Version Control (GIT)

Week 5

A little less conversation, a little more action.

— Elvis Presley

Objectives

- Understand how to work with Git
- Learn a typical workflow of using GitHub
- Specify how to apply GitHub flow into the term project

Contents

- Recap of Git
- Typical workflow
- Merge conflict exercise
- GitHub flow in the term project

Install Git

- Check whether Git is downloaded in your machine
  - `git --version`
- If you don’t have it, install from the official site
- Now, you’re ready!

Recap: Basic Commands (1/4)

- `git init`
  - Start Git in the current working directory
- `git log`
  - Show the history of commits
- `git add <blobs>`
  - Include blobs into the staging area
- `git status`
  - Show modified and staged blobs
- `git commit`
  - Create a commit from the staging area

Recap: Branch Commands (2/4)

- `git checkout <branch name or commit id>`
  - Move to certain branch or commit
  - Create branch if `-b` option given
- `git stash`
  - Temporarily save the modified changes which are not committed
- `git merge <branch name>`
  - Merge the changes of current branch and mentioned branches
- `git rebase <branch name>`
  - Delete commit and create new commit on the mentioned branch

Recap: Undo Commands (3/4)

- `git reset <commit id>`
  - Delete all commits after the determined commit
  - `git reset --hard`
  - `git reset --mixed`
  - `git reset --soft`
- `git revert <commit id>`
  - Create a new commit with reverse patch of the determined one
  - No deletion

Recap: Remote Commands (4/4)

- `git remote add <remote name> <url>`
  - Delete all commits after the determined commit
- `git clone <url> <directory name>`
  - Copy the entire history from remote repository
- `git push <remote name> <branch>`
  - Reflect changes on the branch to the remote repository
- `git fetch <remote name> <branch>`
  - Download changes from the remote repository
- `git pull <remote name> <branch>`
  - `fetch + merge`

GitHub

- The largest host of Git
  - In Git's perception, GitHub is just host for remote repositories
  - Just as GitLab, Bitbucket, etc.
- Many useful tools
  - Actions
  - Issues
  - Copilots

Access GitHub with Your Machine

- Sign in to the GitHub
- Register your SSH key
  - Generate ssh key in your local machine
    - `ssh-keygen -t ed25519 -C "your_email@example.com"`
  - Copy `cat ~/.ssh/id_ed25519.pub`
  - Click your profile → Settings → SSH and GPC keys
  - Press ‘New SSH key’ 

  - Paste your public key
- Check details here
- You can also use tokens

How to Work with Git? (1/3)

- Write commit messages well
  - Use imperative form
  - Let others know changes without looking the source code
  - Explain “why”, “for what”, and “how”
  - We recommend the Conventional Commits specification

```
<type>[optional scope]: <description>

[optional body]

[optional footer(s)]
```

How to Work with Git? (2/3)

- Conventional Commits examples

```
fix!: add missing parameter to service call

The error occurred because ...

BREAKING CHANGES: foo function requires bar argument
```

```
style: remove empty line
```

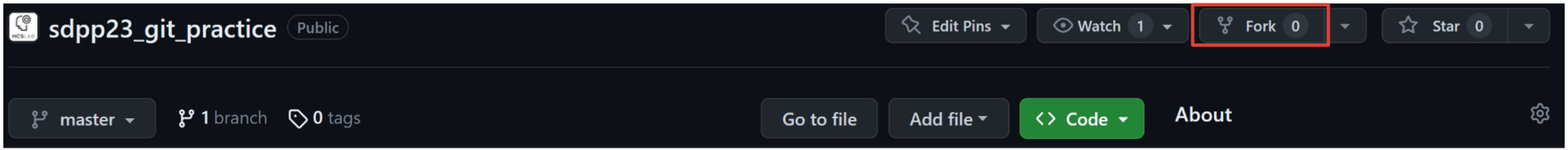
How to Work with Git? (3/3)

- Keep commits and branches concise
  - Single commit is a “logically separate changeset”
  - Single branch must handle single feature
  - Merge after each feature is done (frequently!)
  - Double-check before merging into master branch

Typical Workflow 1 (1/8)

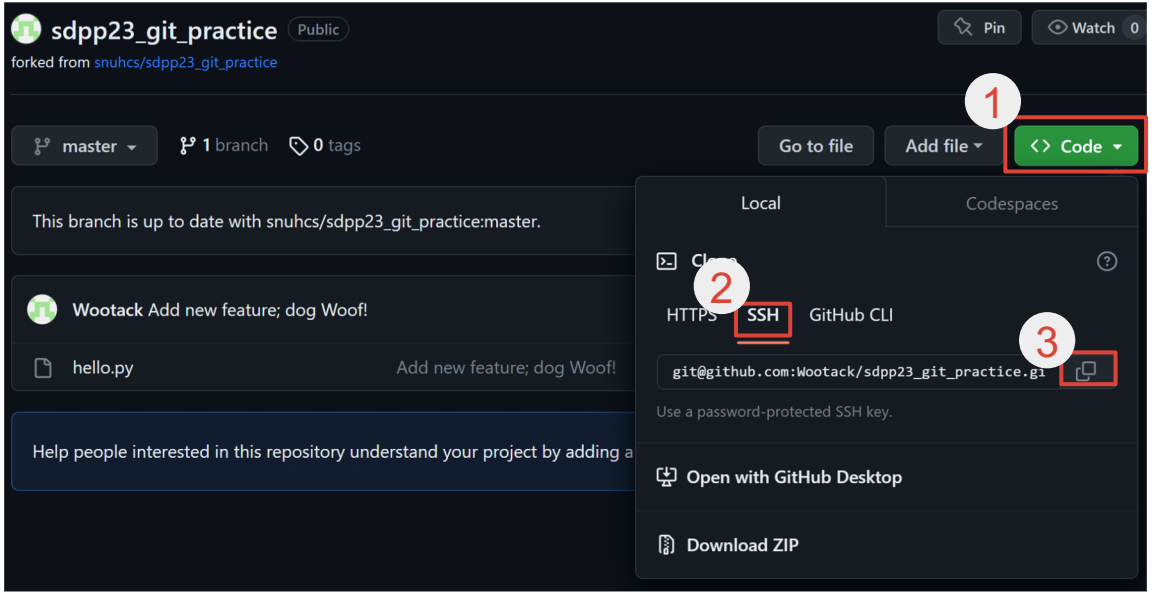
- You are not a contributor of a repository
  - You cannot push your edits

1. Fork the repository into your account



Typical Workflow 1 (2/8)

2. Clone the repository into your local machine




```
$ git clone <Paste url>
```

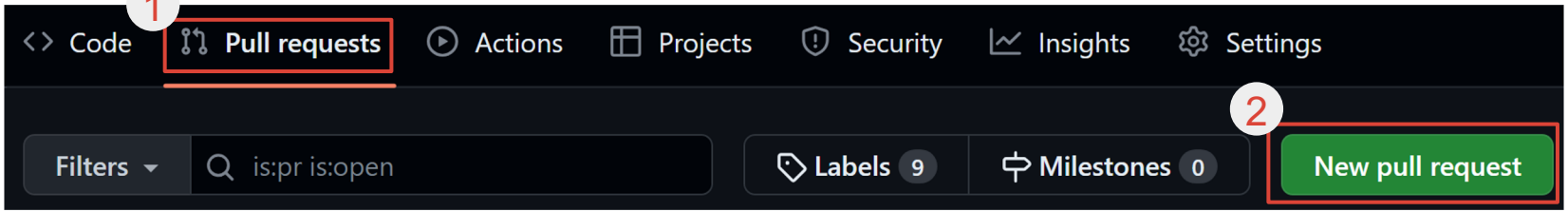
Typical Workflow 1 (3/8)

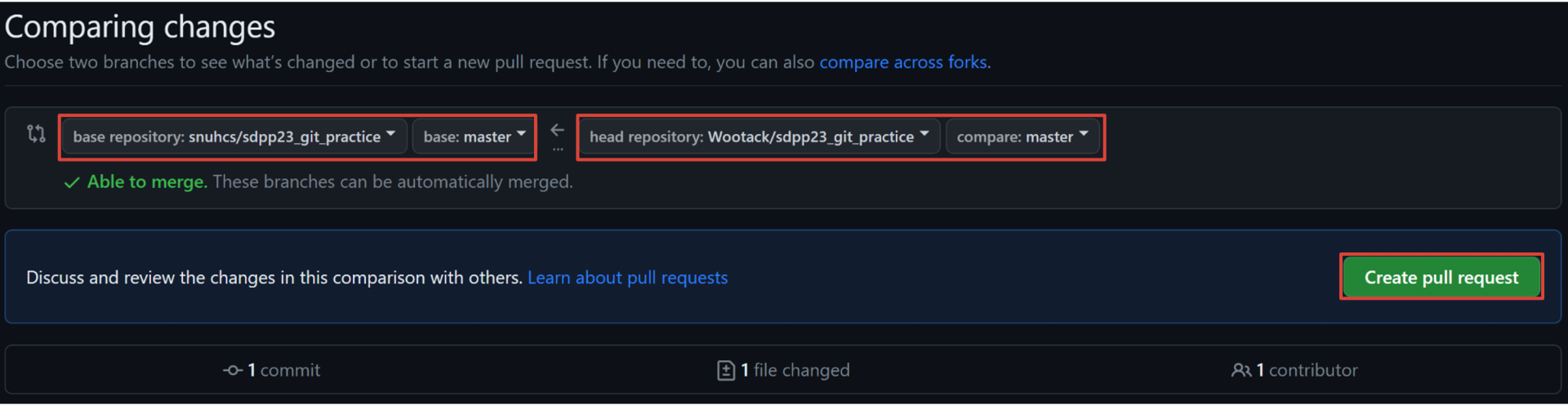
3. Edit file
4. Add modified blobs into the staging area
5. Create commits
6. Push to the forked repository

```
wootackkim@casablanca:~/sdpp/04_git/sdpp23_git_practice$ vim hello.py
wootackkim@casablanca:~/sdpp/04_git/sdpp23_git_practice$ git add hello.py
wootackkim@casablanca:~/sdpp/04_git/sdpp23_git_practice$ git commit
[master f96b0aa] Add new feature; cow Mooo!
 1 file changed, 2 insertions(+)
wootackkim@casablanca:~/sdpp/04_git/sdpp23_git_practice$ git push
Enumerating objects: 5, done.
Counting objects: 100% (5/5), done.
Delta compression using up to 96 threads
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 304 bytes | 304.00 KiB/s, done.
Total 3 (delta 1), reused 0 (delta 0)
remote: Resolving deltas: 100% (1/1), completed with 1 local object.
To github.com:Wootack/sdpp23_git_practice.git
   aab81df..f96b0aa  master -> master
```

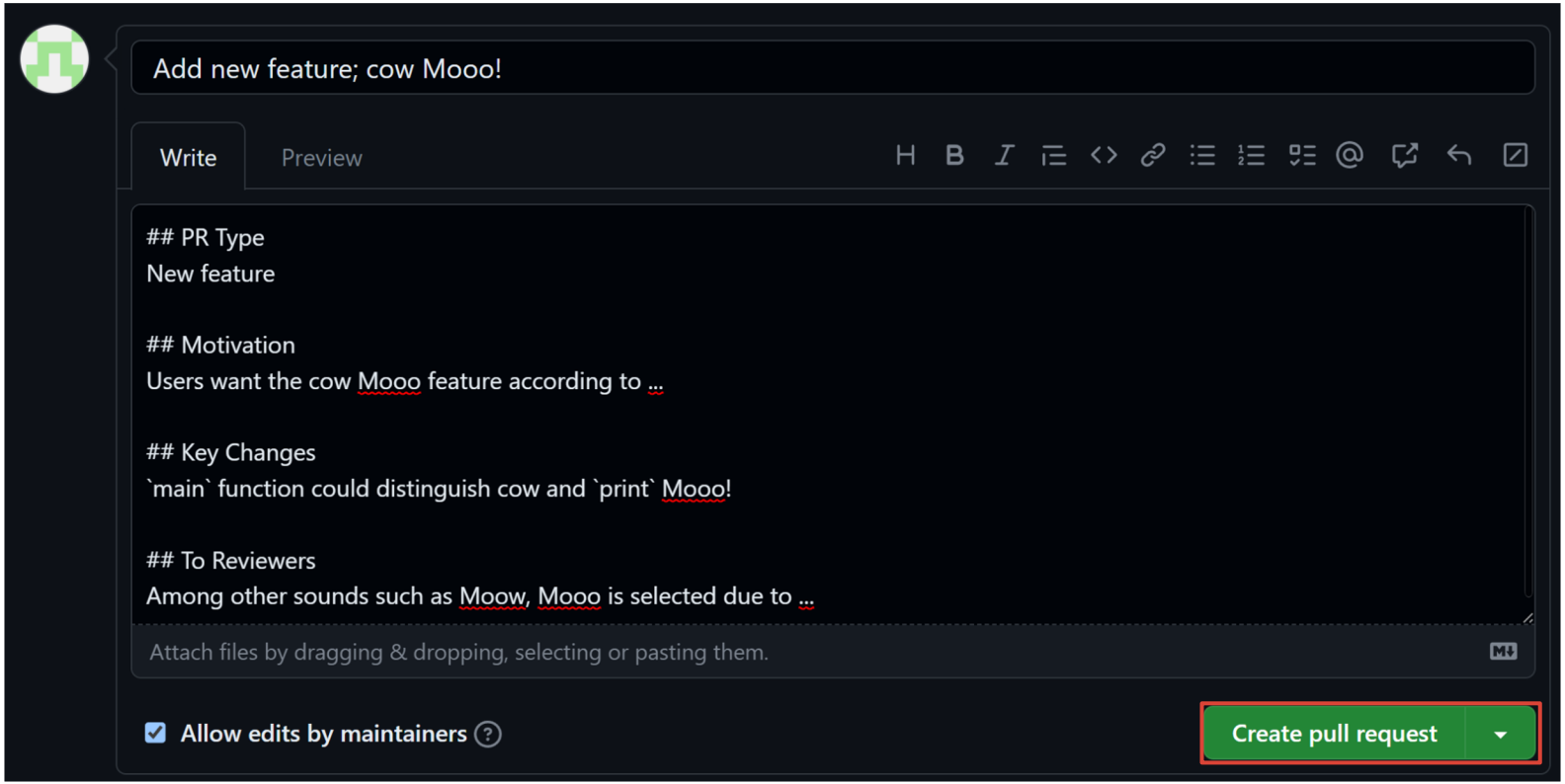
Typical Workflow 1 (4/8)

7. Create a Pull Request (PR)



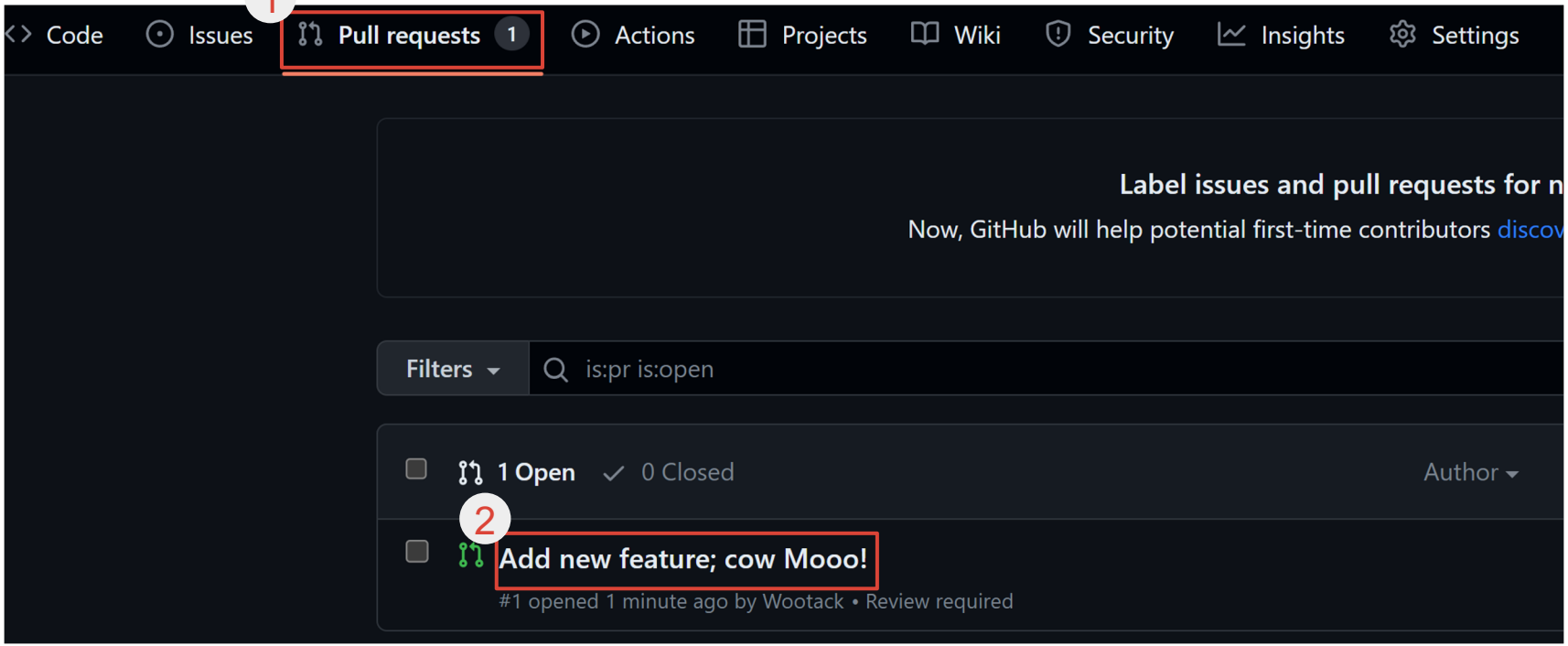


Typical Workflow 1 (5/8)

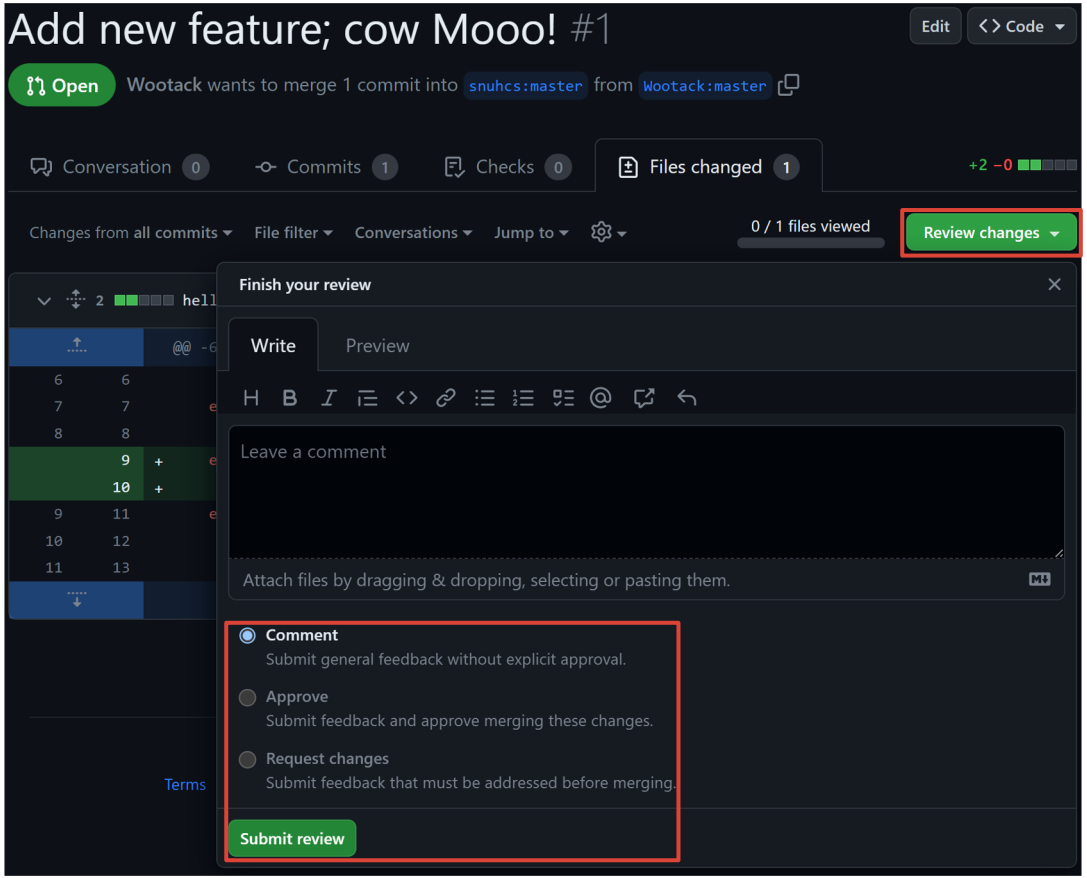


Typical Workflow 1 (6/8)

8. Owners review your PR



Typical Workflow 1 (7/8)



Typical Workflow 1 (8/8)

1. Fork the repository into your account
2. Clone the repository into your local machine
3. Edit file
4. Add modified blobs into the staging area
5. Create commits
6. Push to the forked repository
7. Create a Pull Request
8. Owners review your Pull Request

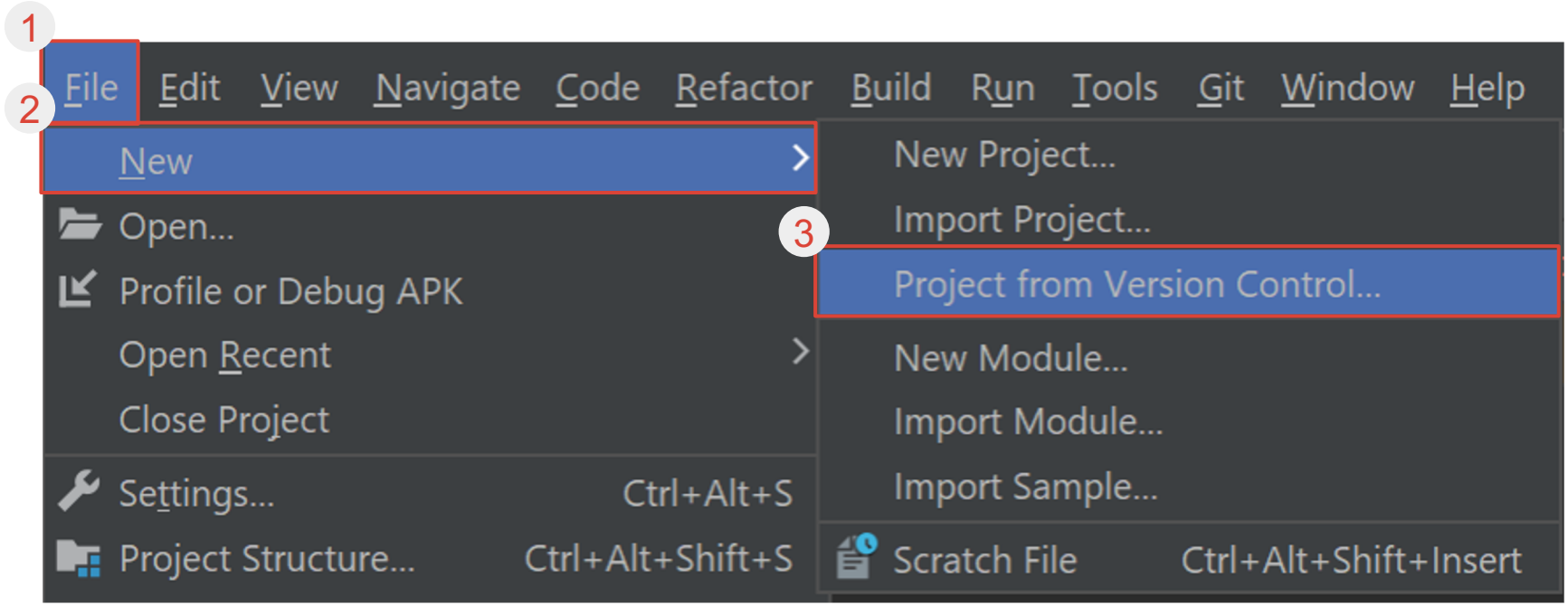
20 mins

Exercise

- Fork the GitHub repository
- Clone the forked repository
- Find a commit which maliciously adds typos
  - See commit message
- **Undo** that commit in proper way
- Push to the forked repository
- Send a **Pull Request**!
- Due: 25.10.12 23:59

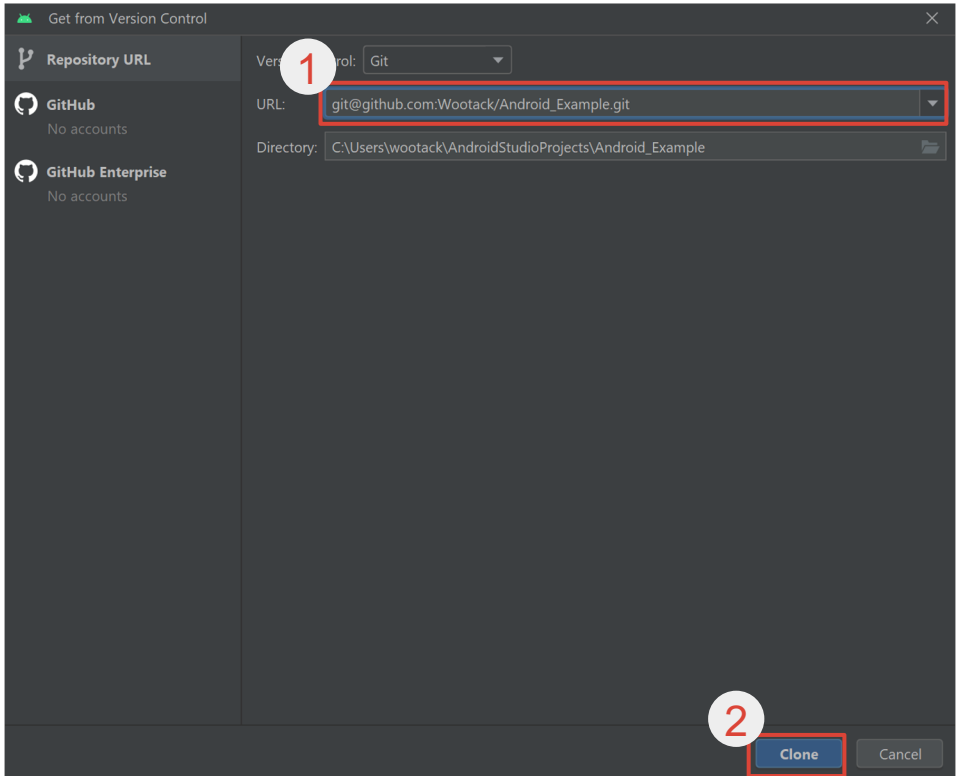
Android Studio with Git/GitHub (1/2)

- “File” → “New” → “Project from Version Control…”



Android Studio with Git/GitHub (2/2)

- Write URL of GitHub repository and Clone!



Merge Conflicts

- If automatic merge is impossible, merge conflict occurs
  - User must **manually** solve it

```
<<<<<<< HEAD
print("Hi cat")
=======
print("Hi " + animalName)
>>>>>>> animal_name
```

Contents from `HEAD`

Contents from incoming branch

Name of the incoming branch

20 mins

Group Exercise (1/4)

1. Join your team's repository by GitHub Classroom
2. Clone the repository

20 mins

Group Exercise (2/4)

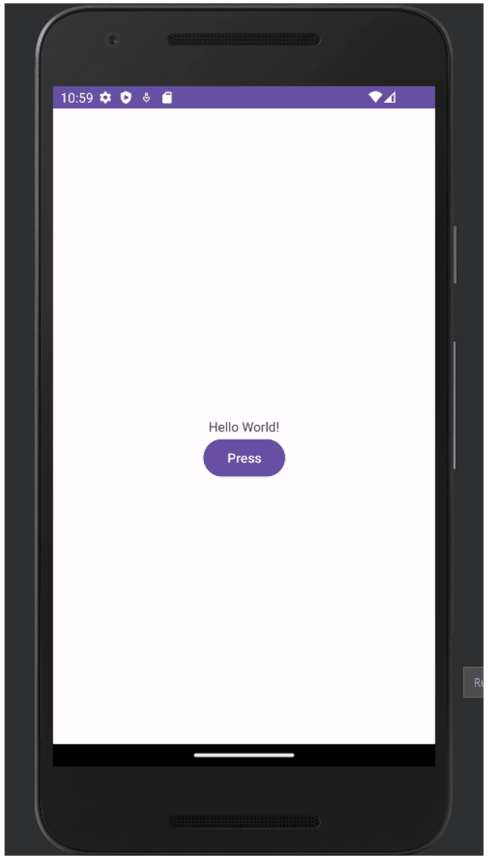
- Pair 1 add the *count* feature
  - Count the number of button press since the `Activity` create
  - Display in <content>_<count> format
- Pair 2 add the *input content* feature
  - Add the `EditText` above the `TextView`
  - On the button click, read the input and display it

20 mins

Group Exercise (3/4)

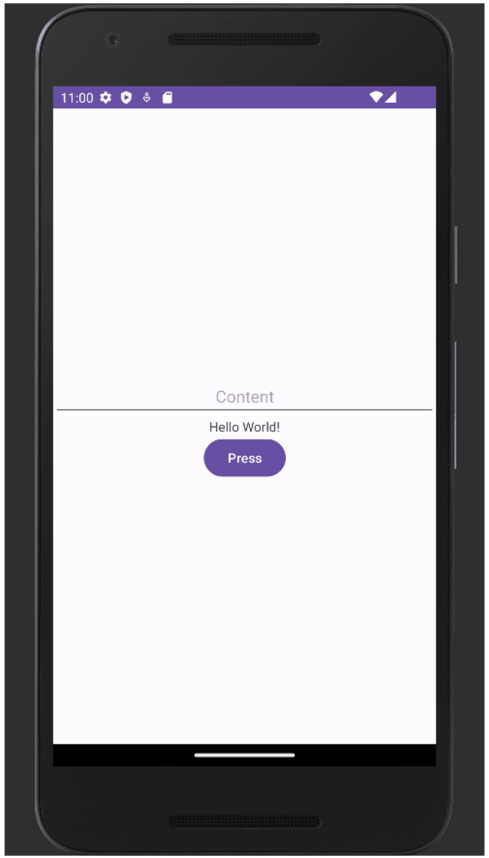
Pair 1

Count



Pair 2

Content

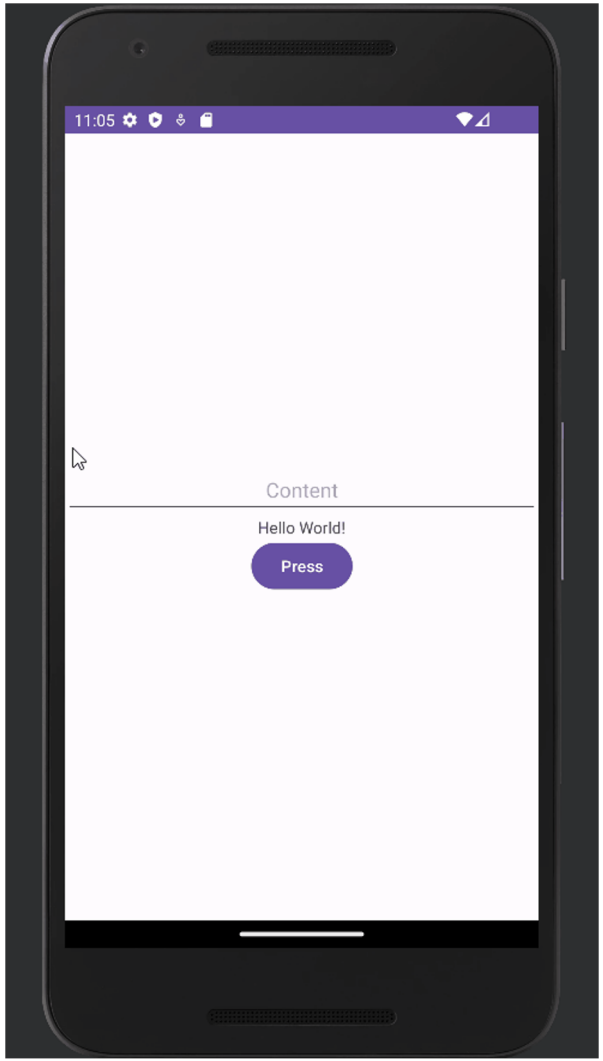


20 mins

Group Exercise (4/4)

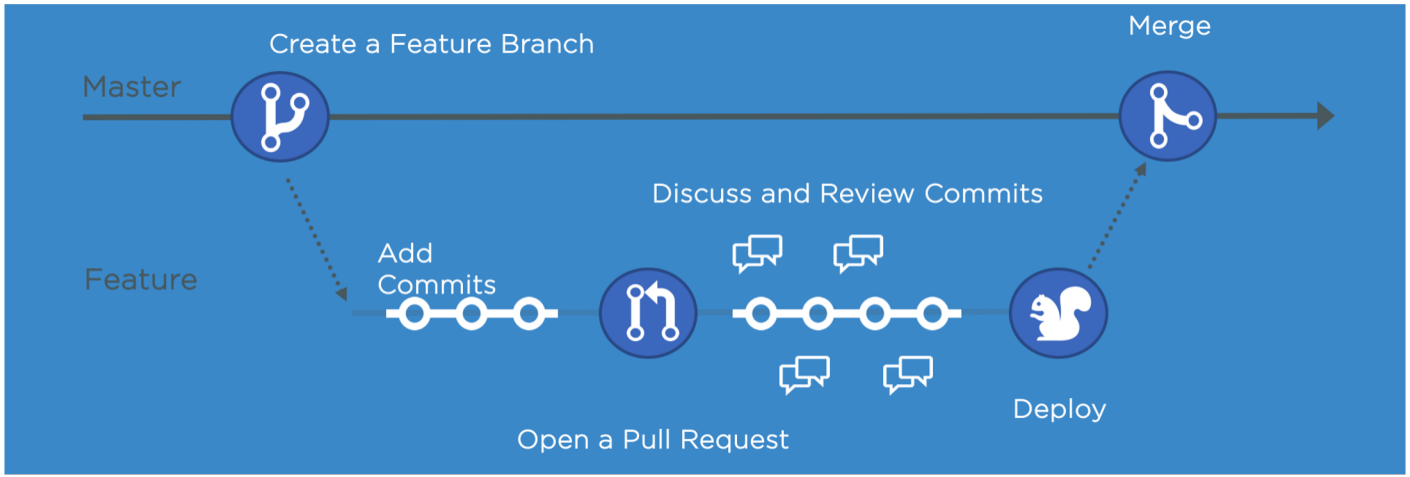
4. Each pair send a pull request with proper content
    - What should you include?
5. Process manager (PM) merge each pull request
    - Discuss with team members to solve the merge conflict

- Deadline: 25.10.12 23:59


11:05
Content
Hello World!
Press

Git for the Term Project (1/7)

- You will use **GitHub flow**
- Only tested codes can be `merged` into the `master`
- Project manager (PM) must review PRs



1

1. https://github.com/SvanBoxel/release-based-workflow/issues/1

Git for the Term Project (2/7)

1. Each pair implements a feature
    a. `git switch master`
    b. `git switch -c feat/<feature name>`
    c. `git commit --author="NAME <EMAIL>"`
        i. E.g., "Wootack Kim <wootack.kim@hcs.snu.ac.kr>"
        ii. Pair programming encourages frequent switch of driver
        iii. The number of commits inside a pair should be balanced
    - Must include **unit test** from iteration 3

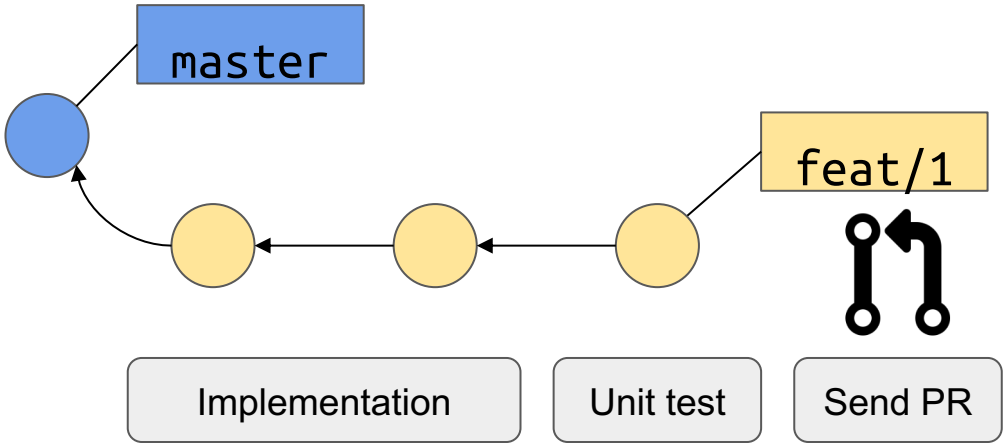
Git for the Term Project (3/7)

```
commit 4f819ba8932c1203ec9a9363c6f8e14c2dcba8ef (HEAD -> feat/login)
Author: Wootack Kim <wootack.kim@hcs.snu.ac.kr>
Date:   Sun Sep 17 00:21:23 2023 +0900

    test: add unit test for login

commit c60aef64ea73575aabb504f5f5a8dc245204a432
Author: Hyunsoo Kim <hyunsoo.kim@hcs.snu.ac.kr>
Date:   Sun Sep 17 00:16:23 2023 +0900

    feat: connect frontend and backend

commit a70e37b6bb816a3ecacac3f6f3cd5f27d9e2d9e4
Author: Wootack Kim <wootack.kim@hcs.snu.ac.kr>
Date:   Sun Sep 17 00:15:10 2023 +0900

    feat: add backend operations for login

commit 8fc7d8aa6572da72dbe58c6e4aea12ea97a76239
Author: Hyunsoo Kim <hyunsoo.kim@hcs.snu.ac.kr>
Date:   Sun Sep 17 00:13:45 2023 +0900

    feat: add listeners for each ui component

commit 318d4fdf5d7b6d458130b76e099a9b79d79c826f (master, develop)
Author: Wootack Kim <wootack.kim@hcs.snu.ac.kr>
Date:   Sun Sep 17 00:08:00 2023 +0900

    feat: add login UI
```

- Number of commits balanced
- Includes unit test

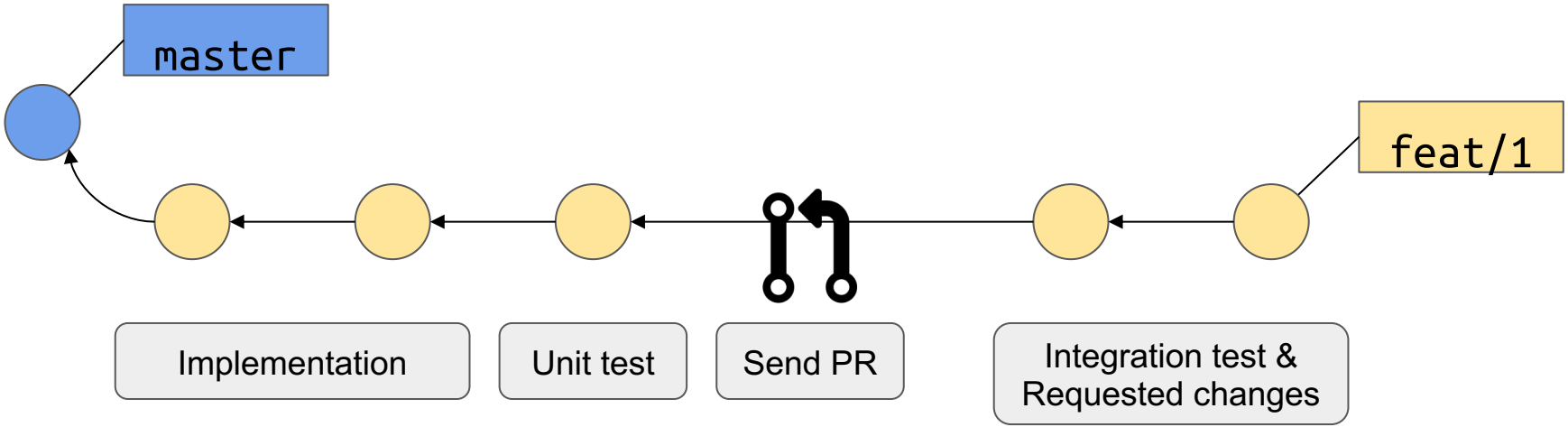
Git for the Term Project (4/7)

2. Each pair sends PR
    a. PM reviews the PR
    b. Requests changes to the pair



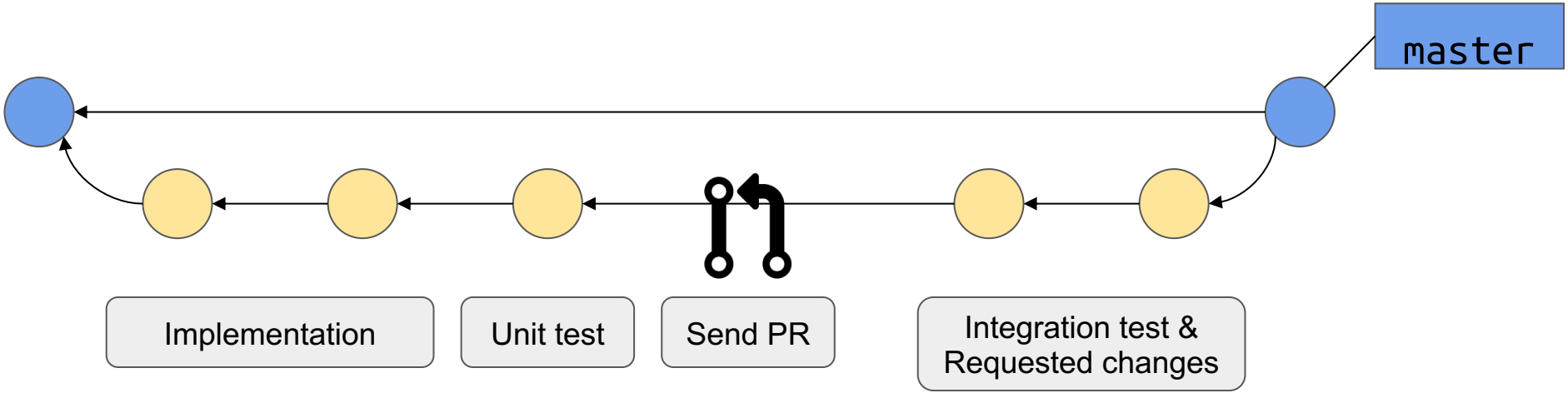
Git for the Term Project (5/7)

3. Prepare `merge`
    a. Pair handles requested changes
    b. PM writes integration test code (from iteration 3)



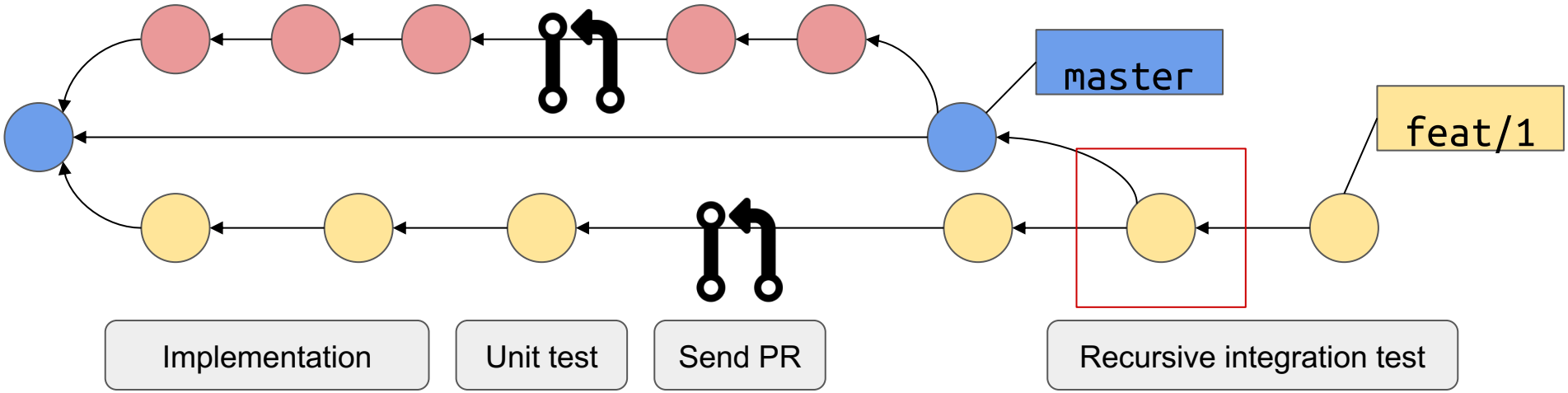
Git for the Term Project (6/7)

4. Integration test and `merge`
    a. If test fails, repeat step 3
    b. Remove `merged` branches



Git for the Term Project (7/7)

- Recursive integration test
  - If the `master` is updated, integration test should reflect it



Git for the Term Project - Tips (1/2)

- Please avoid using `rebase`
  - We will check commit metadata
- Delete `merged` branches
  - `master` is the one and only permanent branch
- Switch role while pair programming
  - Reflect it by setting the author of the commit
- Do not `merge` before passing the integration test
  - Do recursive integration test

Git for the Term Project - Tips (2/2)

- Do not let Git to manage your private information
- Isolate private file and add it into the `.gitignore`
  - In Android Studio, use `properties` file

main.js

.gitignore

```
mysql_connection.json
```

mysql_connection.json

```
{
        “password”:
“1q2w~~”
}
```

Summary

- Fork and send PR for projects which are not yours
- Resolving merge conflict
- GitHub flow in term project
  - Balanced commits
  - Unit test before PR
  - Recursive integration test before merge

Supplementary Materials

- MIT Missing Semester - Version Control (Git)
- Pro Git (2nd)
- Writing a proper GitHub issue
- More Practice on Using Git

Thank You.
Any Questions?