Git Basics

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Git Source Control Manager (SCM)

- Some background on SCM and history of git
- Principles of git
- Hands-on 1: Tutorial on github
- Hands-on 2: Carrot Juice

SCM vs. VCS

- SCM: Source Control Manager
  - git
  - Mercurial (hg)
- VCS: Version Control System
  - Subversion (svn)
  - Concurrent Versions System (cvs)
- Main differences
  - Incremental storage of versions
  - branching / merging mechanism much more powerful in SCM

Git short history[1] [2]

Linux Kernel development

- 1991-2002: File archive + patches
- 2002-2005: Usage of BitKeeper proprietary software
- 2005: BitKeeper not anymore free of charge for the Linux project
- Development of git
- Linux kernel using git since

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[1] source: git-scm.com

[2] Video: Git history by Linus Torvalds @ Google Talk

Git project spirit

- Speed
- Simple design
- **Strong support for non-linear development (thousands of parallel branches)**
- Fully distributed
- Able to handle efficiently large projects like the Linux kernel (speed and data size)
- Distributed under GPL software license
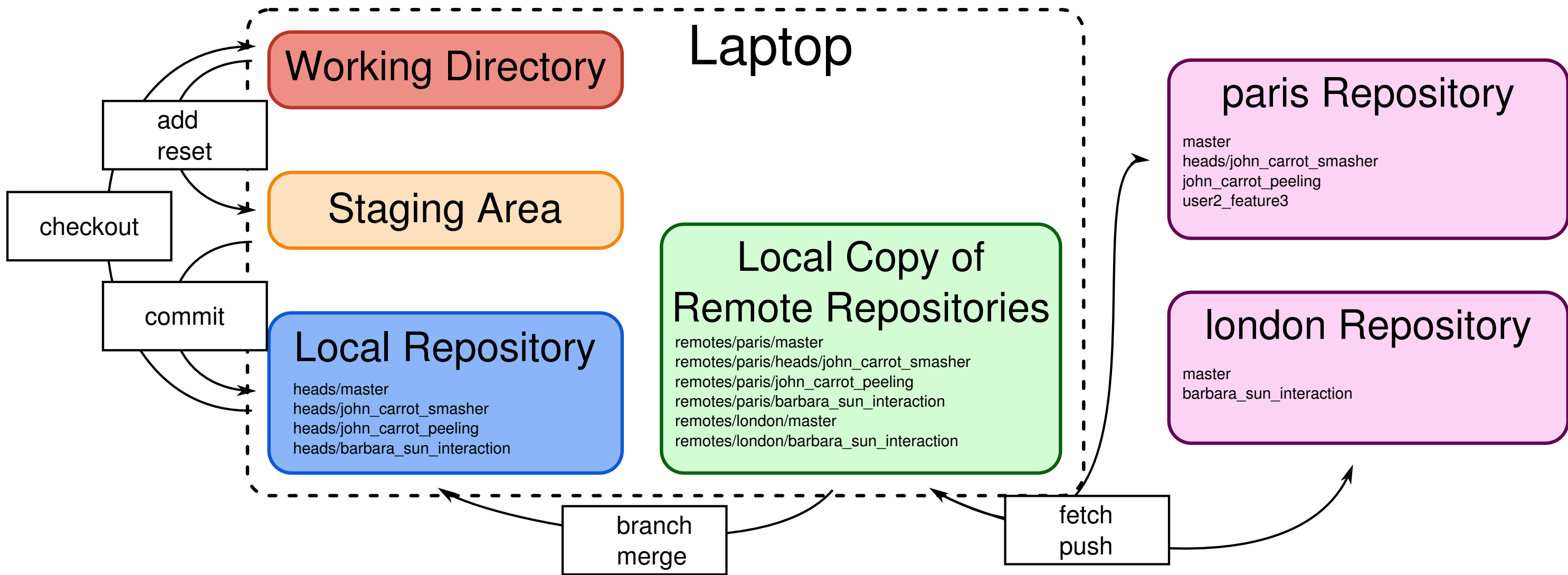
Services provided

git (the GPL project)
- Keep the different versions of your software
- Merge the contributions from many collaborators

github (the company maintaining `github.com`)
- Git repository server
- Nice web interface for collaborative work
- Free for public projects

gitlab can be considered as the GPL version of github.

Typical work flow

- Implement feature / bug fix
- Test if the feature / bug fix is well implemented
- Add the modified files to the staging area
- Commit
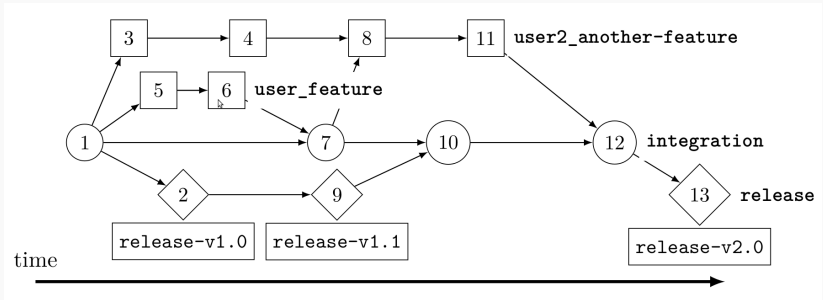- Push sometimes to share your work with collaborators

Git internals

http://eagain.net/articles/git-for-computer-scientists/

HPCSSS Gitflow

HPCSSS: High Performance Computing for Scientific Simulation Software

- Circle, square, diamond: commits
- Numbers: possible ordering
- Arrow: starting point is the parent, arrival is the child
- Text in bold: branches with commits that were made in this branch in the same horizontal line
- Rectangles at the bottom: tags

Merge or Rebase, that is the question

Merge: the historian view
- The commit history of the project should not be changed
- Repository should contain what actually happened

Rebase: the project maintainer view
- The commit history is the story of how the project was made
- You would not publish the first draft of a book
- Telling a nice story is easier to read for future collaborators

If it is the first time you hear about git, DO NOT REBASE OR AMMEND for now, you could break things

References

- http://book.git-scm.com/index.html
- http://git-scm.com/documentation
- http://nvie.com/posts/
  a-successful-git-branching-model/
- http://gitref.org/index.html

Hands-on 1: Github

github.com

Hands-on 2: Carrot Juice

- Choose your weapon between C and F90
- Stupid story about planting, growing, harvesting and making juice out of carrots
- Arrays containing seeds, plants and carrots
- Operations that transform ones into another
- Be creative when contributing to the software !

Fork the repository on Maison de la Simulation's gitlab and clone it on your laptop.

My god, a conflict !

1. Carlo and Dominik clone their repository
2. Carlo modifies the value of Pi line 33
   Pi=3.1 $\Rightarrow$ Pi=3.14
3. Carlo commits
4. Carlo pushes
5. Dominik modifies the value of Pi line 33
   Pi=3.1 $\Rightarrow$ Pi=3.1415
6. Dominik commits
7. Dominik pushes $\Rightarrow$ [rejected] error: failed to push some refs!
8. Dominik pulls $\Rightarrow$ Conflict !

Now in Dominik's file

```
<<<<<<< HEAD
Pi = 3.1415;
=======
Pi = 3.14;
>>>>>>> f6f2a6c975df9a06f353e6640997ca39c6d071e3
```

- Between the $<<<$ and the $===$ Dominik's local version
- Between the $===$ and the $>>>$ Carlo's remote version
- Carlo and Dominik have to agree on the value of Pi

How to fix a conflict

- Replace everything between the $<<<$ and the $>>>$ by the correct version
- Carlo and Dominik agreed on adding yet another digit
- Check that your program works
- git add file
- git commit
- Automatic commit message indicating conflict resolution

```
Pi = 3.14159;
```