

# Git & GitHub

## QUICK INTRODUCTION

Introduction to Git as a version control system:  
concepts, main features and practical aspects.

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POLITECNICO  
DI TORINO



# Goal

- What is Revision Control?
- What is Git?
- What is GitHub?
- How to access Revision Control with Git and GitHub from within Eclipse?
- What are the Eclipse workflows useful in this course?

# Version Control Systems

Record changes to a file or a set of files over time so that you can recall specific versions later

## Three generations:

1. Local (RCS, SCCS)
2. Centralized (CVS, Subversion, Team Foundation Server)
3. Distributed (Git, Mercurial)



# Basic Concepts

## Repository

- place where you store all your work
- contains every version of your work that has ever existed
  - files
  - directories layout
  - history
- can be shared with the whole team



REPOSITORY

# Basic Concepts

## Working copy

- a snapshot of the repository used for... working
- the place where changes happens
- private, not shared with the team
- it also contains some metadata so that it can keep track of the state of things
  - has a file been modified?
  - is this file new?
  - has a file been deleted?

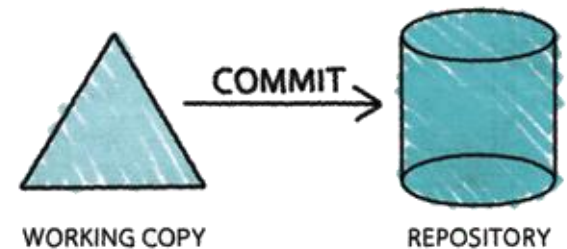


WORKING COPY

# Basic Concepts

## Commit

- the operation that modifies the repository
- atomically performed by modern version control tools
  - the integrity of the repository is ensured
- it is typical to provide a log message (or comment) when you commit
  - to explain the changes you have made
  - the message becomes part of the history of the repository



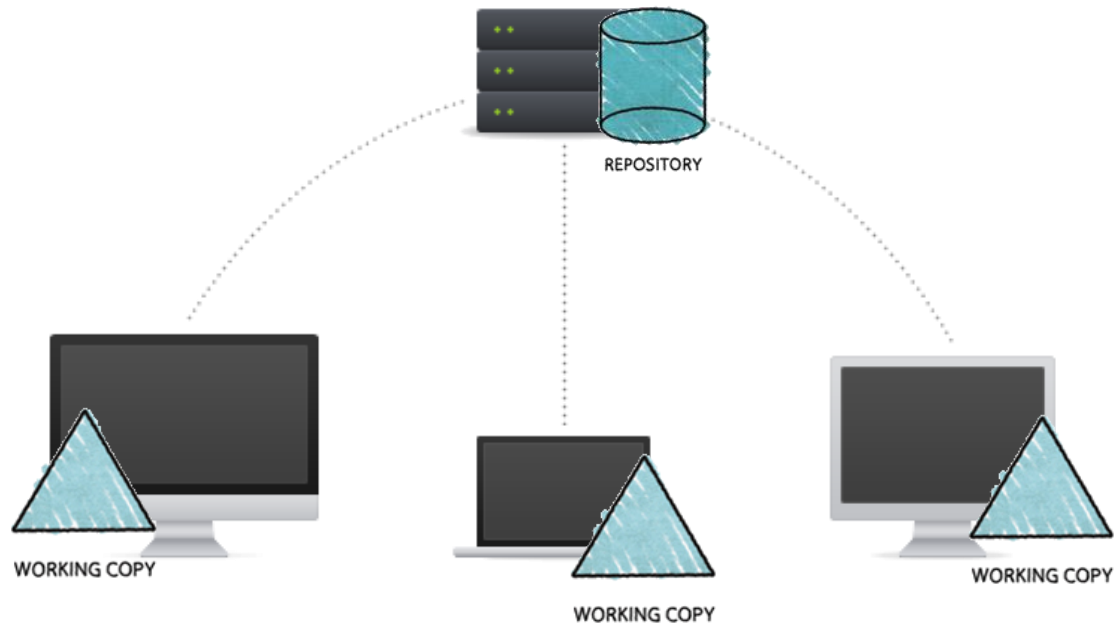
# Basic Concepts

## Update

- update the working copy with respect to the repository
  - apply changes from the repository
  - merge such changes with the ones you have made to your working copy, if necessary



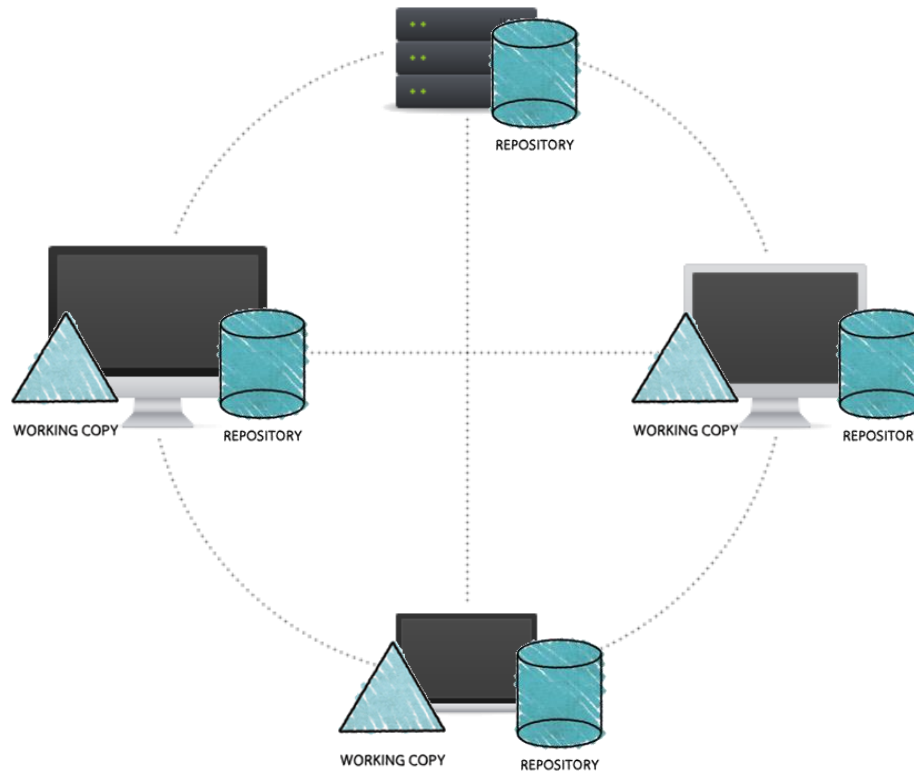
# Centralized Version Control



- one central repository
- client-server relationship



# Distributed Version Control

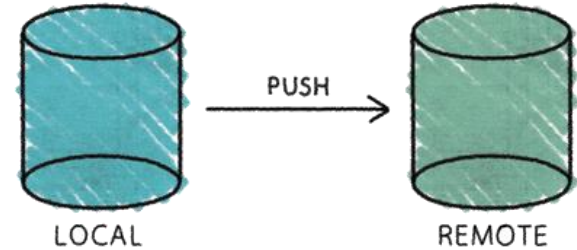


- clients and server have the full copy of the repository
  - local repositories 'clone' a remote repository
- it is possible to have more than one server

# More Basic Concepts

## Push

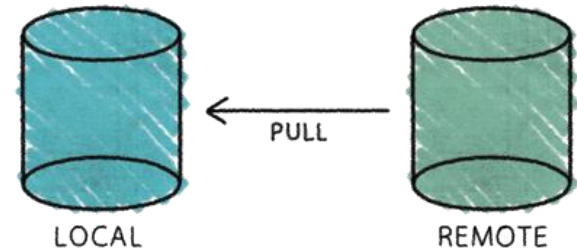
- copy changesets from a local repository instance to a remote one
  - synchronization between two repository instances



# More Basic Concepts

## Pull

- copy changesets from a remote repository instance to a local one
  - synchronization between two repository instances



# Introducing... Git



- Distributed Version Control System
- Born
  - on 2005 for the Linux kernel project
  - to be used via command line
- Website: <http://git-scm.com>
- Highlights:
  - free and open source
  - strong support for non-linear development
  - fully distributed
  - efficient handling of large projects
  - cryptographic authentication of history

# Who uses Git?

Google

facebook

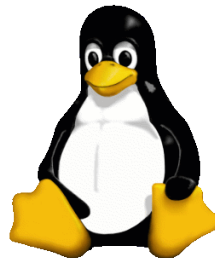


Microsoft



LinkedIn

NETFLIX



# Getting started with Git

- Standard installations
  - <http://git-scm.com/downloads>
- Available for all the platform
- Git Graphical Applications
  - <http://git-scm.com/downloads/guis>
  - Suggestion: GitExtensions, SourceTree
- For this course, Git is
  - integrated in Eclipse (plugin “EGit”)

# Installing Git (outside Eclipse)

- Windows
  - download and install Git from <http://git-scm.com/downloads>
- Linux
  - check if it is already installed
    - open a terminal and type “git”
  - otherwise, install it from your package manager or via <http://git-scm.com/downloads>
- Mac
  - check if it is already installed
    - open a terminal and type “git”
  - otherwise, install it from <http://git-scm.com/downloads>

# Hosted Git

- To have (at least) one remote repository
  - alternative: set up your own Git server!
- Most popular:
  - GitHub, <https://github.com/>
  - Bitbucket, <https://bitbucket.org/>
  - GitLab, <https://about.gitlab.com/gitlab-com/>
  - Sourceforge, <http://sourceforge.net/>
  - CodePlex (by Microsoft), <https://www.codeplex.com/>



# GitHub



- Slightly different than other code-hosting sites
  - instead of being primarily based on the project, it is user-centric
  - social coding
- A commercial company
  - charges for accounts that maintain private repository
  - free account to host as many open source project as you want
  - free Micro plan for students
    - 5 private repositories, unlimited public repositories
    - <https://education.github.com>

# Bitbucket



- Similar to GitHub
- Less used than GitHub, right now
- Mercurial support
- A commercial company
  - free private and public repositories for small team (up to 5 private collaborators)
  - charges for project involving bigger team
  - free for academia (also for students)
    - unlimited public and private repositories
    - unlimited users for single projects

# GitHub Pages

- Website for your (GitHub) repository
  - <https://pages.github.com/>
- FAQ
  - <https://help.github.com/categories/github-pages-basics/>

# For Labs

- Create a personal GitHub account
  - you can also ask for a “student discount” at <https://education.github.com>
- Try Git!
  - <http://try.github.io/>
  - 15 minutes tutorial

# Workflow 1: “Create new project”

- Create a project in Eclipse (normally, or using Maven Archetypes)
- Create the local repository in Eclipse (Team | Share)
- Create a new project in GitHub
- Push changes (Team | Commit&push)

# New Project on GitHub



The screenshot shows the GitHub 'Repositories' page for user TdP-2016. At the top, there is a search bar with the text 'Find a repository...' and a green '+ New repository' button. Below the search bar are tabs for 'All', 'Forks', 'Sources', 'Private', and 'Public', with 'All' selected. A list of repositories is displayed, each with a computer icon and a blue link:

- TdP-2016/[EsIndovinaNumero](#)
- TdP-2016/[Lab1](#)
- TdP-2016/[Lab0](#)
- TdP-2016/[EsContaLettere](#)
- TdP-2016/[WordSet\\_dumb](#)
- TdP-2016/[materiale](#)

## Create a new repository

A repository contains all the files for your project, including the revision history.

Owner:  TdP-2016 / Repository name:

Great repository names are short and memorable. Need inspiration? How about [curly-pancake](#).

### Description (optional)

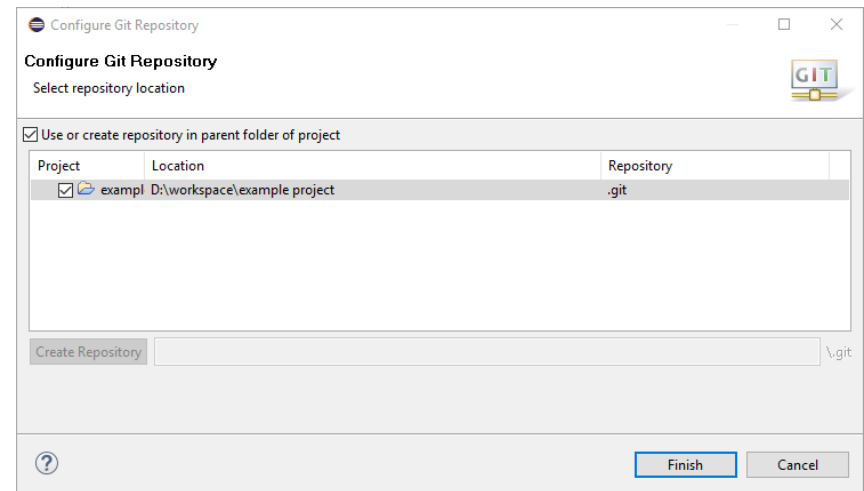
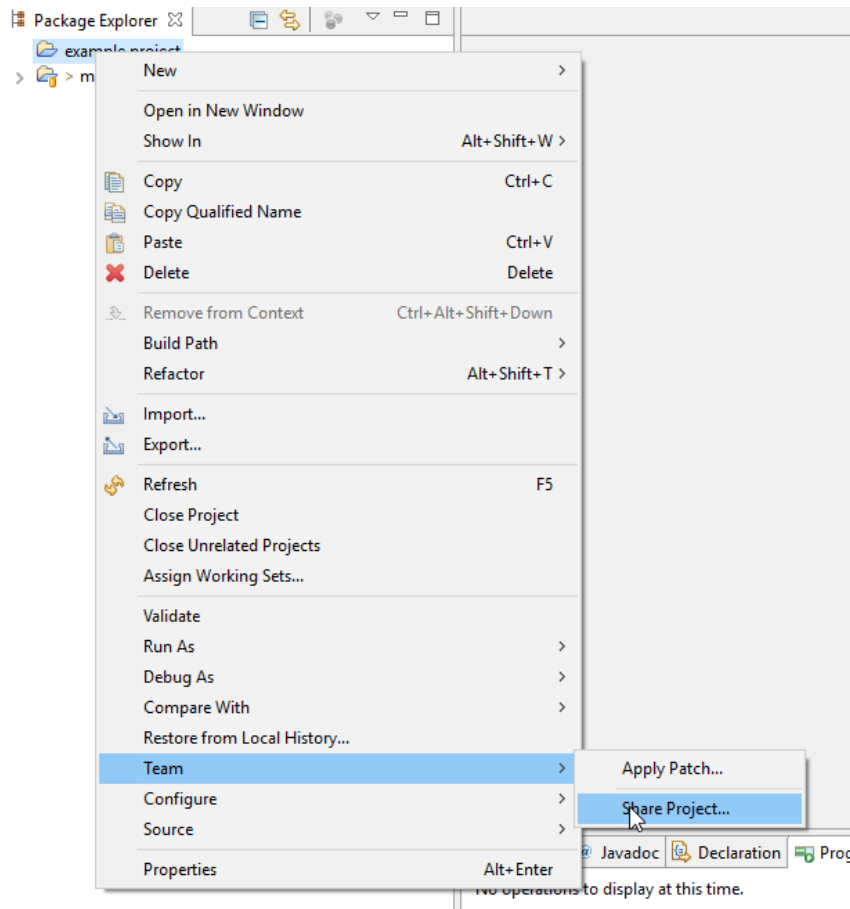
- Public**  
Anyone can see this repository. You choose who can commit.
- Private**  
You choose who can see and commit to this repository.

- Initialize this repository with a README**  
This will let you immediately clone the repository to your computer. Skip this step if you're importing an existing repository.

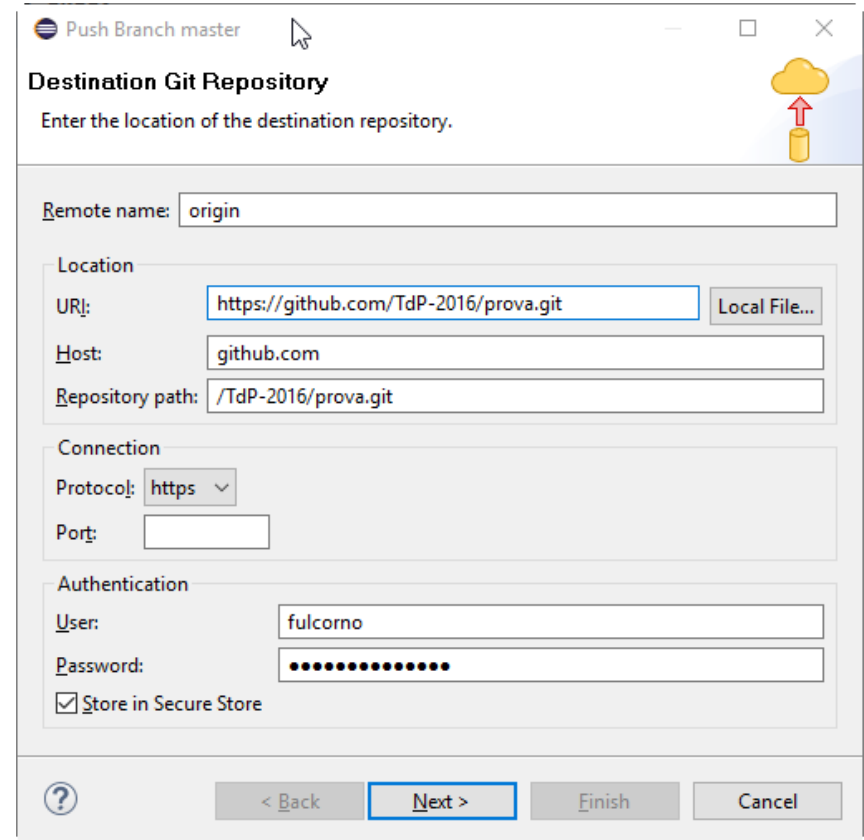
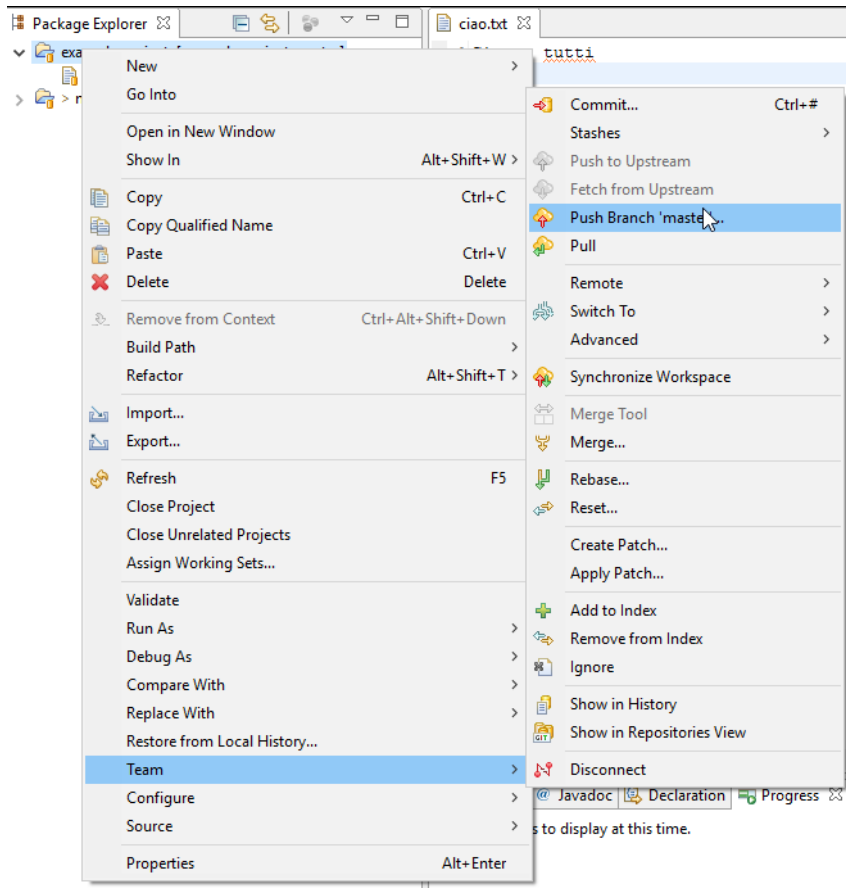
Add .gitignore: **None** | Add a license: **None** ⓘ

**Create repository**

# New repository in Eclipse



# Add remote & push in Eclipse





# Workflow 2: “Work on a project”

- Fork the project in GitHub (you make a copy in your repository)
- Clone your project in Eclipse
- Work on the project
- Commit and Push the changes

# Forking

- “Fork” makes a private copy of some else’s repository
- You may clone, work, and commit on this repository

The screenshot shows the GitHub interface for a repository named 'lab1-fulcorno-studente' under the user 'TdP-2016-Lab'. The repository has 2 watches, 0 stars, and 0 forks. It was created by Classroom for GitHub. The repository statistics show 1 commit, 1 branch, 0 releases, and 1 contributor. The current branch is 'master'. There are buttons for 'New pull request', 'New file', 'Upload files', 'Find file', 'HTTPS', and 'Download ZIP'. The commit history shows a single commit by 'jimmy-sonny' with the message 'First commit' and the hash 'db49503', made 14 hours ago. The commit includes a folder 'Lab1\_Alien' and a file 'ese01.pdf', both with 'First commit' messages and made 14 hours ago.

TdP-2016-Lab / lab1-fulcorno-studente

Watch 2 Star 0 Fork 0

Code Issues 0 Pull requests 0 Wiki Pulse Graphs

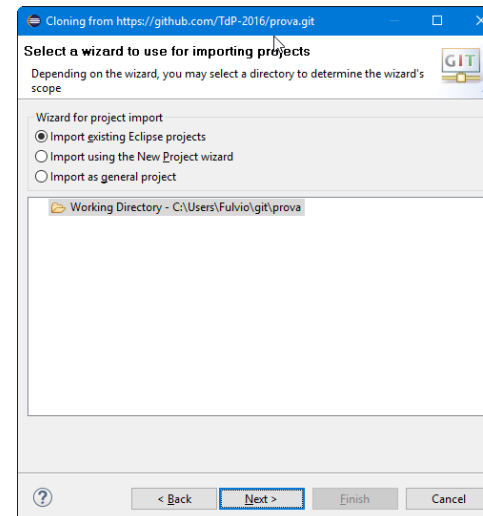
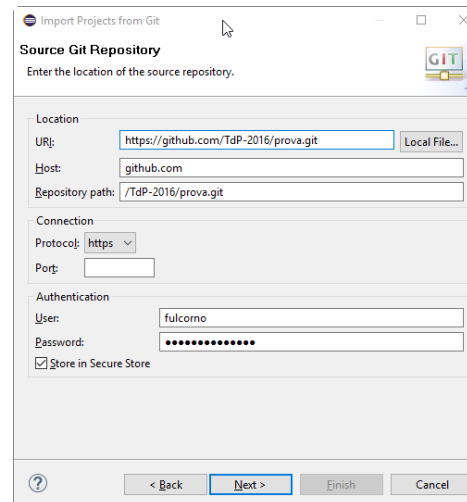
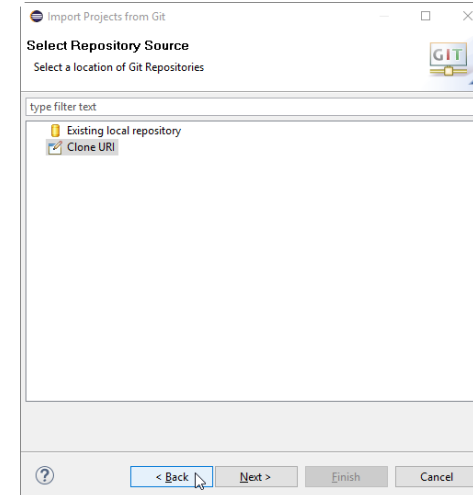
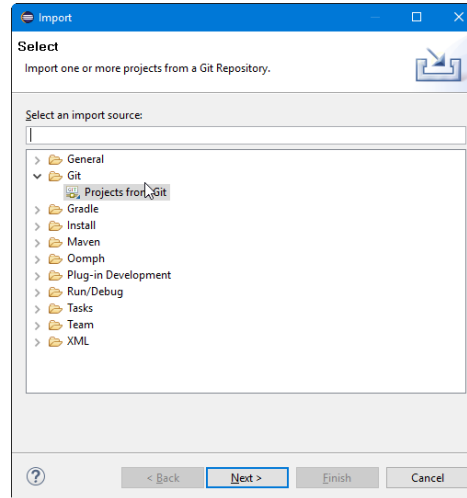
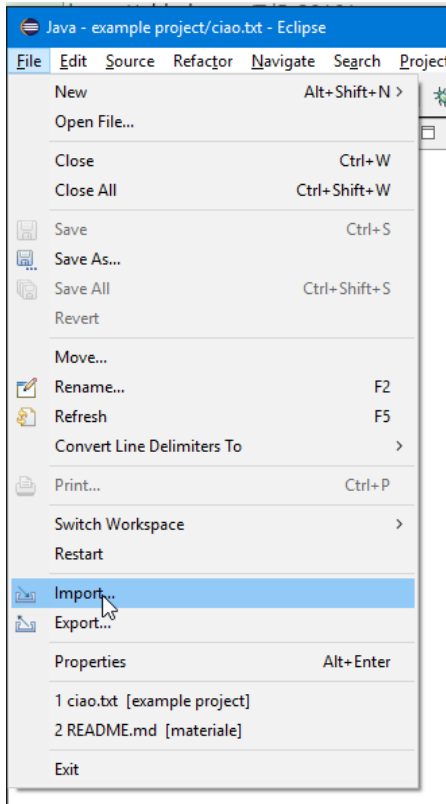
lab1-fulcorno-studente created by Classroom for GitHub

1 commit 1 branch 0 releases 1 contributor

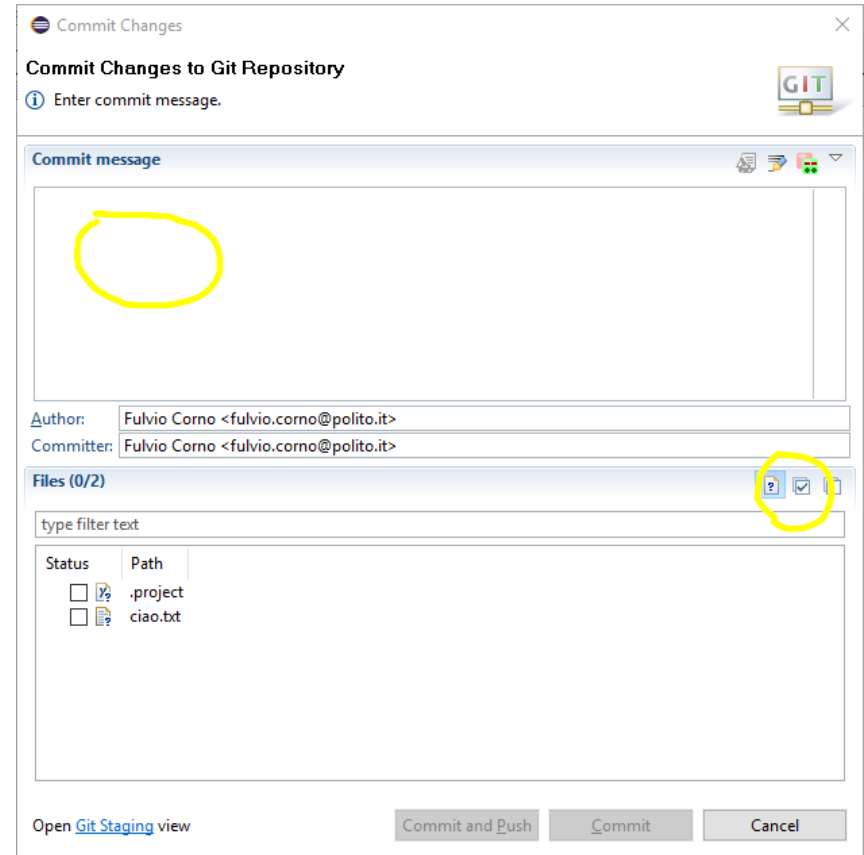
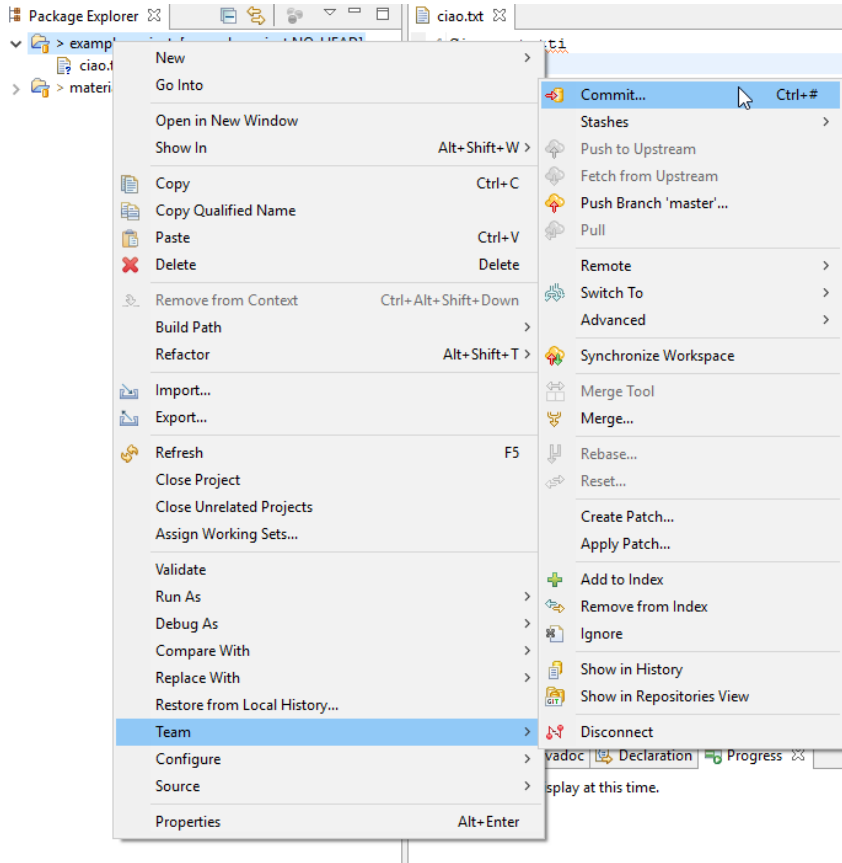
Branch: master New pull request New file Upload files Find file HTTPS https://github.com/TdP-20 https://github.com/TdP-20 Download ZIP

jimmy-sonny	First commit	Latest commit db49503 14 hours ago
Lab1_Alien	First commit	14 hours ago
ese01.pdf	First commit	14 hours ago

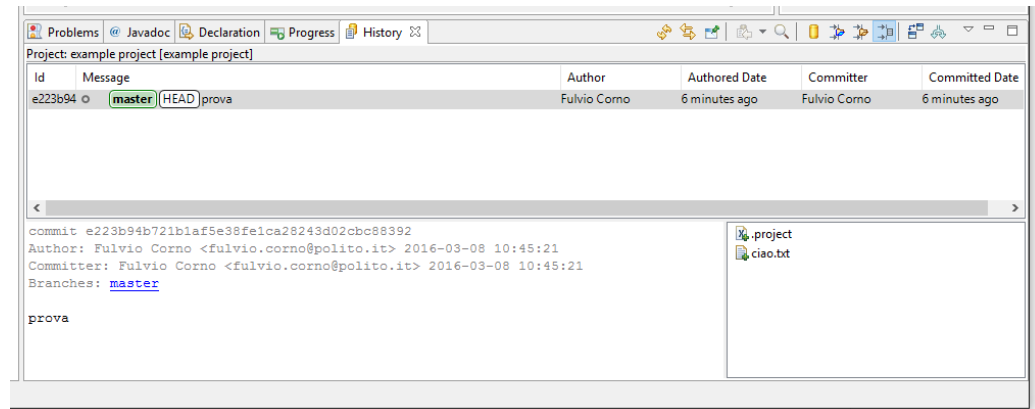
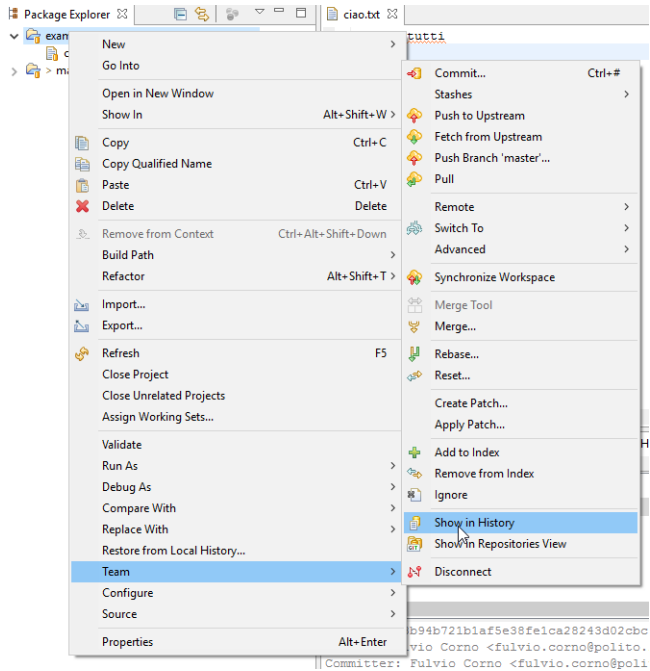
# Cloning in Eclipse



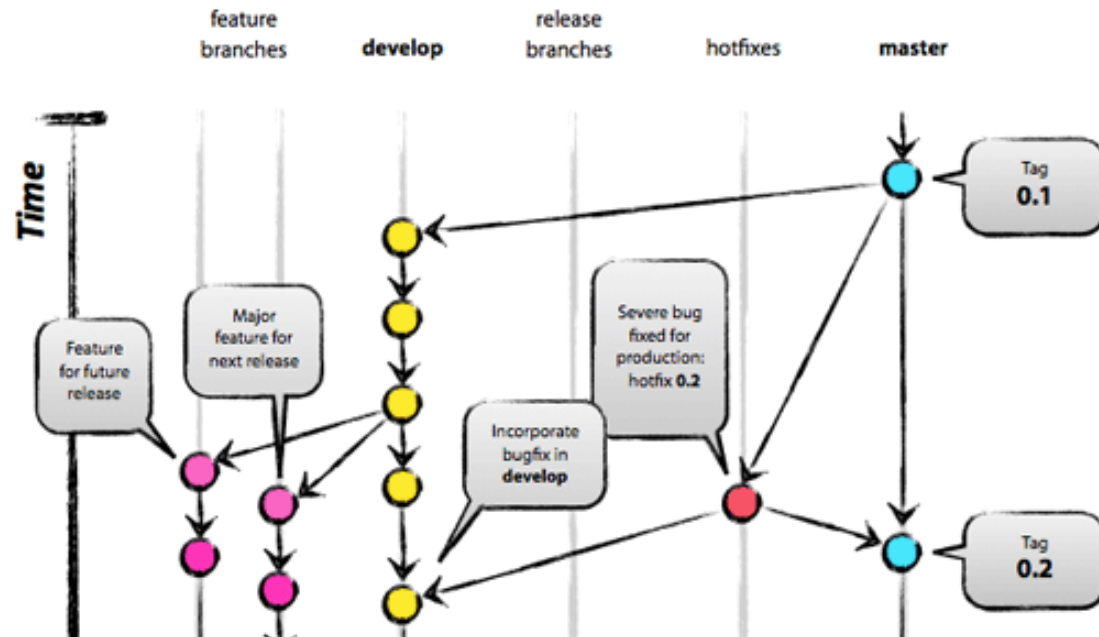
# Commit in Eclipse



# History in Eclipse



# Tags and Branches in a Nutshell



- Local and remote
- Do not push automatically

[Image from <http://nvie.com/posts/a-successful-git-branching-model/>]

# Branches... in brief

- used to develop features isolated from each other
- the *master* branch is the “default” branch when you create a repository
  - you should use other branches for development and merge them back to the master branch upon completion
- really lightweight in Git
- commands:
  - *git branch [branch-name]*, create a new branch
  - *git branch*, lists all existing branches
  - *git checkout [branch-name]*, switches to the selected branch
  - *git branch -d [branch-name]*, removes the selected branch

# Tags... in brief

- useful to mark **release points**
- two types:
  - lightweight
  - annotated (more complete)
- commands:
  - *git tag*, shows the available existing tags
  - *git tag [tag-name]*, creates a lightweight tag
  - *git tag -a [tag-name] -m [message]*, creates an annotated tag
  - *tag show [tag-name]*, shows the tag data






# References

- Git Reference
  - <http://gitref.org/>
- Git - the simple guide
  - <http://rogerdudler.github.io/git-guide/>
- Git Documentation
  - <http://git-scm.com/docs>
- Pro Git (online book)
  - <http://git-scm.com/book>
- Version Control by Example (online book)
  - <http://www.ericSink.com/vcbe/>

# References

- Try Git!
  - <http://try.github.io/>
- Various Git resources
  - <https://help.github.com/articles/what-are-other-good-resources-for-learning-git-and-github>
- A successful Git branching model
  - <http://nvie.com/posts/a-successful-git-branching-model/>
- Some Git (graphical) clients
  - <http://git-scm.com/downloads/guis>

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