

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



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?

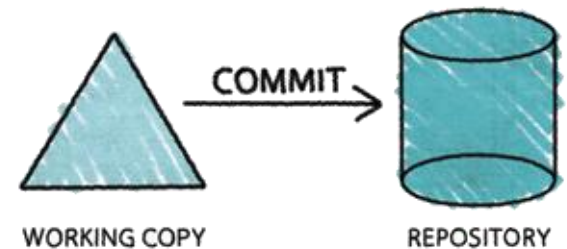


WORKING COPY

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



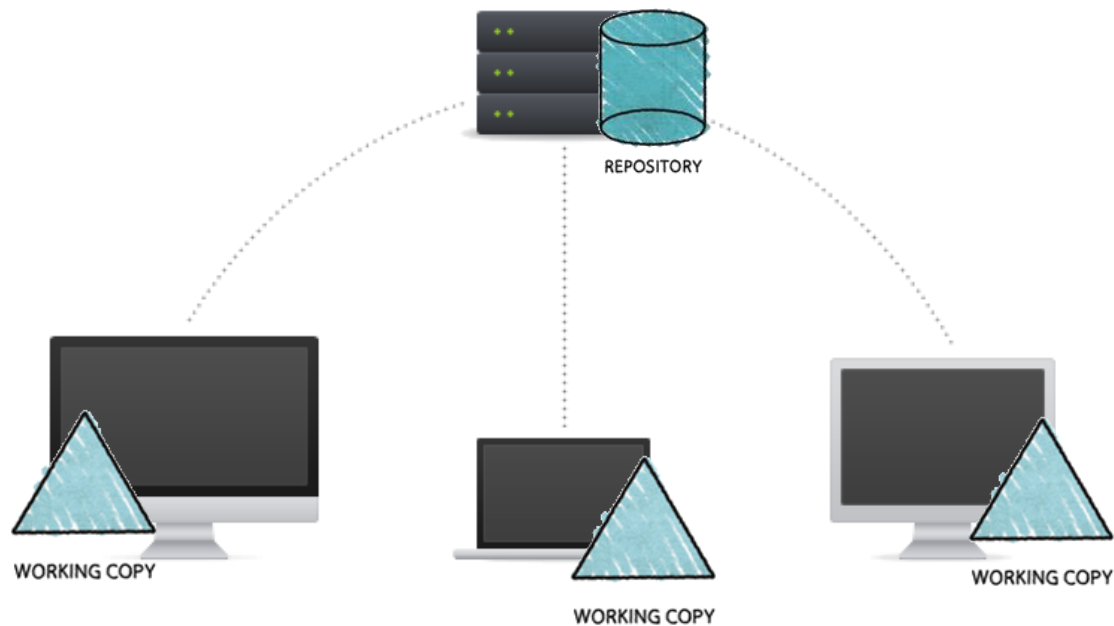
Basic Concepts

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

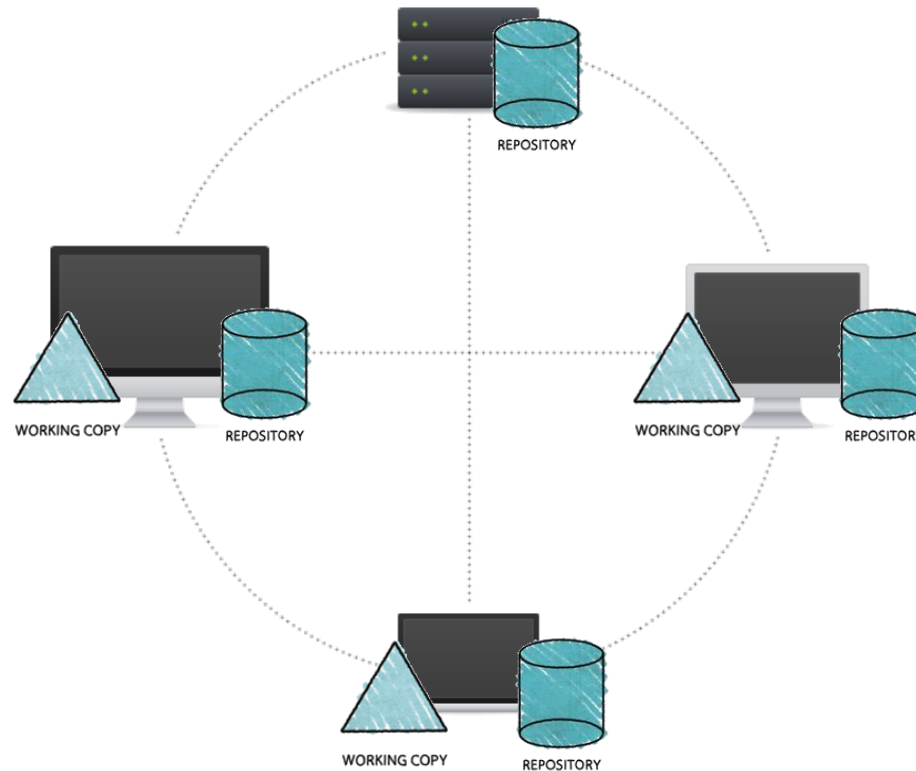


Centralized Version Control



- one central repository
- client-server relationship

Distributed Version Control

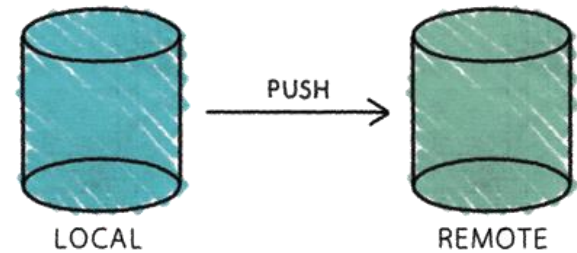


- clients and server have the full copy of the repository
 - local repositories 'clone' a remote repository
- it is possible to have more than one server

More Basic Concepts

Push

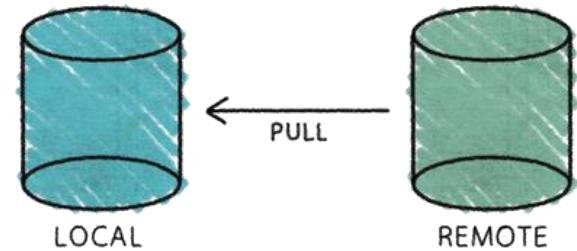
- copy changesets from a local repository instance to a remote one
 - synchronization between two repository instances



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

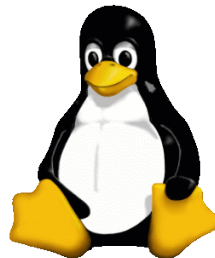


Microsoft



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)
- 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 a user named '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 to the repository name:

- 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.

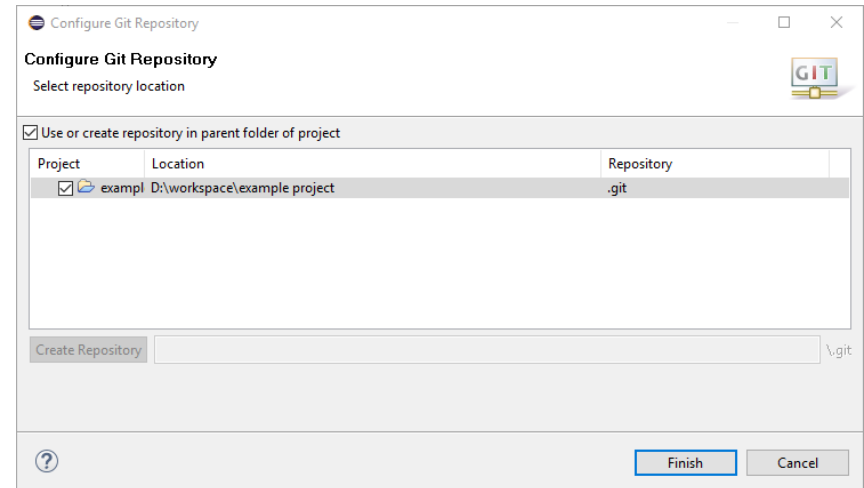
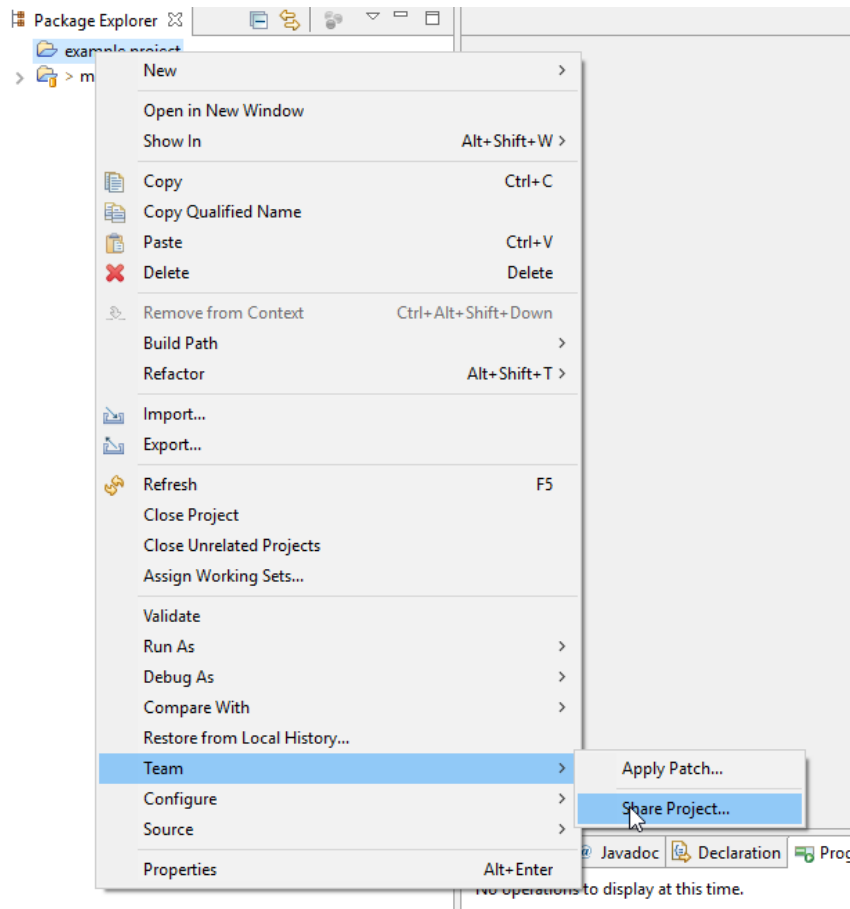
Initialize this repository with a README

This will let you immediately clone the repository to your computer. Skip this step if you're importing an existing repository.

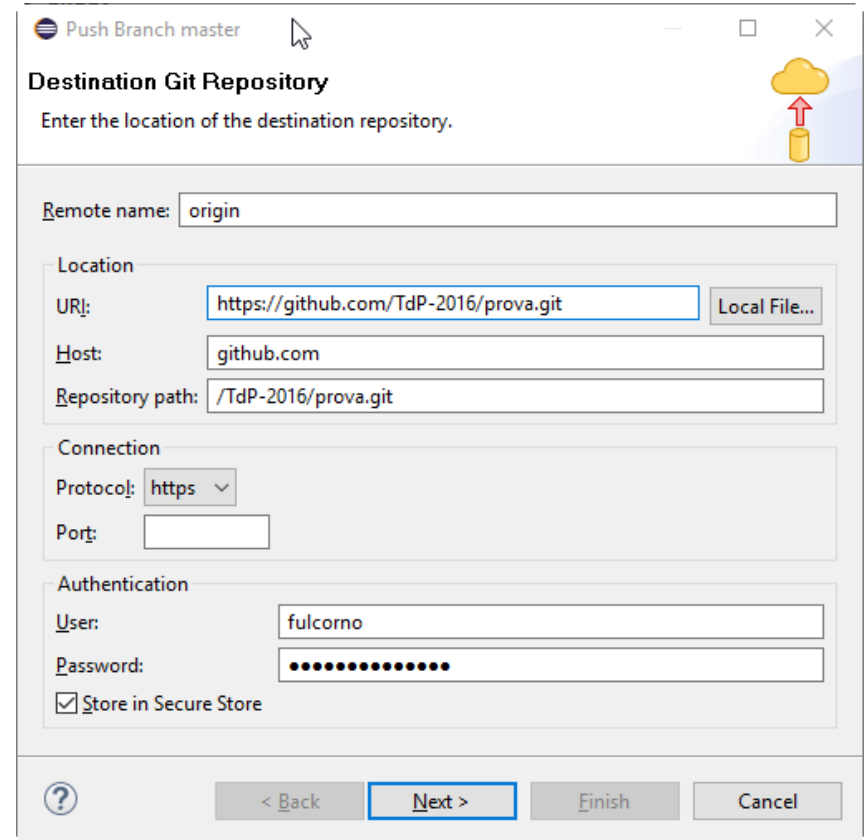
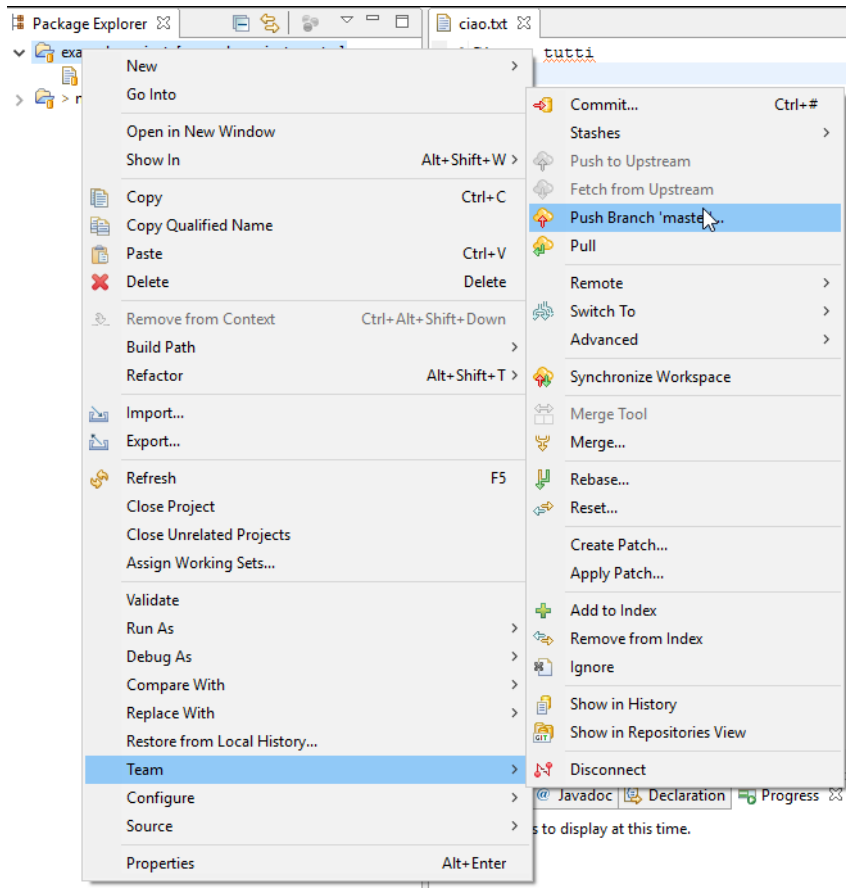
Add .gitignore: **None** | Add a license: **None** ⓘ

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

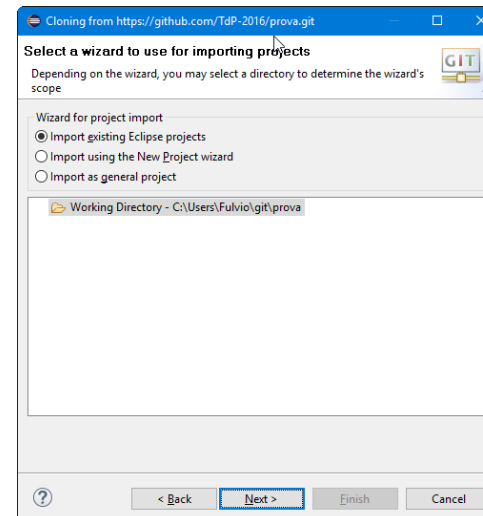
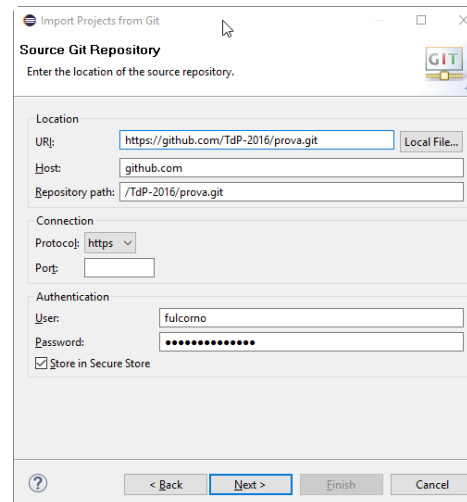
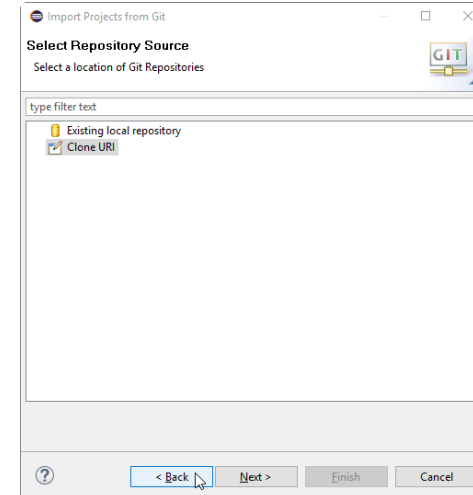
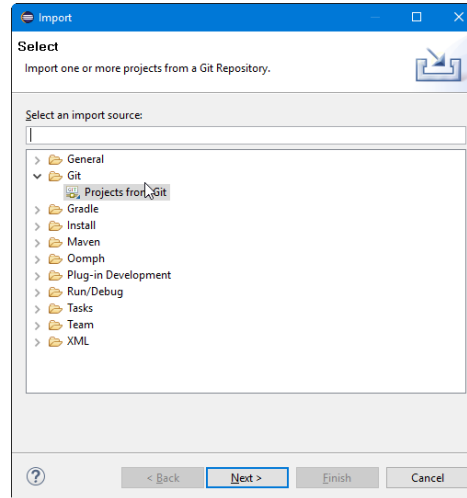
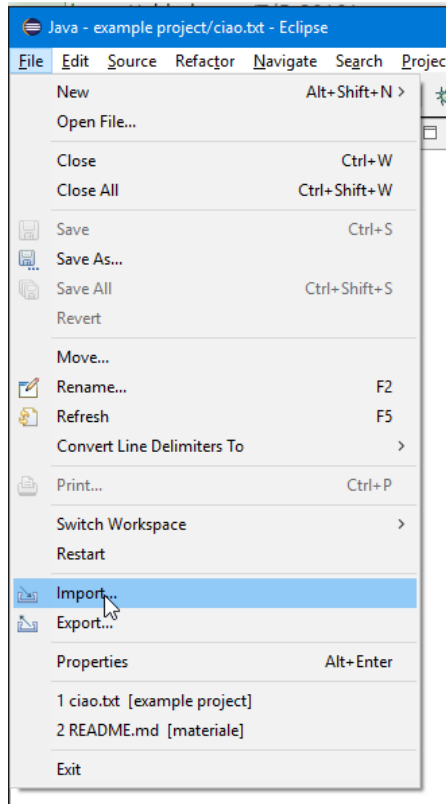
Forking

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

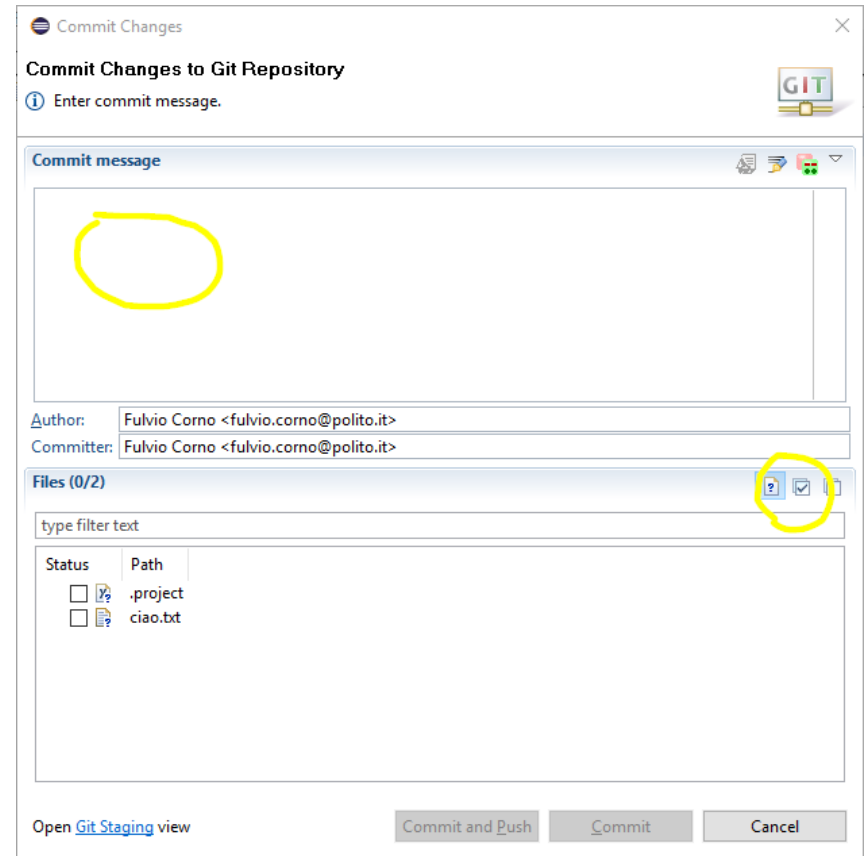
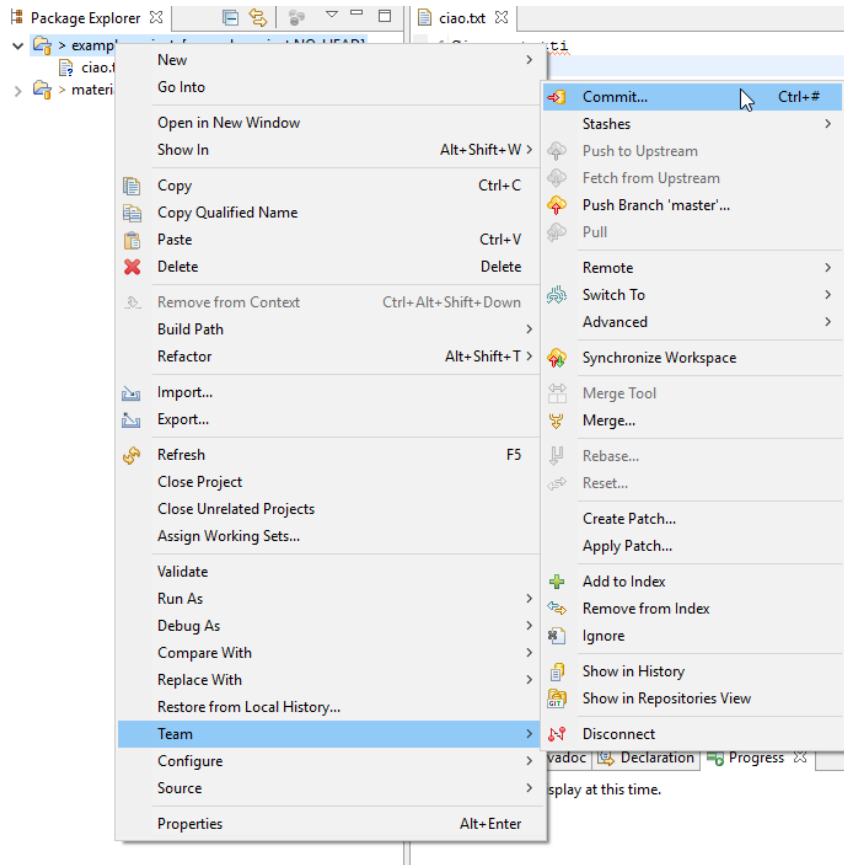
The screenshot shows the GitHub interface for the repository 'TdP-2016-Lab / lab1-fulcorno-studente'. At the top, there are buttons for 'Watch' (2), 'Star' (0), and 'Fork' (0). Below this is a navigation bar with 'Code', 'Issues' (0), 'Pull requests' (0), 'Wiki', 'Pulse', and 'Graphs'. A message states 'lab1-fulcorno-studente created by Classroom for GitHub'. A summary bar shows '1 commit', '1 branch', '0 releases', and '1 contributor'. Below this is a toolbar with 'Branch: master', a 'New pull request' button, and buttons for 'New file', 'Upload files', 'Find file', 'HTTPS' (with a dropdown arrow), the repository URL 'https://github.com/TdP-20', a copy icon, a download icon, and a 'Download ZIP' button. The commit history table is as follows:

Commit	Author	Message	Time
jimmy-sonny	First commit		Latest commit db49503 14 hours ago
Lab1_Alien	First commit		14 hours ago
ese01.pdf	First commit		14 hours ago

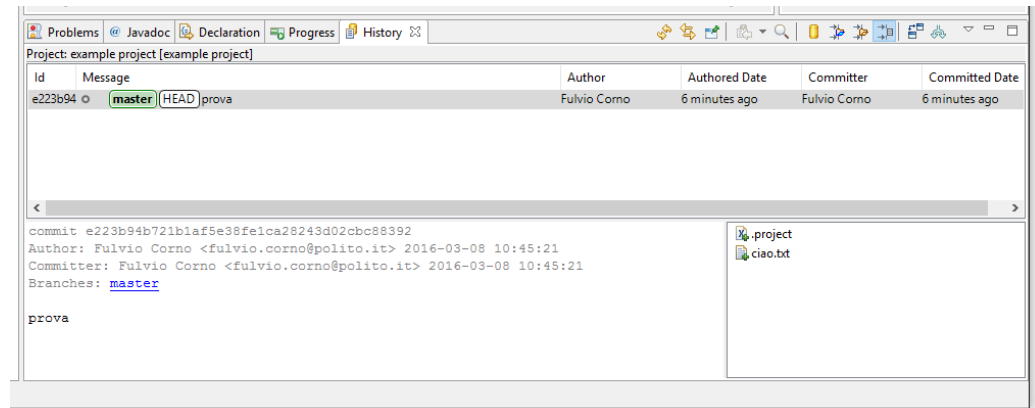
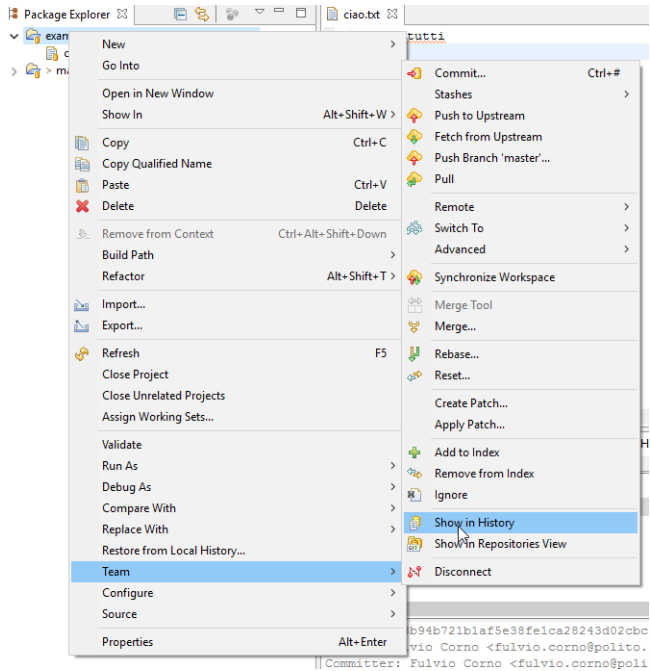
Cloning in Eclipse



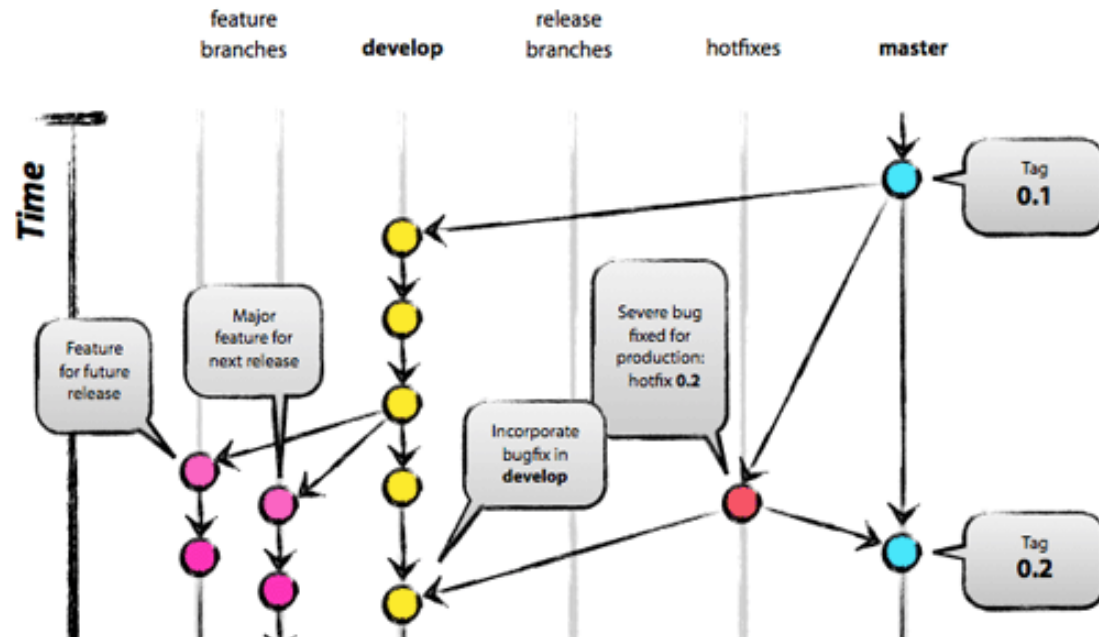
Commit in Eclipse



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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