

Version Control Systems (aka VCSs)

Athanasis Zolotas

Outline

- Introduction
 - Why VCS?
- History
 - Which VCS?
- Let's try Git
 - 3 parts

Introduction

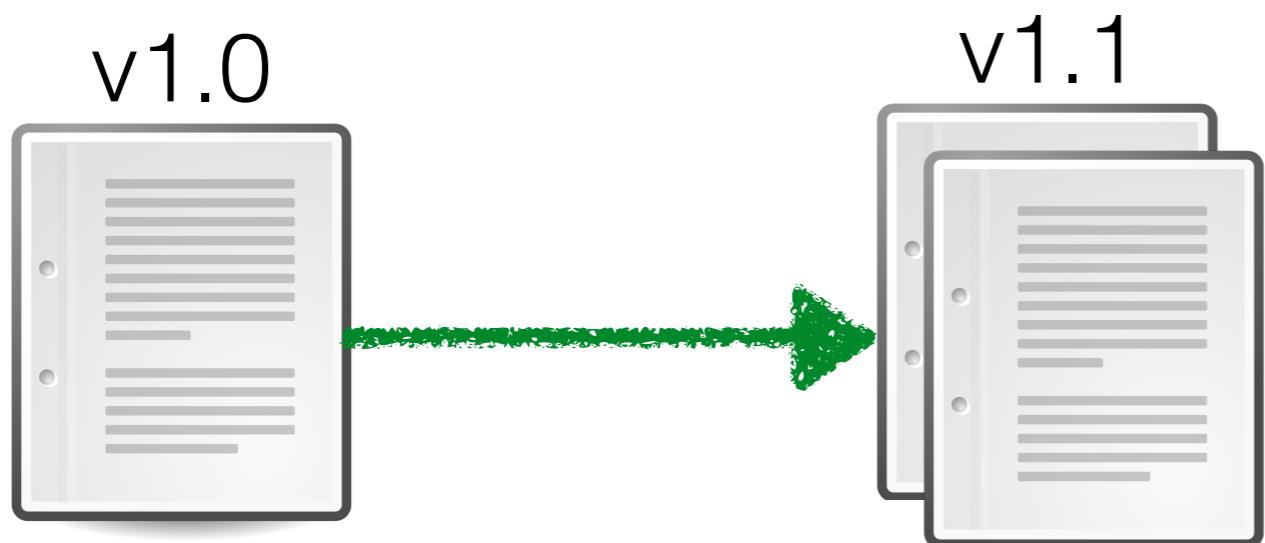
- As the name suggests its a technology to control versions of an artefact
 - Most probably code
 - It's quite common for text project

Introduction

v1.0



Introduction



Introduction



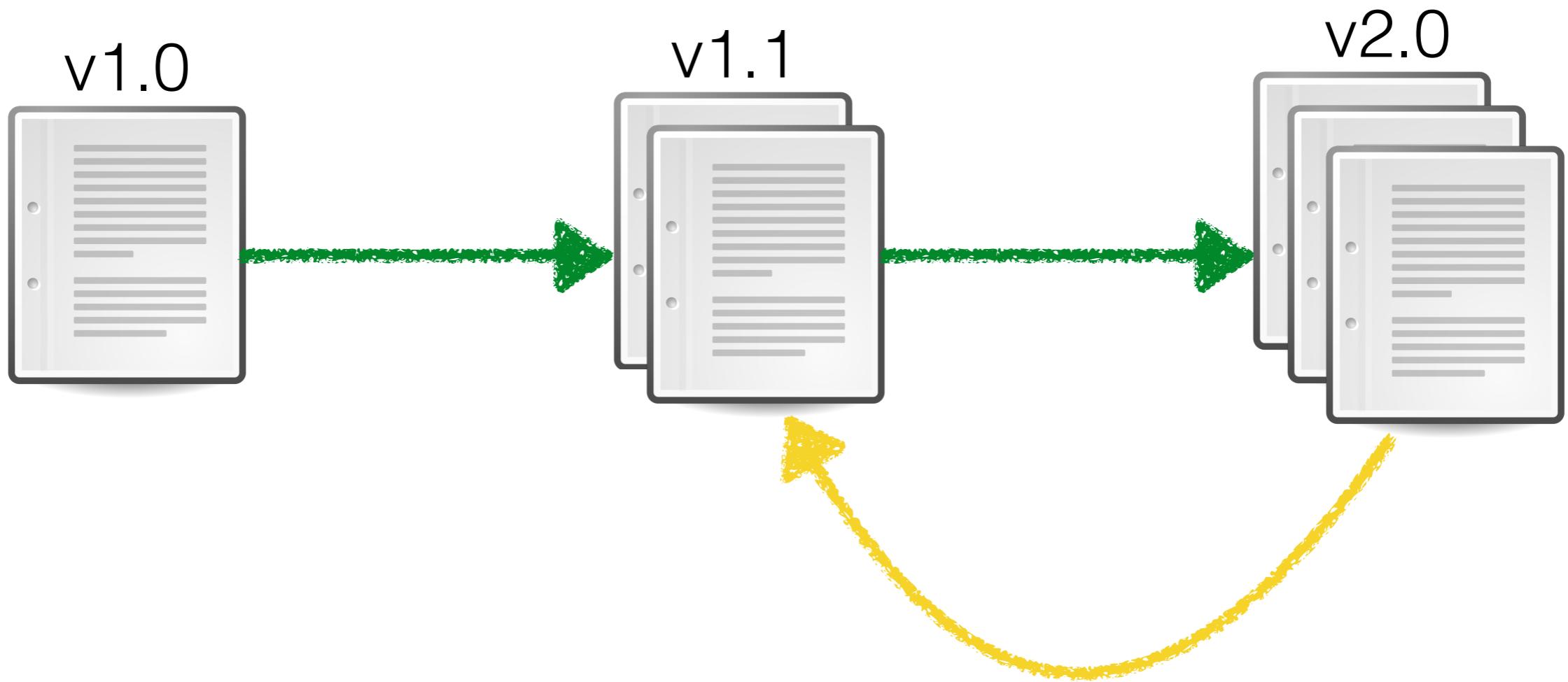
Introduction



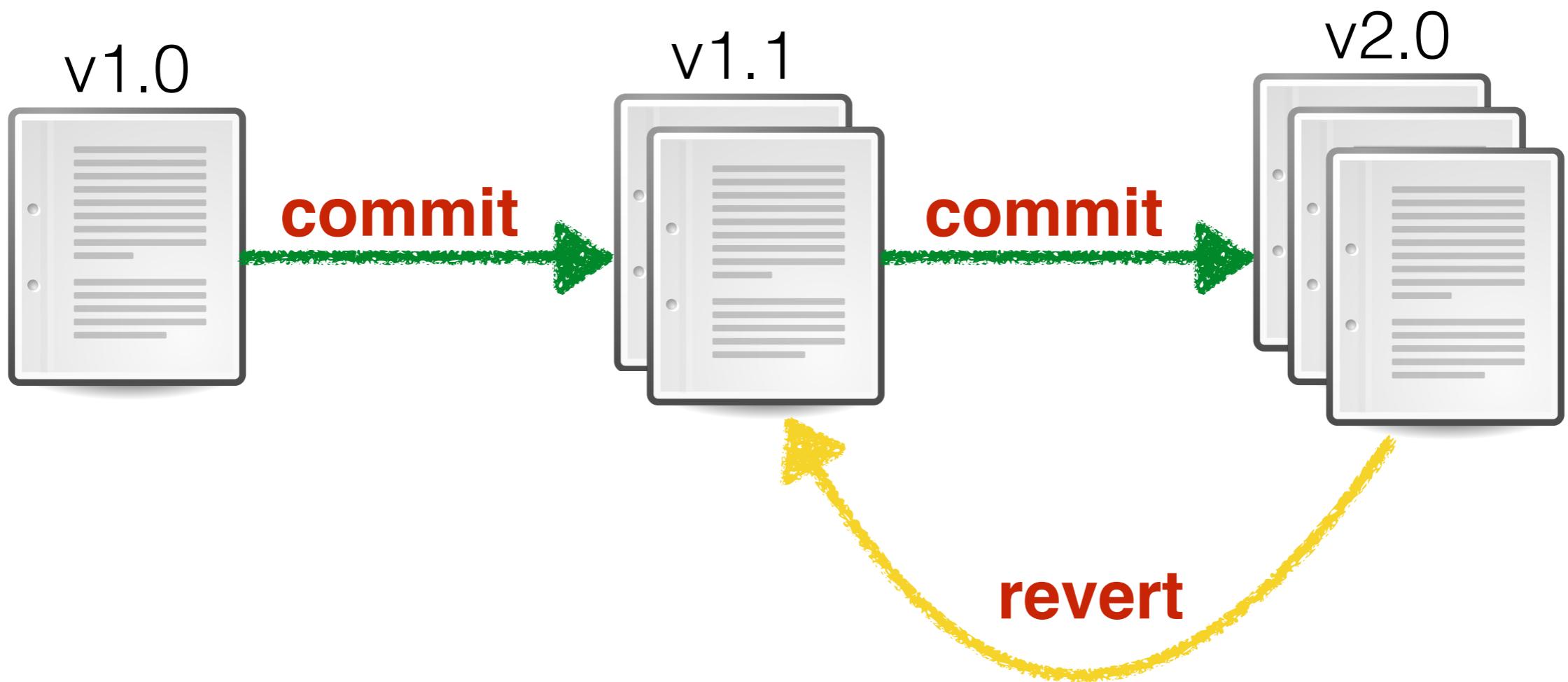
Introduction



Introduction



Introduction



Why VCS?

- Control / Store different versions, historical data of your application / documents
- Bug fixes (find at which step the error happened)
- But VCSs have more uses:
 - Enable collaboration
 - Work as a backup

History

History

- Filenames:
 - project_191015.docx → project_211015.docx
 - project_v1.zip → project_v2.zip

History

- Filenames:
 - project_191015.docx → project_211015.docx
 - project_v1.zip → project_v2.zip
- Diff utilities
 - Find changes between two files

History

- Filenames:
 - project_191015.docx → project_211015.docx
 - project_v1.zip → project_v2.zip
- Diff utilities
 - Find changes between two files
- Post-its or cups

History

History

- Source Code Control System (SCCS) - 1972

History

- Source Code Control System (SCCS) - 1972
- Revision Control System (RCS) - 1981

History

- Source Code Control System (SCCS) - 1972
- Revision Control System (RCS) - 1981
- IBM Rational ClearCase - 1990

History

- Source Code Control System (SCCS) - 1972
- Revision Control System (RCS) - 1981
- IBM Rational ClearCase - 1990
- Source Safe - 1991

History

- Source Code Control System (SCCS) - 1972
- Revision Control System (RCS) - 1981
- IBM Rational ClearCase - 1990
- Source Safe - 1991
- Microsoft Delta - 1994

History

- Source Code Control System (SCCS) - 1972
- Revision Control System (RCS) - 1981
- IBM Rational ClearCase - 1990
- Source Safe - 1991
- Microsoft Delta - 1994
- ...

Modern VCSSs

Modern VCSs

- Apache Subversion

Modern VCSs

- Apache Subversion
- Darcs

Modern VCSs

- Apache Subversion
- Darcs
- Git

Modern VCSs

- Apache Subversion
- Darcs
- Git
- Mercurial

Modern VCSs

- Apache Subversion
- Darcs
- Git
- Mercurial
- Bazaar

Modern VCSs

- Apache Subversion
- Darcs
- Git
- Mercurial
- Bazaar
- ...

Modern VCSs

- **Apache Subversion - SVN**
- Darcs
- **Git**
- Mercurial
- Bazaar
- ...

Approaches

- Centralised
- Decentralised (or Distributed)

Terminology

Terminology

Repository: Where everything is stored (files & historic data).

Terminology

Repository: Where everything is stored (files & historic data).

Commit [v]: Store a change to the repository.

Terminology

Repository: Where everything is stored (files & historic data).

Commit [v]: Store a change to the repository.

Commit [n]: A revision in the repository. A version.

Terminology

Repository: Where everything is stored (files & historic data).

Commit [v]: Store a change to the repository.

Commit [n]: A revision in the repository. A version.

Branch : The project is forked. New paths that share the same code base.

Terminology

Repository: Where everything is stored (files & historic data).

Commit [v]: Store a change to the repository.

Commit [n]: A revision in the repository. A version.

Branch : The project is forked. New paths that share the same code base.

Merge : Combine two paths.

Terminology

Repository: Where everything is stored (files & historic data).

Commit [v]: Store a change to the repository.

Commit [n]: A revision in the repository. A version.

Branch : The project is forked. New paths that share the same code base.

Merge : Combine two paths.

Conflict : Changes performed at the same files cannot be resolved automatically.

Approaches

Approaches

- Centralised:
 - Unique, central repository
 - Changes are committed to this central copy of the project

Approaches

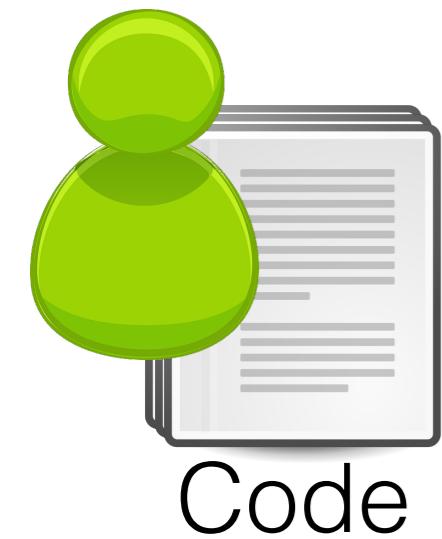
- Centralised:
 - Unique, central repository
 - Changes are committed to this central copy of the project
- Decentralised / Distributed:
 - Different copies, each copy is equally valid
 - Commits are happening to your local repository

SVN

- Apache Subversion
 - Is a centralised VCS
 - When a new version is committed, its id increments sequentially (e.g. 1, 2, 3, ...)

SVN Example

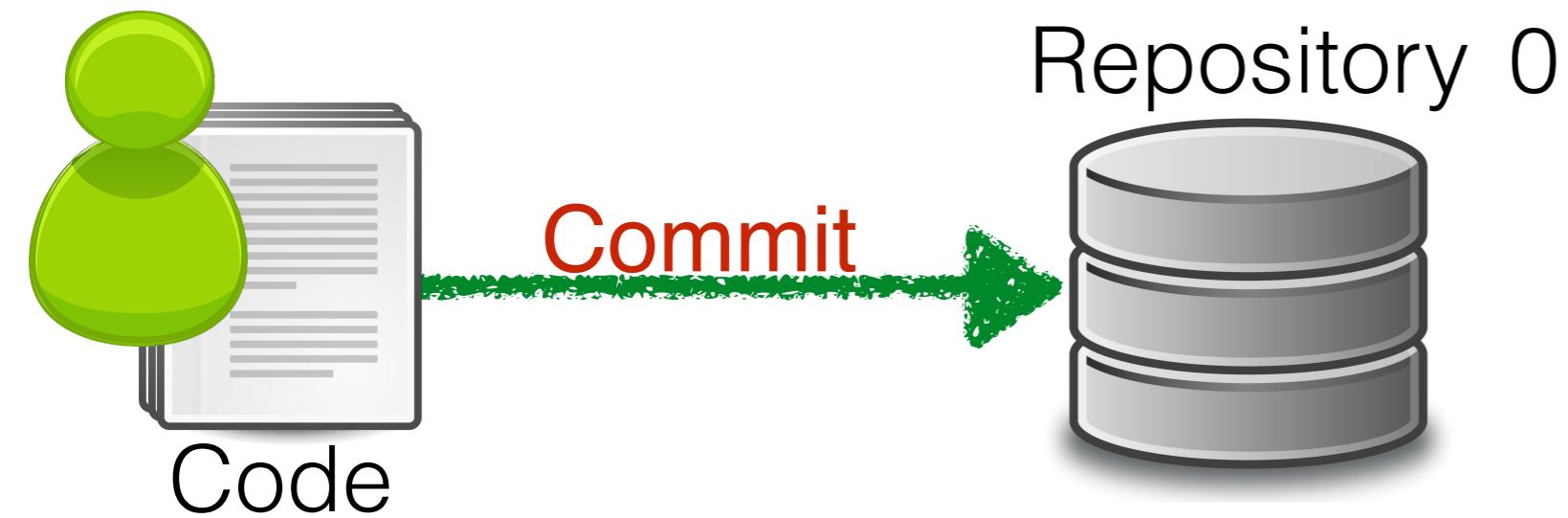
SVN Example



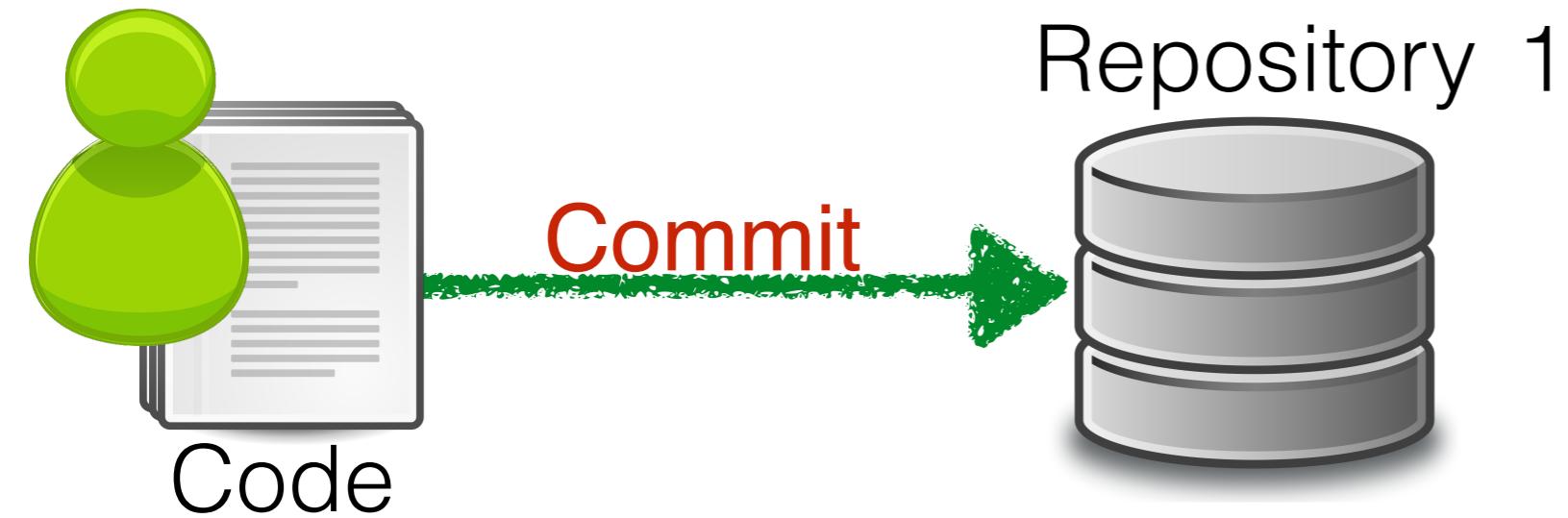
Repository 0



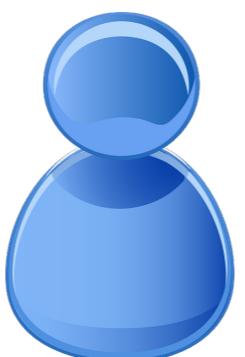
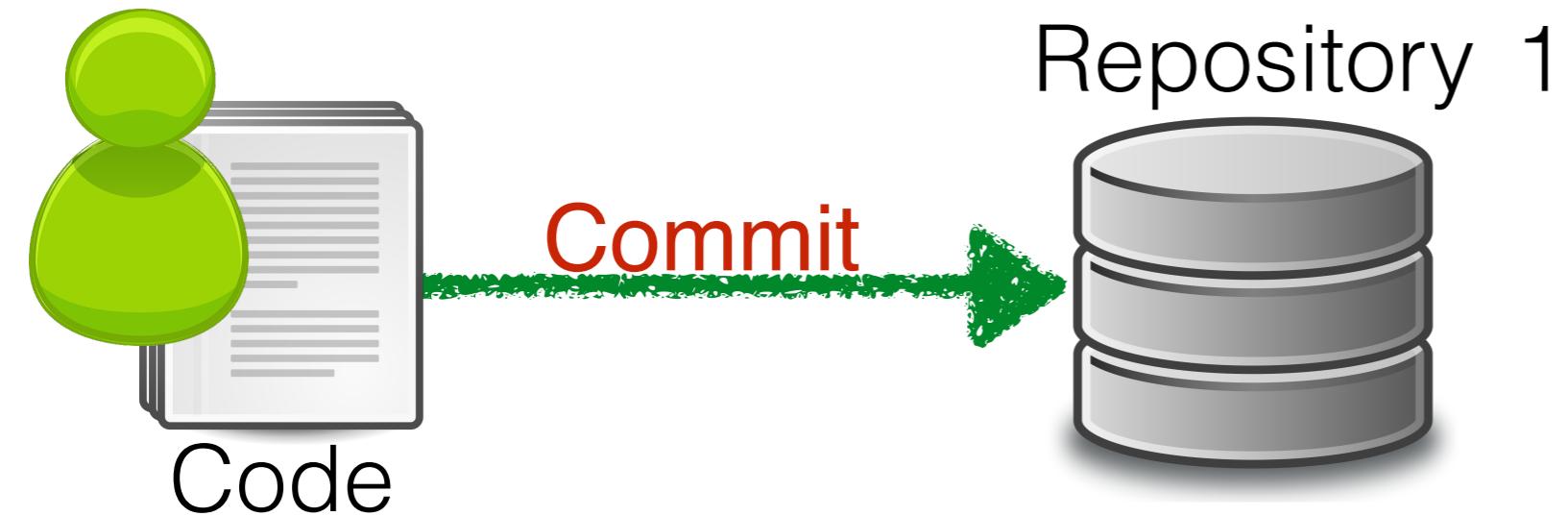
SVN Example



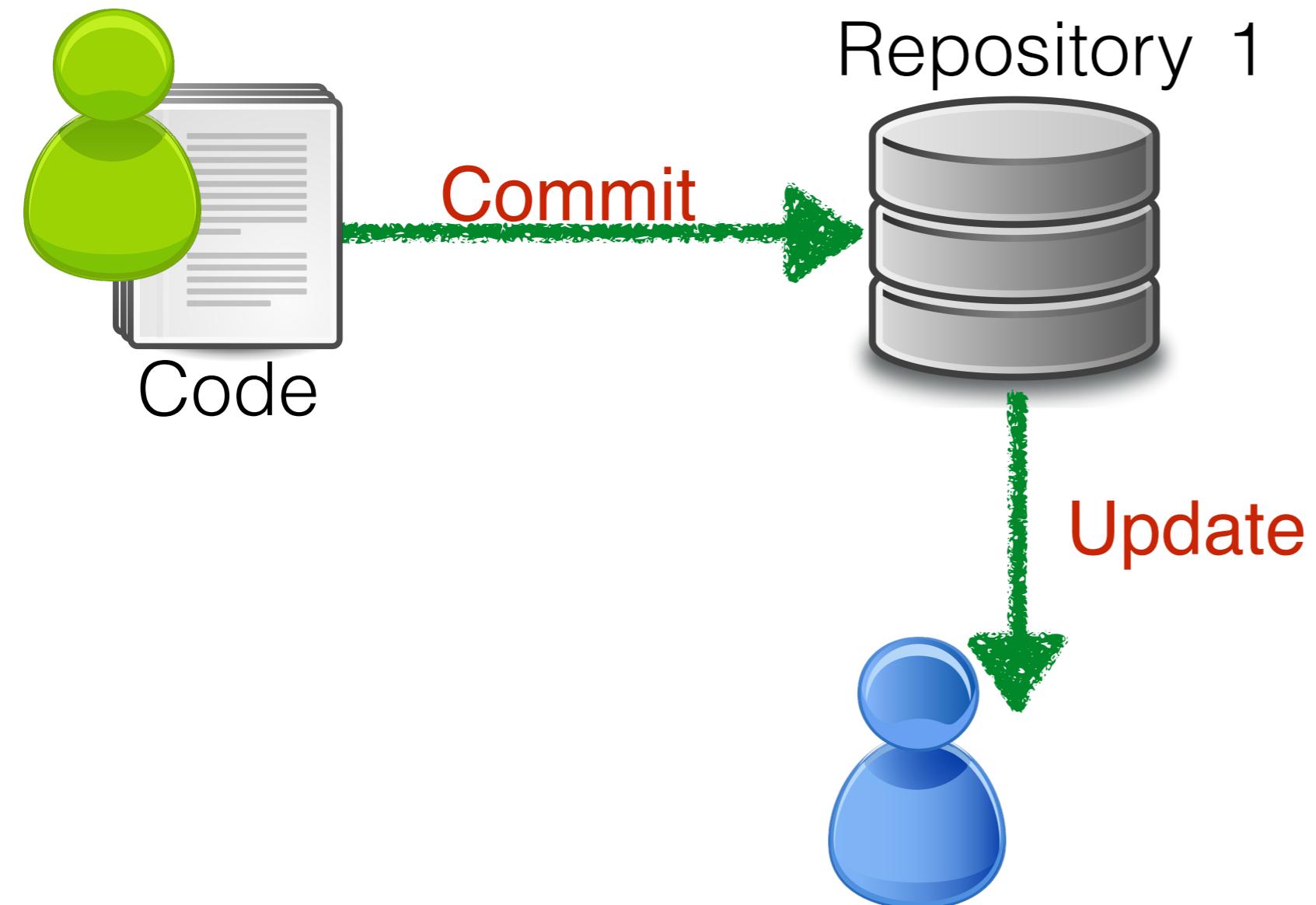
SVN Example



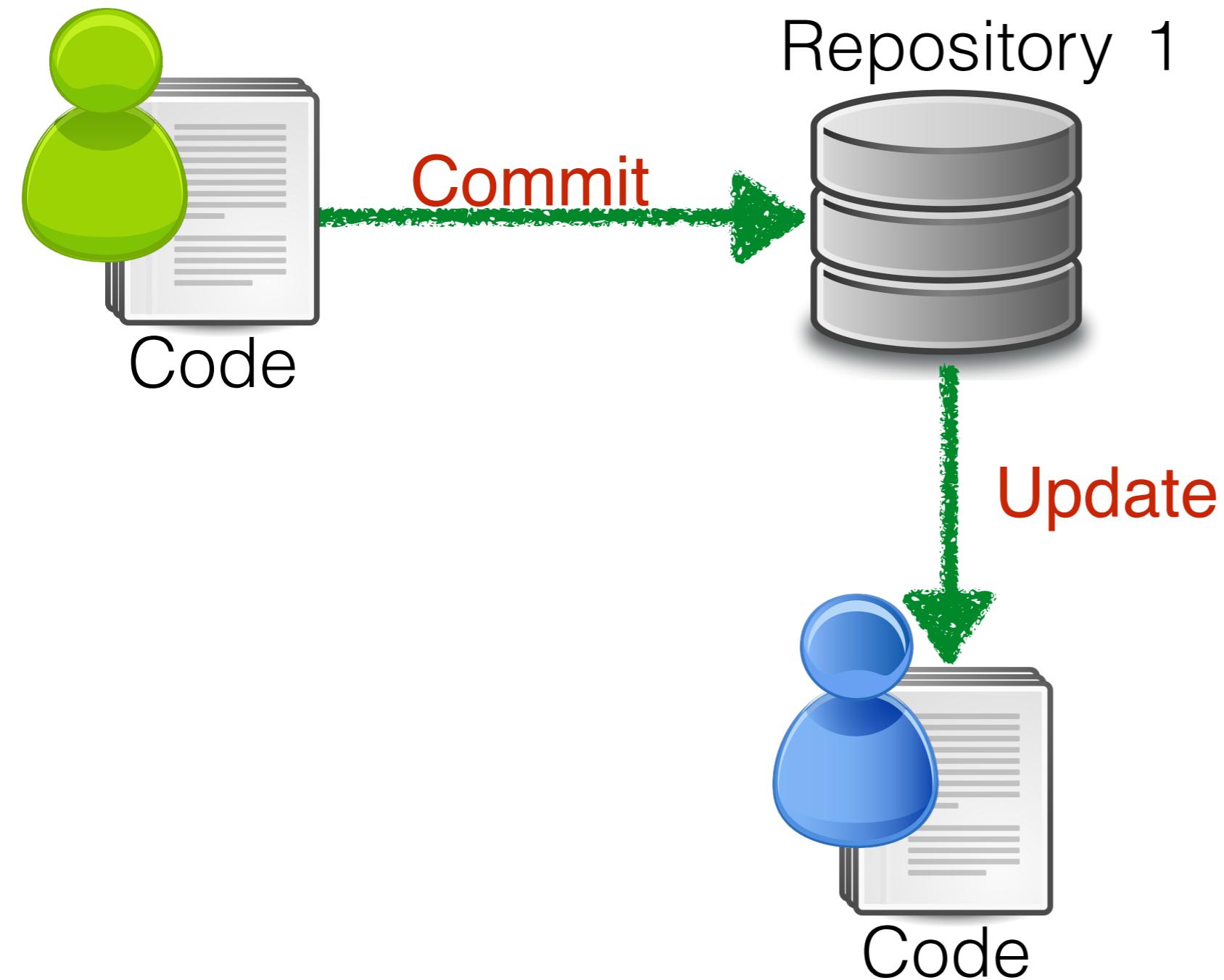
SVN Example



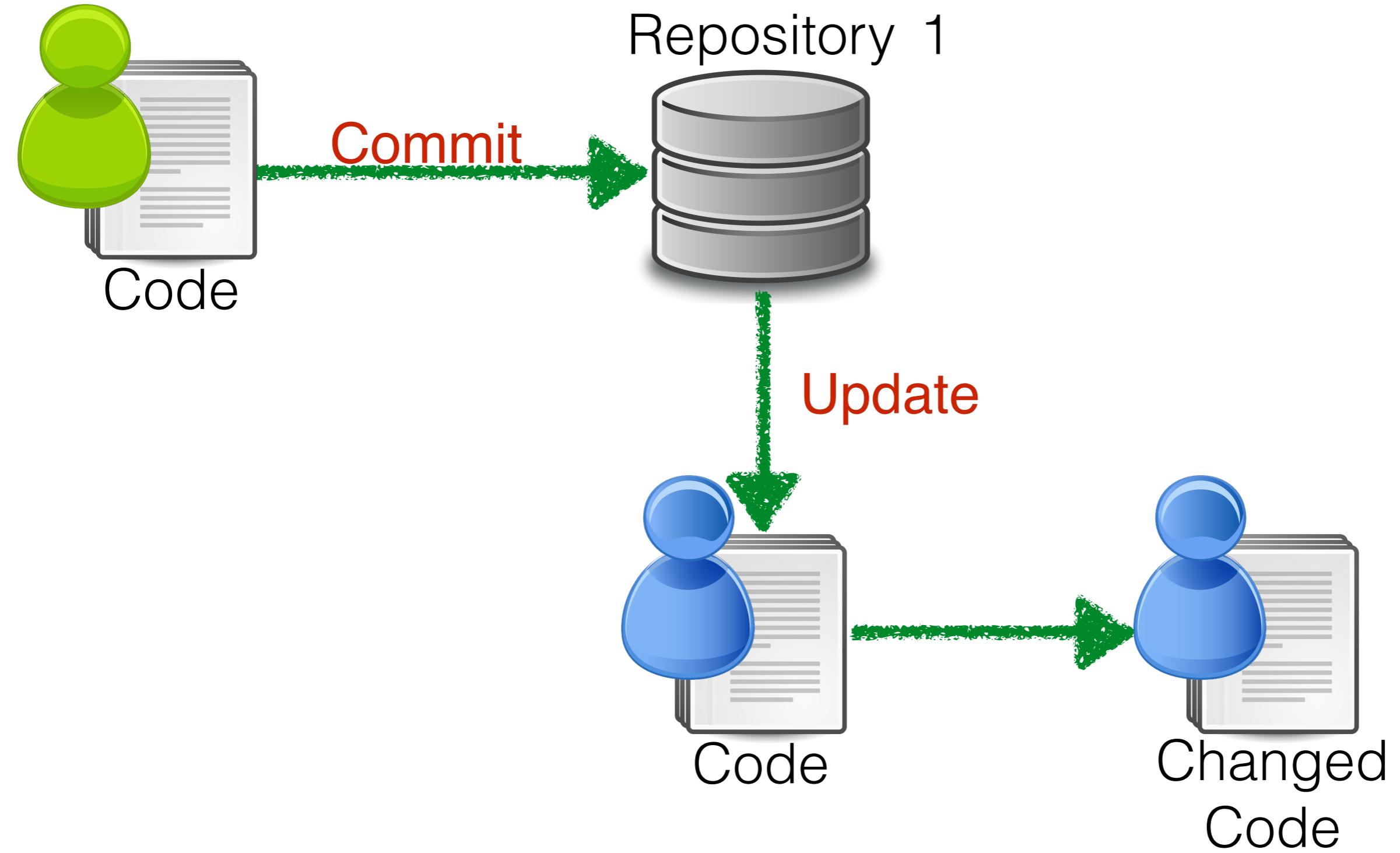
SVN Example



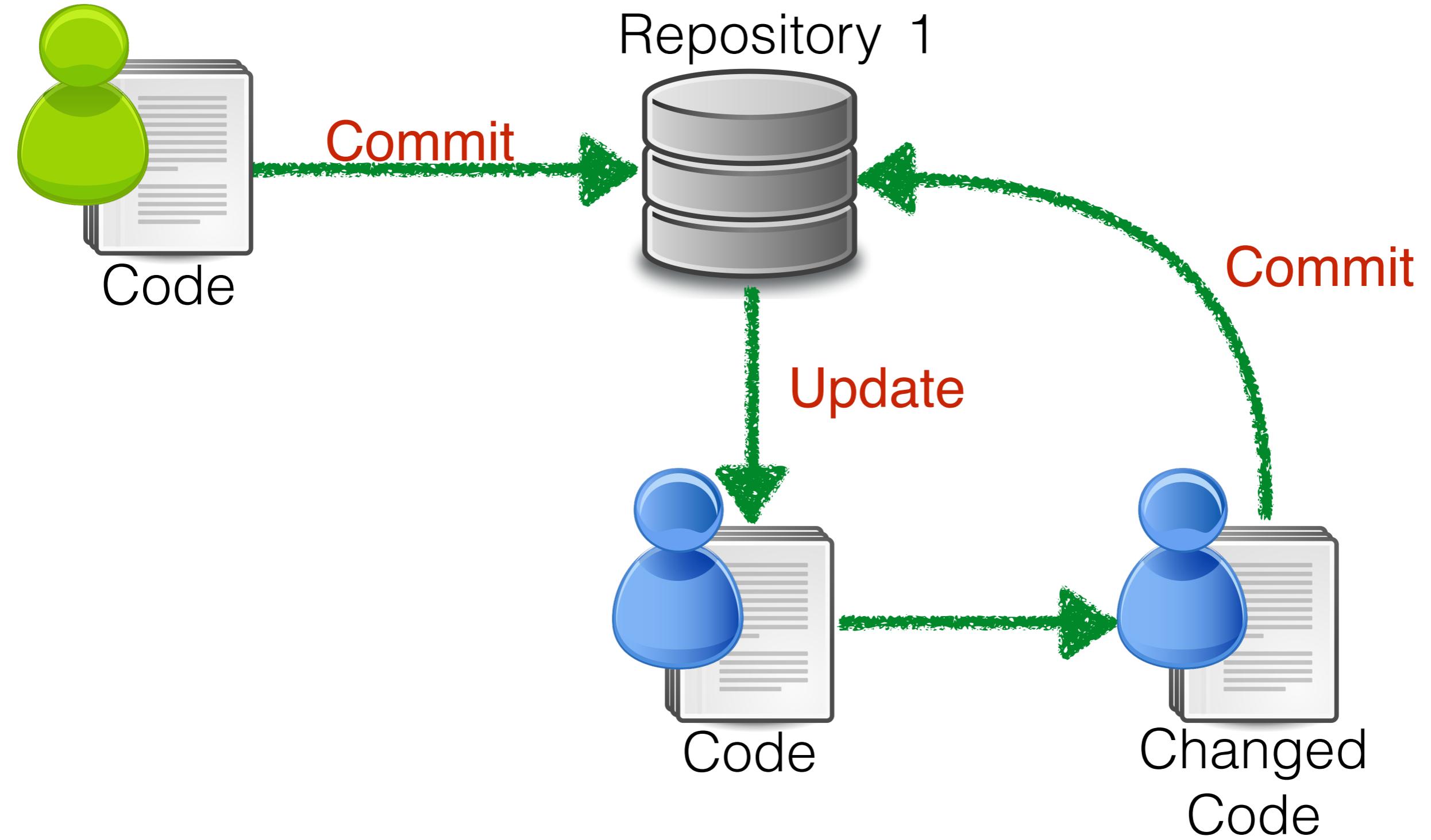
SVN Example



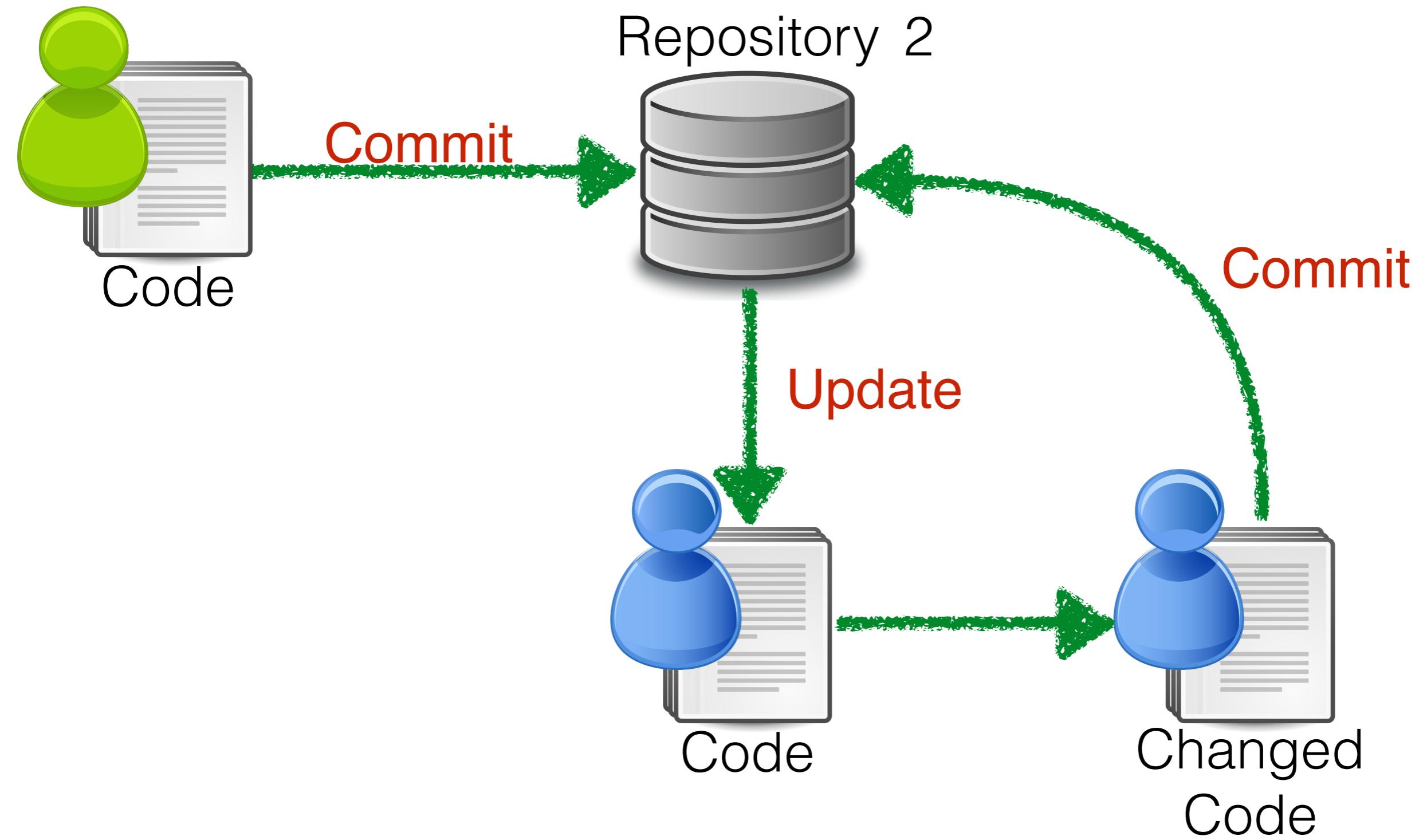
SVN Example



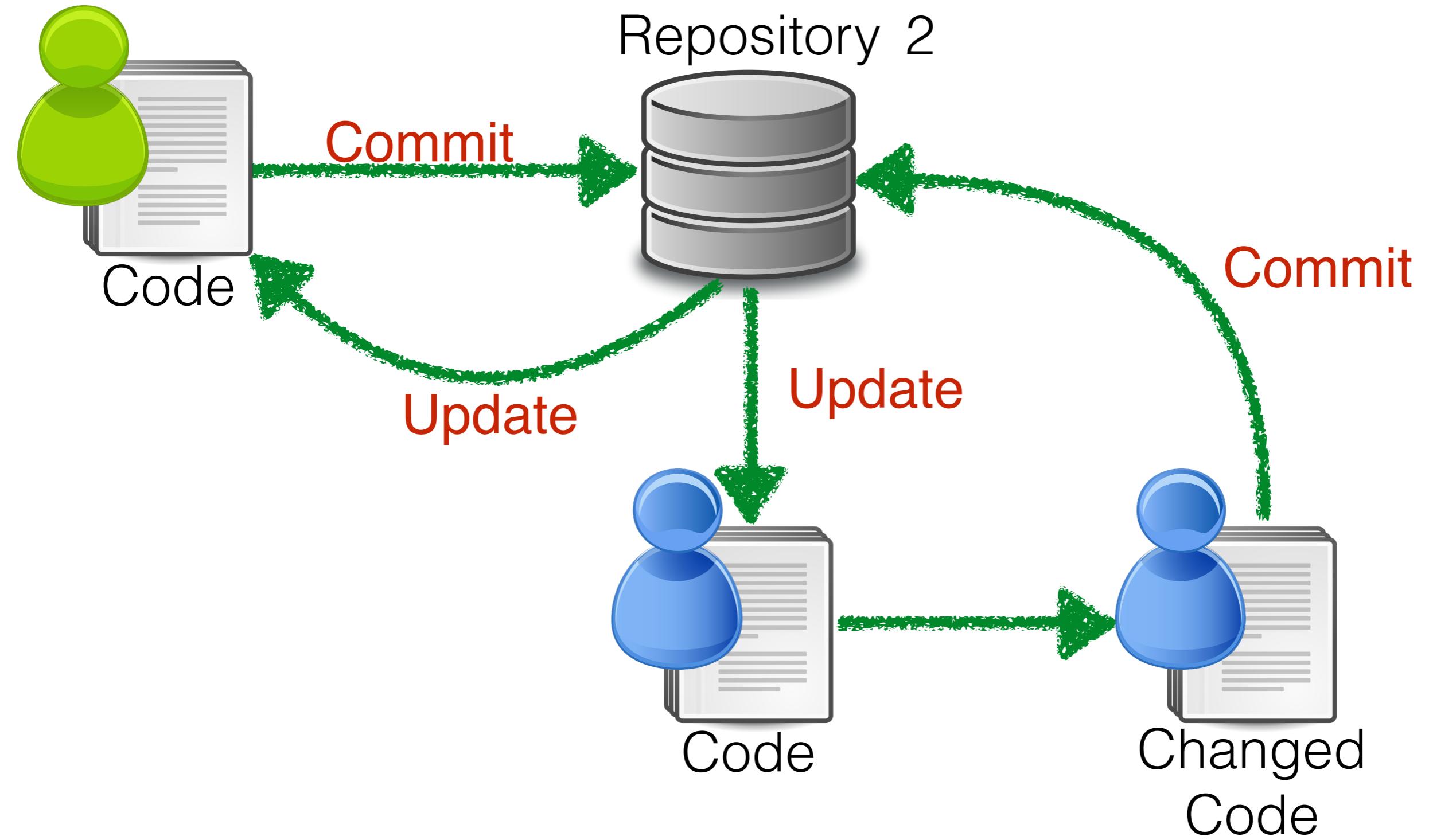
SVN Example



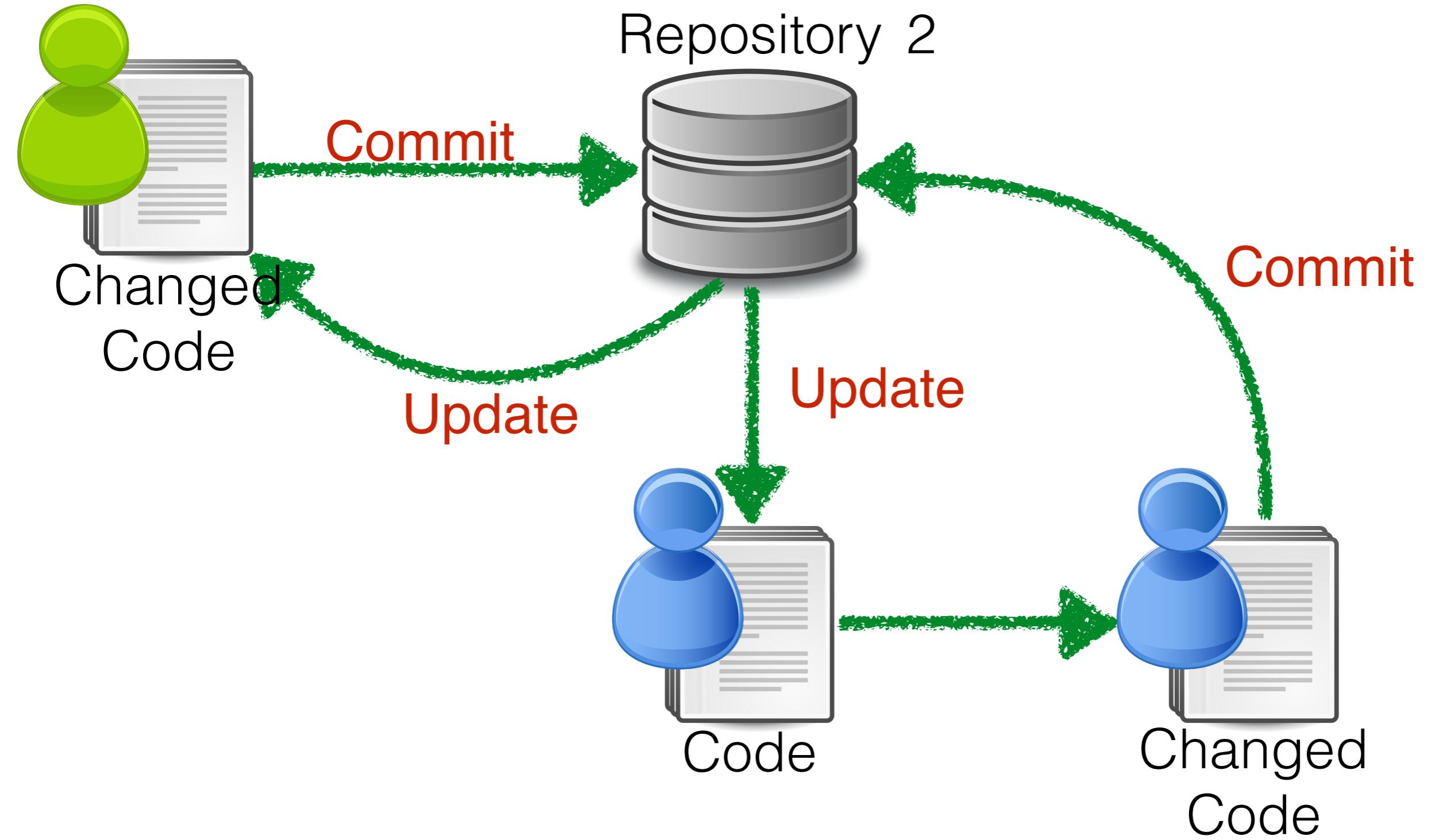
SVN Example



SVN Example



SVN Example



SVN Software

- Windows:
 - **TortoiseSVN** - free
- Mac OS:
 - Versions - \$
 - **SmartSVN** - free/\$
- Linux:
 - RapidSVN - free
- Or Eclipse:
 - **Subversive** - free
 - Subclipse - free

SVN Pros & Cons

SVN Pros & Cons

- ✓ Works as you expect

SVN Pros & Cons

- ✓ Works as you expect
- ✓ Only one copy so everyone knows on what code the changes are made

SVN Pros & Cons

- ✓ Works as you expect
- ✓ Only one copy so everyone knows on what code the changes are made
- ✓ Widely used - Plenty of learning resources

SVN Pros & Cons

- ✓ Works as you expect
- ✓ Only one copy so everyone knows on what code the changes are made
- ✓ Widely used - Plenty of learning resources
- A single copy stored in a server. If server fails you're not able to do versioning

SVN Pros & Cons

- ✓ Works as you expect
- ✓ Only one copy so everyone knows on what code the changes are made
- ✓ Widely used - Plenty of learning resources
- A single copy stored in a server. If server fails you're not able to do versioning
- Encourages large commits

SVN Pros & Cons

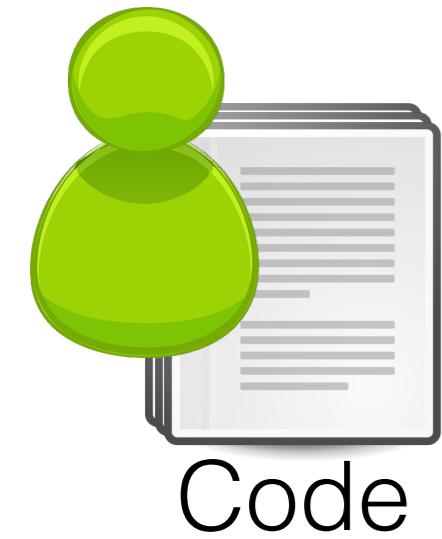
- ✓ Works as you expect
- ✓ Only one copy so everyone knows on what code the changes are made
- ✓ Widely used - Plenty of learning resources
- A single copy stored in a server. If server fails you're not able to do versioning
- Encourages large commits
- Discourages branching

Git

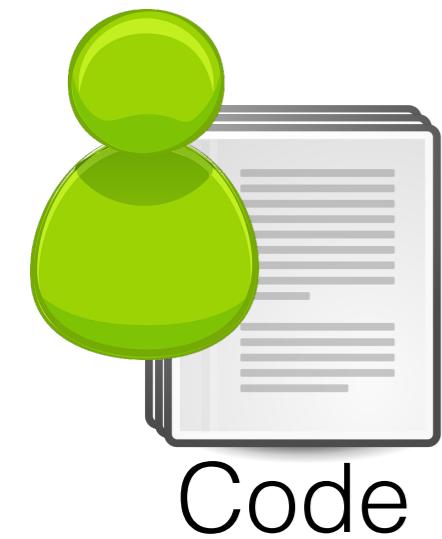
- Is a decentralised (distributed) VCS
- 40 hexadecimal numbers for commit versions (e.g. f3abe64fc121b75f3f0566c73f2f1a4e8ffd68e)
 - Constructed based on author, commit message, previous version, ...

Git Example

Git Example



Git Example



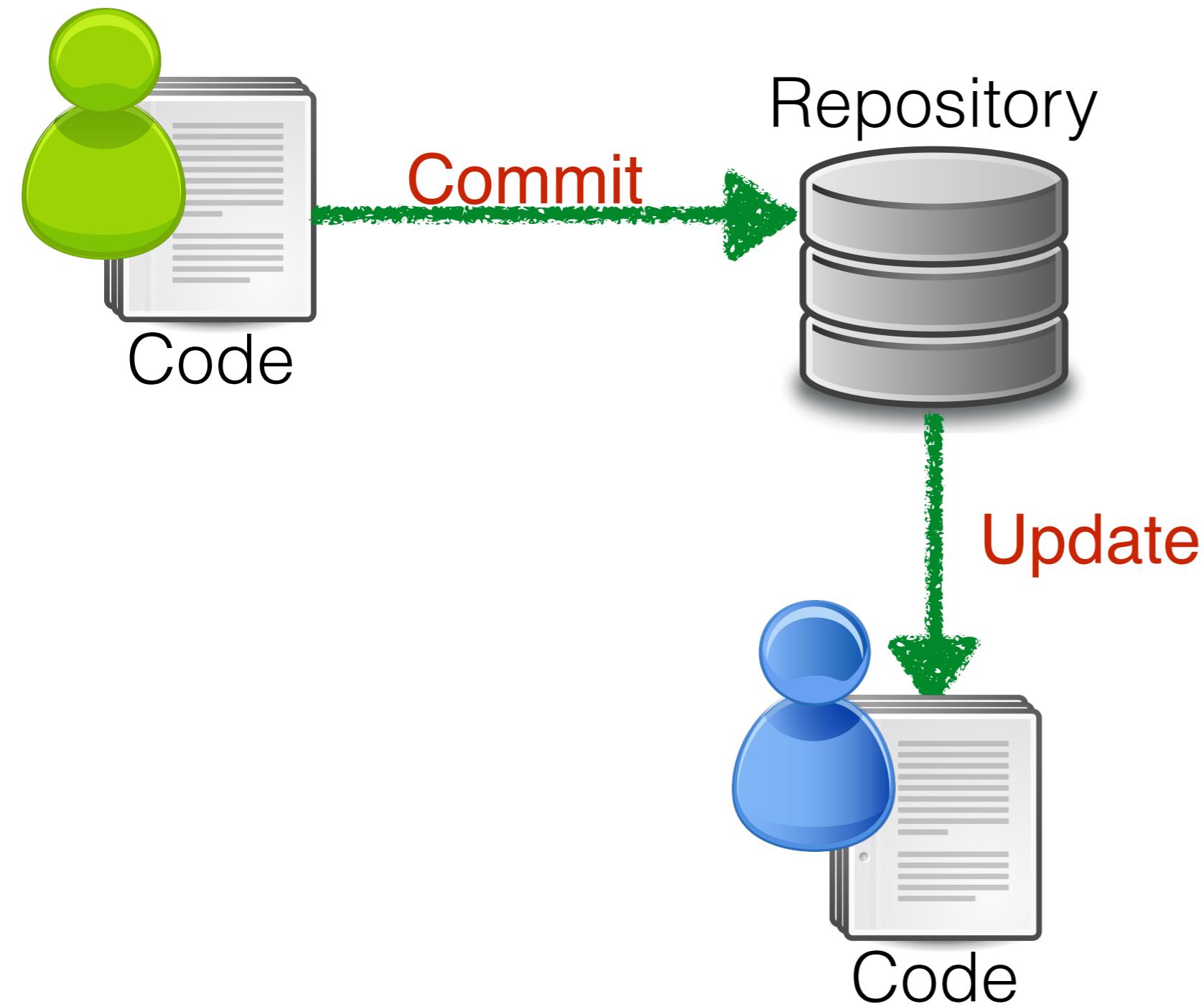
Repository



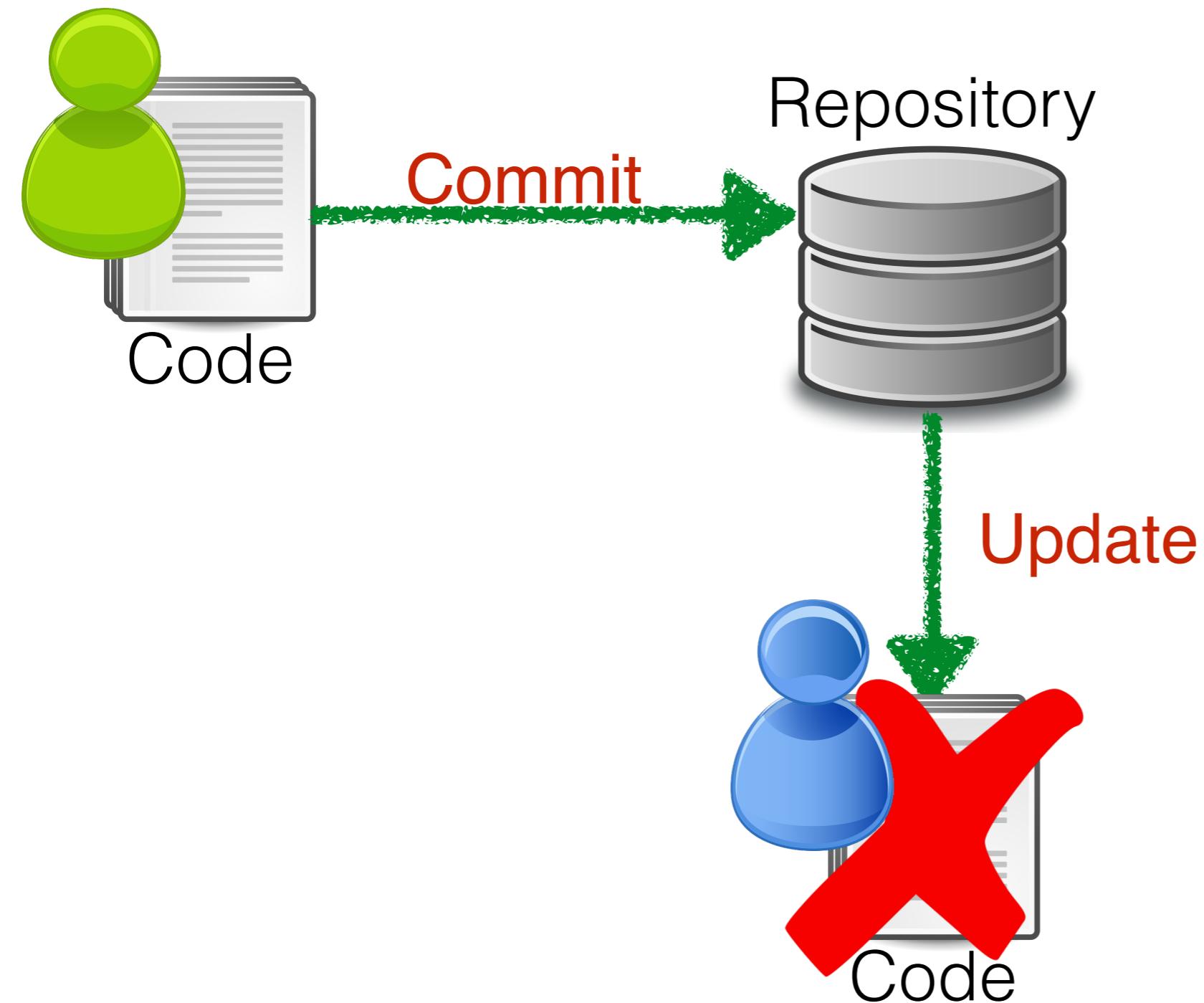
Git Example



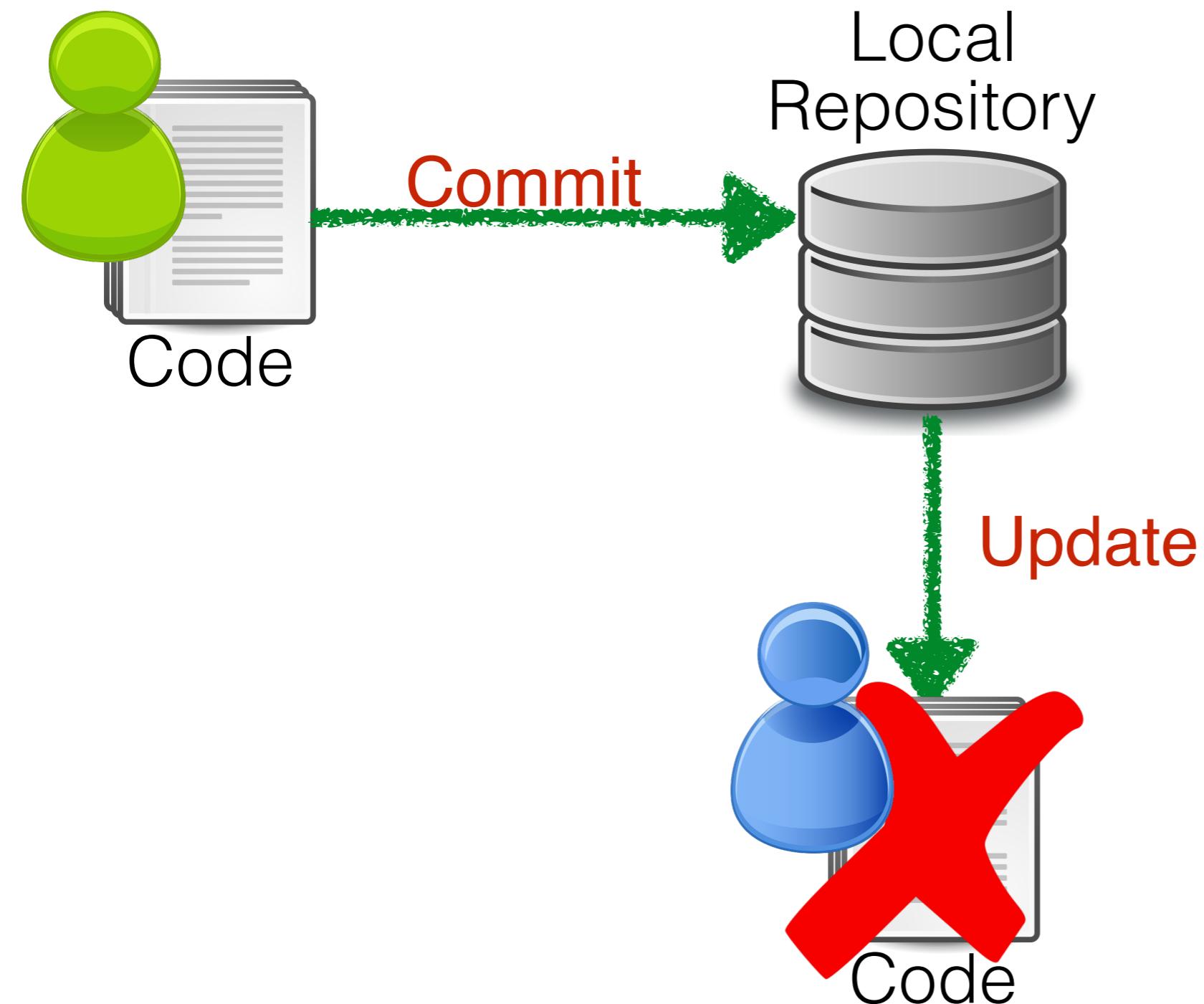
Git Example



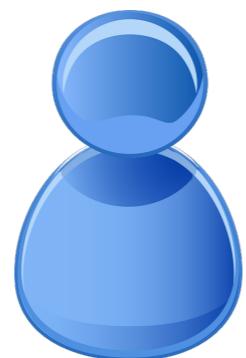
Git Example



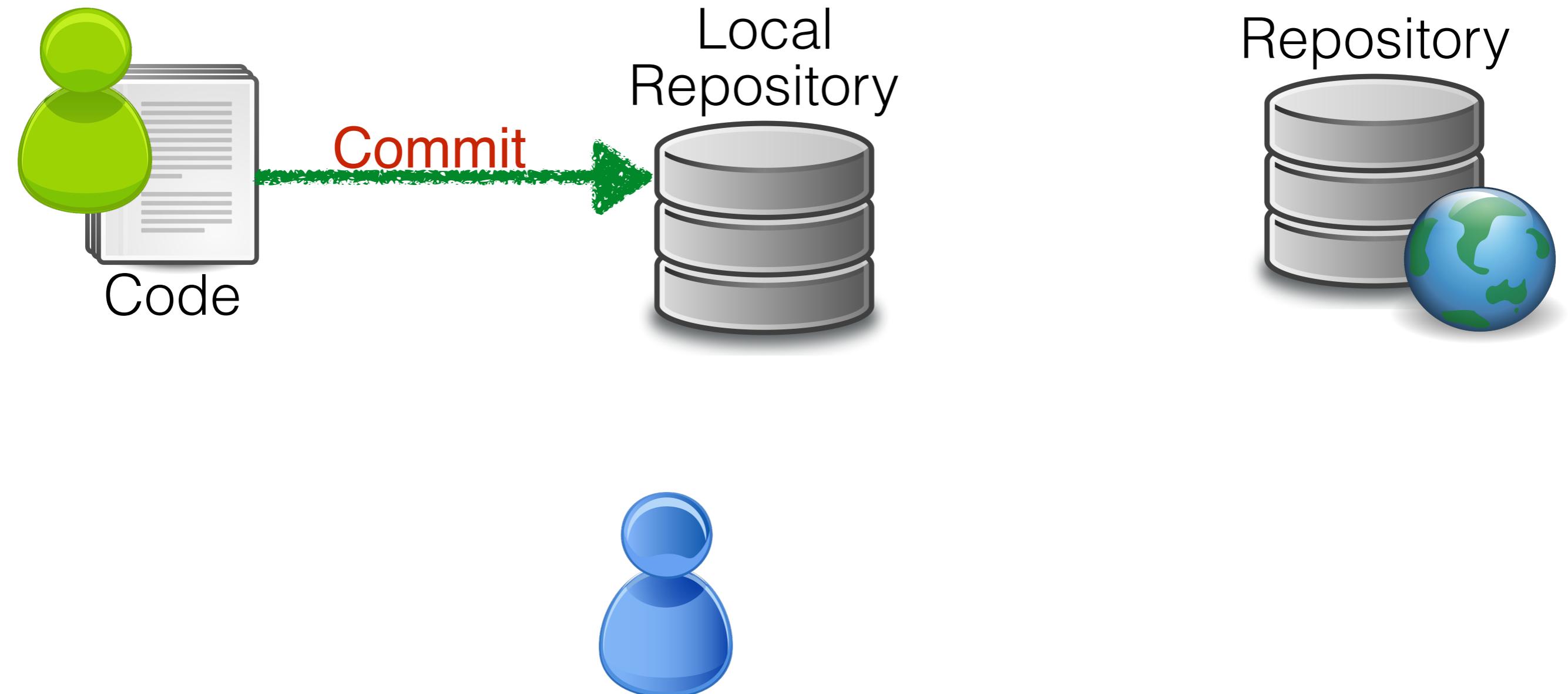
Git Example



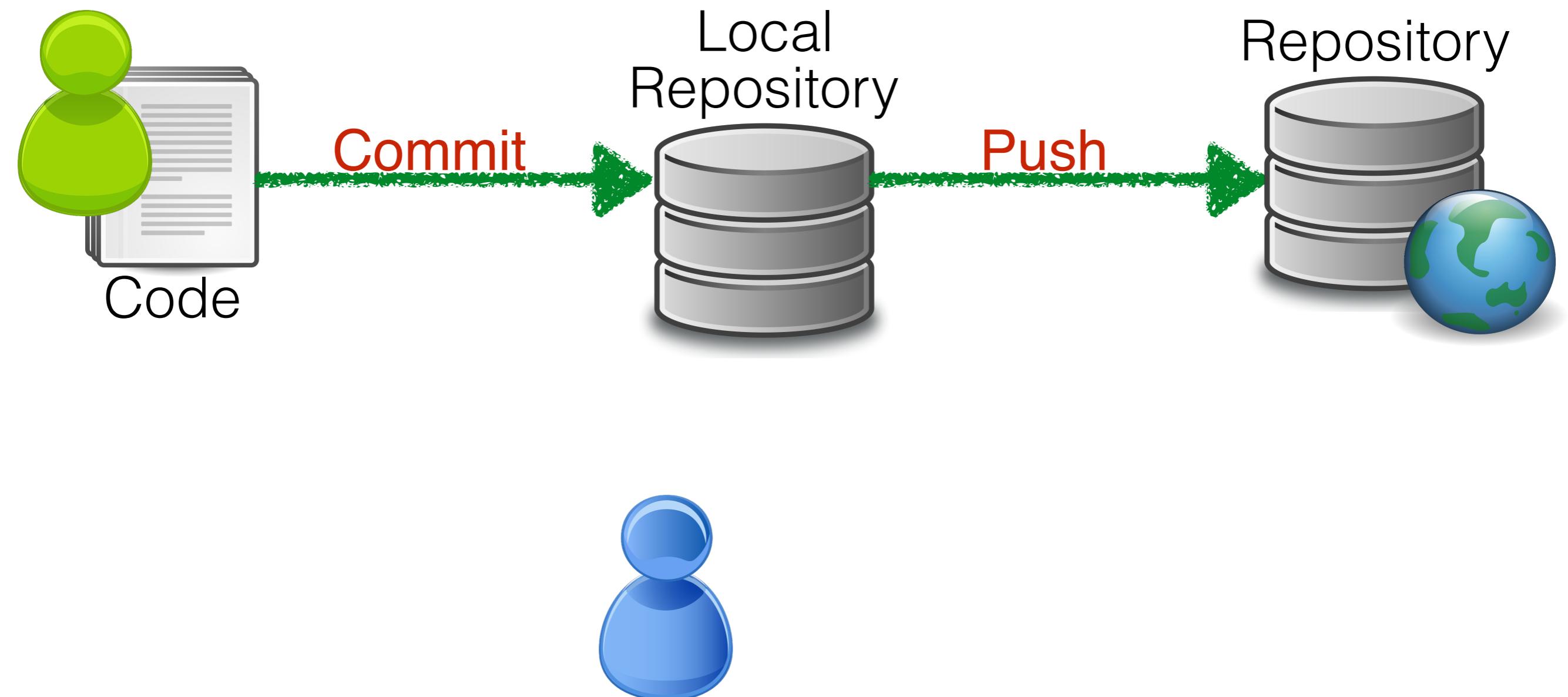
Git Example



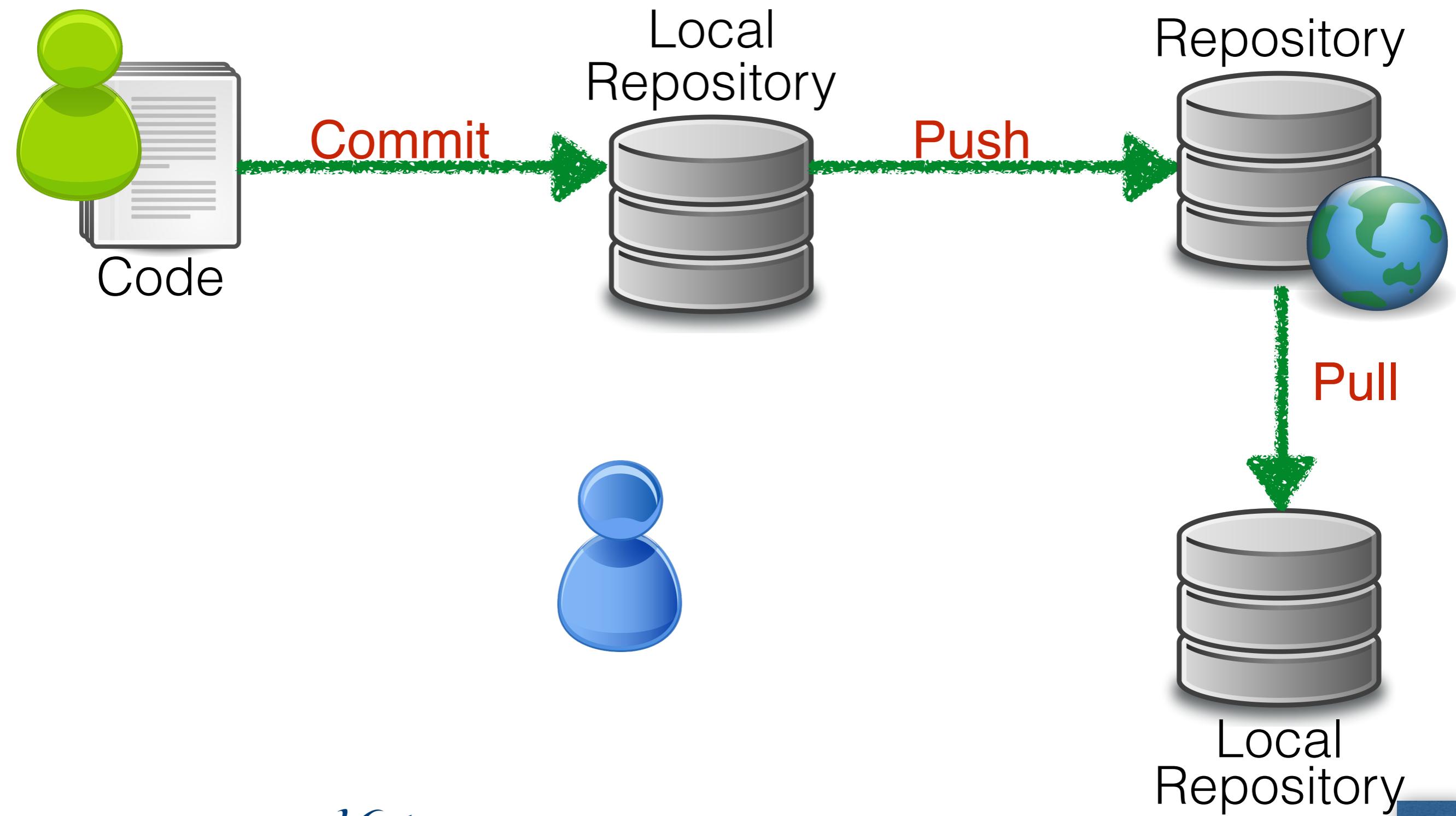
Git Example



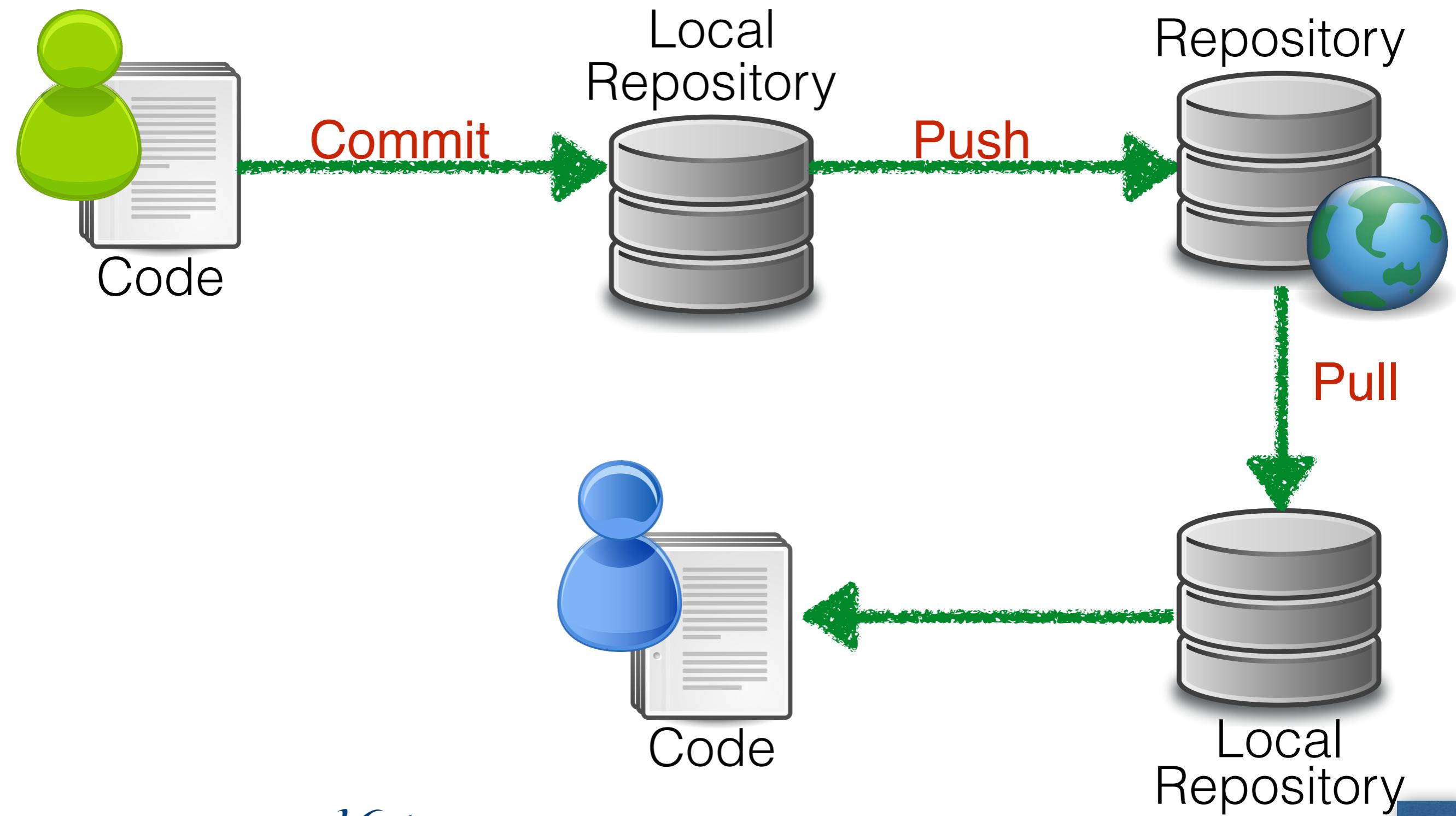
Git Example



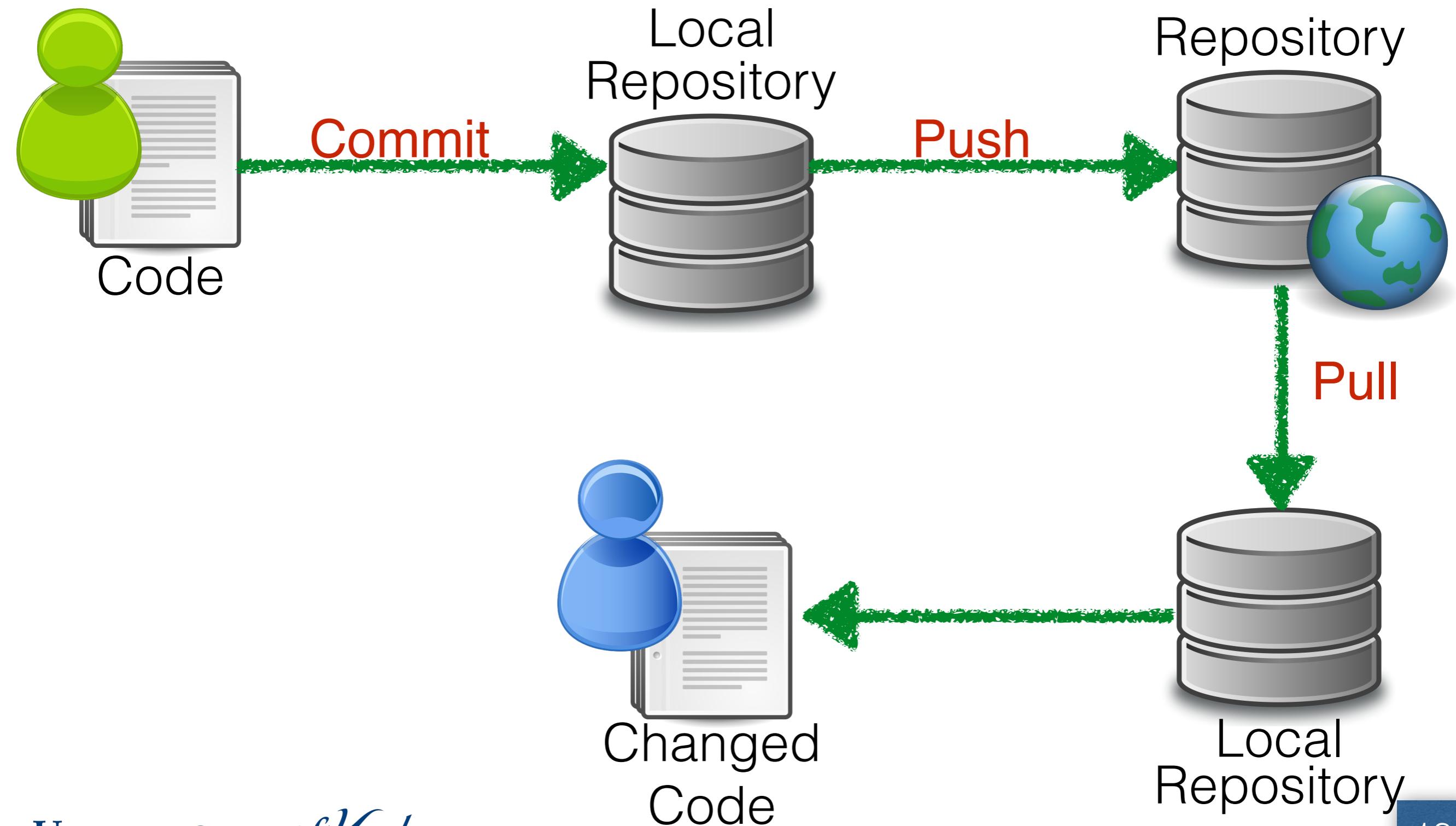
Git Example



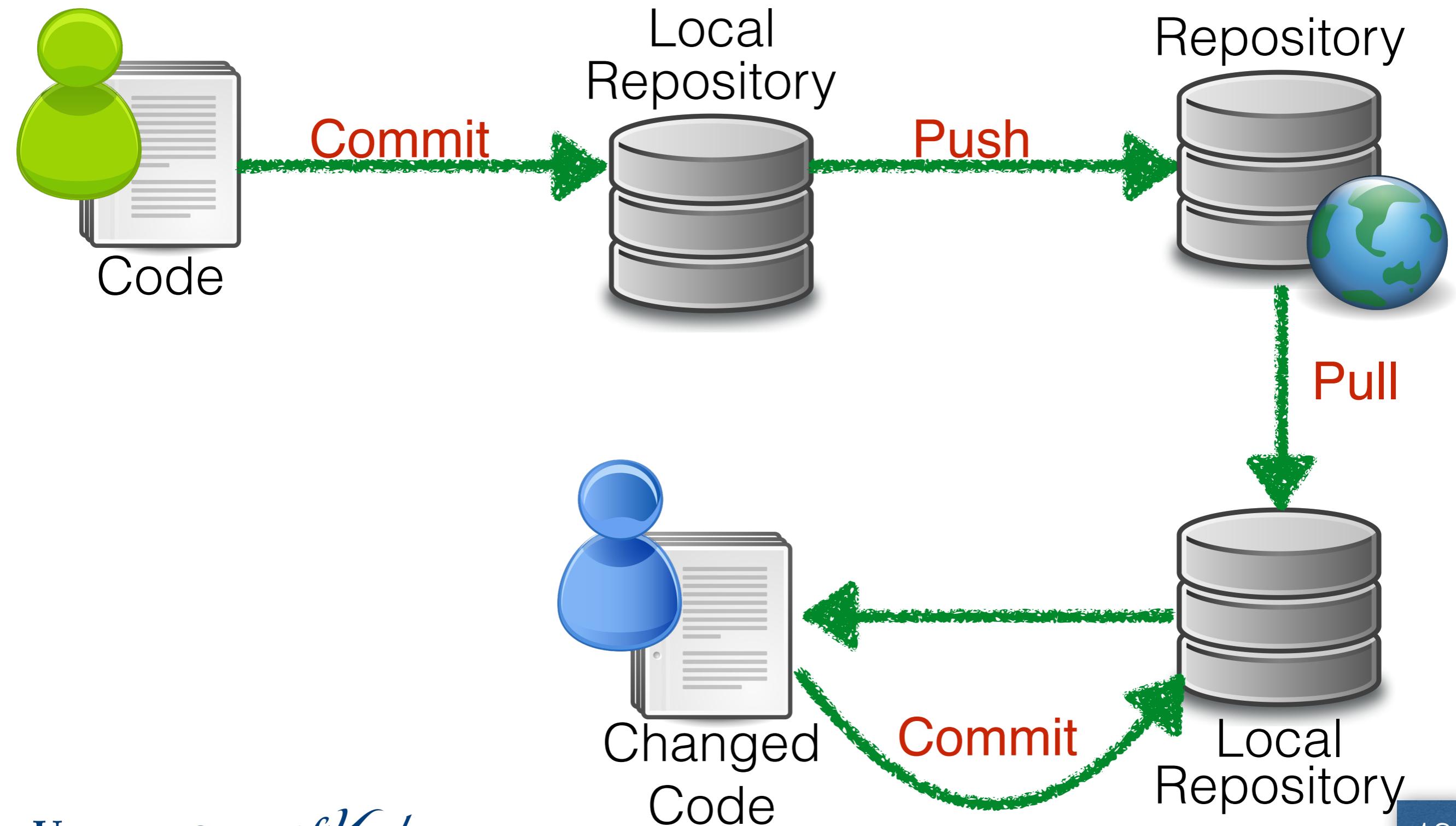
Git Example



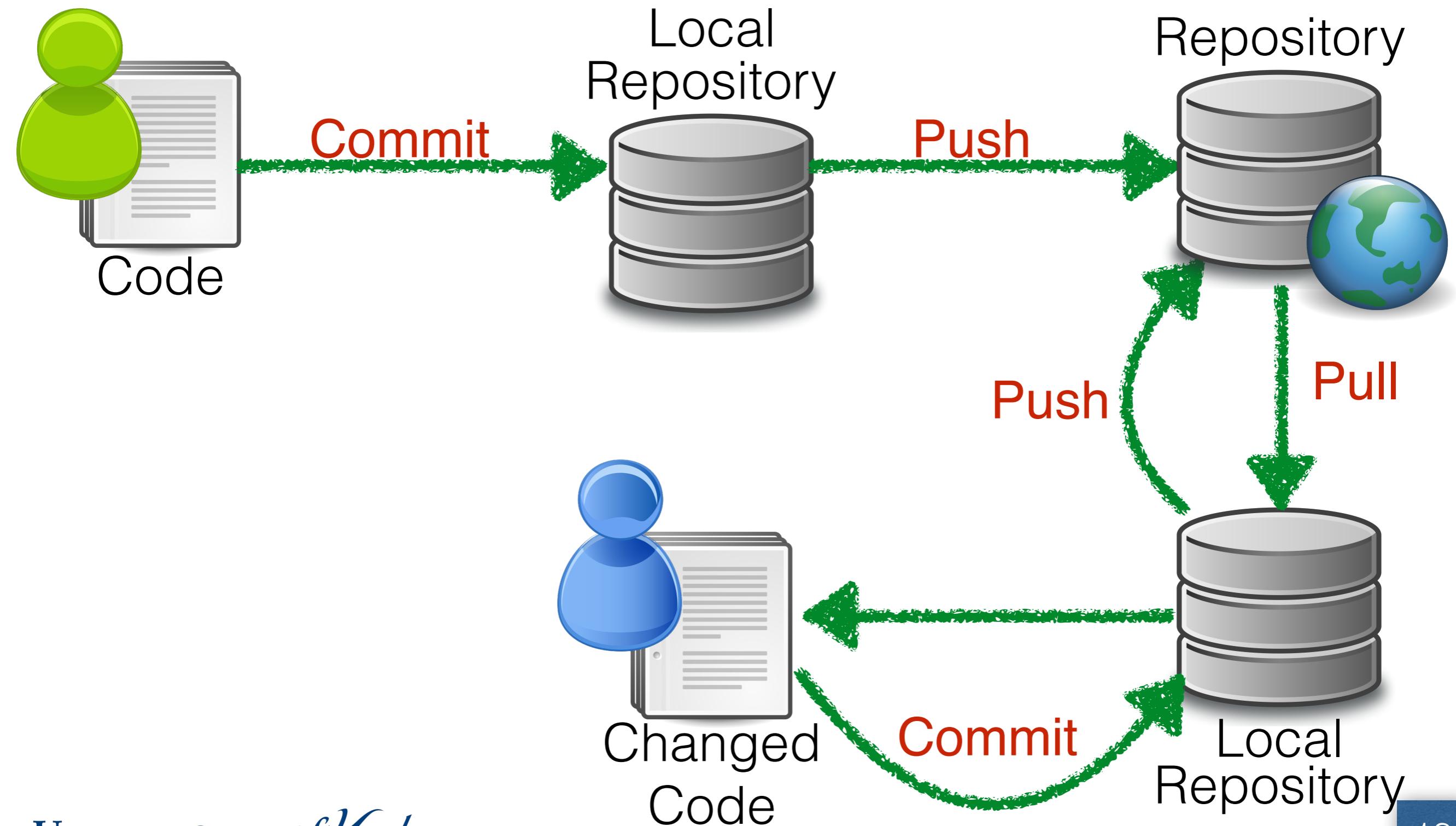
Git Example



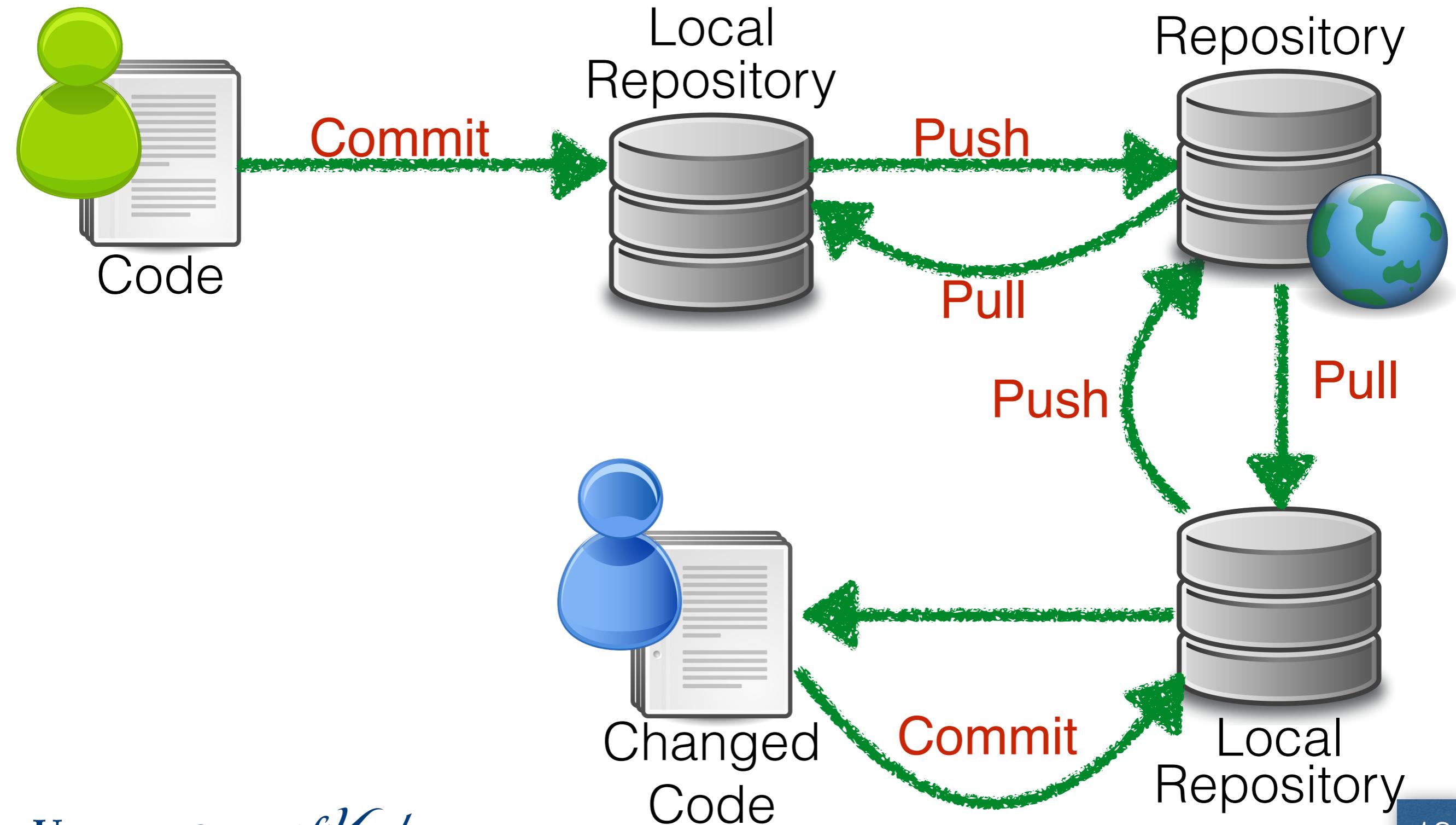
Git Example



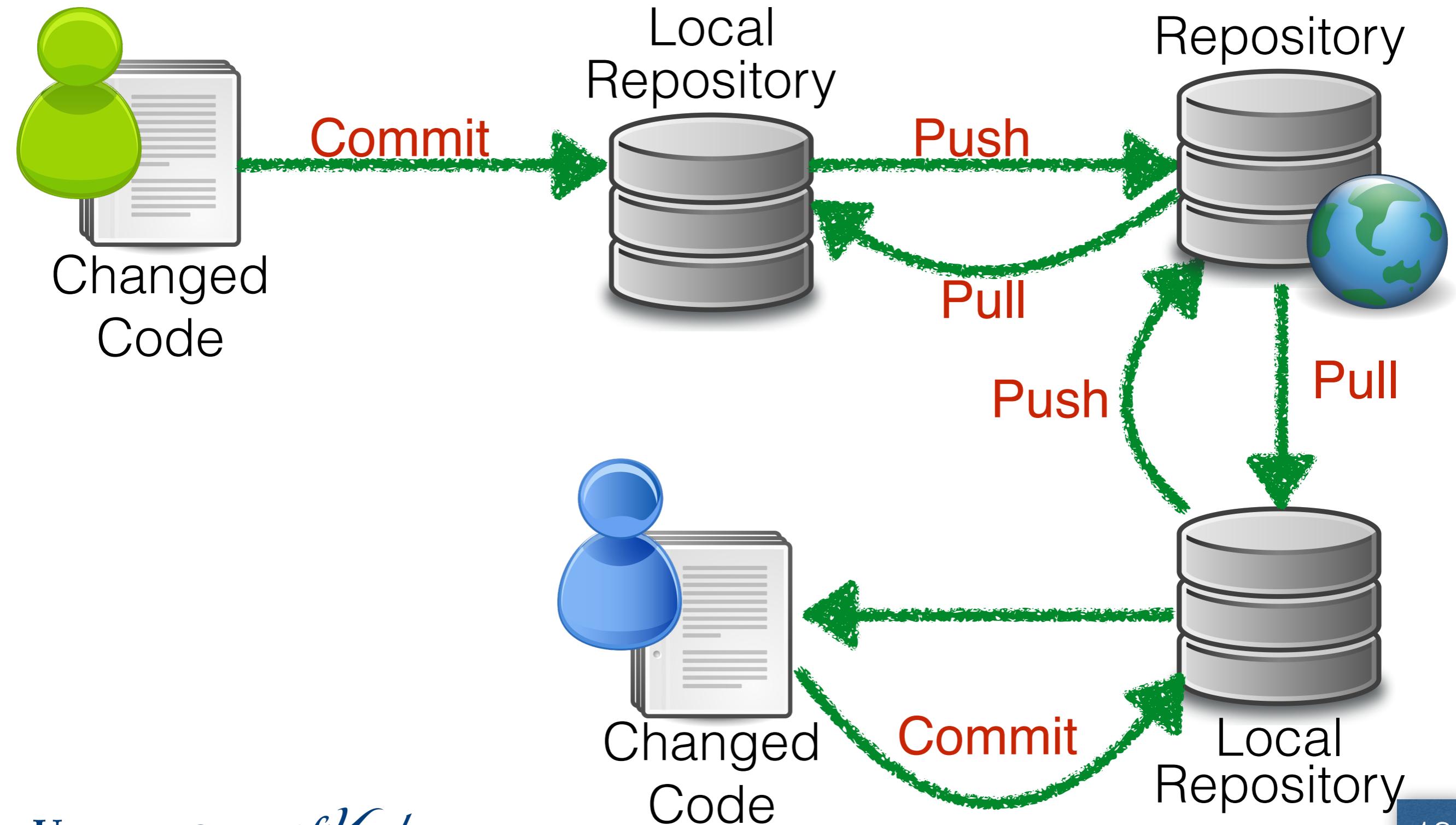
Git Example



Git Example



Git Example



Decentralised



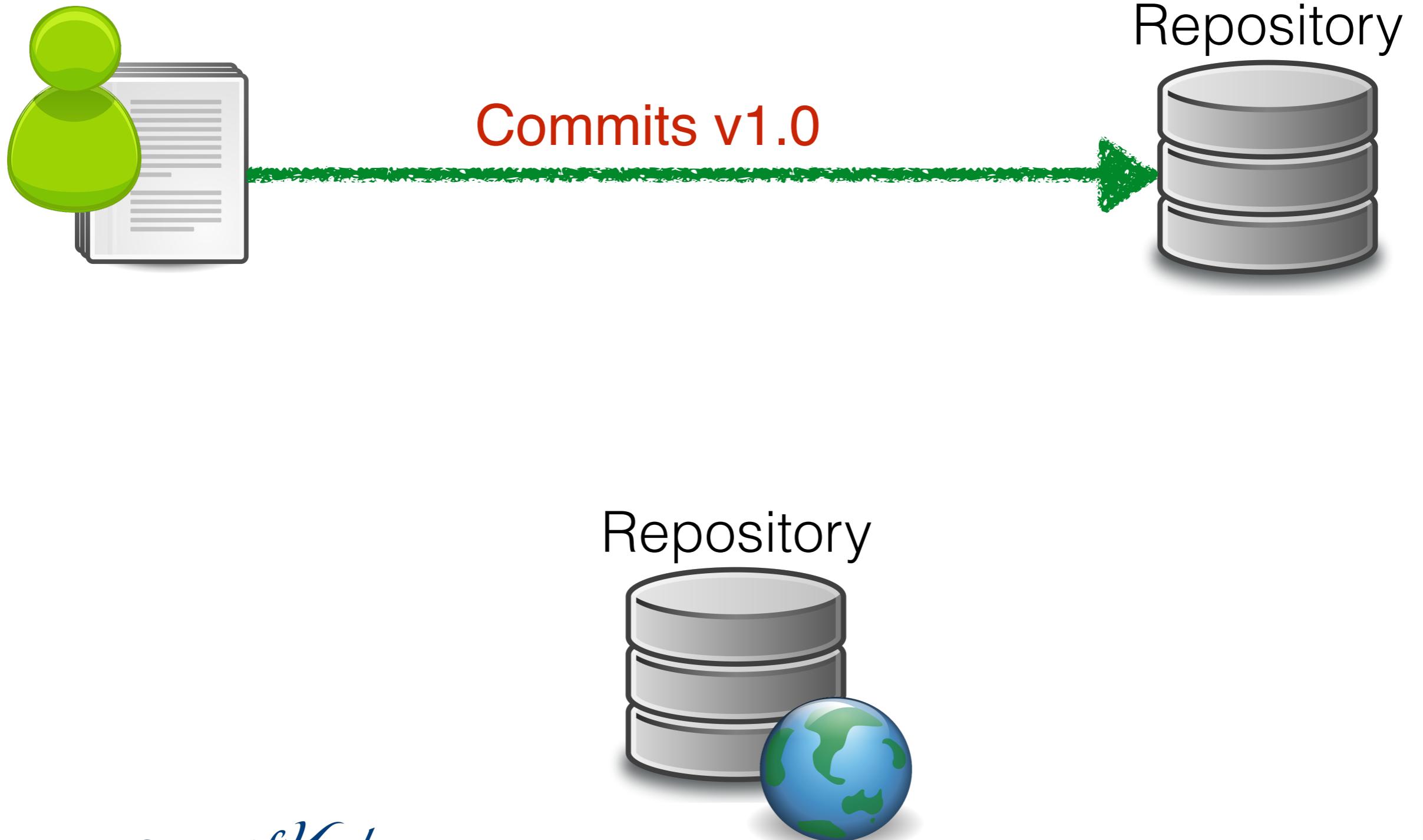
Local
Repository



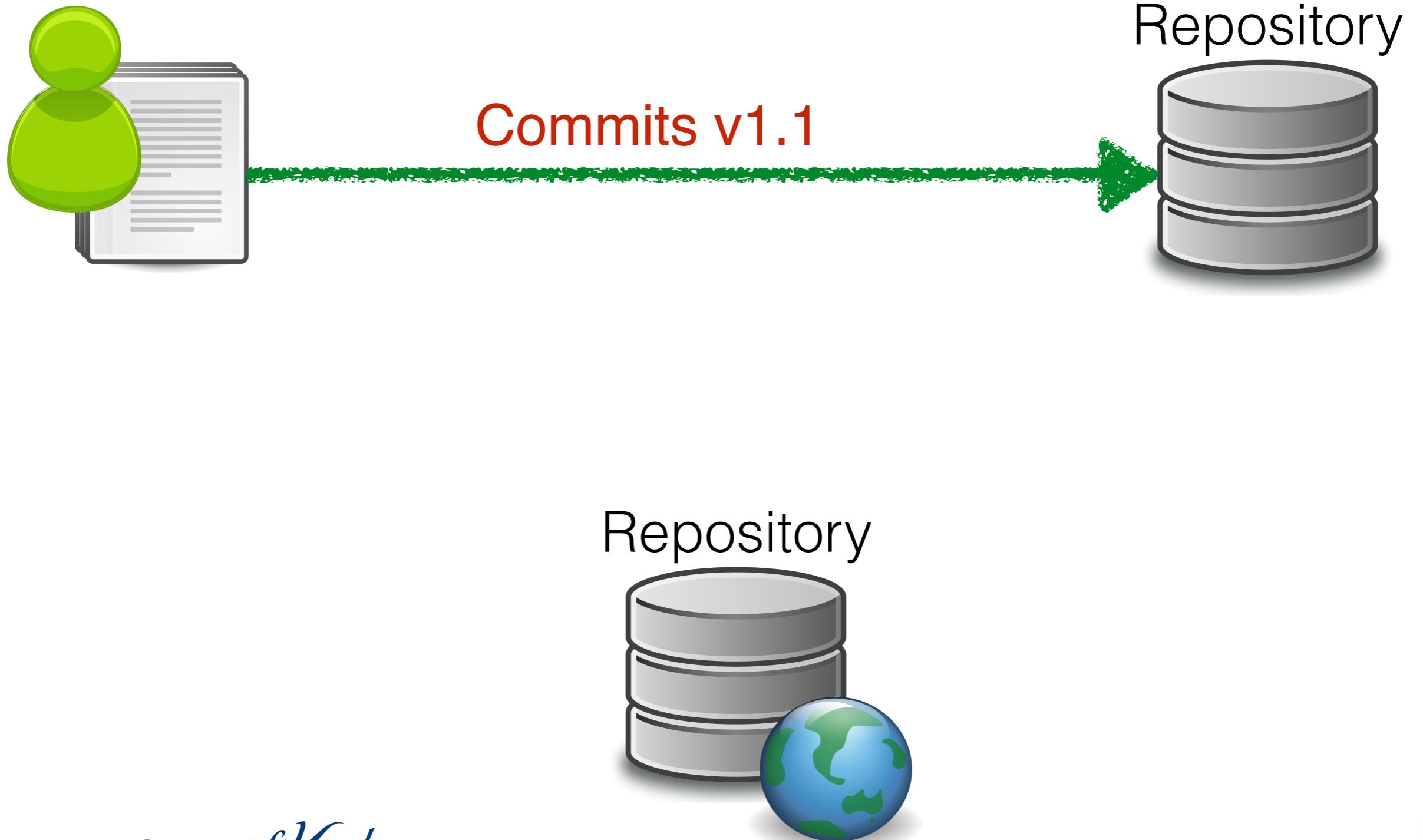
Repository



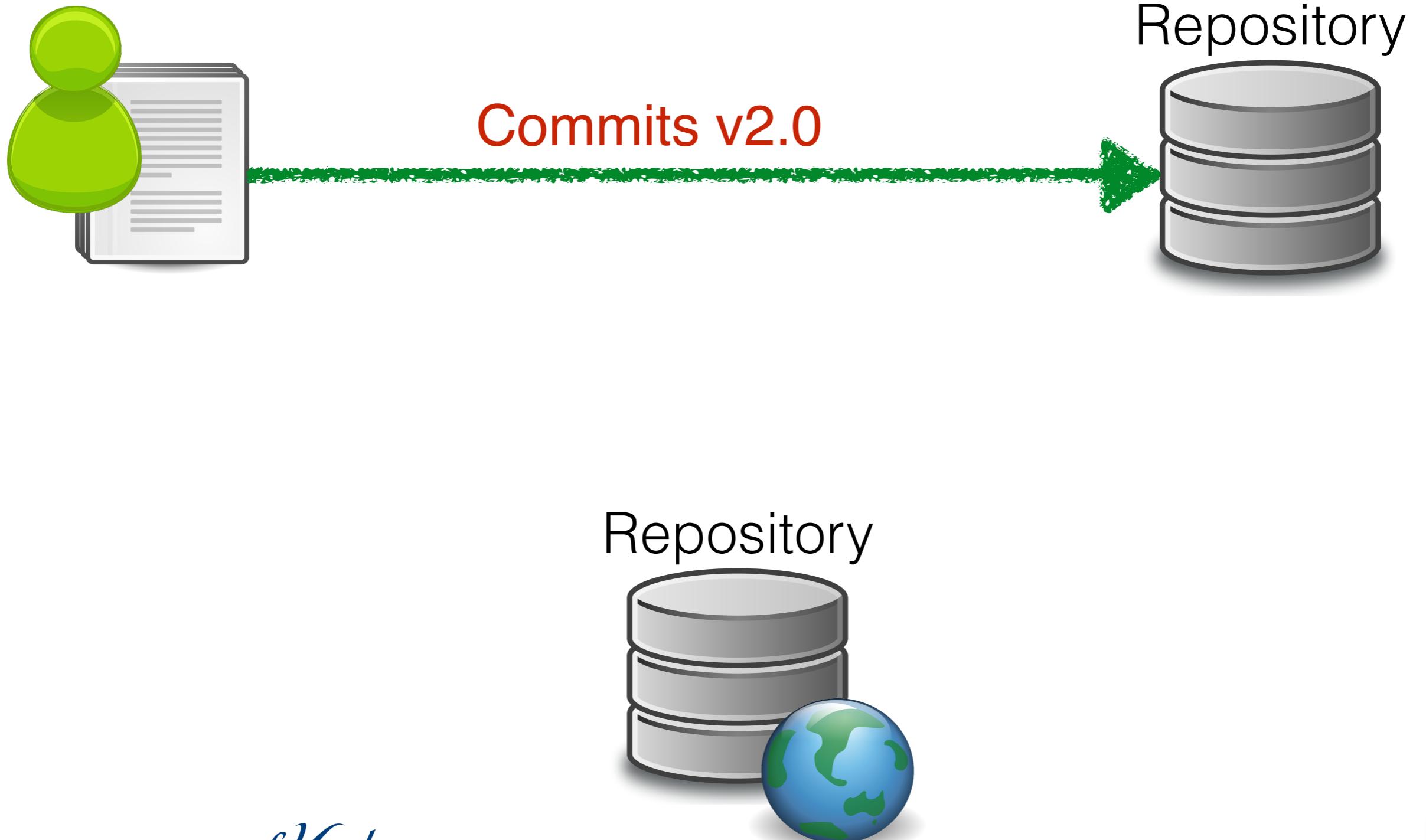
Decentralised



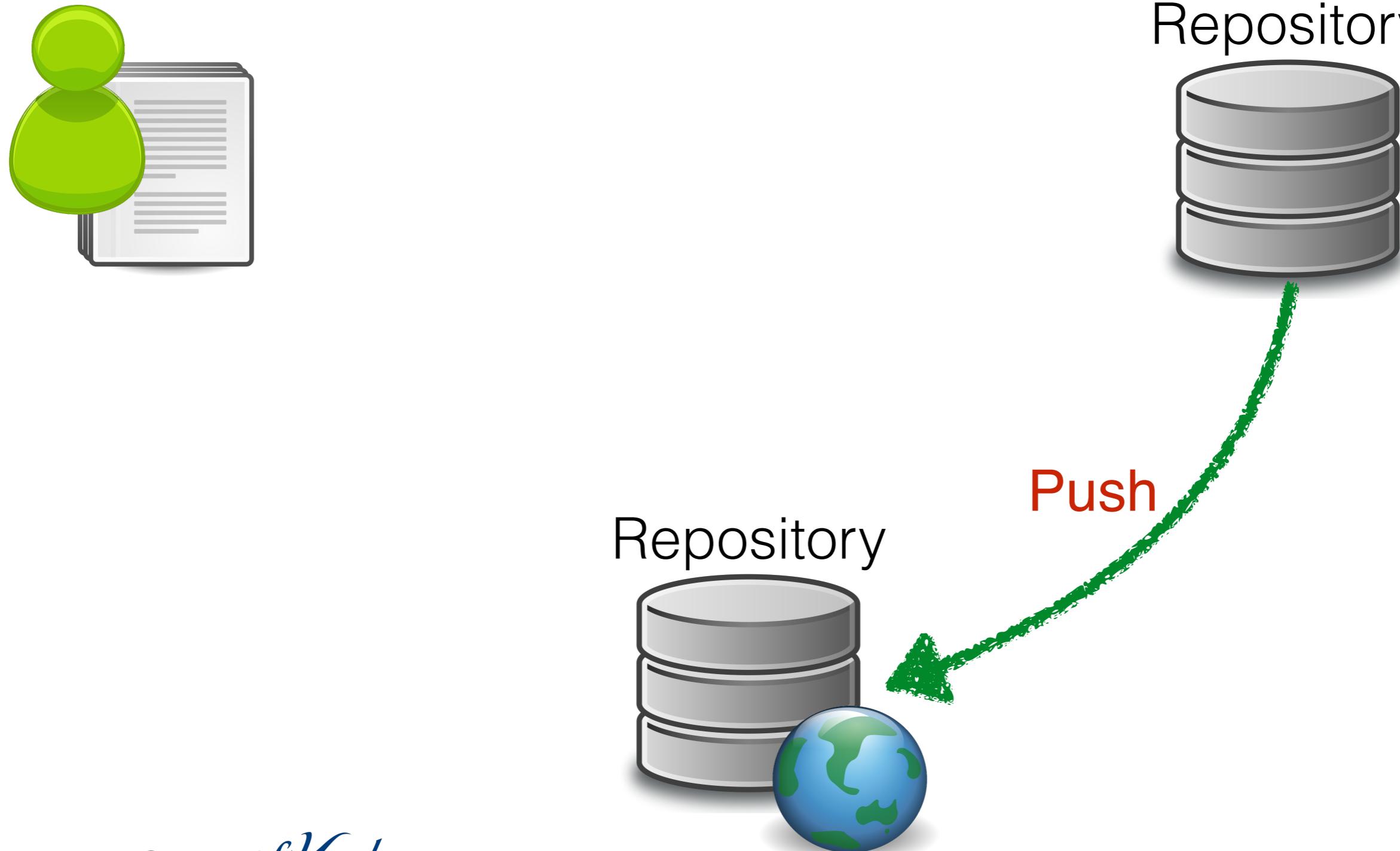
Decentralised



Decentralised



Decentralised



Decentralised



Local
Repository



Repository



Decentralised



Git Software

- Windows:
 - **Git-bash** (command line) - free
 - **SourceTree** - free
- Mac OS:
 - **Terminal** - free
 - **SourceTree** - free
- Linux:
 - Git Cola - free
 - GitK - free
 - Terminal - free
- Eclipse (cross-platform):
 - EGit - free
- GitKraken (cross-platform)

Git Pros & Cons

Git Pros & Cons

- ✓ Small (offline) commits

Git Pros & Cons

- ✓ Small (offline) commits
- ✓ Encourages branching

Git Pros & Cons

- ✓ Small (offline) commits
- ✓ Encourages branching
- ✓ Widely used (trending VCS)

Git Pros & Cons

- ✓ Small (offline) commits
- ✓ Encourages branching
- ✓ Widely used (trending VCS)
- ✓ More features than SVN

Git Pros & Cons

- ✓ Small (offline) commits
- ✓ Encourages branching
- ✓ Widely used (trending VCS)
- ✓ More features than SVN
- Can be difficult

Git Pros & Cons

- ✓ Small (offline) commits
- ✓ Encourages branching
- ✓ Widely used (trending VCS)
- ✓ More features than SVN
- Can be difficult
 - Yes, more difficult than SVN (but after a while it is going to be your best friend in group projects)

Practical

- Let's try Git
- 1st part: single-user exercises
- 2nd part: branches, collaboration & conflicts
- 3rd part: work with your teams

Part 1

- Navigate to this practical's git repo: <https://github.com/zolotas4/VersionControlLecture>
 - <https://tinyurl.com/git-sepr> (or this that will redirect you to the above)
- Follow the instructions under Part 1
- IF YOU'VE FINISHED TAKE A BREAK. WE WILL BE BACK AT **10:30** FOR PART 2.

Part 2

- Collaboration through GUI (SourceTree). I will:
 - Create a repo on GitHub
 - Clone it locally
 - Create files, stage them and commit
 - Invite a collaborator
 - Work together
 - Create and resolve conflicts

Part 3 (optional)

- Having a VCS for your team project is not a requirement
- ... however, I encourage you to do or at least give it a try
- If you are thinking of having one then spent the remaining time on:
 - Choosing which is the best for your needs
 - Experiment with different GUIs and choose which fits you best (or reject them all and use terminal)
 - If you pick Git, then create a repository online (Github or Bitbucket are good services)
 - Add the files you have so far created for your project
 - Try to collaborate
 - If conflicts appear don't panic - try to resolve them