LECTURE 44

VERSION CONTROL WITH GIT

MCS 275 Spring 2022

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LECTURE 44: VERSION CONTROL WITH GIT

Course bulletins:

- Please **complete your course evaluations**. The deadline is 11:55pm Sunday.
- Project 4 due today at 6pm.

VERSION CONTROL

A system to:

- Track changes
- Document changes
- Archive previous versions
- Allow concurrent work

Version control systems (VCS) are also known as "source code management" (SCM).

DO YOU HAVE THIS?

```
project4.py
project4draft.py
project4-new.py
project4-fixed.py
project4-fixed-debug.py
project4final.py
project4final2.py
project4final3.py
project4final3 (1).py
project4final_fixed-new2_revised\ (1).2022-04-27.py
```

A version control system (VCS) can help.

GIT

A VCS created by Linus Torvalds in 2005.

Key properties:

- Open source
- Distributed
- Nonlinear
- Offline-friendly

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* Finnish software developer and creator of Linux (1993).

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Key properties:

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- Nonlinear
- Offline-friendly

* Free to use; multiple implementations available.

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Key properties:

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- **Distributed**
- Nonlinear
- Offline-friendly

* Everyone has a copy of full history.

GIT

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Key properties:

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- Distributed
- **Nonlinear**
- Offline-friendly

* Supports parallel branches of development; no concept of a single "latest" version.

GIT

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Key properties:

- Open source
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- Nonlinear
- **Offline-friendly**

* Many commands operate only on local files. Sync with others when ready.

ONLINE SERVICES

There are some popular online services that will keep a copy of your project on a server that everyone working on it can exchange updates with. E.g.

- gitlab
- github
- bitbucket

These let you voluntarily centralize a purposely decentralized system.

REPOSITORY

A set of files and directories for which git tracks changes and a database of previous changes to those files.

Think of it as a single "project".

`git init`

Creates a git repository in the current directory.

Initially has empty history and doesn't track any files.

DATA LIFECYCLE

DATA LIFECYCLE

Untracked | Tracked | Staged | Repository | Remote

Files that git ignores

DATA LIFECYCLE

Untracked | Tracked | Staged | Repository | Remote

Files that git monitors for changes

DATA LIFECYCLE

Untracked | Tracked | Staged | Repository | Remote

Files ready to commit to repository

DATA LIFECYCLE

Untracked | Tracked | Staged | Repository | Remote

Database of commits (content versions)

DATA LIFECYCLE

Untracked | Tracked | Staged | Repository | Remote

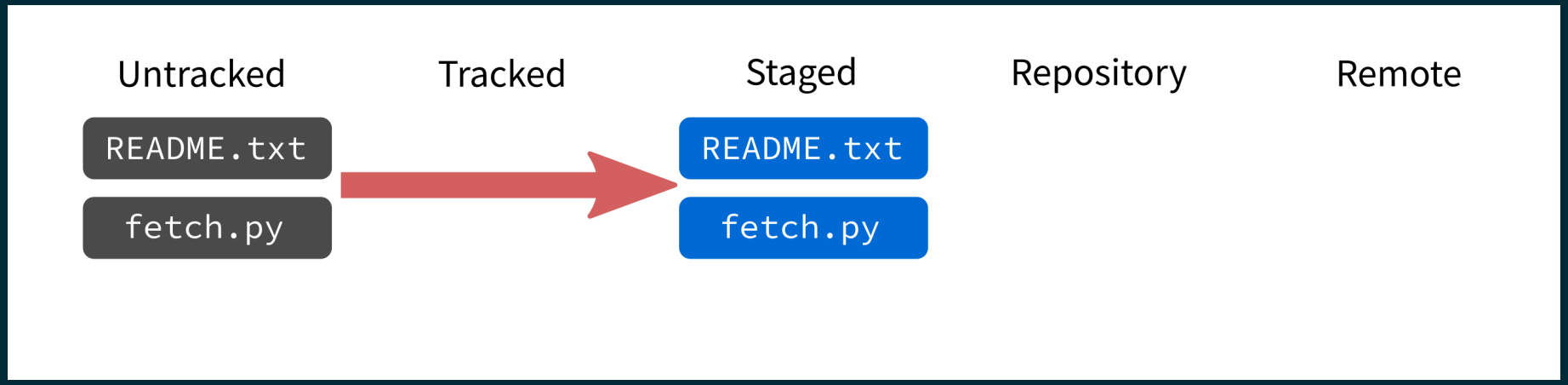
Repository stored elsewhere (e.g. GitHub)

DATA LIFECYCLE

git add

Put current version of the file in a staging area.

git add



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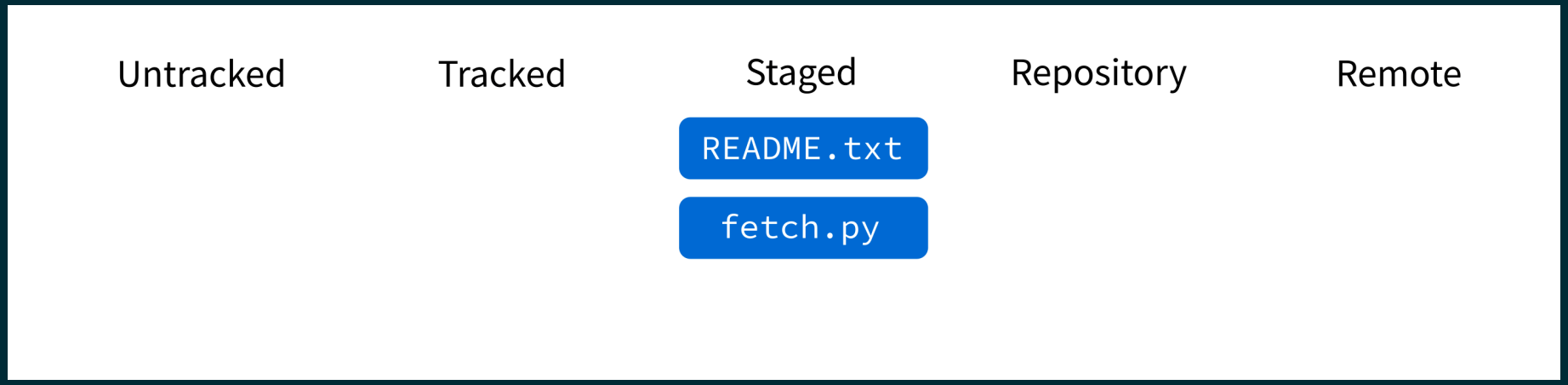
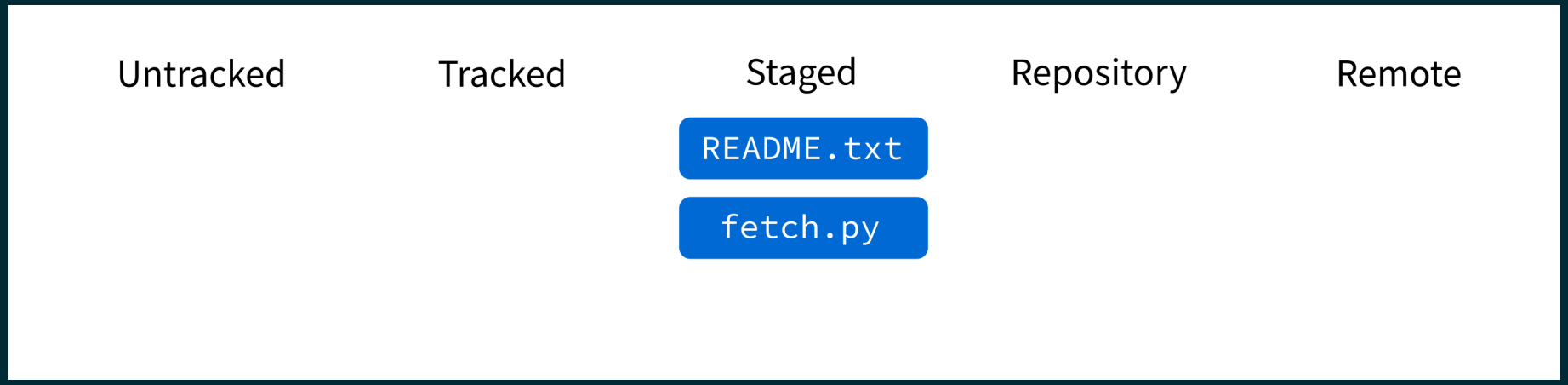


Put current version of the file in a staging area.

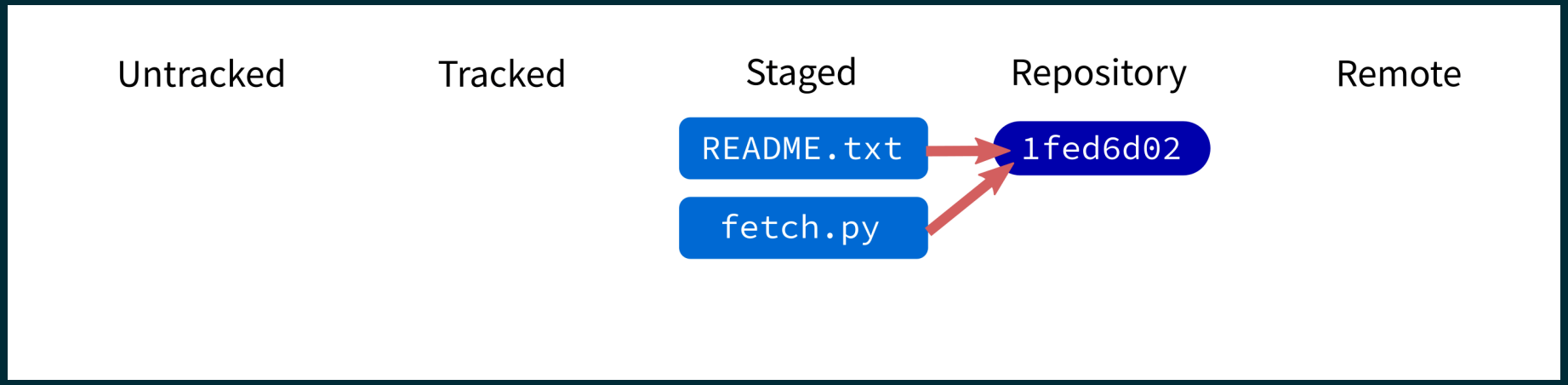
git commit



Record staged changes in the database.

(These files will be tracked from now on.)

git commit



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(These files will be tracked from now on.)

git commit

Record staged changes in the database.

(These files will be tracked from now on.)

`git log`

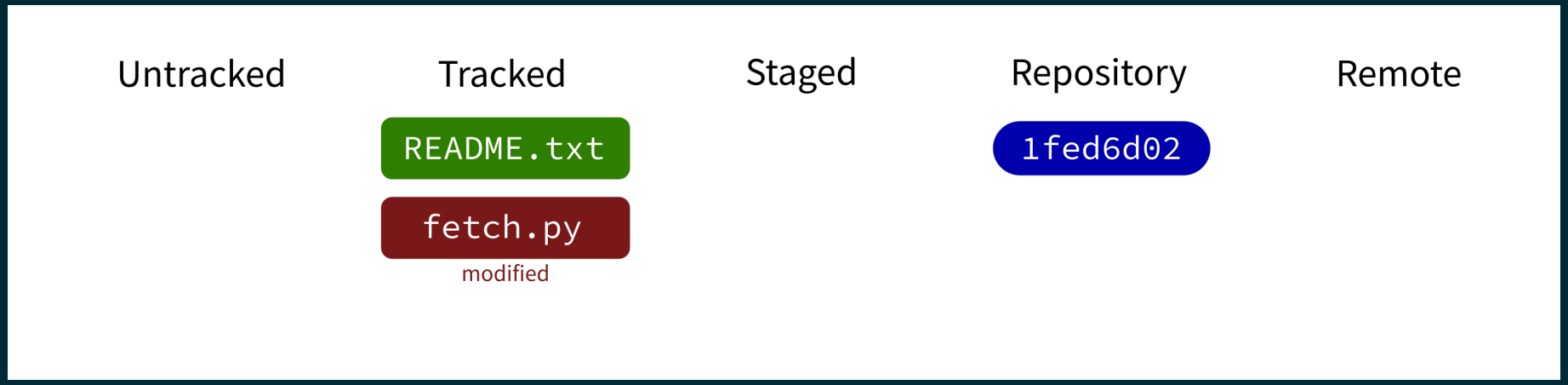
Show recent commits and descriptions.

`git status`

Show summary of current situation.

ANOTHER COMMIT

ANOTHER COMMIT



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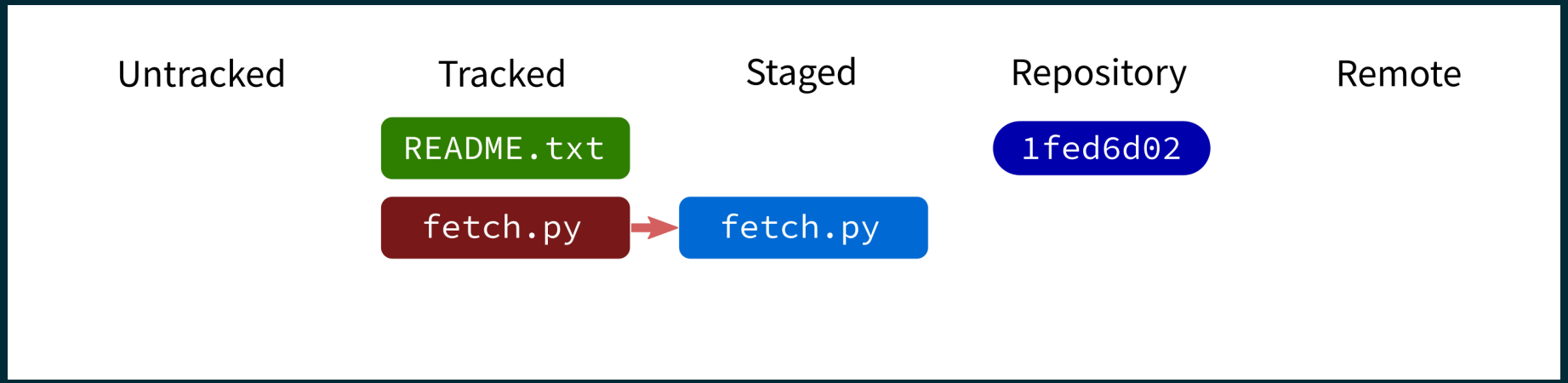

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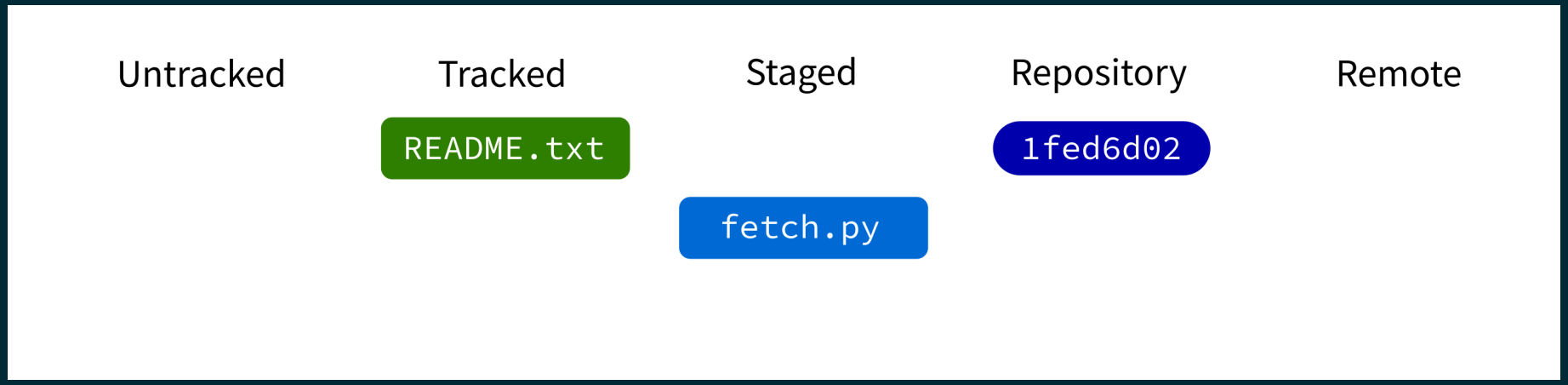

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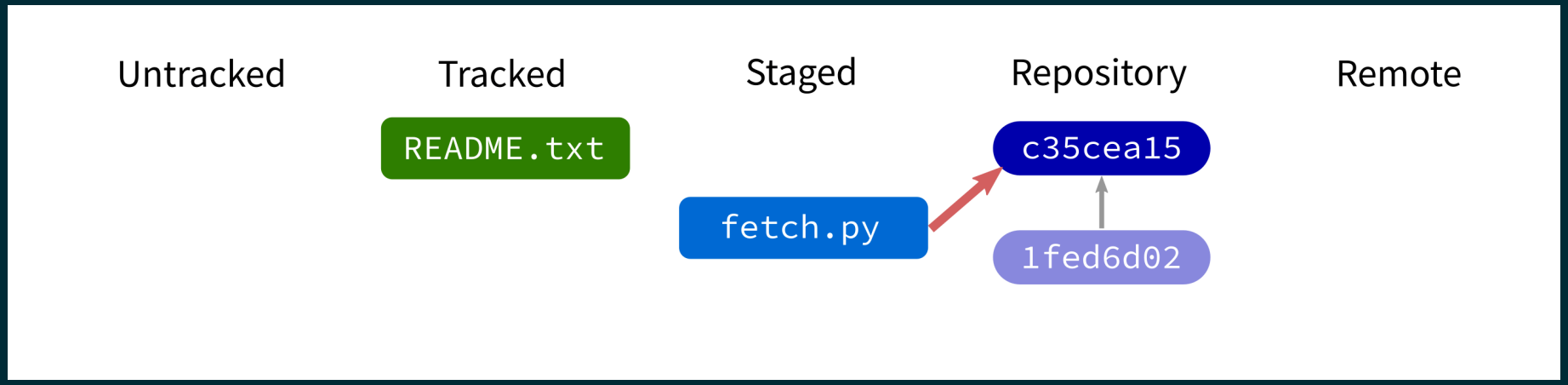

ANOTHER COMMIT

git push

Contact a remote repository and send it commits that are in our database but not theirs.

Fails if remote has changed since our last push!

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git pull

Contact a remote repository and get commits from its database that are not yet in ours.

May trigger a **merge** if there have been changes to both local and remote since we last pulled.

git pull

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May trigger a **merge** if there have been changes to both local and remote since we last pulled.

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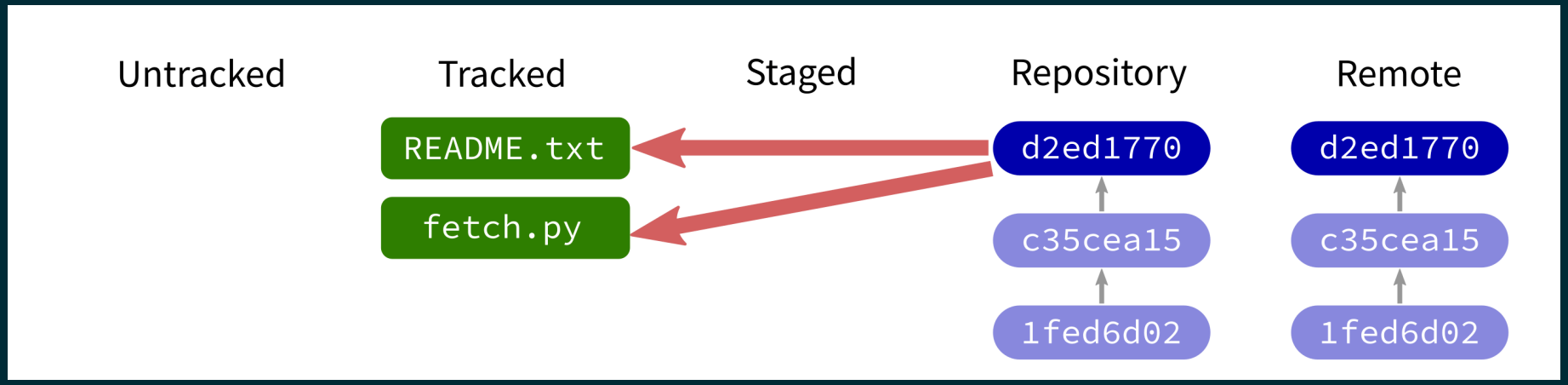

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May trigger a **merge** if there have been changes to both local and remote since we last pulled.

LOOKING AT HISTORY

```
git show COMMIT:FILE
```

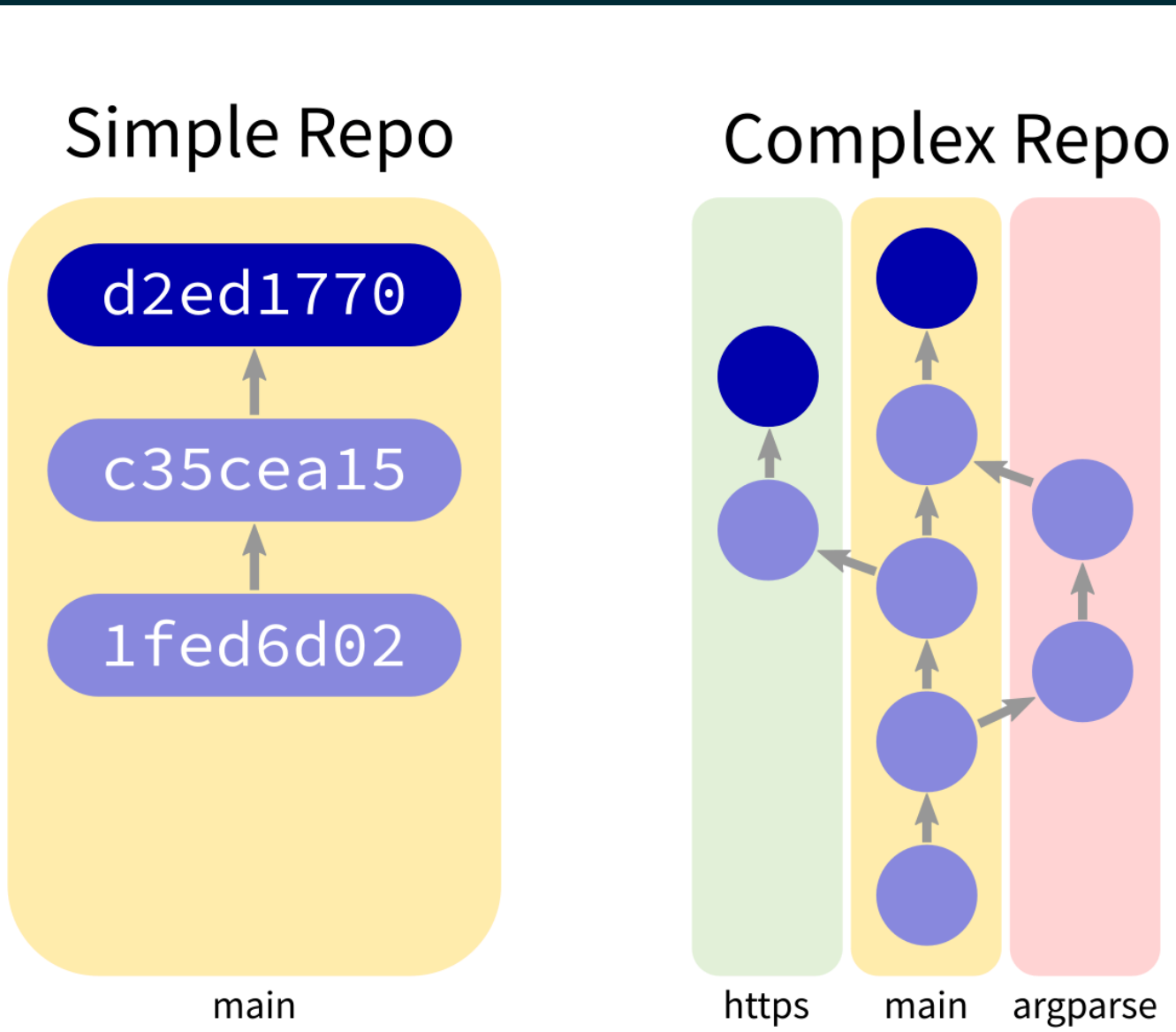
will display file contents at any commit.

GIT CLONE

Make a local copy of an existing repository (from URL, directory, ...).

NOT COVERED

- reset – undo things / restore files or repo to an earlier state
- branch – named series of commits; related commands:
  - checkout
  - merge
  - rebase


Simple Repo
d2ed1770
c35cea15
1fed6d02
main
Complex Repo
https
main
argparse

REFERENCES

- git home page
- Official git documentation (includes tutorial videos, Pro Git book)
- git - the simple guide

REVISION HISTORY

- 2022-04-29 Initial publication