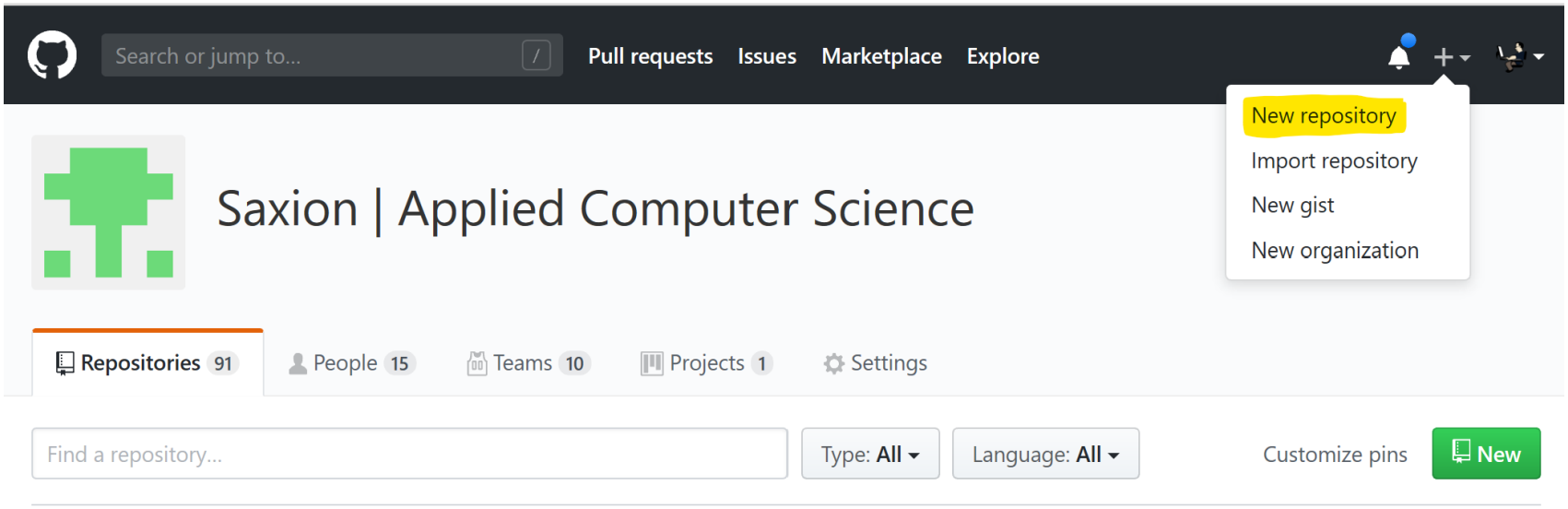

Server Computer
Version Database
Version 3
Version 2
Version 1
Computer A
File
Version Database
Version 3
Version 2
Version 1
Computer B
File
Version Database
Version 3
Version 2
Version 1

Github

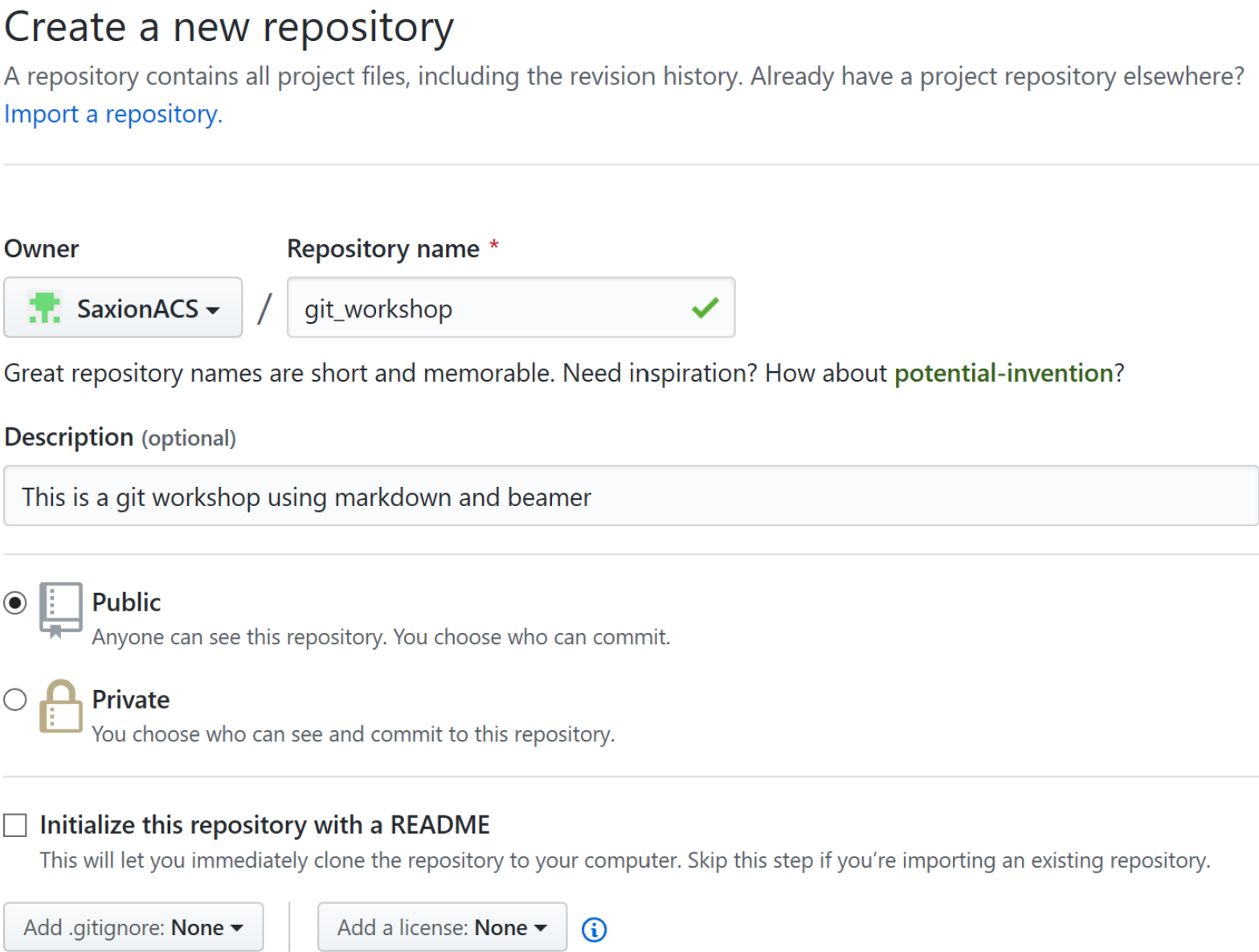
https://github.com/

- (Still) most popular git-hosting service
- Free for everyone (with restrictions)
- Free for education (without restrictions)
- GitHub Classroom (continued)

Creating a new repository on GitHub



Entering details



Public vs. Private

Public

Anyone can see and copy (but not modify) the files.
Only the owner and team members can modify the files.

Private

Only the owner and team members can see, copy or modify the files.

Linking local with remote

Quick setup — if you've done this kind of thing before

Set up in Desktop or HTTPS SSH https://github.com/SaxionACS/git_workshop.git

Get started by creating a new file or uploading an existing file. We recommend every repository include a README, LICENSE, and .gitignore.

...or create a new repository on the command line

```
echo "# git_workshop" >> README.md
git init
git add README.md
git commit -m "first commit"
git remote add origin https://github.com/SaxionACS/git_workshop.git
git push -u origin master
```

Linking an existing (local) repo with a remote

```
$ git remote add origin
    https://github.com/SaxionACS/git_workshop.git
$ git push -u origin master
```

Replace the url in the command with your repo url!

Alternative: cloning the remote to a new folder

```
$ mkdir my_project
$ cd my_project
$ git clone
  https://github.com/SaxionACS/git_workshop.git
```

Has it worked?

SaxionACS / git_workshop

Unwatch 1 | Star 0 | Fork 0

Code | Issues 0 | Pull requests 0 | Projects 0 | Wiki | Insights | Settings

This is a git workshop using markdown and beamer

Edit

Manage topics

4 commits | 1 branch | 0 releases | 1 contributor

Branch: master | New pull request | Create new file | Upload files | Find File | Clone or download

zaldawid readme.txt naar originele revisie — Latest commit 4000548 18 hours ago

info.txt	info.txt toegevoegt	19 hours ago
readme.txt	readme.txt naar originele revisie	18 hours ago

readme.txt

```
readme.
```

Has it worked?

```
$ git remote -v

origin
 https://github.com/SaxionACS/git_workshop.git (fetch)
origin
 https://github.com/SaxionACS/git_workshop.git (push)
```

What's next?

It depends:

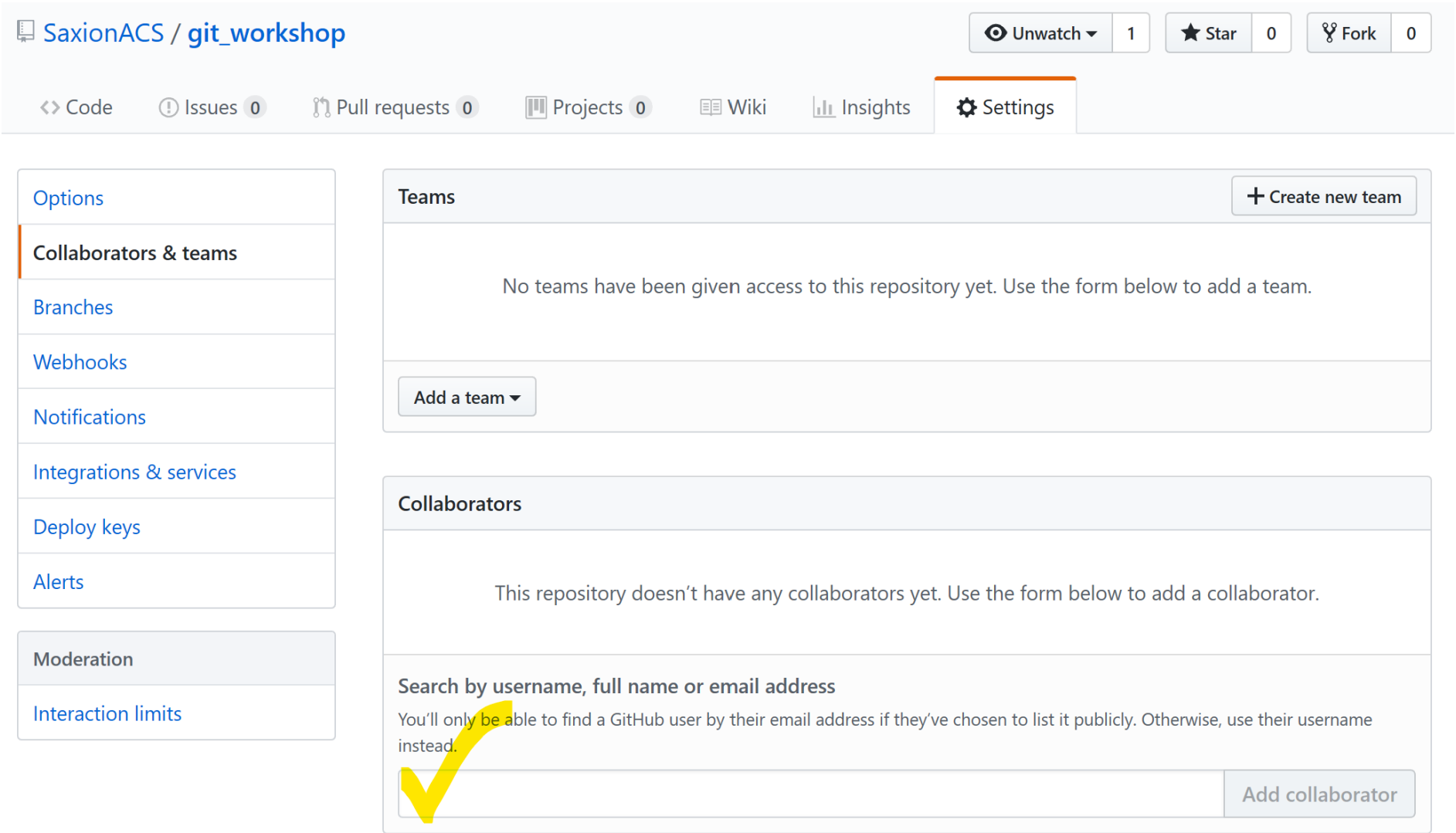
- Solo user
- Team user

Remote for a solo user

```
$ git pull
[work on project]
$ git status
$ git add .
$ git commit -m "..."
$ git push
```

- `pull`: Changes remote -> local
- `push`: Changes local -> remote

Remote for a team: collaborators



Remote for a team: initialization

Everyone must point their local repo to the same remote.

One person takes care of the initialization of the remote repository.

Then:

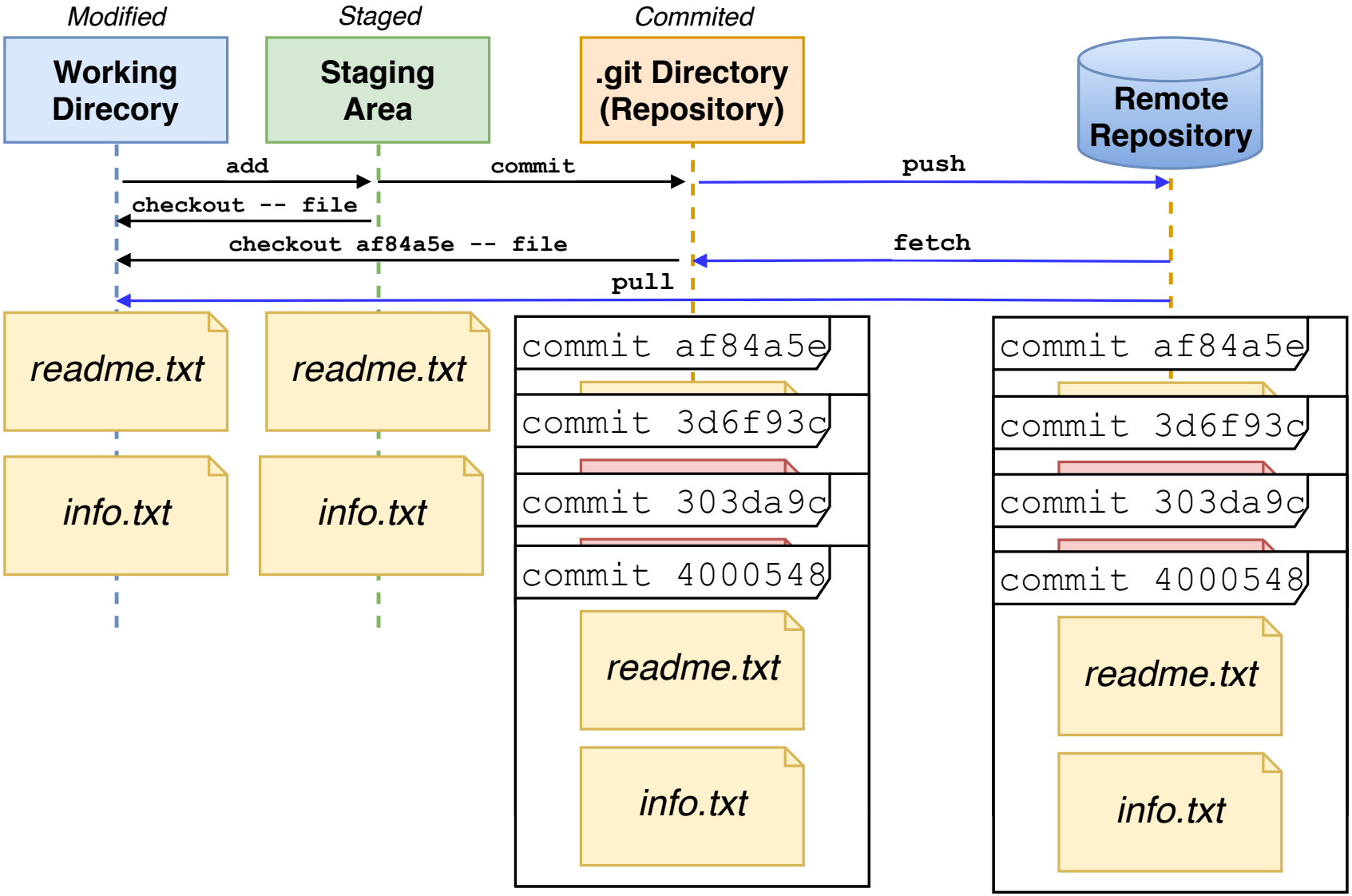
```
$ git clone
  https://github.com/SaxionACS/git_workshop.git
```

Remote for a team: workflow

```
$ git pull --rebase
[work on files]
$ git status
$ git add .
$ git commit -m "..."
$ git pull --rebase
$ git push
```

`--rebase` enables “simple” commit history

Working with remote



GitHub for education

GitHub for students

- Free pro accounts
- Some extra freebees
- Check https://education.github.com/pack for more info