LAB II LECTURE
Developing with Git

Seoul National University
Graphics & Media Lab

Today's Contents

- Introduction
- Setting up Git / Git Basics
  - Install and Config
  - Init local
  - Clone
  - Make changes in git repository

- Basic Branching / Merging

Big Game Company

Graphics

User Interface

Simulation

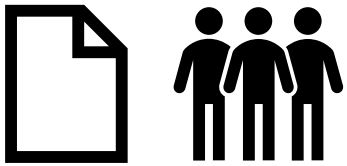
Game Management

Battle Management

Etc…

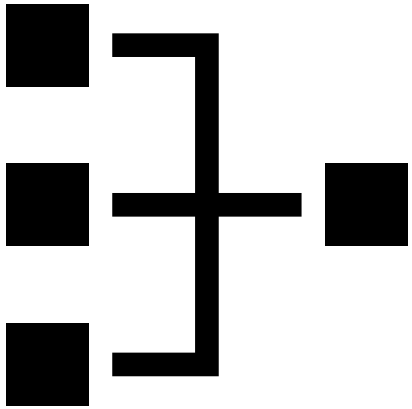
Working Together

Obtain well-cleaned source files without any conflicts to other source files



Graphics.cpp

- Graphics
- User Interface
- Simulation
- Battle Management
- Game Management
- Etc…



Version Control

- We want to keep previous works
  - We may want to restart from previous work
- The simplest way => Make copies
  - Too many copies in the end: 100+ revisions = 100+ copies?
  - Hard to distinguish between versions

- Things will get uglier in a team projects

문서집계표(최종).HWP
문서집계표(최종수정).HWP
문서집계표(최종수정컨펌).HWP
문서집계표(컨펌V1).HWP
문서집계표(컨펌V2).HWP
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문서집계표(회장님지시수정).HWP
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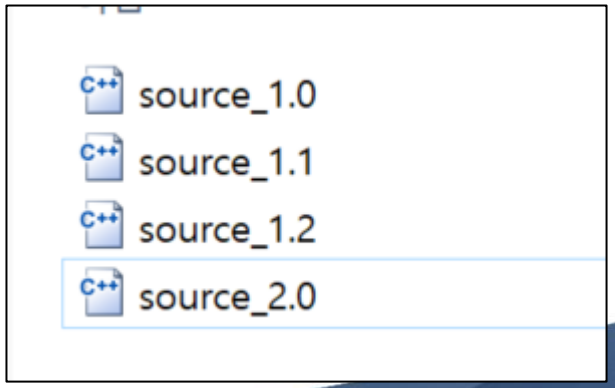
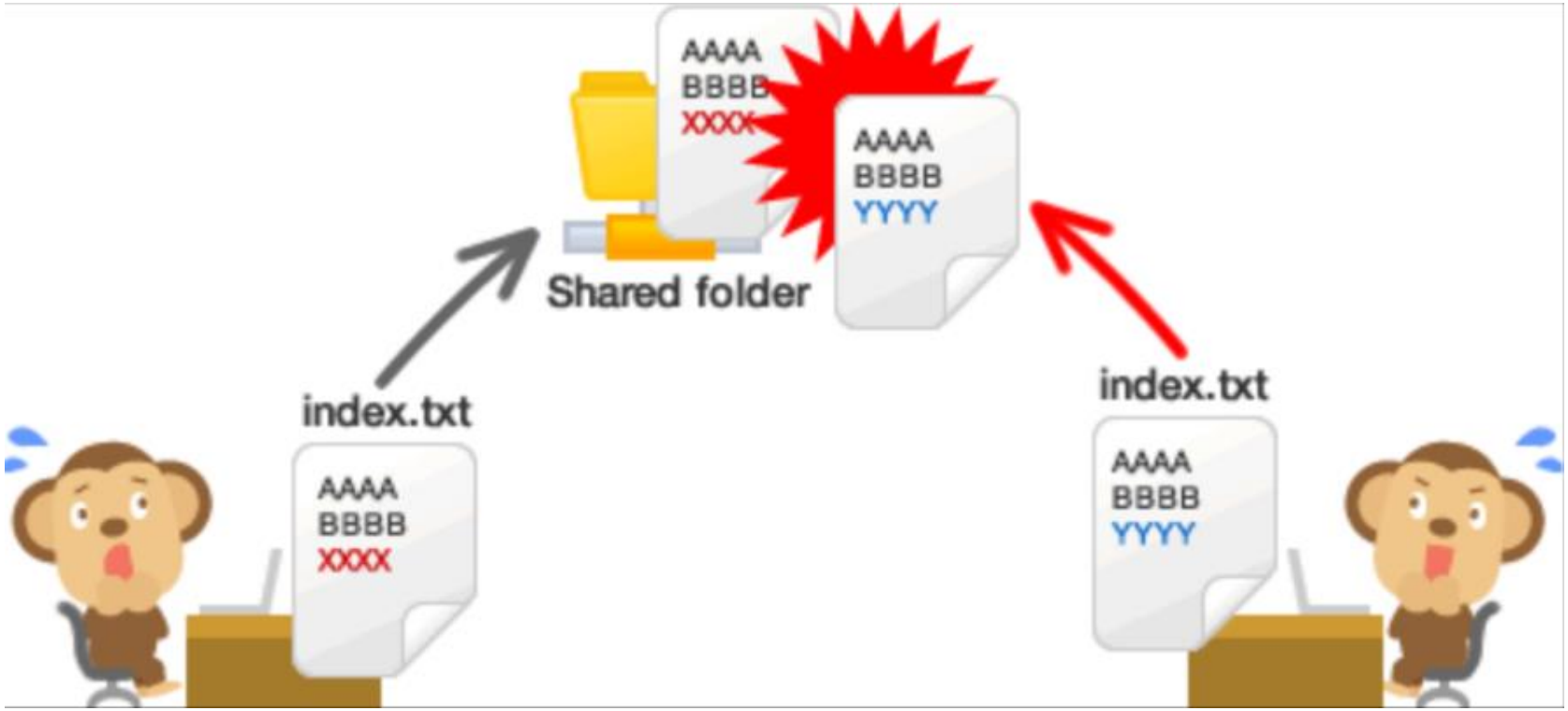
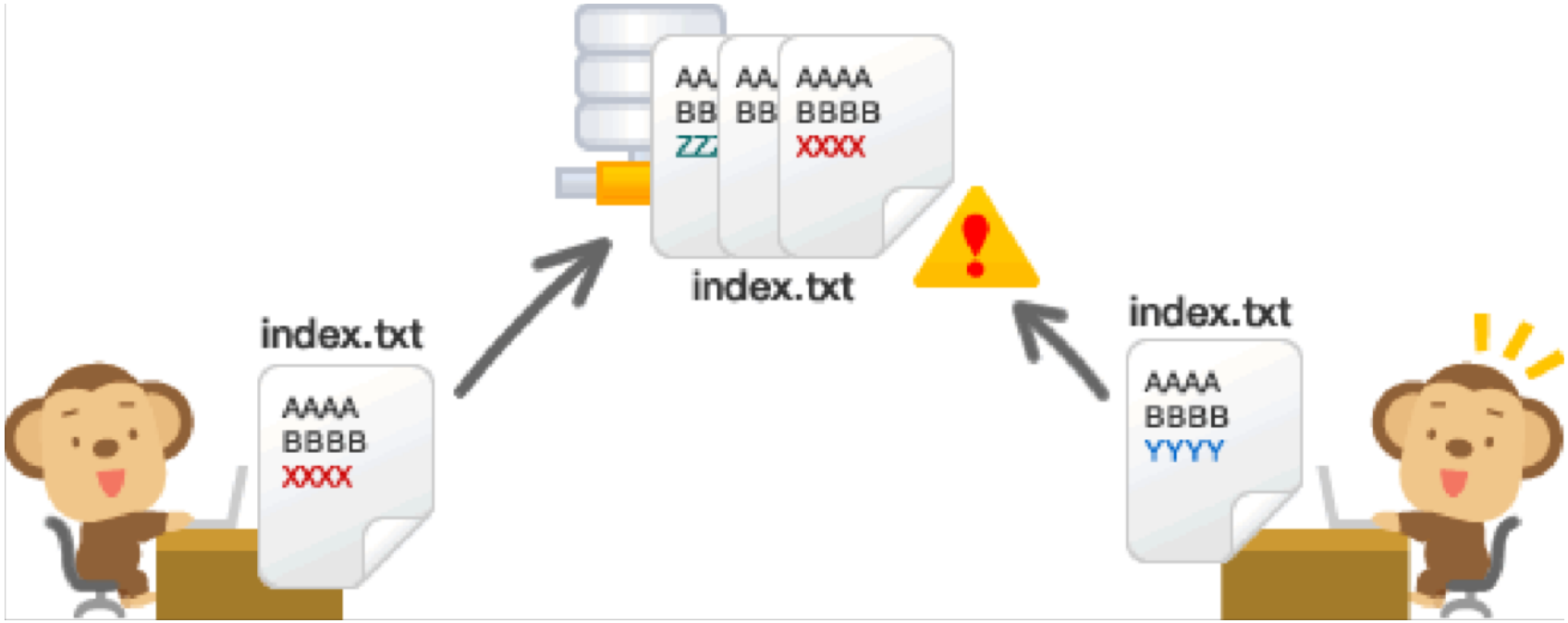


Conflicts occur when working in teams

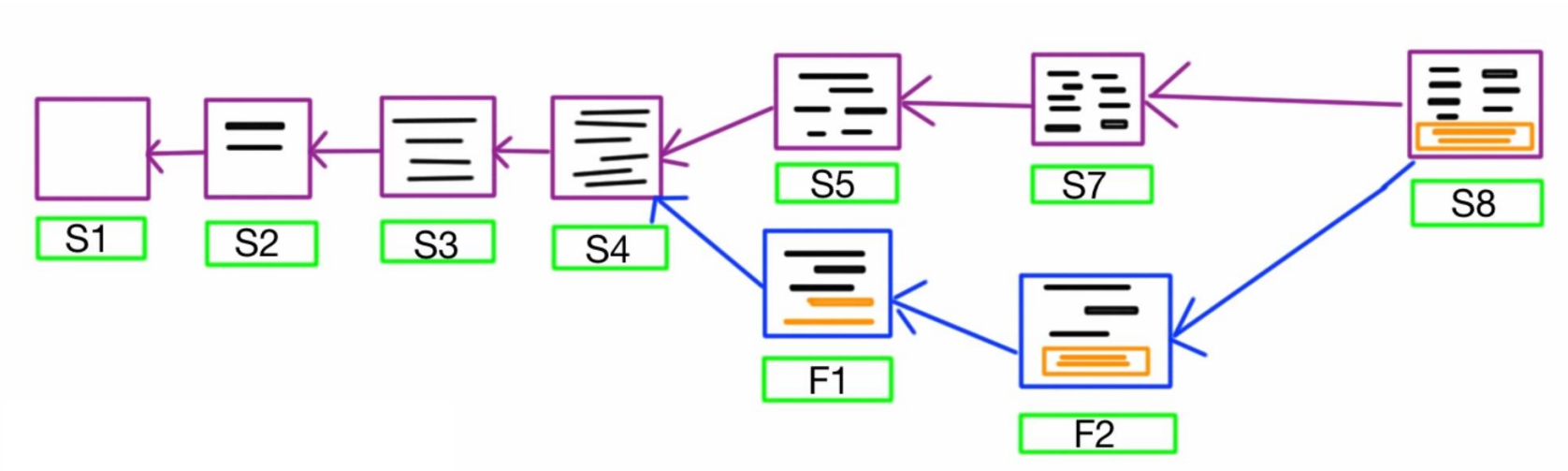


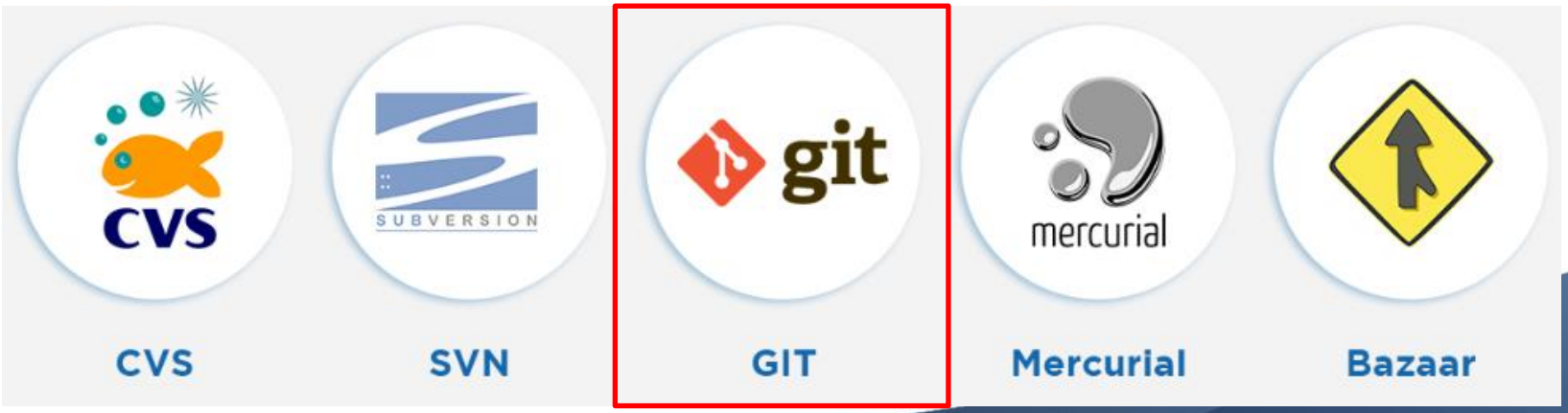
Version Control System (VCS) Supports Teamwork



What is Version Control System?

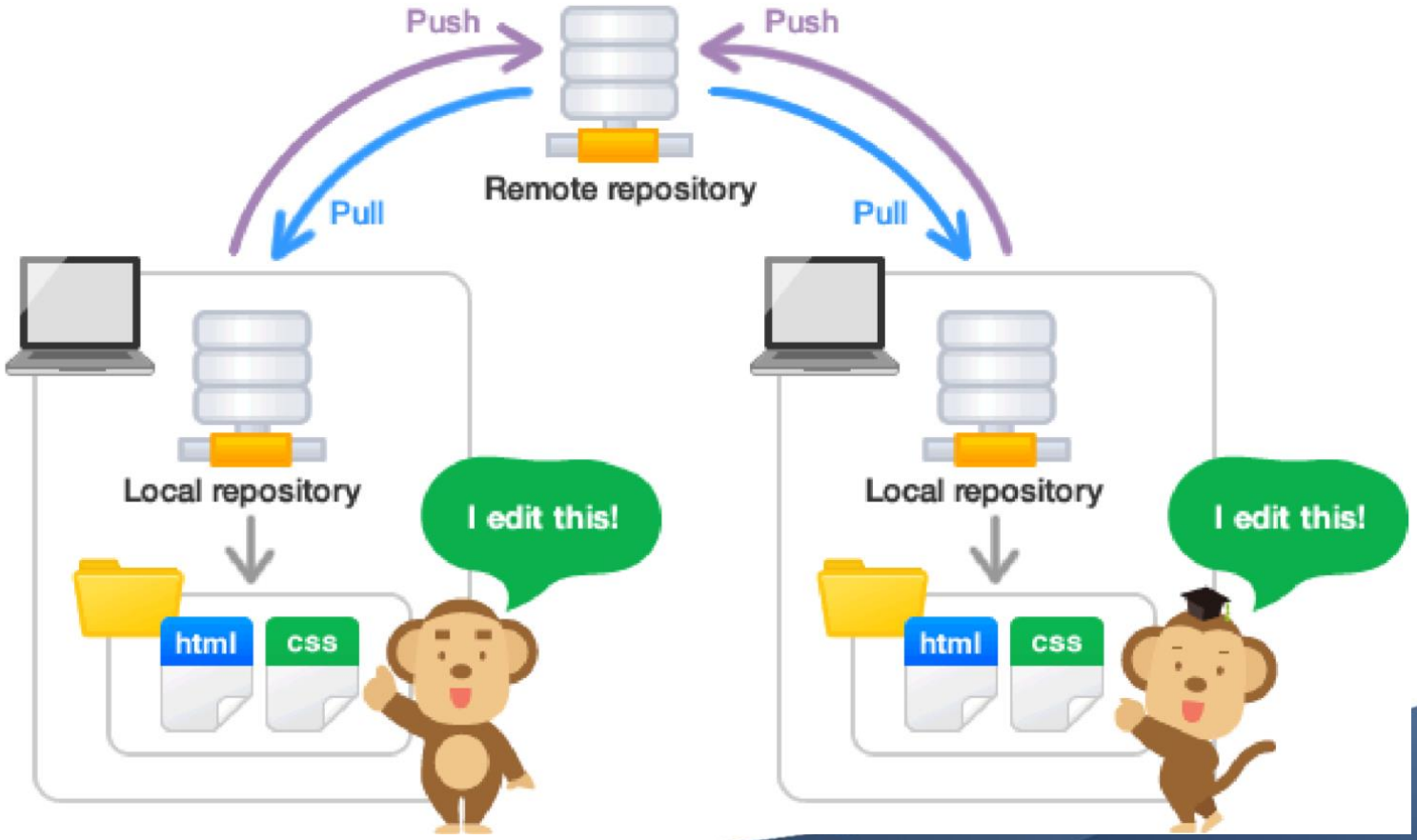
- A system that records changes to the files over time
- User can restore specific versions at any time





What is Git?

- A distributed control system
- Clients fully mirror the repository to the local environment, work in local environments, and updates changes to the server on demand



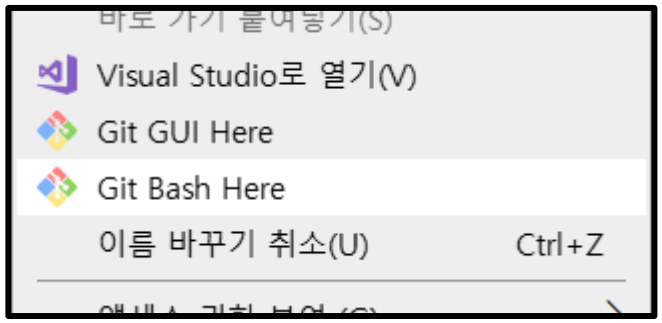
Why Git?

- Developments could be continued even if the server (remote repository) went down
- Each developer can create their own specific revisions and could be merged later
- Many open-source projects use Git and can be easily found in GitHub (https://www.github.com)

Setting up Git

- Download from https://git-scm.com/downloads

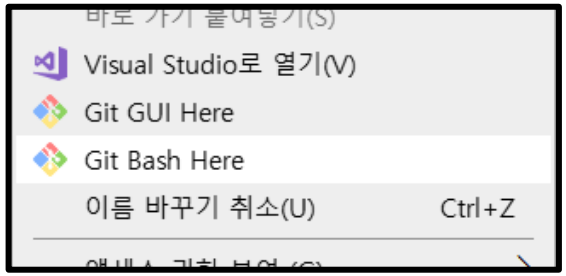
- Invoking Git commands
  - Windows: open a console for Git
    - Right click on the folder ->Click 'Git Bash here'

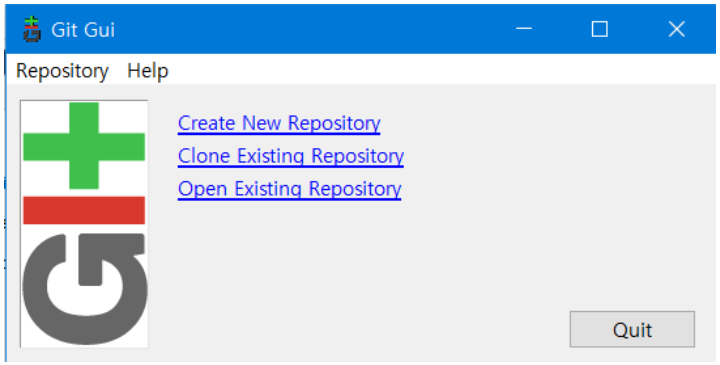


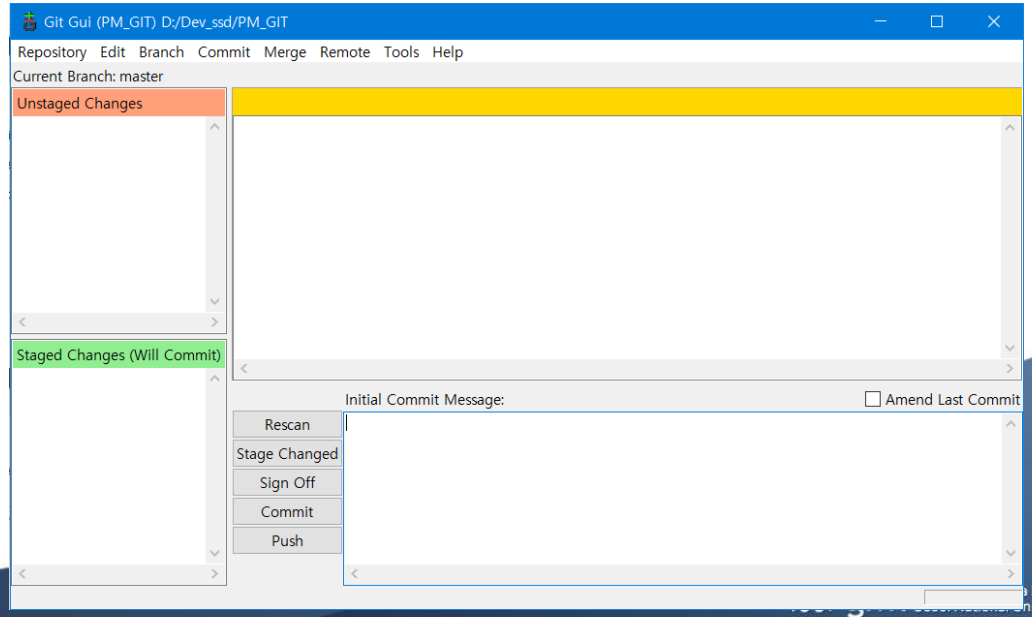
- Basic setup (user name and e-mail)
  - git config --global user.name "Your Name"
  - git config --global user.email yourmail@example.com
- Check setting with
  - git config --global --list

Git Basics: Creating a Git Repository

- To make current working directory as a git repository
  - Using git CLI
    - Open git bash as previous slide where you want to make a git repo.
    - Type git init
  - Using git GUI
    - Open git GUI in the same way as you opened git bash (Git GUI Here)
    - Select "Create New Repository"
    - Choose a directory into which you want to make repo

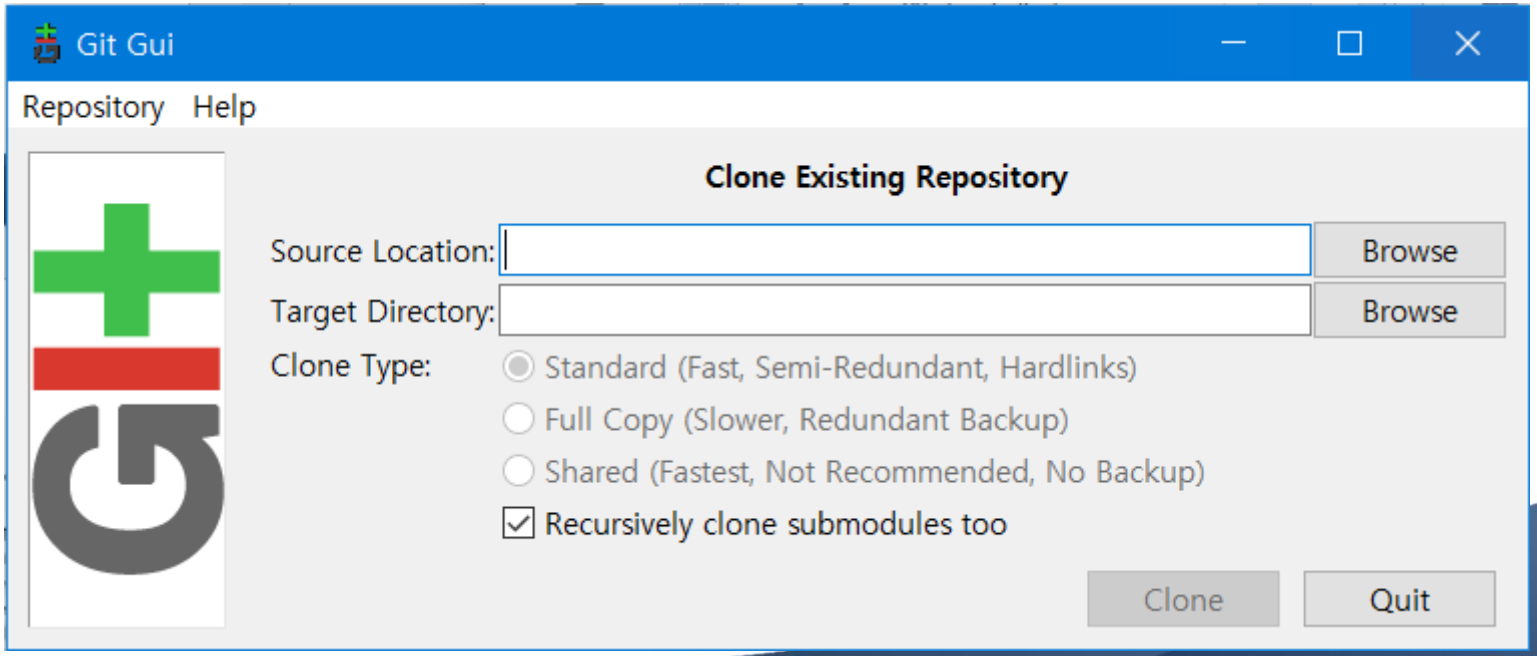






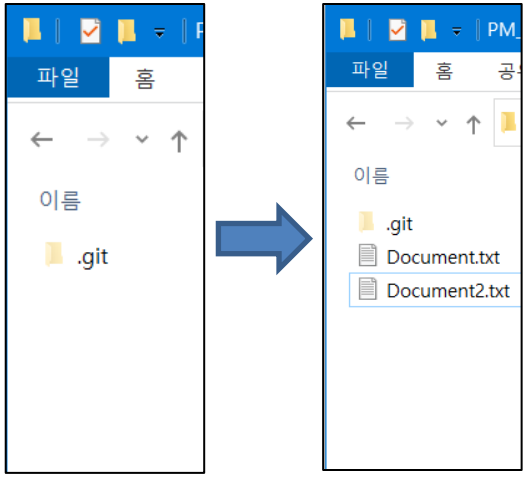
Git Basics: Cloning a Git Repository

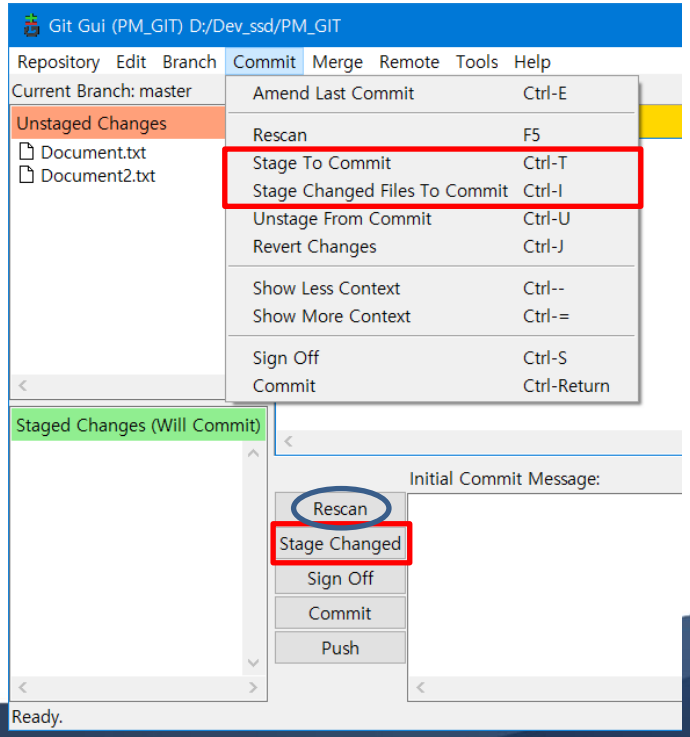
- Or you can clone existing git repository into your workspace
  - Using Git CLI
    - git clone <URL/path to a Git Repository>
    - git clone <URL/path to a Git Repository> <target directory>
  - Using Git GUI
    - Select "Clone Existing Repository"

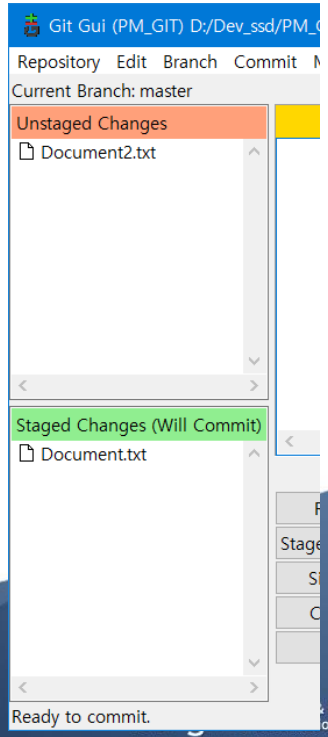


Git Basics: Making Changes in Git Repo Staging

- New or modified files are noticed in GUI, as 'Unstaged Changes'
  - If changes are not shown, click 'Rescan'
- Changes can be added to git by staging
  - Only files that are staged will be committed and versioned in git
  - Stage can be done by clicking Stage Changed Files to Commit (Everything) / Stage To Commit (Selected)

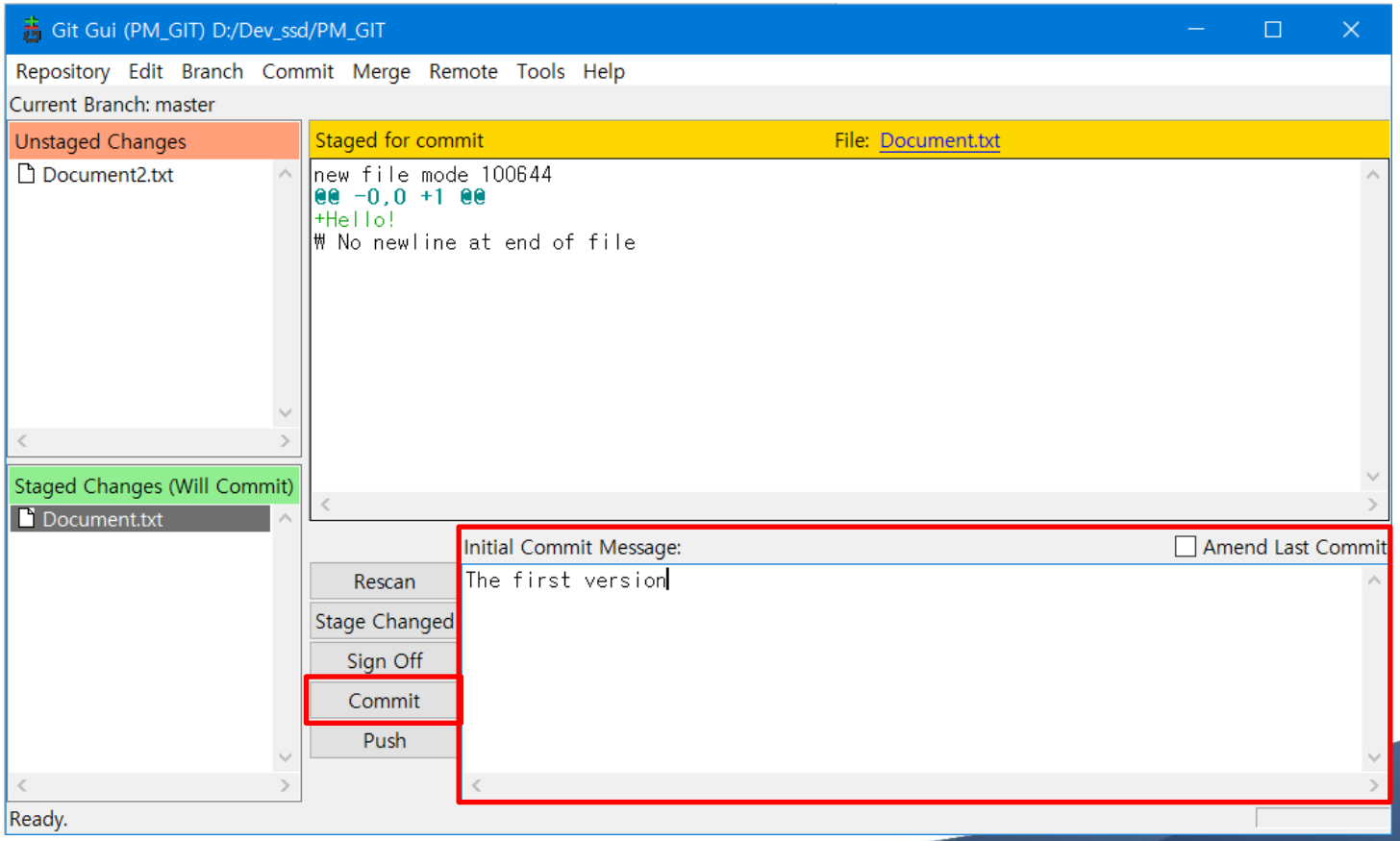






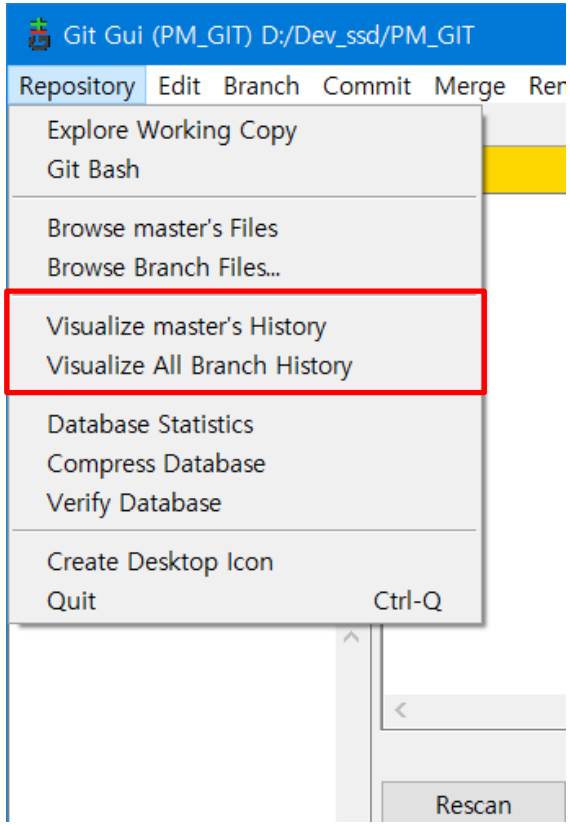
Git Basics: Making Changes in Git Repo Commit

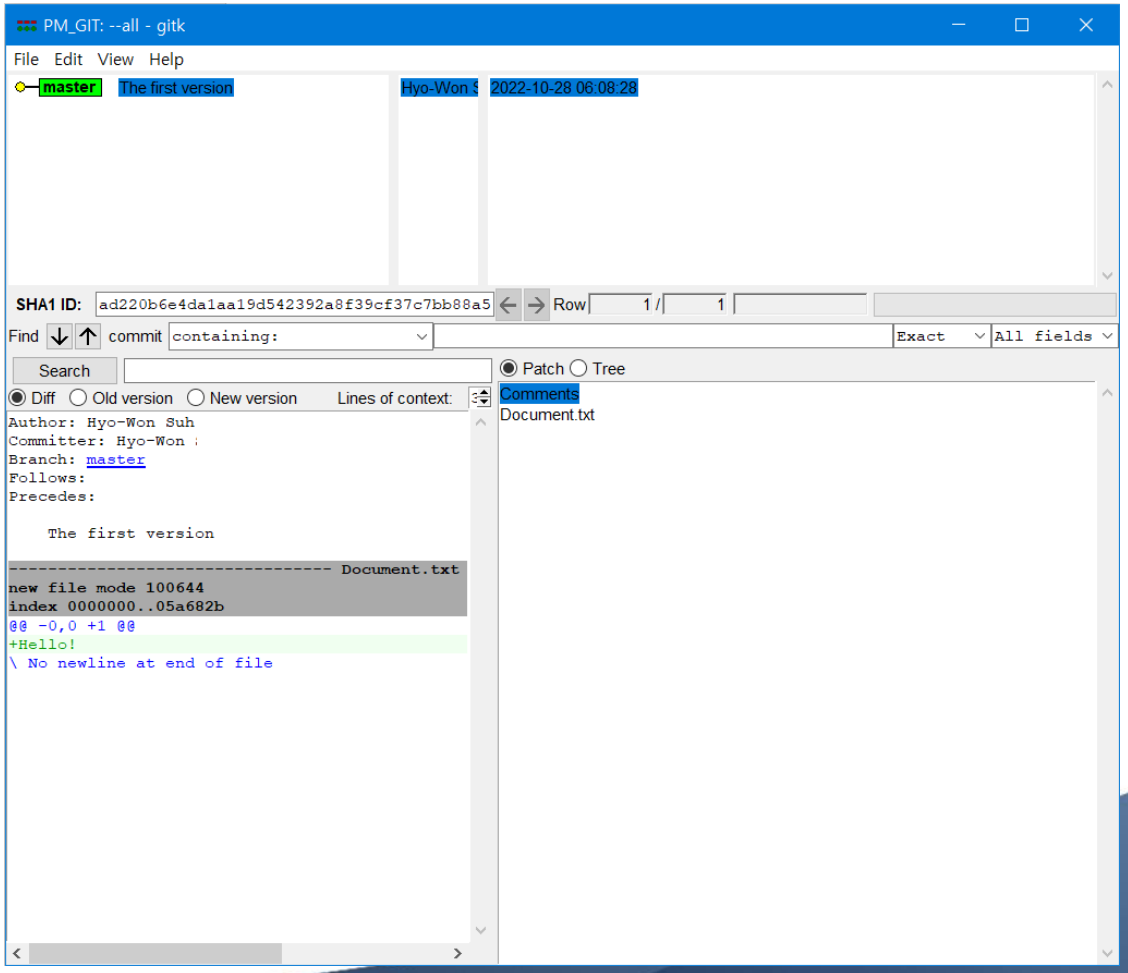
- To make a version from staged changes, type a message and click 'Commit'



Git Basics: Version History

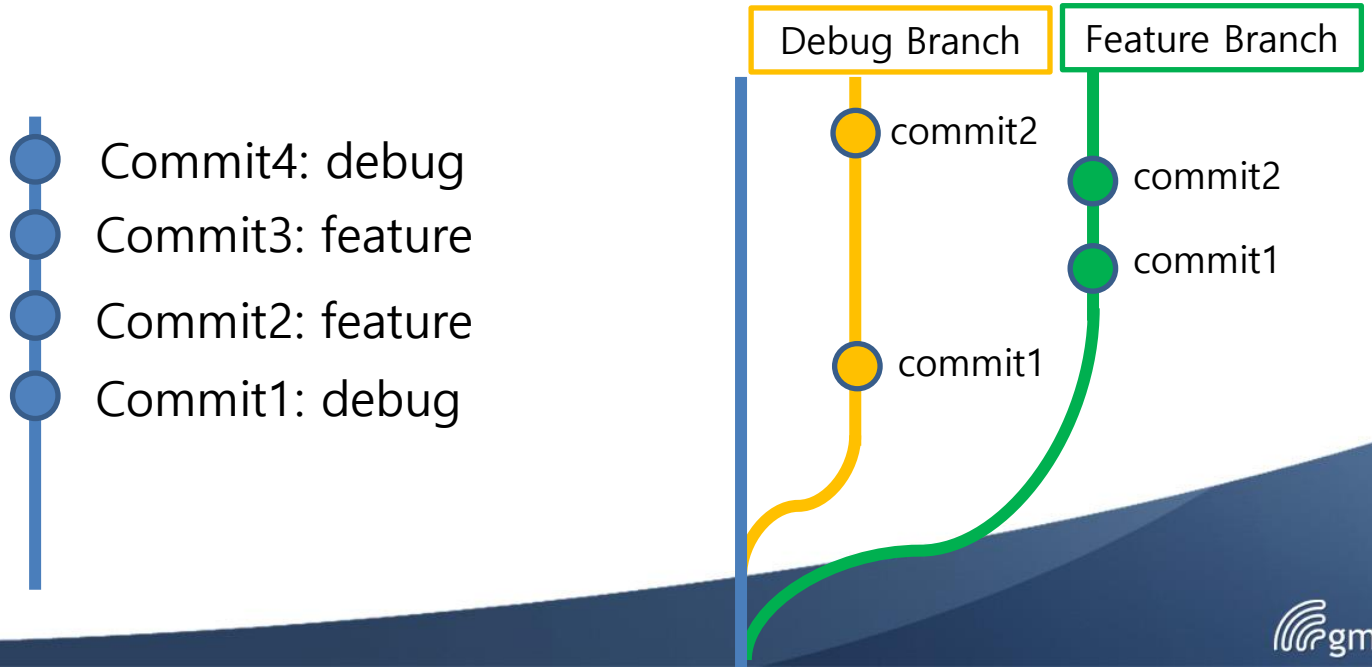
- Version history can be viewed in ‘Visualize All Branch History’





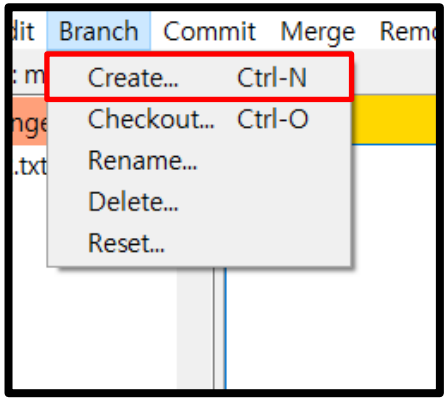
Branching

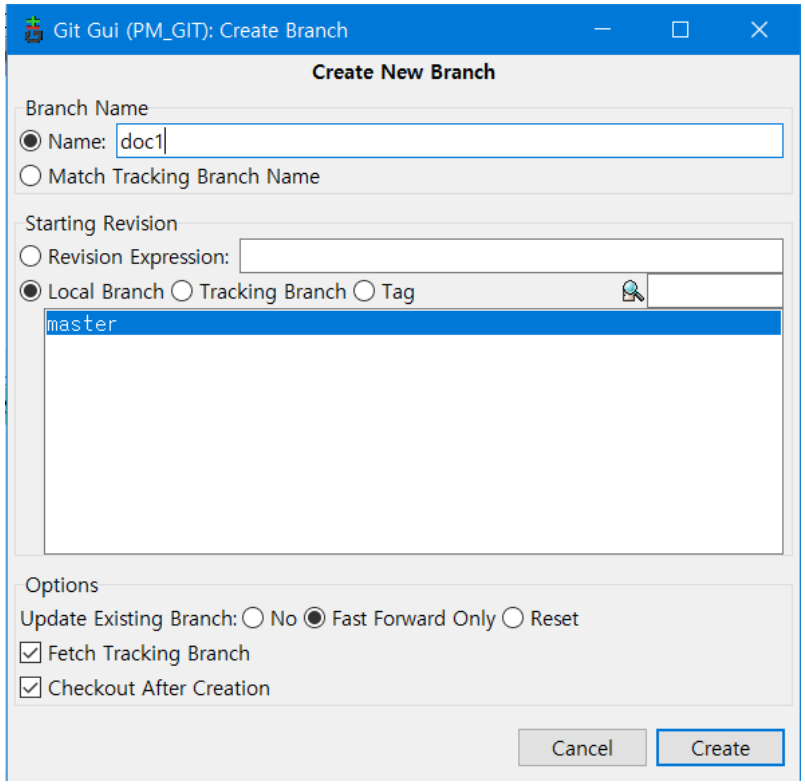
- In a collaborative environment, it is common for several developers to share and work on the same source code
  - For instance, some developers is fixing bugs while others are implementing new features
  - In such case, committed versions is hard to follow because it is hard to know which part of the project the commit is related to
- Make a "branch" with meaningful name which will be an independent line of development (debug, feature, etc.)
- Branches make the history of the version easy to read



Branching in Git

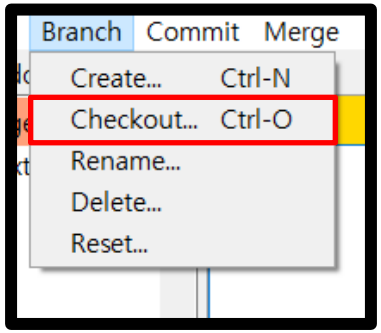
- Every git repository has the ‘master’ branch by default
- Additional branches can be created using ‘Branch>Create’ menu

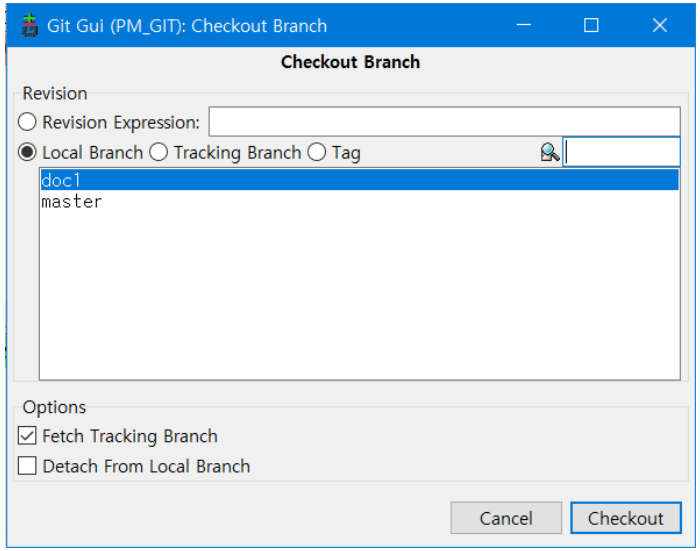


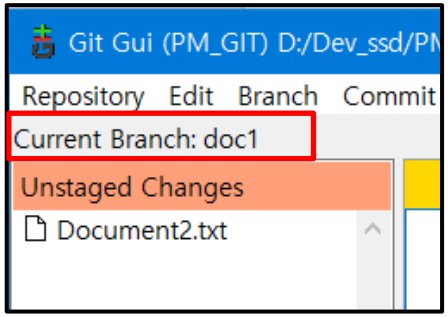


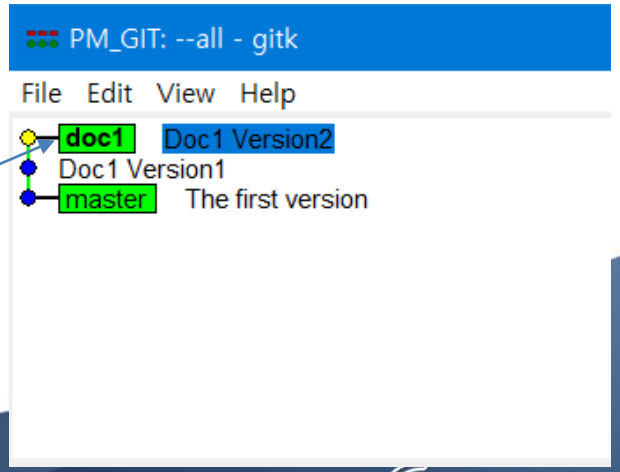
Switching Branch

- "Checkout" the branch you wish to work on
  - Branch>Checkout





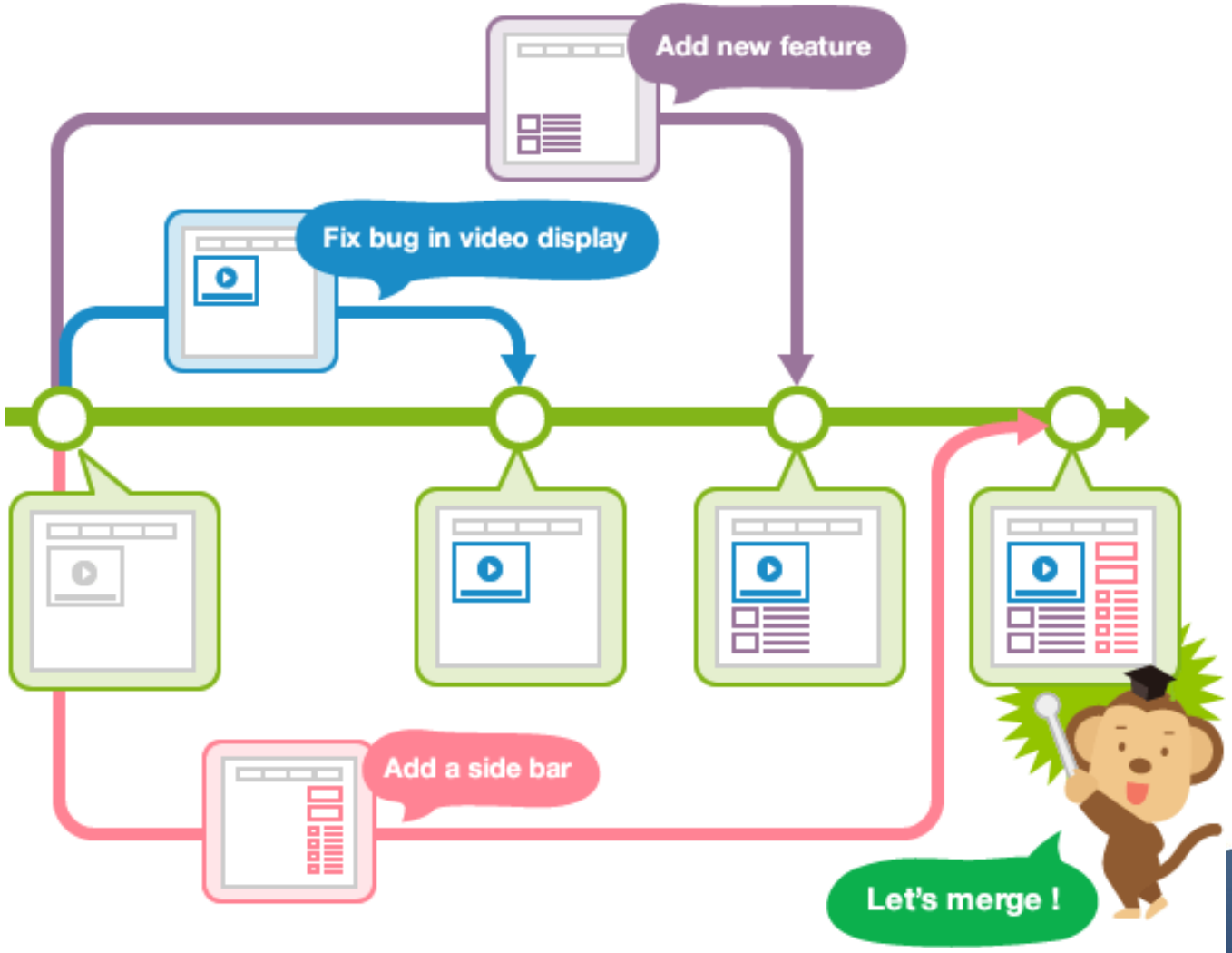




HEAD
last commit
of a branch

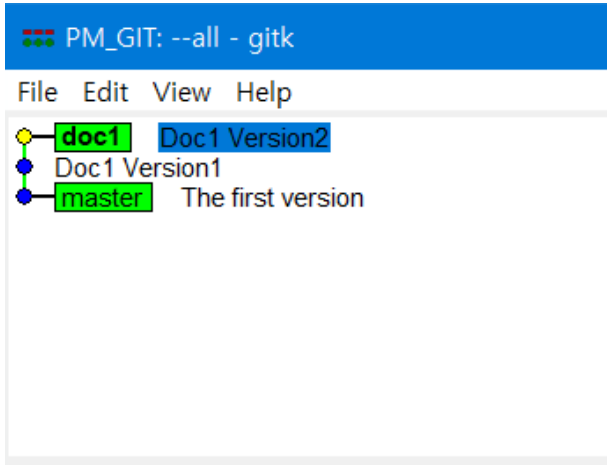
Merging

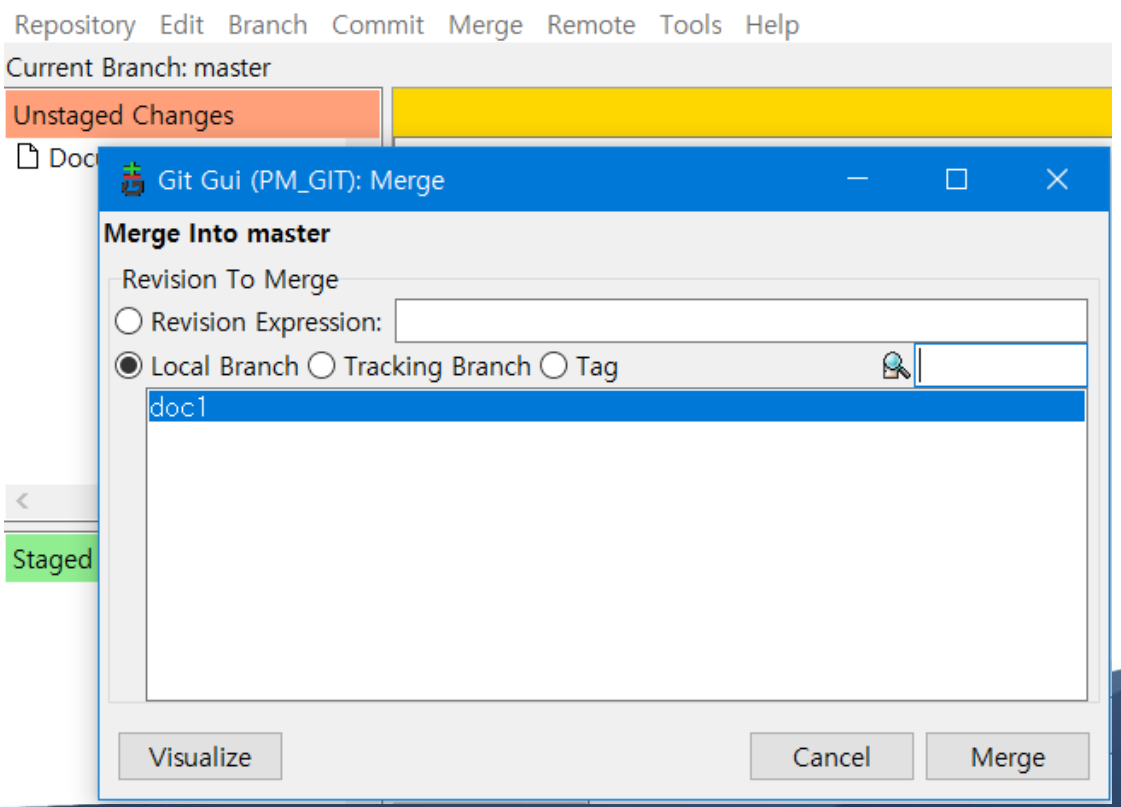
- Different branches can be **merged**



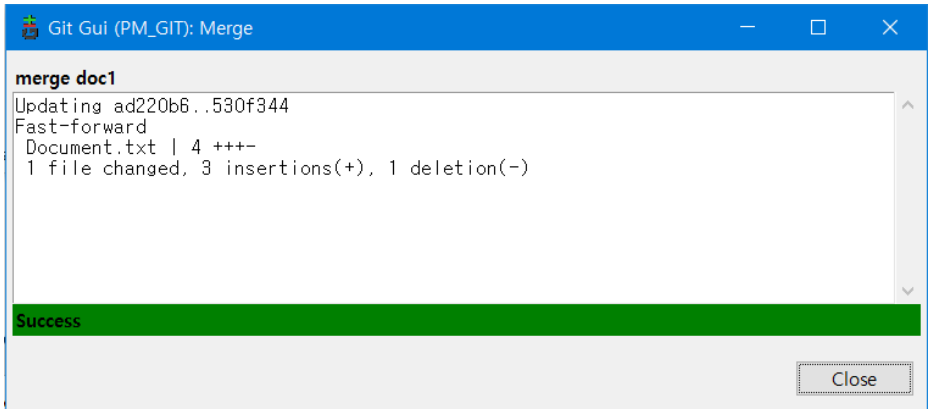
Merging

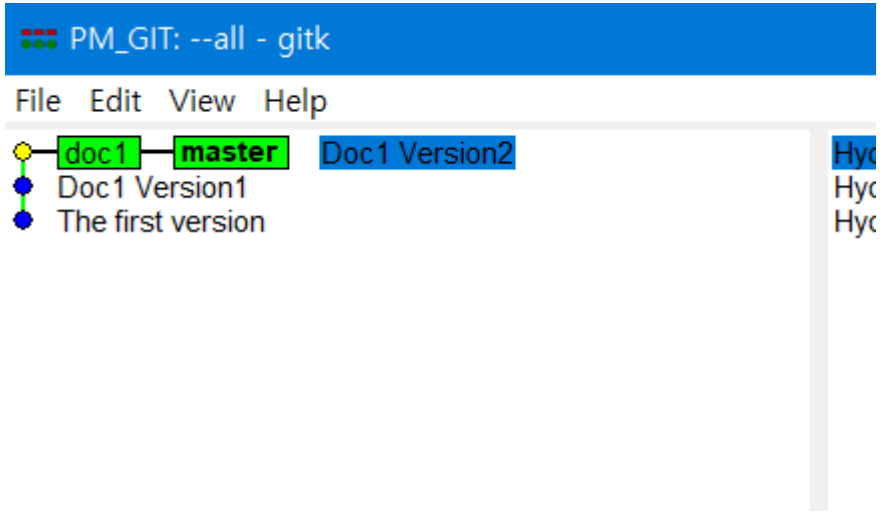
- Combine the revision of Doc1 to master by merge menu
  - Checkout to master branch first
  - Go to Merge>Local Merge and select a branch to merge





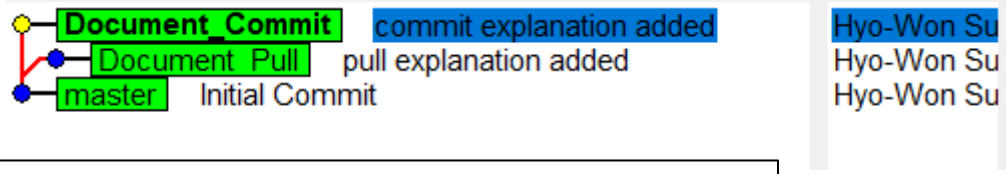
Merge Result





Conflicts

- Automatic merge cannot be performed when there are any 'conflicts' between branches
  - For instance, a file is modified in both branches, so that contents are not same
  - In the example, we are going to merge Document_Commit and Document_Pull branch into master



Git commands even a monkey can understand
add: Register a change in an index

master HEAD

Git commands even a monkey can understand
add: Register a change in an index
pull: Obtain the content of a remote repository

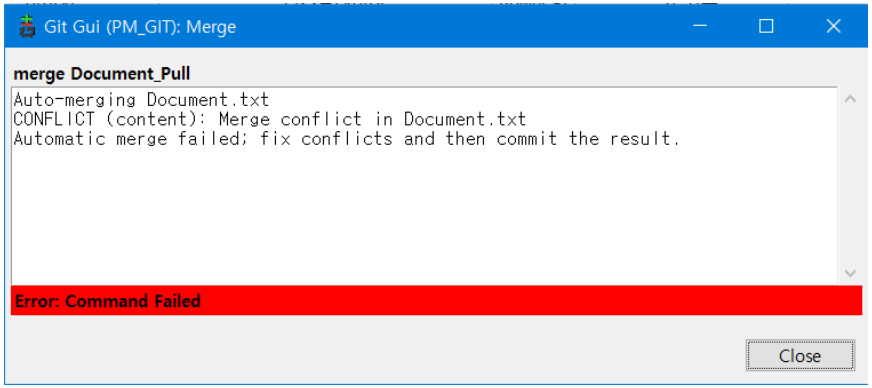
Document_Pull HEAD

Git commands even a monkey can understand
add: Register a change in an index
commit: Save the status of an index

Document_Commit HEAD

Conflicts

1. Merge Document_commit into master
   - Automatic merge should be done without any conflicts
2. Merge Document_pull into master
   1. Conflicts occurs and automatic merge fails



Git commands even a monkey can understand
add: Register a change in an index
commit: Save the status of an index

Document_Commit HEAD
Master HEAD

Git commands even a monkey can understand
add: Register a change in an index
pull: Obtain the content of a remote repository

Document_Pull HEAD

Resolving conflicts

- To resolve conflicts, modify files which caused conflict

```
  Git commands even a monkey can understand
  add: Register a change in an index
- commit: Save the status of an index
 -pull:Obtain the content of a remote repository
  <<<<<<< HEAD
++commit: Save the status of an index
  =======
++pull:Obtain the content of a remote repository
  >>>>>>> fc0dec9d83a4724cde9b6f962f6f02a3a5bdb12a
```

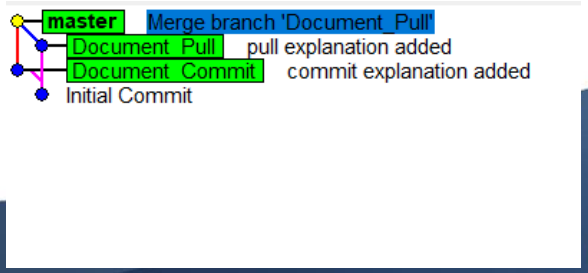
Version in HEAD (currently master)

Version in Incoming (commit ID)

Modify

Git commands even a monkey can understand
add: Register a change in an index
commit: Save the status of an index
pull:Obtain the content of a remote repository

Stage and commit



Appendix: Git CLI commands

- Status command (`git status`)
  - Check the staged (tracked), unstaged (new or modified, but not tracked) files
- commit command (`git commit –m “descriptions”`)
  - Committing last changes and make a version
- Log command (`git log`)
  - Viewing history of commit
  - Difference between files can also be checked using `–p` switch
- `.gitignore` file
  - contains a list of files which should not be tracked
  - log files, any temporary files, etc

Appendix: Git CLI Commands

- Undoing Changes
  - Commit with amend switch (`git commit --amend`)
    - Make additional changes to the latest commit
    - Useful to avoid excessive commits
- Unstaging files (`git reset HEAD FILENAME`)
  - Useful when files are changed, but want to be committed later
- Unmodifying files (`git checkout -- FILENAME`)
  - Reverting files to the latest commit

Appendix: Git CLI Commands

- Branch related
  - Create a branch (branch command)
    - `git branch NAME_OF_BRANCH`
  - Merge with another branch (merge command)
    - `git merge BRANCH_TO_MERGE_WITH`