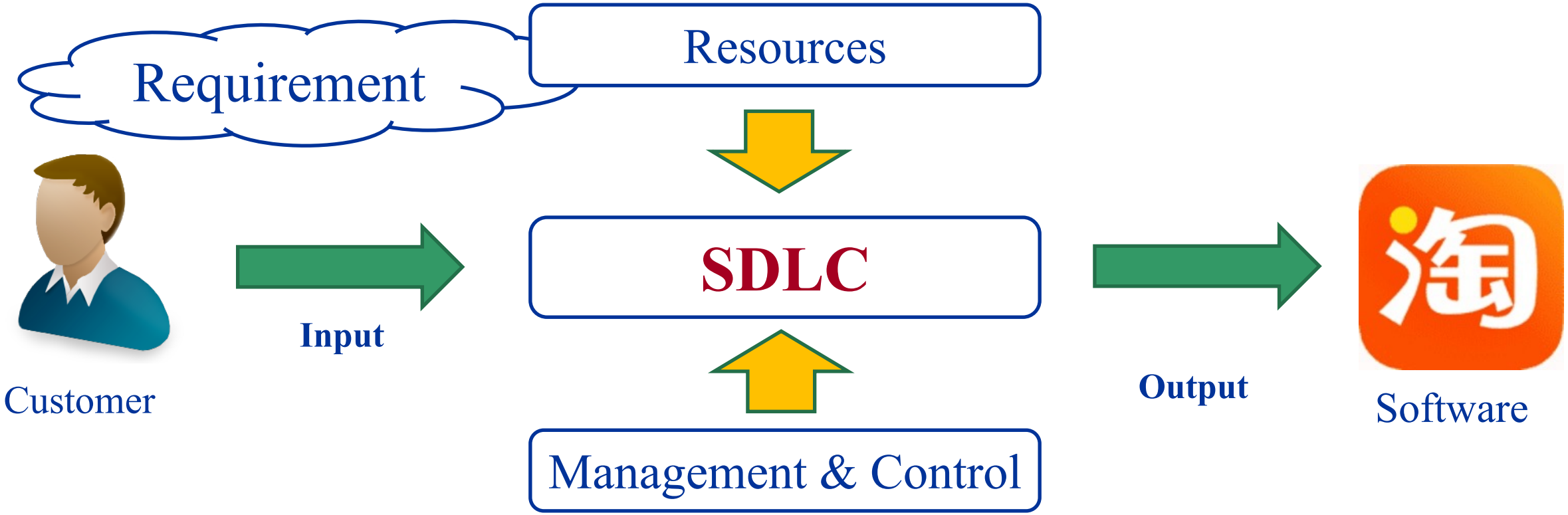
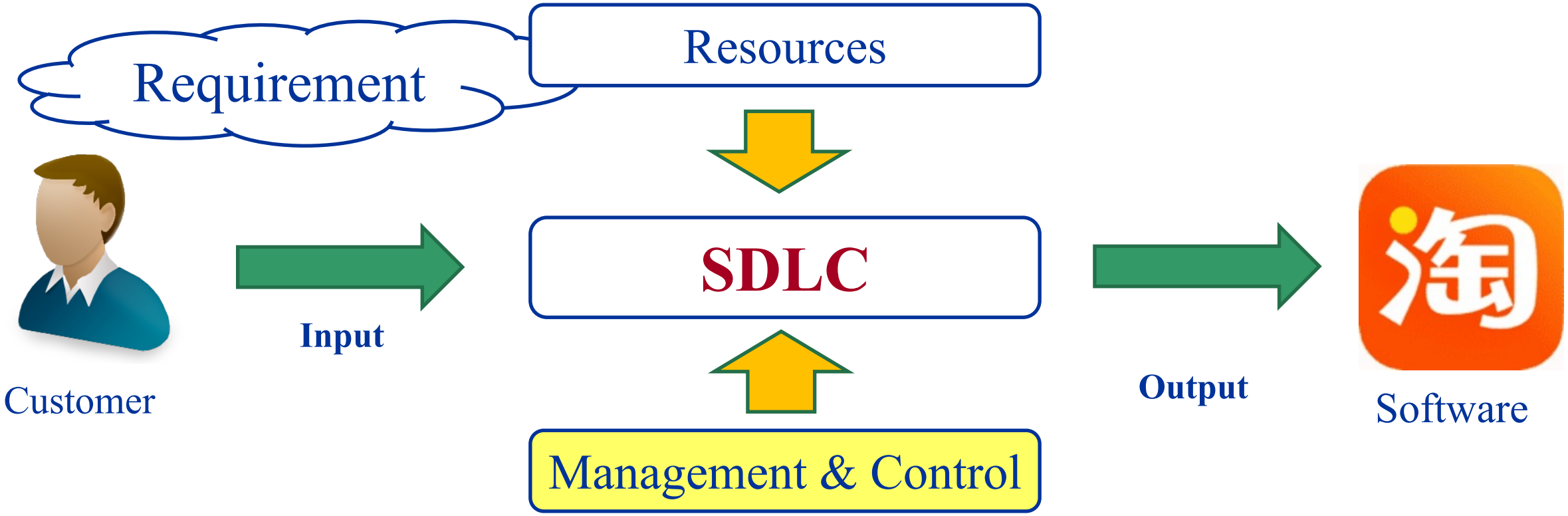
Software Development Life Cycle (SDLC)



Software Development Life Cycle (SDLC)



(Project Management & Software Configuration Management)

Lecture 3: Software Configuration Management

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Software Configuration Management (SCM)

- Software Configuration Management is the task of tracking and controlling changes in the software, including revision control and the establishment of baselines.

- Outline
  - Software Versioning
  - Version Control
  - Git & Github

Software Versioning

- A normal version number MUST take the form X.Y.Z where X, Y, and Z are non-negative integers, and MUST NOT contain leading zeroes.
- X is the major version, Y is the minor version, and Z is the patch version (Format: X. Y. Z).
- For instance: 1.9.0 → 1.10.0 → 1.11.0.
- Major version zero (0.y.z) is for initial development.
- Version 1.0.0 defines the public API.

Software Versioning (2)

- Patch version Z (x.y.Z) MUST be increased if only backwards compatible bug fixes are introduced.
- Minor version Y (x.Y.z) MUST be increased if new, backwards compatible functionality is introduced to the public API.
- Major version X (X.y.z) MUST be increased if any backwards incompatible changes are introduced to the public API.

Software Versioning-Pre-release Version

- A pre-release version MAY be denoted by appending a hyphen and a series of dot separated identifiers immediately following the patch version.
  - alpha/a: e.g., 1.0.0-alpha, 1.0.0-a, 1.0.0-a.1;
  - beta/b: e.g., 1.0.0-beta;
  - rc: release candidate;
- A pre-release version indicates that the version is unstable and might not satisfy the intended compatibility requirements as denoted by its associated normal version

Software Versioning-Pre-release Version (2)

- Pre-release Version:
- alpha: programs in an early stage;
- beta: programs become mature but are not yet ready for release;
- rc (release candidate): programs are soon to be released;
- Relation: alpha < beta < rc < release (without pre-release version code)
- E.g.,: 1.0.0-alpha < 1.0.0-beta < 1.0.0-rc < 1.0.0

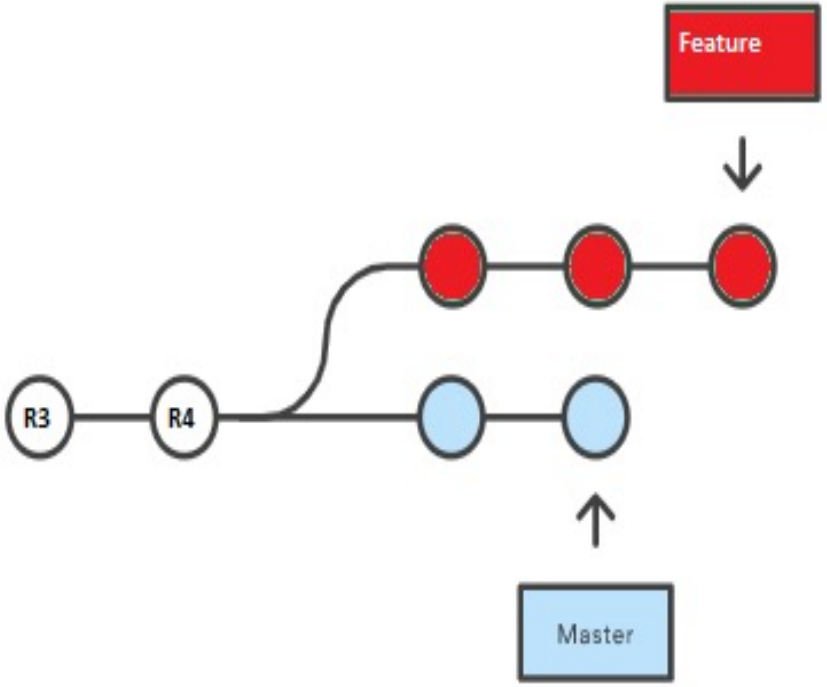
Software Versioning - Summary

- Version: X. Y. Z
- Major. Minor. Patch
  - Major: break APIs;
  - Minor: not break APIs;
  - Patch: bug fixing;
- Pre-release Version: Major. Minor. Patch-Prerelease
  - alpha, beta, rc
  - E.g., 1.0.0-alpha, 1.0.0-beta
- Pre-release Version (not stable)

Version Control

Version Control (2)

- Purpose
  - Manage change in time (history) and space (branches)
- Benefits
  - Ease collaboration
  - Allow branching and continuous integration
  - Track ownership and change history



Repositories and Working Copies

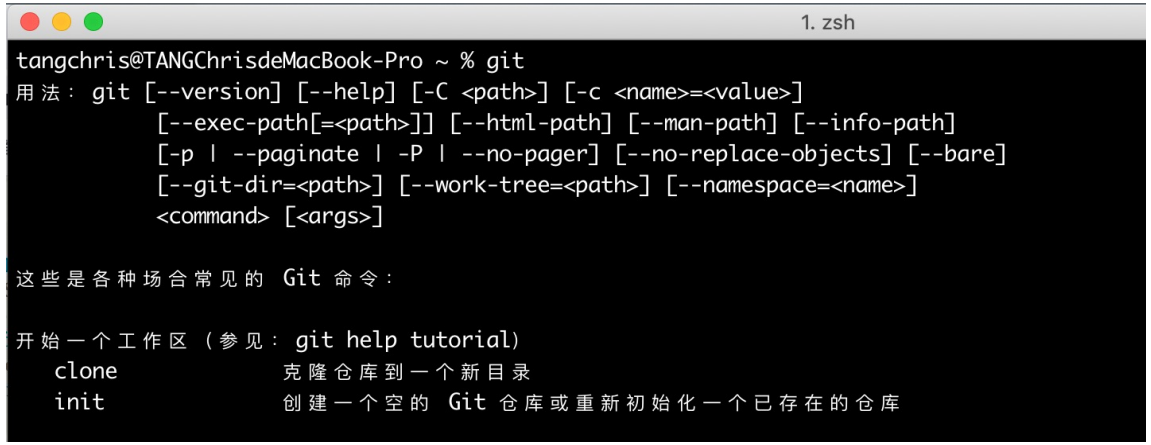
- Version control uses *a repository* (a database of changes) and *a working copy* where you do your work.
- Working copy
  - Your personal copy of all the files in the project.
  - You make arbitrary edits to this copy, without affecting your teammates.
  - You can commit your changes to a repository.
- Repository
  - Database of all the edits to, and historical versions of your project.
  - You can update your working copy to incorporate any new edits.

Git

- https://git-scm.com/
- Free and open source distributed version control system
- Linus Torvalds (Linux)
- Linux Kernel (1991-2002)
  - changes to the software were passed to Linus as patches and archived files.
- Linux Kernel (2002-2005)
  - BitKeeper (for free of charge).
  - In 2005, the relationship between Linux and BitKeeper broken down
- Linux Kernel (2005+): Git

Installing Git

- Download Git from official website: https://git-scm.com/;
- Add Git to System PATH;
- Test Git from Terminal with command: git;



- Reference: https://git-scm.com/book/en/v2/Getting-Started-Installing-Git.

Github

- What is Github?
  - https://github.com/
  - Based on Git;
  - Git with a web interface;
  - Git hosting;
  - Issue and request tracking system;
  - Documentation system;

Git vs Github

	git	
1	It is a software	It is a service
2	It is installed locally on the system	It is hosted on web
3	It is a command line tool	It provides a graphical interface
4	It is a version control system that lets you manage and keep track of your source code history	It is a cloud-based hosting service that let you manage Git repositories
5	It provides version control functions	It provides version control functions as well as its own features

Create a Repository on Github

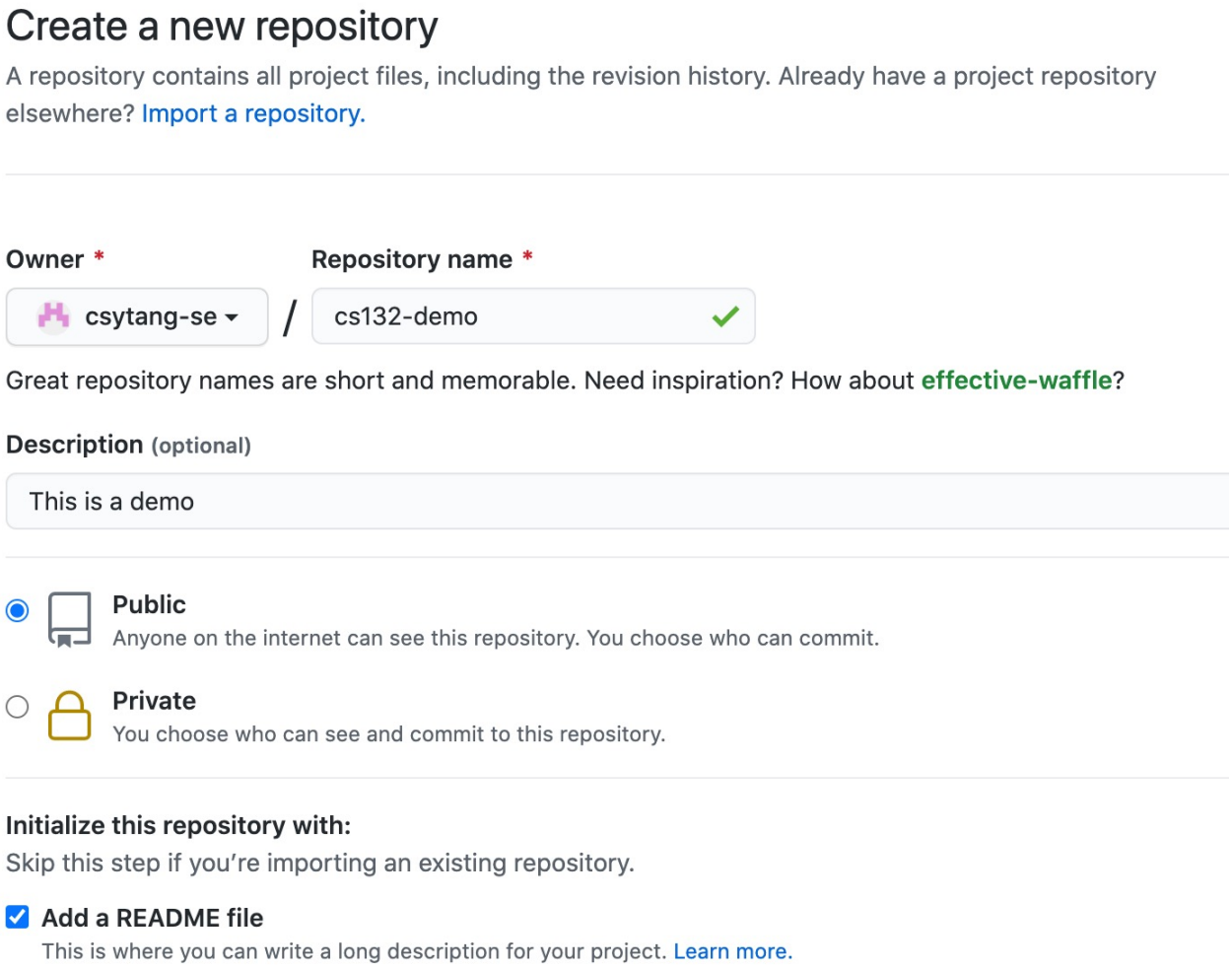
- https://github.com/new;

The name of the repository

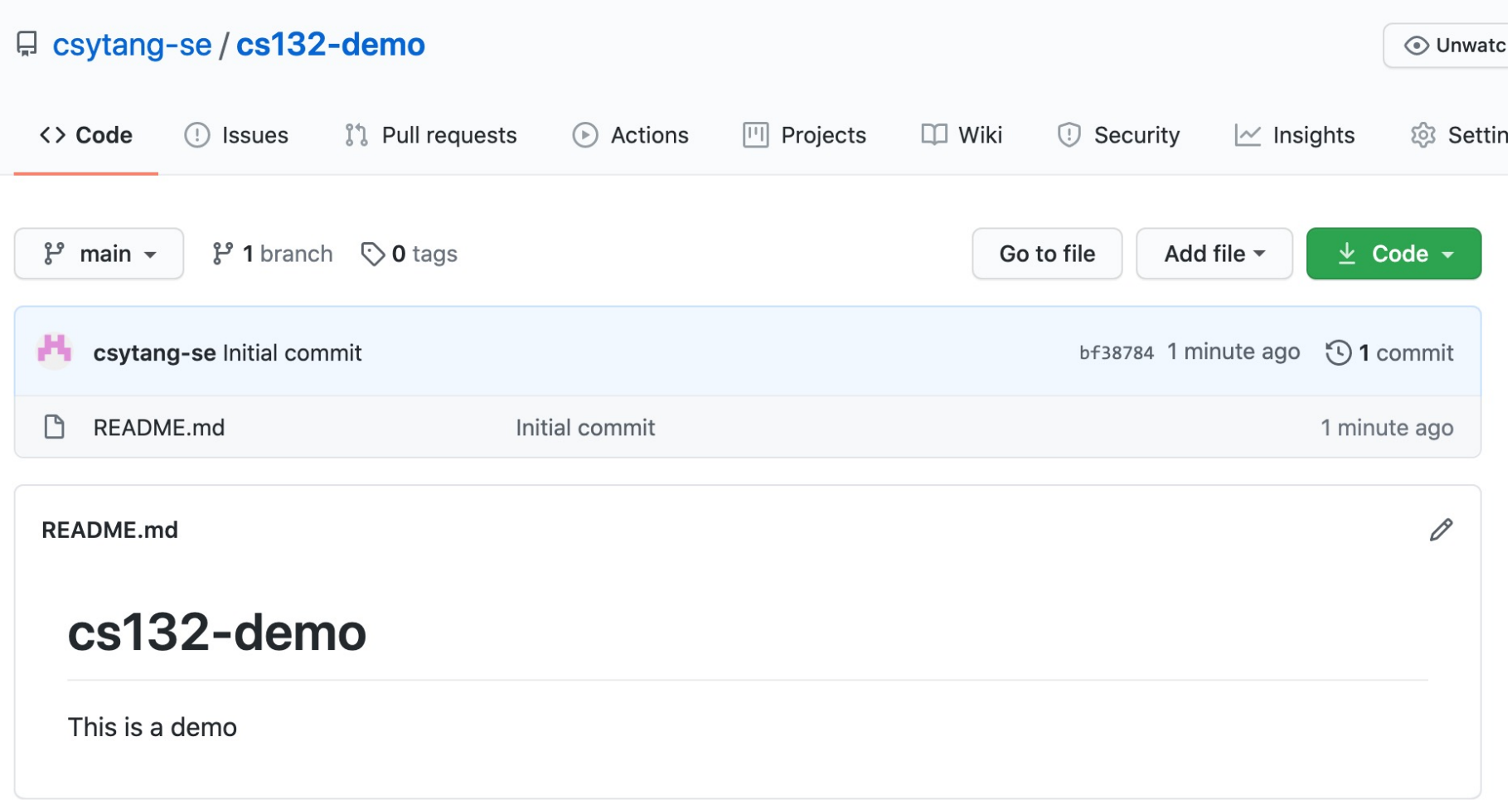
The description of the repository

Public or private repository?

Other configurations



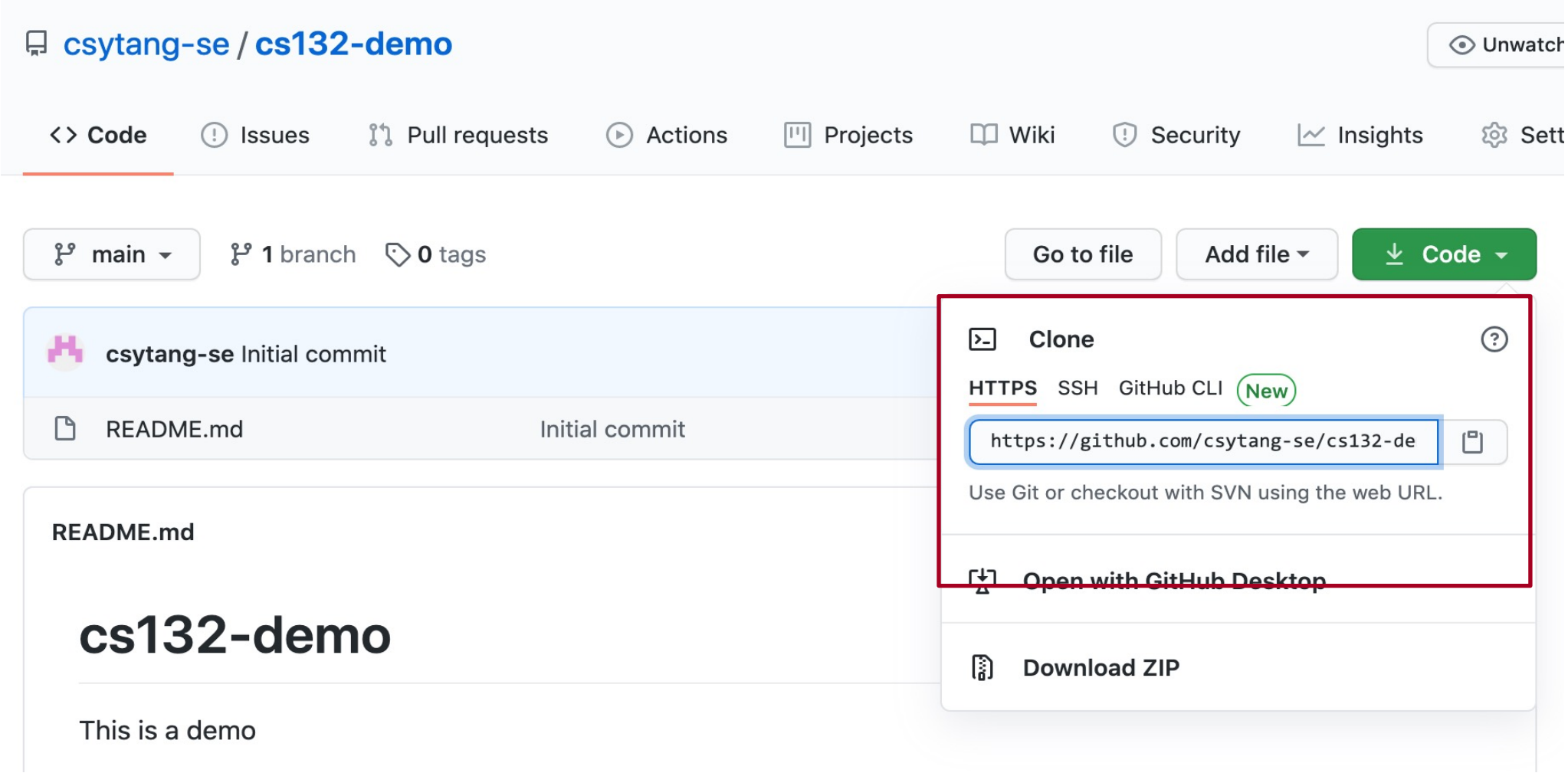
Create a Repository on Github (2)



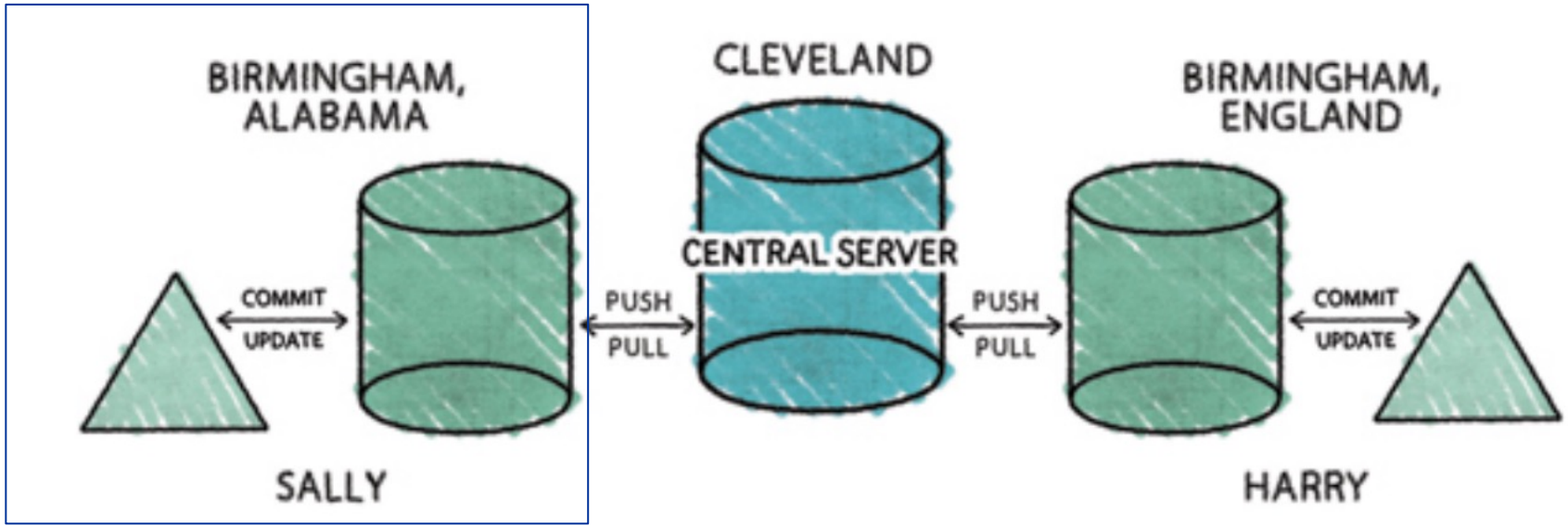
Clone the Repository (1)

- To clone a Git repository, you need:
  - git clone <url>
- eg.,:
  - git clone https://github.com/csytang-se/cs132-demo.git (demo repo)
  - git clone https://github.com/torvalds/linux.git (linux)
  - git clone https://github.com/tensorflow/tensorflow.git (Tensorflow framework)

Clone the Repository (2)



Clone the Repository (3)



Working Copy 1 Local Repository 1

Remote Repository (on Github)

gitignore

- A gitignore file specifies intentionally untracked files that Git should ignore.
- Each line in a gitignore file specifies a pattern.
- STEP 1. Create a new file named `.gitignore` in your local repository;
- STEP 2. Specify the file patterns in .gitignore file
  - *.class → ignore all class files
  - build/ → ignore all files in build folder

gitignore

```
# Eclipse settings
.project
.classpath
.settings/

# Maven output folder
target/

# Vim swap files
*.swp
```

Comments

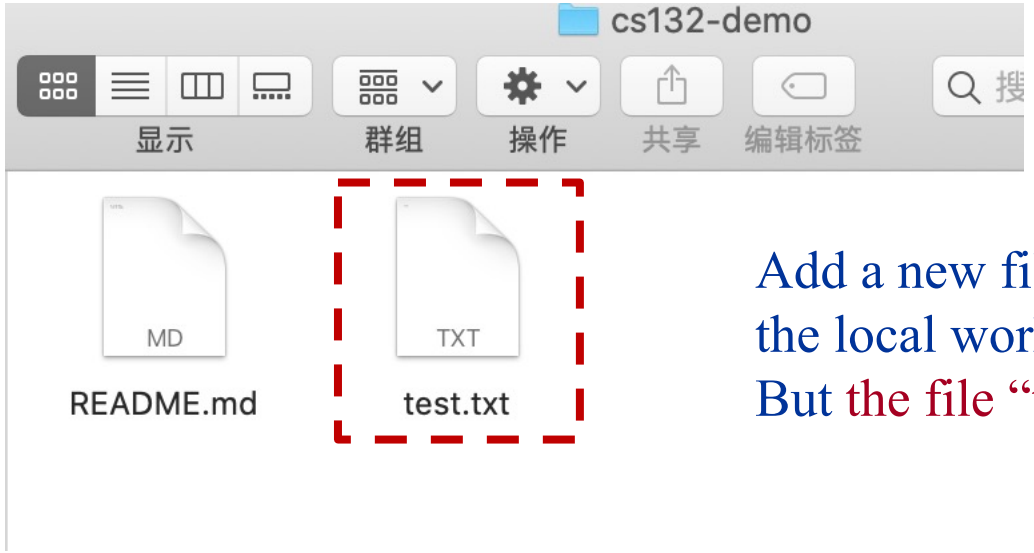
Match by name (both file and folder)

Match only folder

Match by pattern

Add Files (1)

- STEP 1: Create a file to the working directory;



Add a new file named “test.txt” to the local working directory.
But the file “test.txt” is not under version control by git.

Add Files (2)

- STEP 2: Add a file to version control with add command;
  - git add <file>

- eg.,
  - cd cs132-demo
  - git add test.txt

- For multiple files, use `git add --all`

Commit

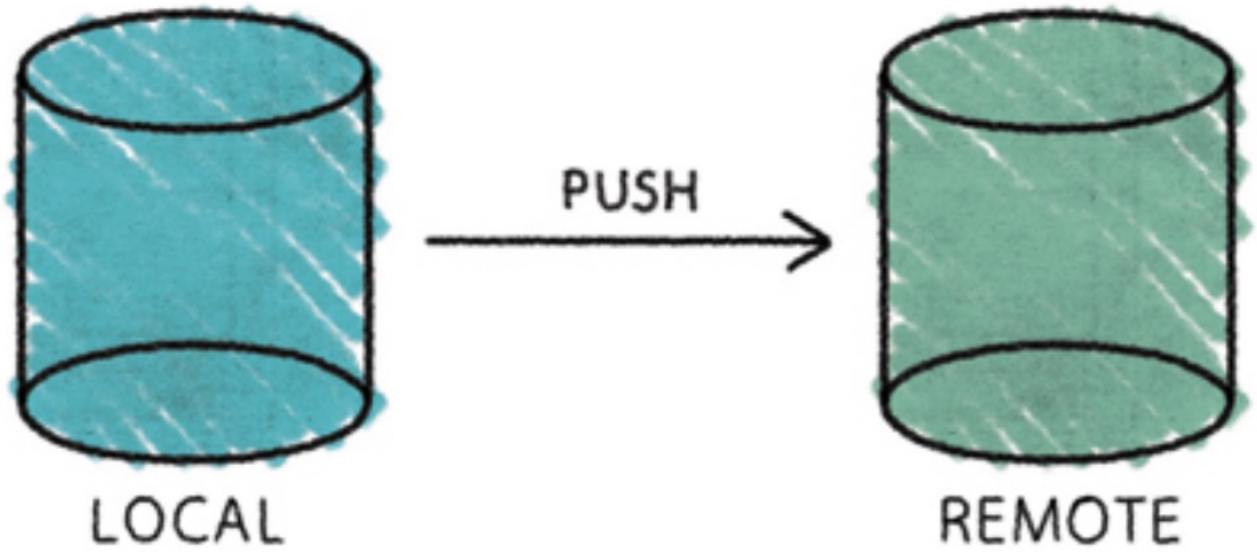
- STEP 3: Apply the modifications in the working copy to the repository as a new changeset.

(Local working copy) (Local repository)

- Commit changes with: git commit –m “<message>”
  - eg: git commit –m “add test.txt to repo”

Push

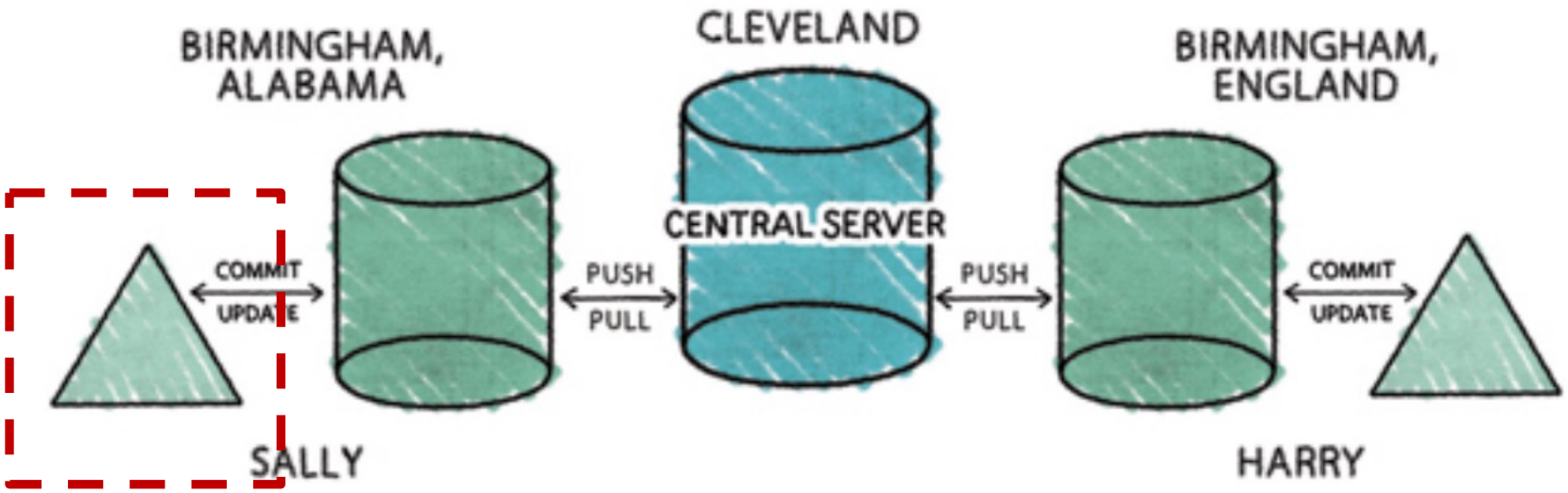
- STEP 4:Copy changesets from a local repository instance to a remote one.
  - git push



(Local repository) (Remote repository on Github)

Recap: Add File

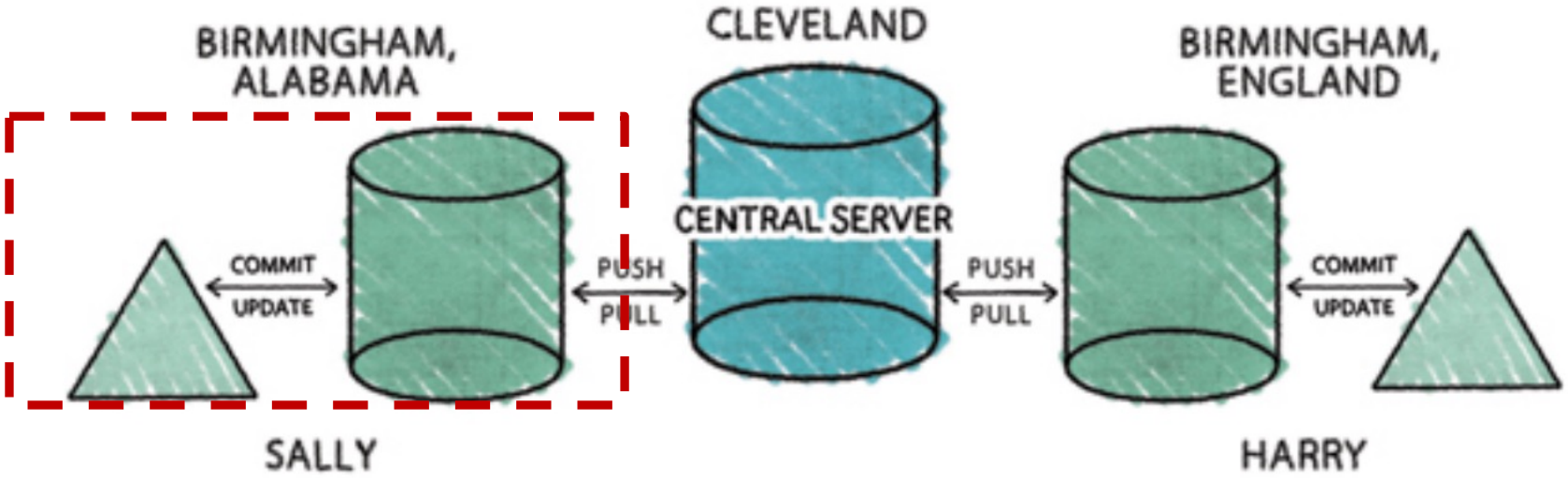
- STEP 1: Create a file to the working directory;
- STEP 2: Add the file to the version control system; (git add …)



(Local working copy)

Recap: Add File (2)

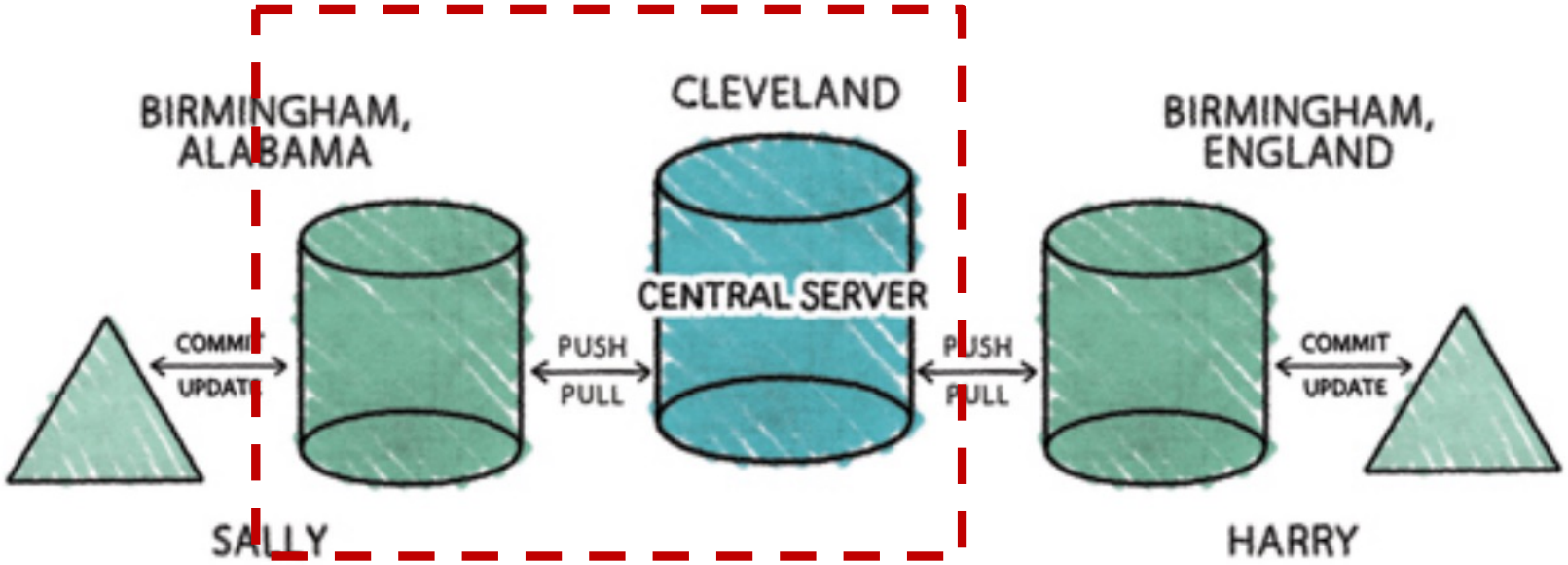
- STEP 3: Commit change to the local repository; (git commit –m "…")



(Local working copy) (Local repository)

Recap: Add File (3)

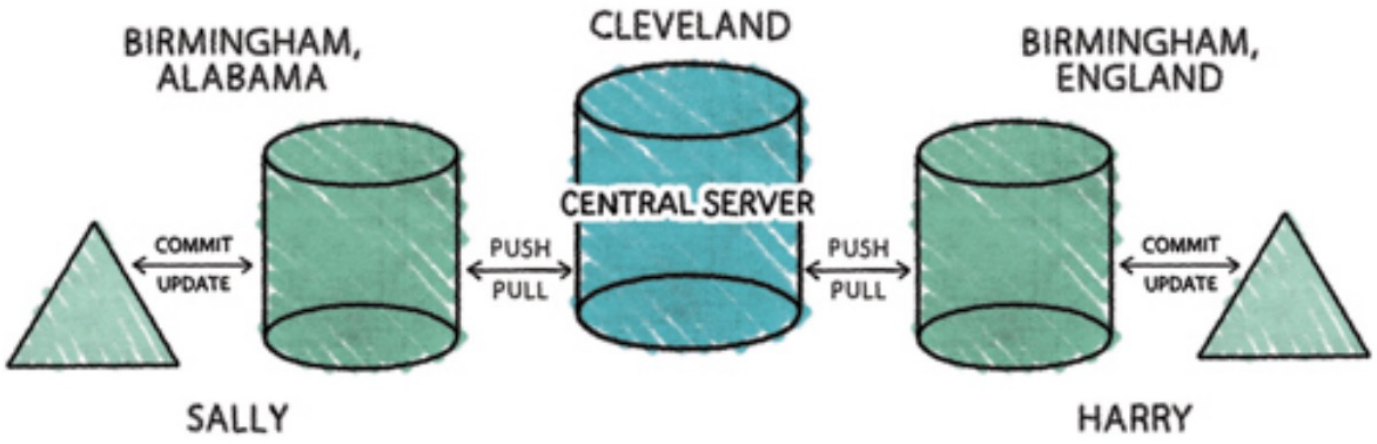
- STEP 4: Update the remote repository on Github (git push)



(Local repo) (Remote repo --- Github)

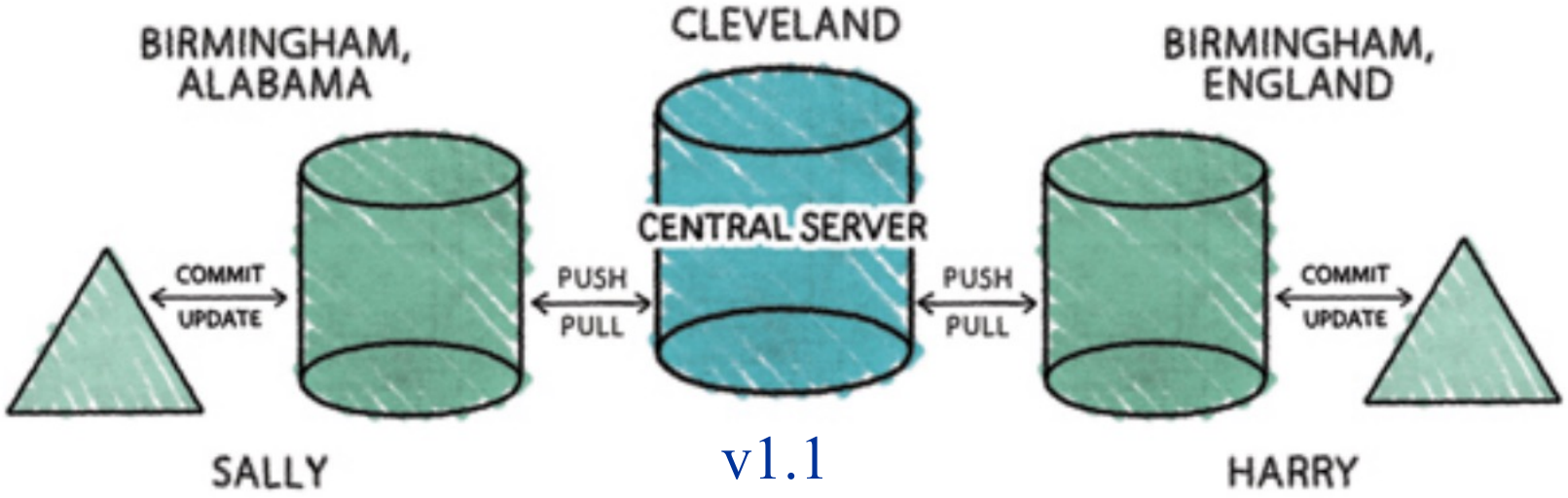
Recap: Add File (4)

- STEP 1: Create a file to the working directory;
- STEP 2: Add the file to version control system; (git add …)
- STEP 3: Commit change to the repository; (git commit –m "…")
- STEP 4: Update the remote repository on Github (git push)



Pull

- Copy changesets from a remote repository instance to a local one.
- git pull

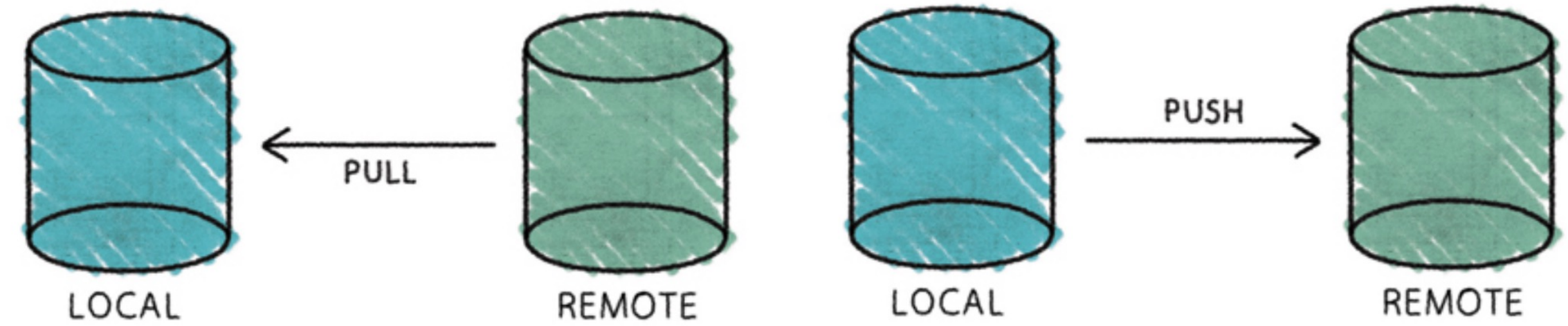


v1.1

v1.0

New features: v1.0→ v1.1

Push vs Pull



Delete

- Delete a file or directory;
- git rm <file>
- STEP 1: Delete a file or directory (git rm <file>)
  - eg., git rm test.txt
- STEP 2: Commit the change to the local repository (git commit –m "<message>")
  - eg., git commit –m "remove test.txt"
- STEP 3: Update to the remote repository on Github (git push)

Edit

- Edit an existing file under version control;
- STEP 1: Edit an existing file;
- STEP 2: Record the changes with git (git add <file>);
- STEP 3: Commit to local repository repository (git commit –m "<message>");
  - eg., git commit –m "edit test.txt"
- STEP 4: Update to the remote repository on Github (git push);

Move

- Move a file or directory;
- STEP 1: git mv <file> <dest>
  - eg. git mv test.txt src
- STEP 2: Commit to local repository repository (git commit –m “<message>”);
  - eg., git commit –m “edit test.txt”
- STEP 3: Update to the remote repository on Github (git push);

Rename

- Rename a file under version control;
- STEP 1: git mv <old-name> <new-name>
  - eg. git mv test.txt newname.txt
- STEP 2: Commit to local repository repository (git commit –m "<message>");
  - eg., git commit –m "edit test.txt"
- STEP 3: Update to the remote repository on Github (git push);

Status

- List the modifications that have been made to the working copy.
- git status

```
tangchris@TANGChrisdeMacBook-Pro cs132-demo % git status
位于分支 main
您的分支与上游分支 'origin/main' 一致。

要提交的变更：
  （使用 "git restore --staged <文件>..." 以取消暂存）
        新文件：    "edit\347\232\204\345\211\257\346\234\254.txt"
        新文件：    "edit\347\232\204\345\211\257\346\234\2542.txt"
        新文件：    "edit\347\232\204\345\211\257\346\234\2543.txt"
        新文件：    "edit\347\232\204\345\211\257\346\234\2544.txt"
```

Log

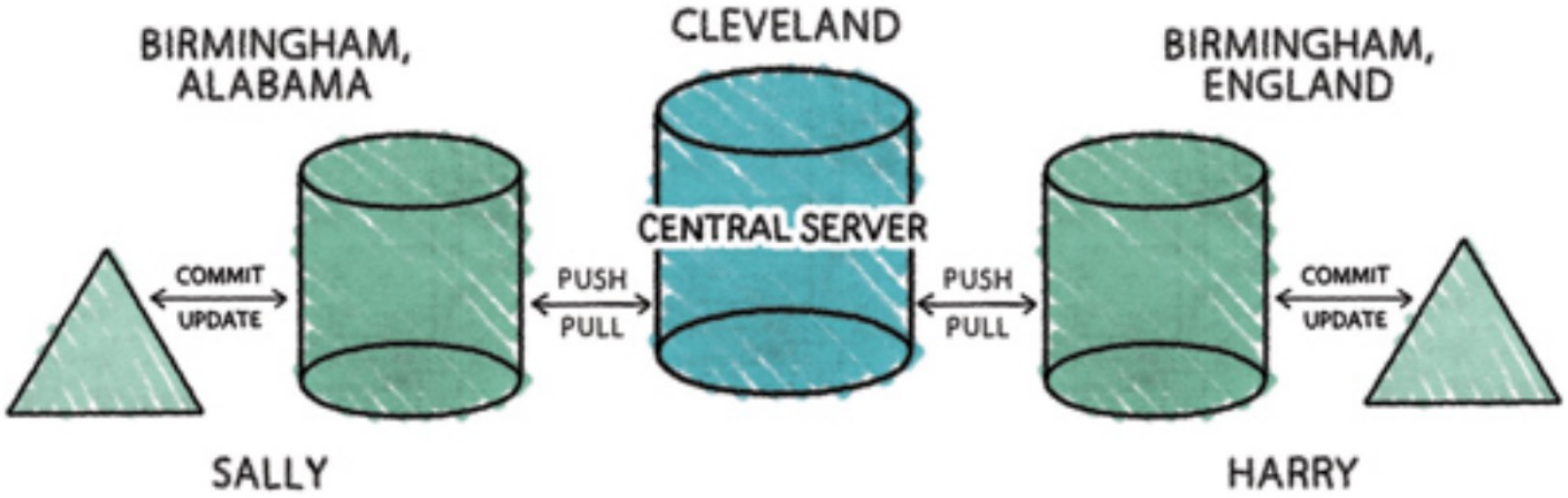
- Show commit logs
- git log
- To view recent n commit logs:
  - git log -n
  - eg., git log -2 (recent 2 commits)

```
*   commit 9c8e9fd335381fe6a97708f7b3cd1d5acf670d2d
|\  Merge: 8aba87e... 6041ddd...
| | Author: Nick Quaranto <nick@quaran.to>
| | Date:   Sun Jan 25 13:22:03 2009 -0500
| |
| |     Fixing conflict!
| |
| * commit 6041dddac354fff0feec911e75a575082d8addb8
| | Author: Nick Quaranto <nick@quaran.to>
| | Date:   Sun Jan 25 13:10:23 2009 -0500
| |
| |     Changing cutoff default
| |
* | commit 8aba87e2e24744b7d1941e104b35033b9e2dbab5
|/  Author: Nick Quaranto <nick@quaran.to>
|   Date:   Sun Jan 25 13:16:04 2009 -0500
|
|       Causing a merge on purpose
|
* commit 670e3538533554d0643ca128428997c98eb5d54e
| Author: Nick Quaranto <nick@quaran.to>
| Date:   Sun Jan 25 13:04:30 2009 -0500
|
|     Adding cutoff method to string
```

Diff

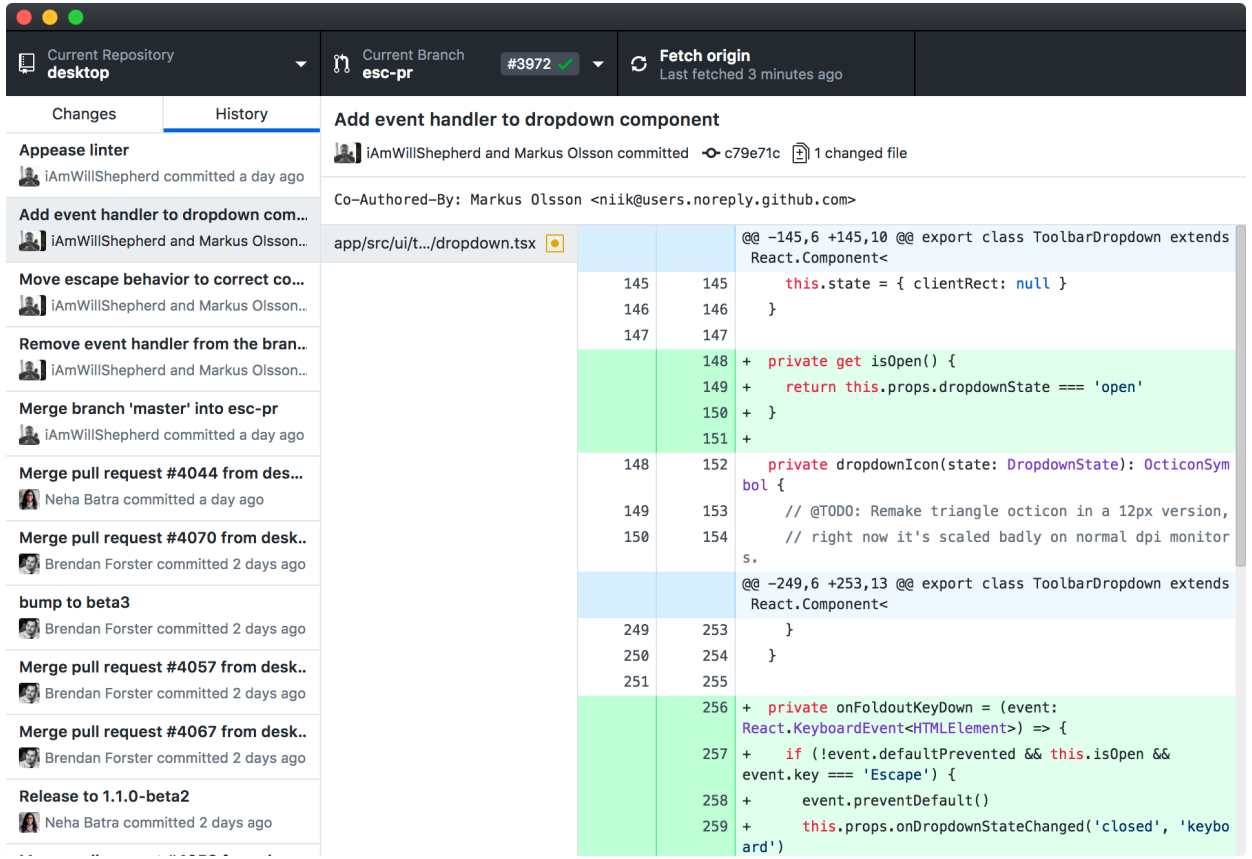
- Compare current with a specific commit
- git diff <commit-id>
- eg., git diff 92154f8dc38d273dc093d88ed98e21e7575d66f7

Recap

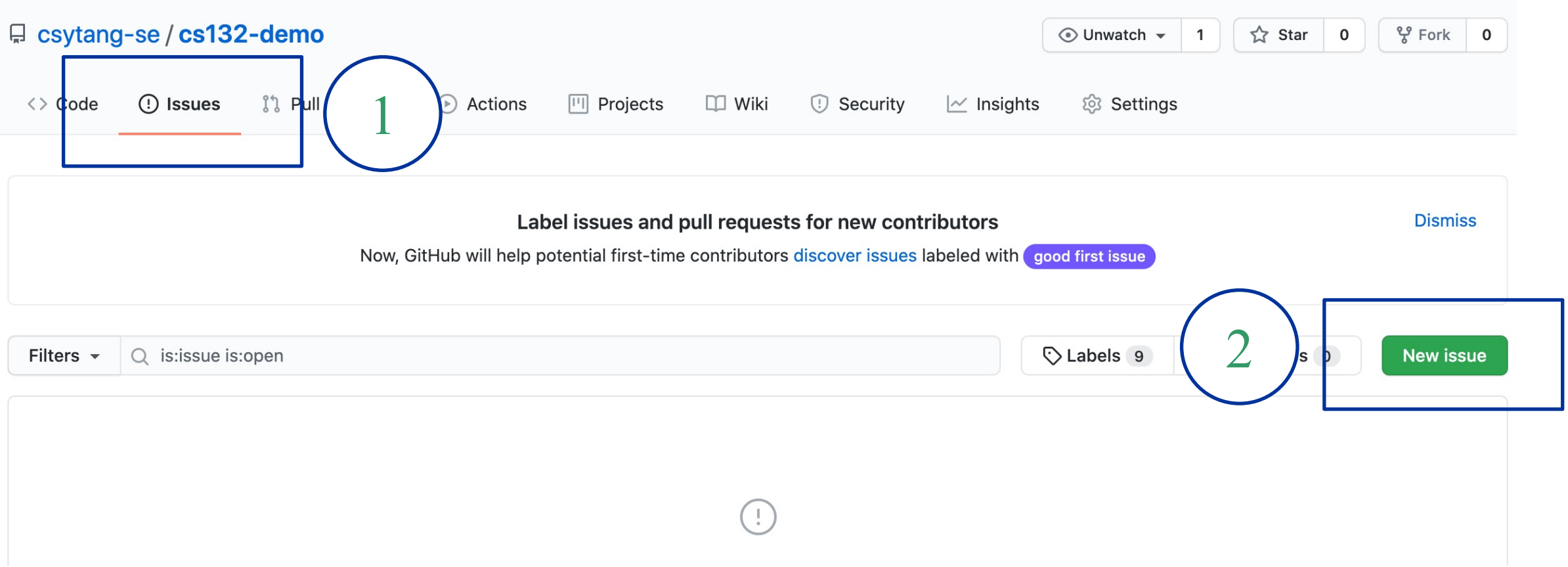


- Local commands: mv, rm, add, commit, status, log
- Local<->Remote commands: pull, push

Installing Github Desktop

- Download Github Desktop from https://desktop.github.com/;
- 

Issue Tracking on Github



Issue Tracking on Github (2)

Code Issues

Title & Description

Demo issue

Write Preview

This is a demo issue : please fix the bug

Attach files by dragging & dropping, selecting or pasting them.

Styling with Markdown is supported

Submit new issue

Attributes

Assignees

csytang-se

Labels

enhancement

Projects

None yet

Milestone

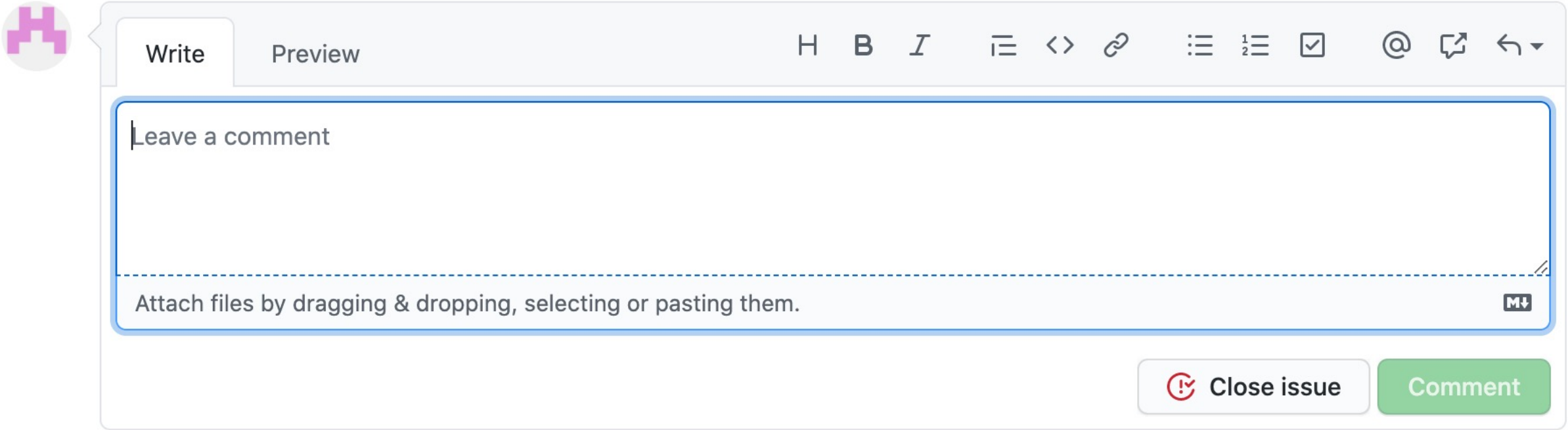
No milestone

Linked pull requests

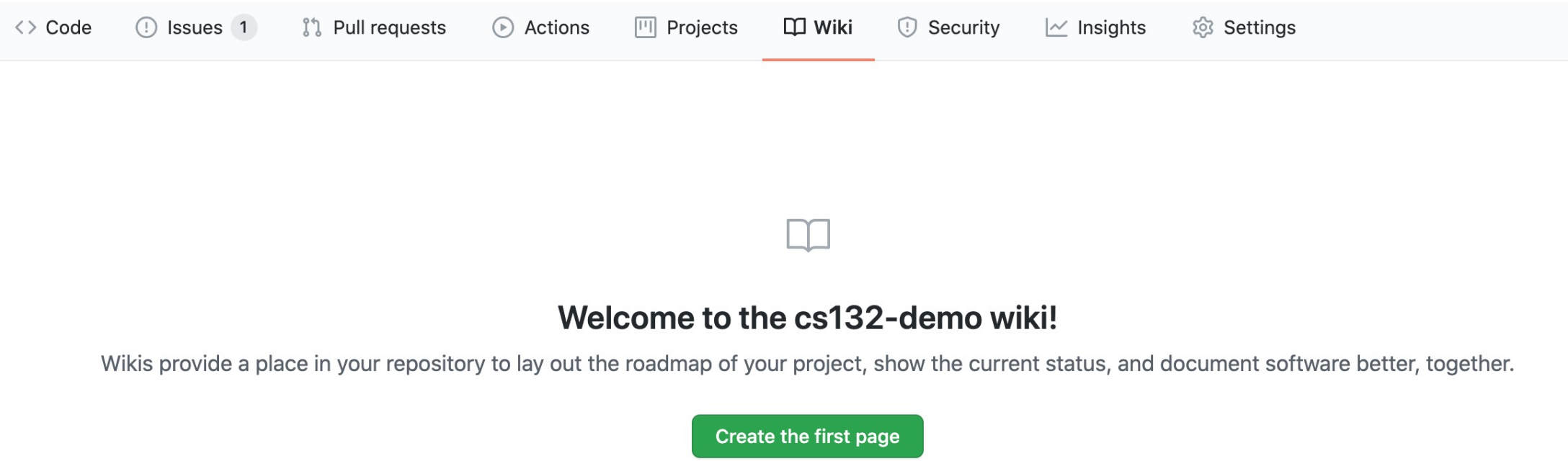
Successfully merging a pull request may close this issue.

Issue Tracking on Github (3)

- Close the issue when it is resolved.



Wiki page on Github



Wiki page on Github (2)

Create new page

Home

Write Preview

h1 h2 h3 B i Edit mode: Markdown

```
Welcome to the cs132-demo wiki!
# Introduction
....

# Environment
....

# HowTo
....


# Demo
....
```

Introduction
Environment
Installation
Howto
Bug fixing
Contact

Reference

- Version Control by Example. Eric Sink https://ericsink.com/vcbe/vcbe_a4_lo.pdf (Free, online available);
- Pro Git: https://git-scm.com/book/zh/v2
- Official doc of Github: https://docs.github.com/cn