Git & GitHub

QUICK INTRODUCTION

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

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POLITECNICO
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e-Lite

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)

NOW

Basic Concepts

Repository

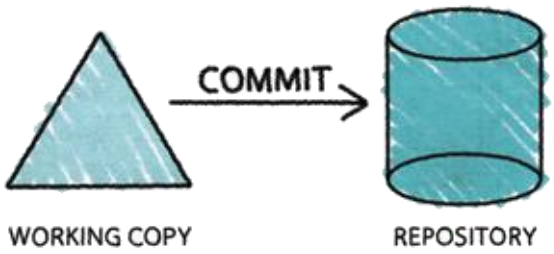
- place where you store all your work
- contains every version of your work that has ever existed
  - files
  - directories layout
  - history
- can be shared with the whole team

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?

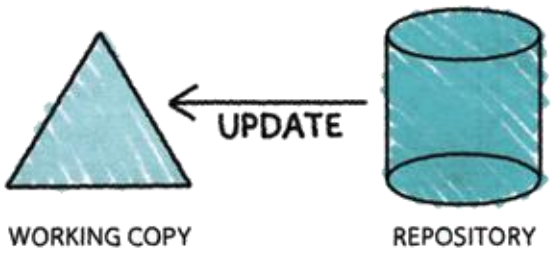
Basic Concepts



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

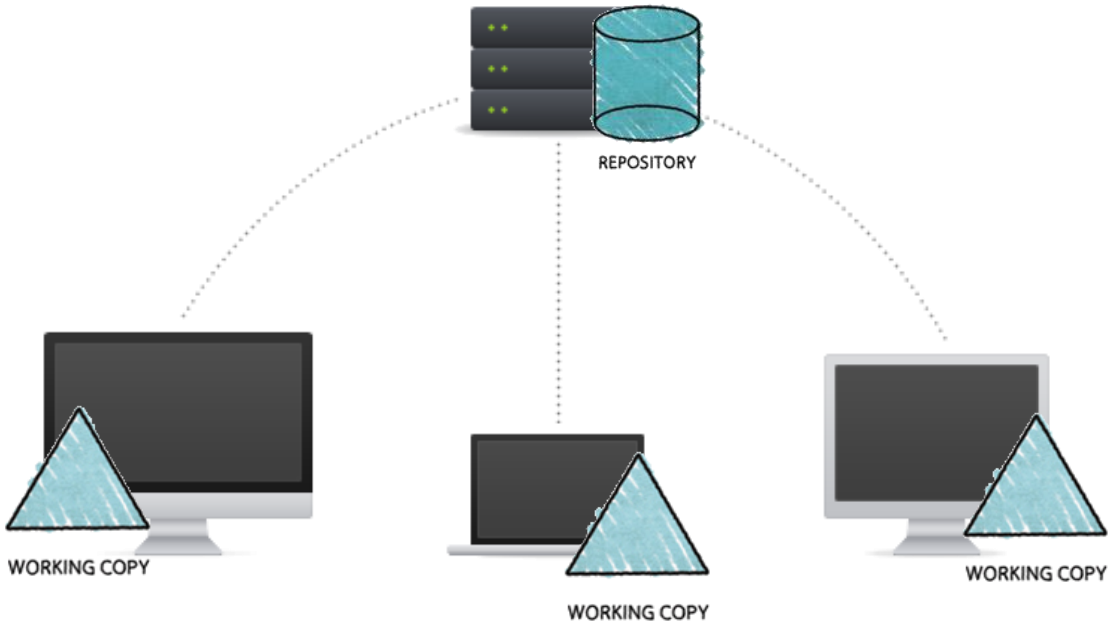
Basic Concepts



Update

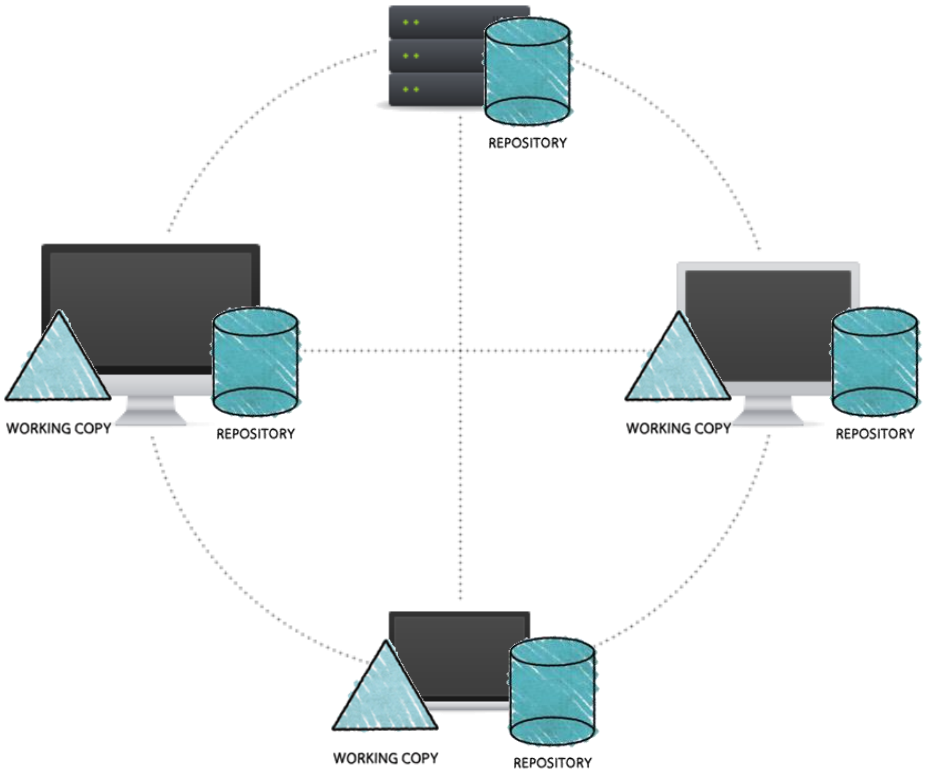
- update the working copy with respect to the repository
  - apply changes from the repository
  - merge such changes with the ones you have made to your working copy, if necessary

Centralized Version Control



- one central repository
- client-server relationship

Distributed Version Control

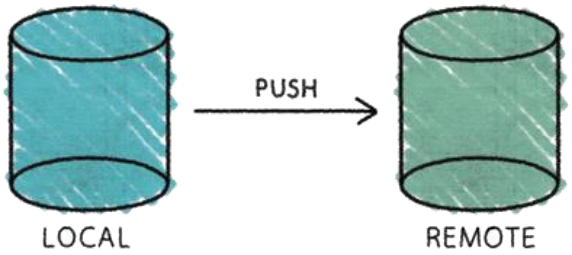


- clients and server have the full copy of the repository
  - local repositories ‘clone’ a remote repository
- it is possible to have more than one server

More Basic Concepts

Push

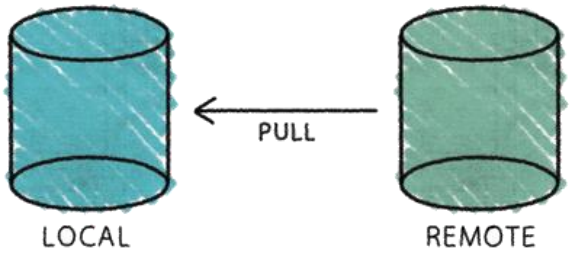
- copy changesets from a local repository instance to a remote one
  - synchronization between two repository instances



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

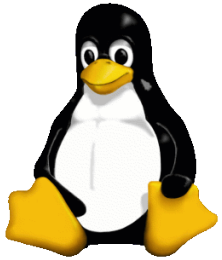

facebook


Microsoft


LinkedIn


NETFLIX


GNOME




RAILS


Qt


eclipse

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/

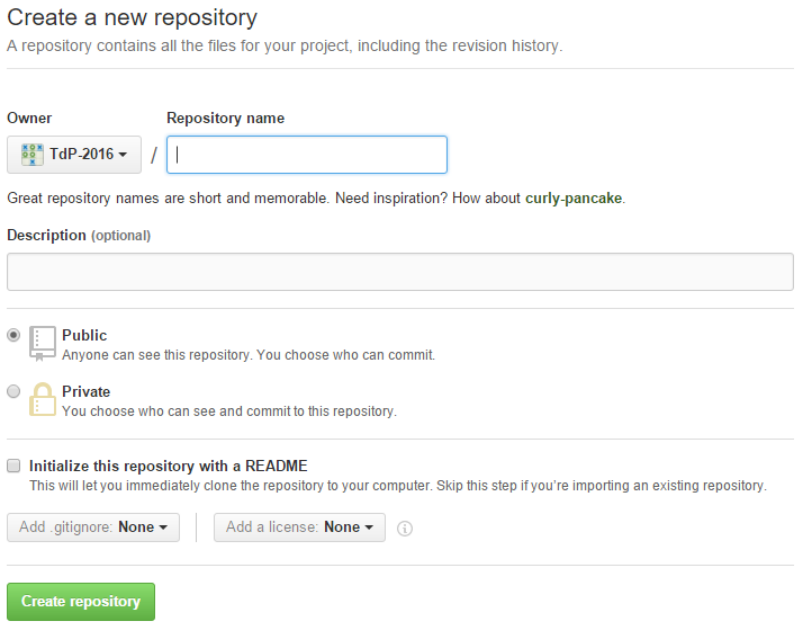
For Labs

- 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

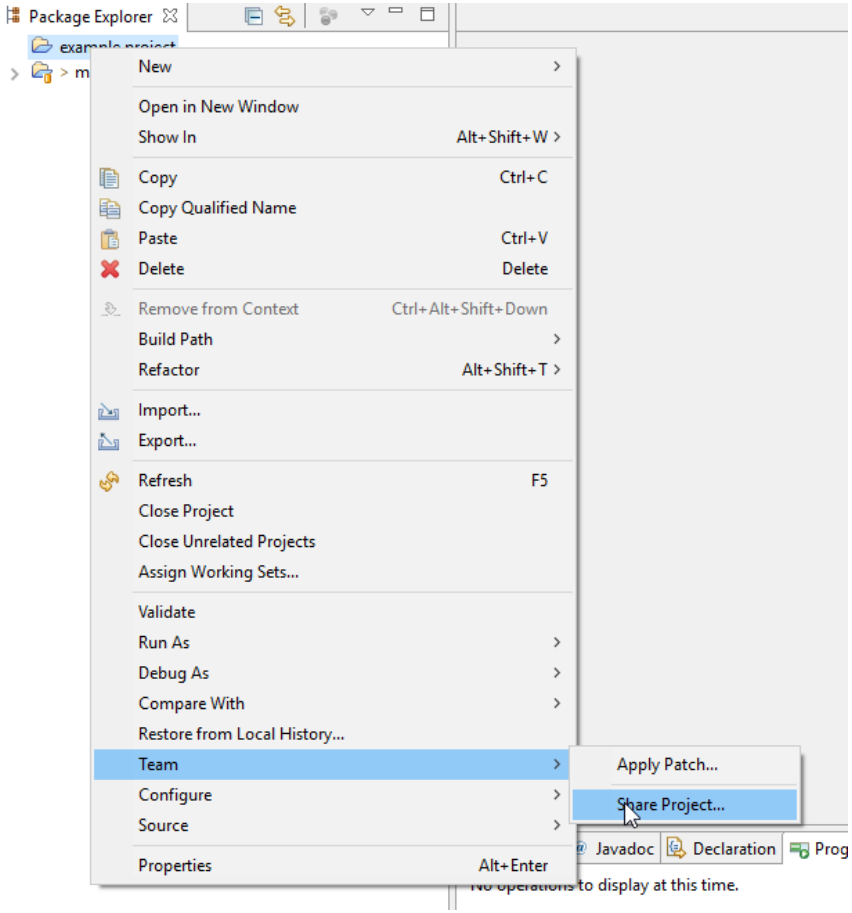
Workflow 1: “Create new project”

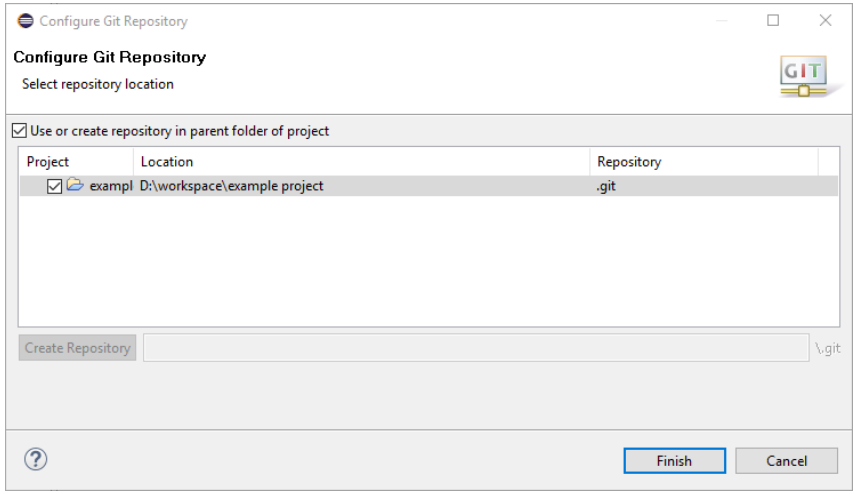
- Create a project in Eclipse (normally)
- Create the local repository in Eclipse (Team|Share)
- Create a new project in GitHub
- Push changes (Team|Commit&push)

New Project on GitHub

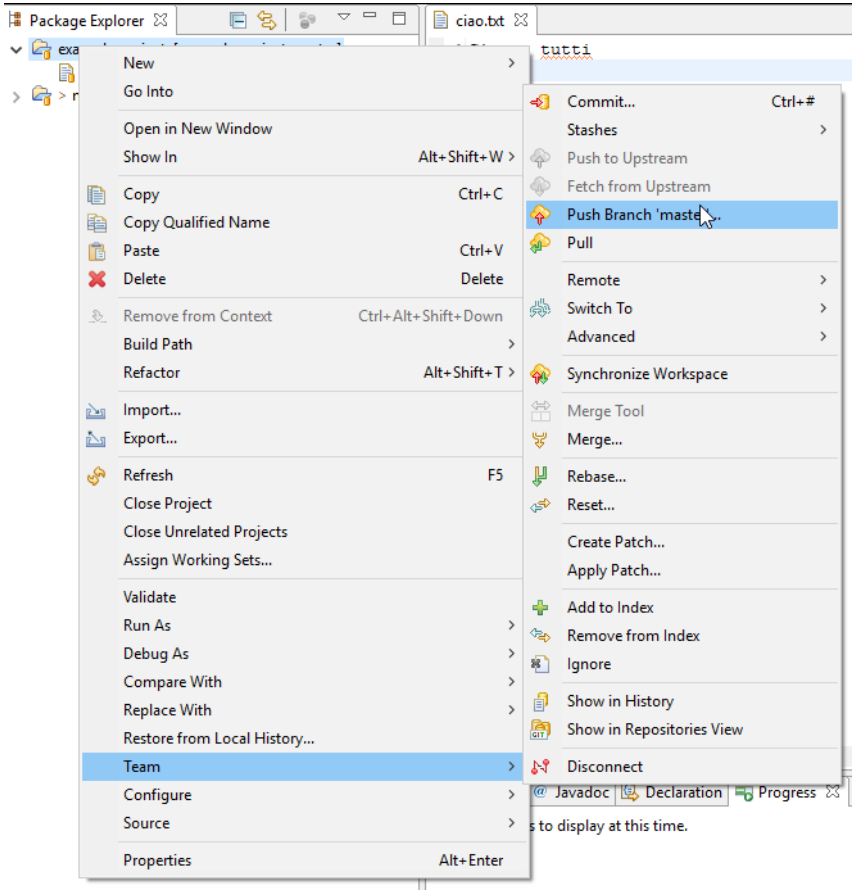


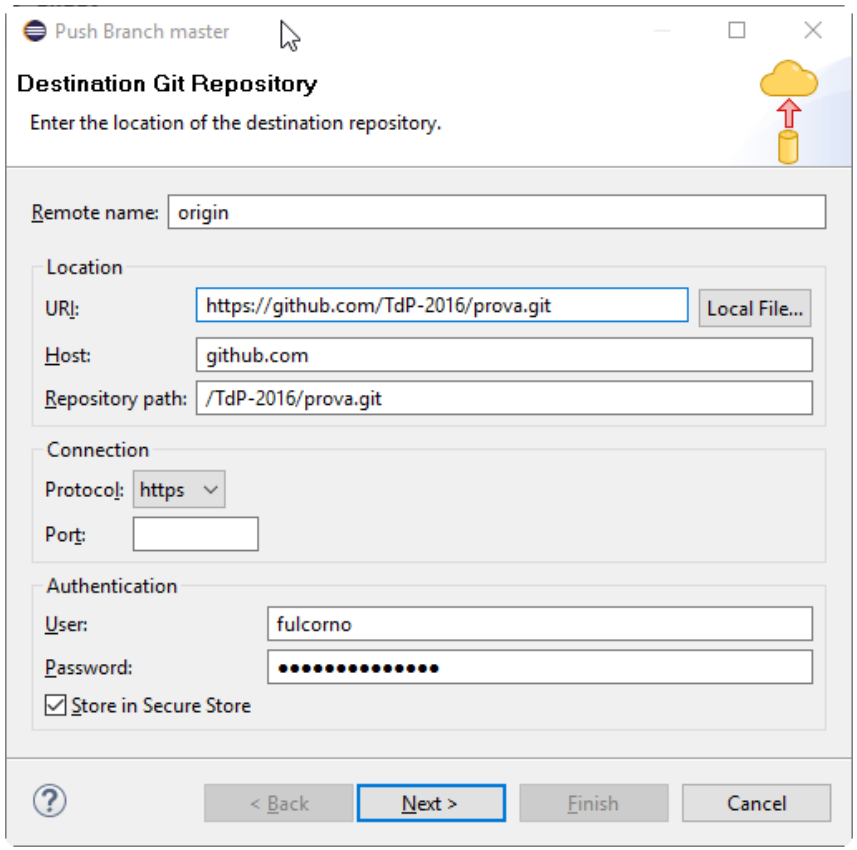
New repository in Eclipse





Add remote & push in Eclipse



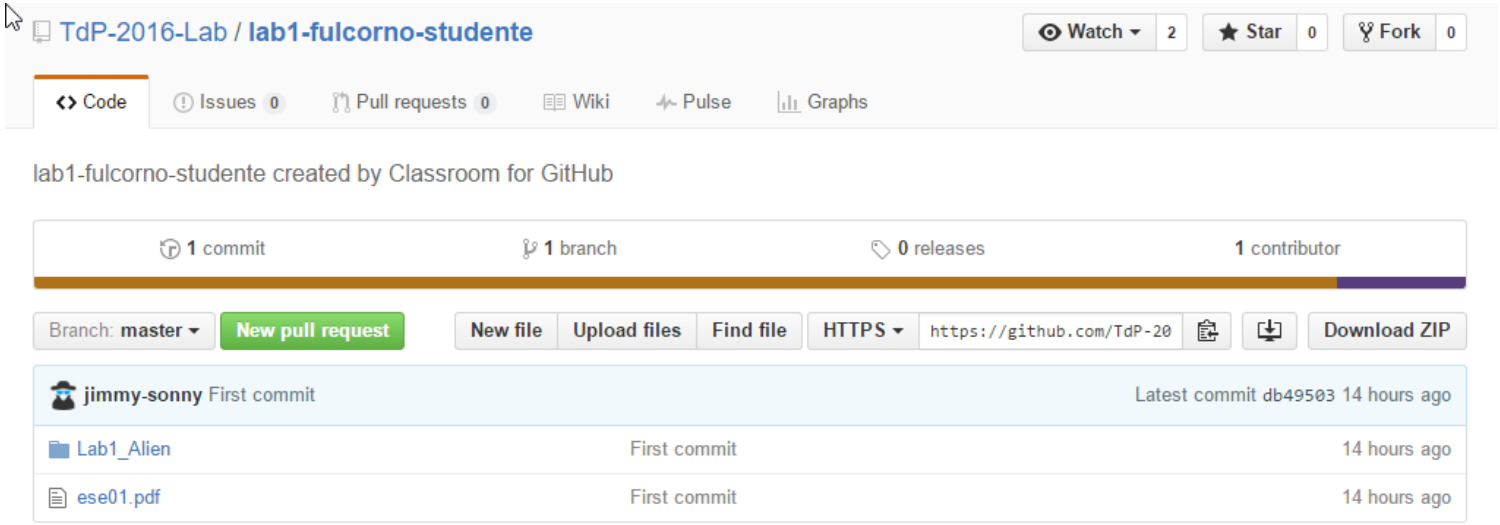


Workflow 2: “Work on a project”

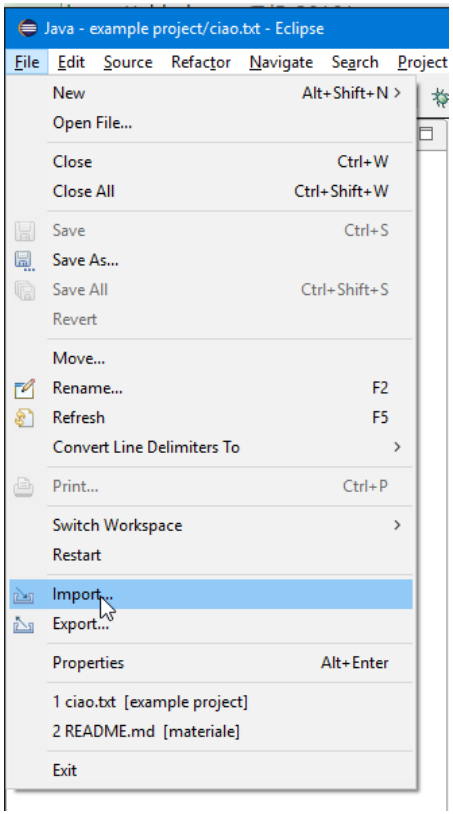
- Fork the project in GitHub (you make a copy in your repository)
- Clone your project in Eclipse
- Work on the project
- Commit and Push the changes

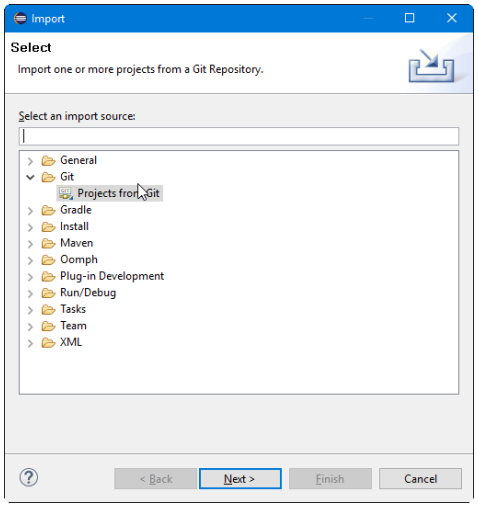
Forking

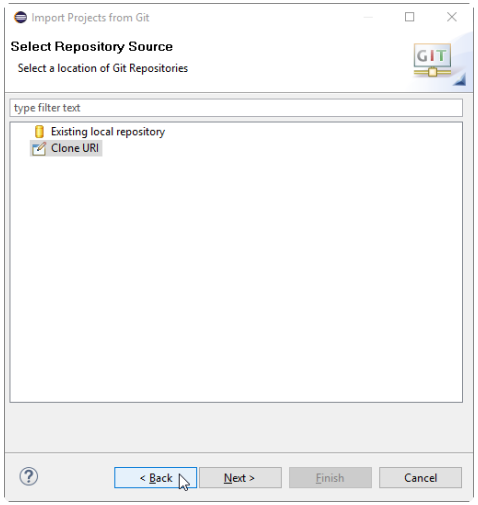
- “Fork” makes a private copy of some else’s repository
- You may clone, work, and commit on this repository

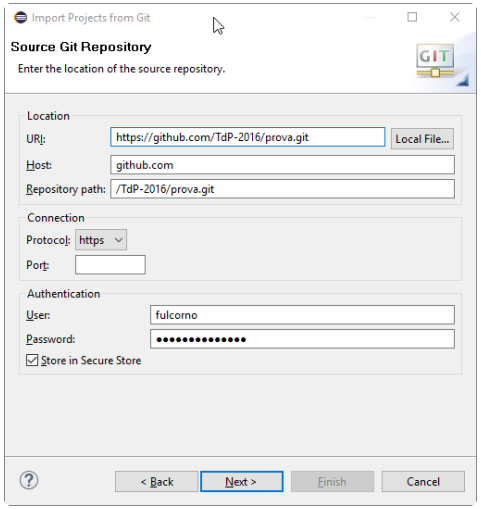


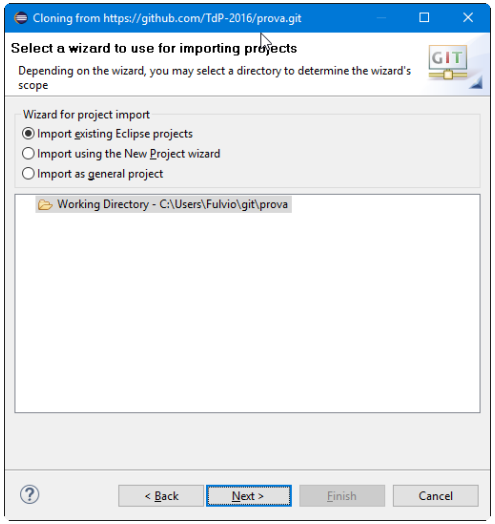
Cloning in Eclipse



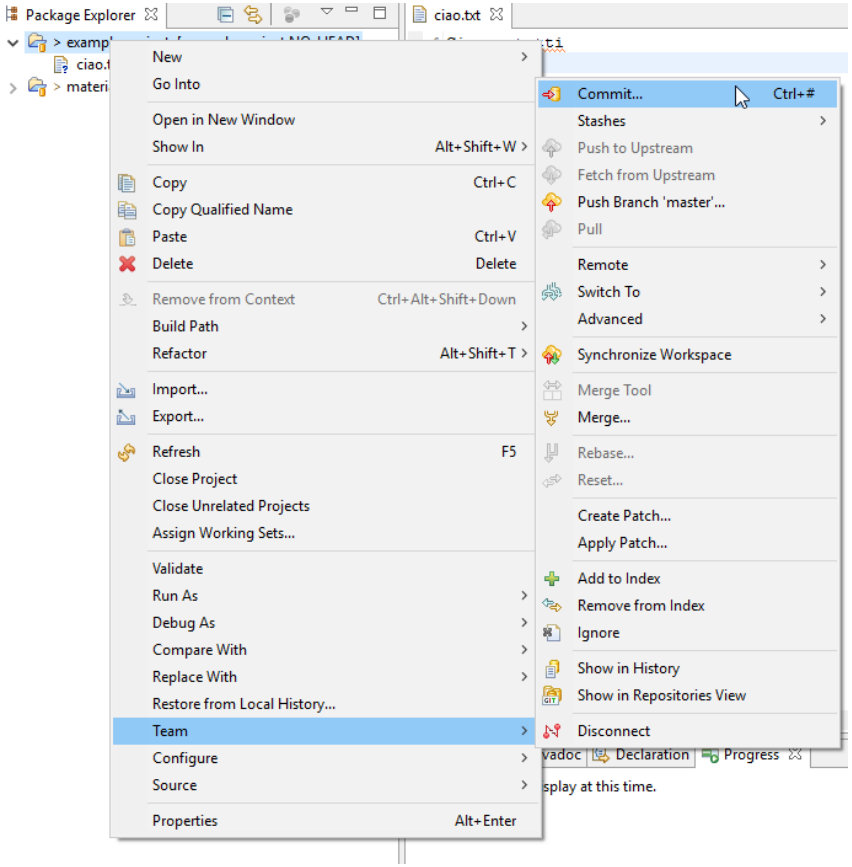


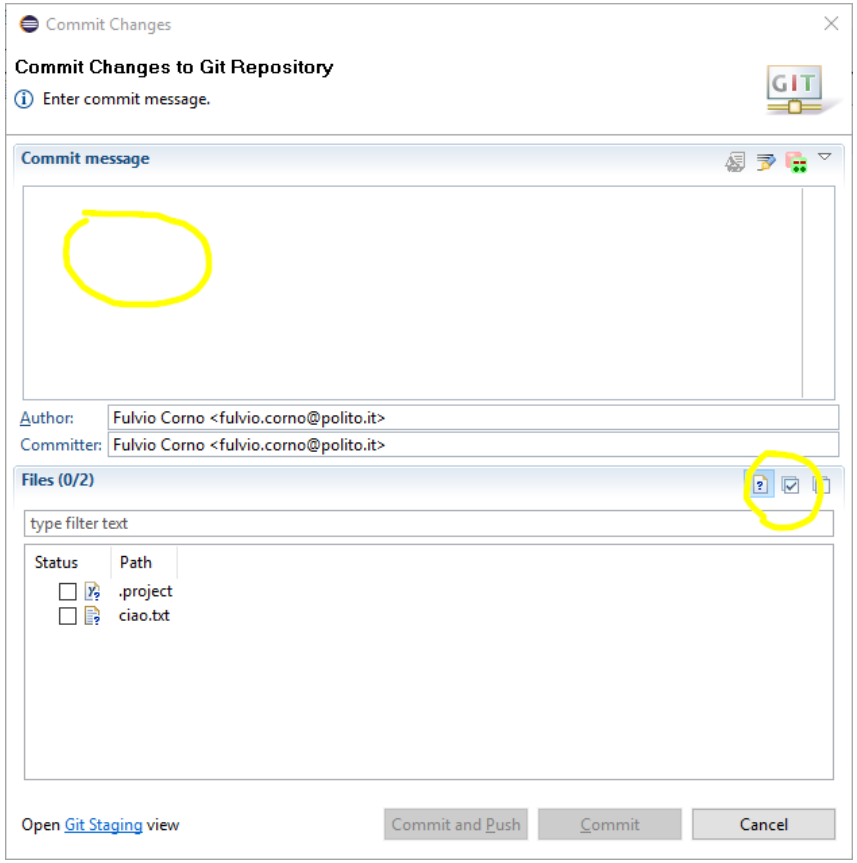




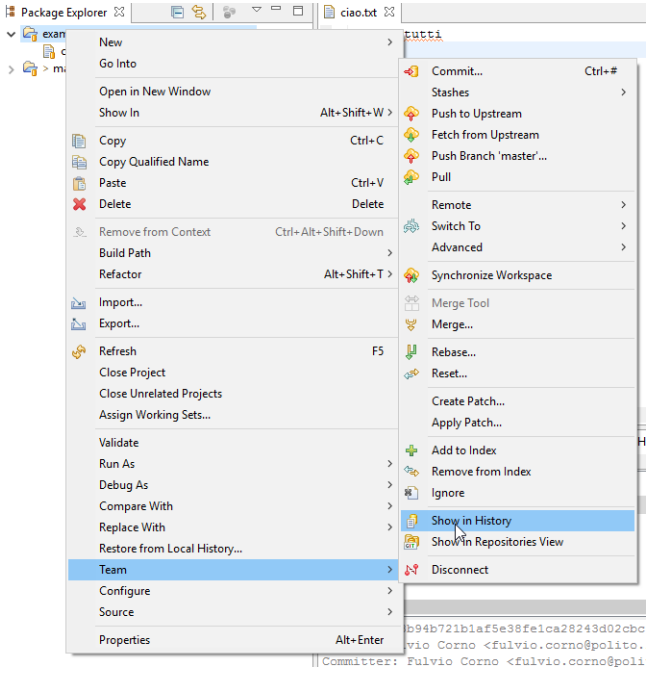


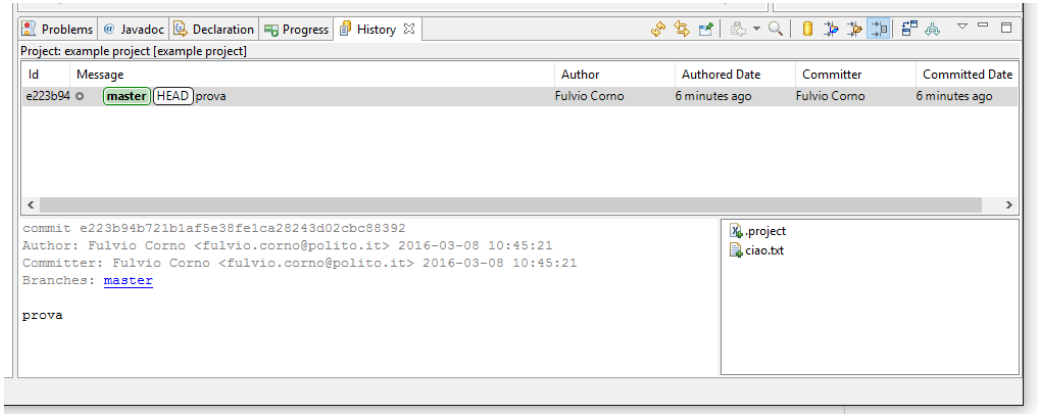
Commit in Eclipse



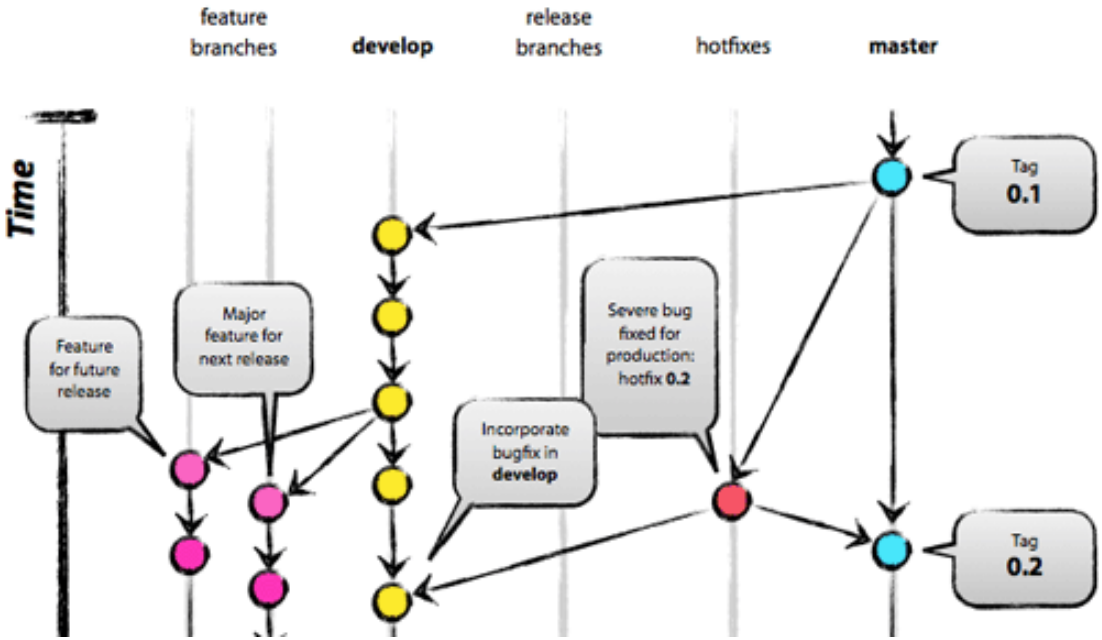


History in Eclipse





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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