Introduction to Versionning & Git

Based on Sébastien Mosser's course

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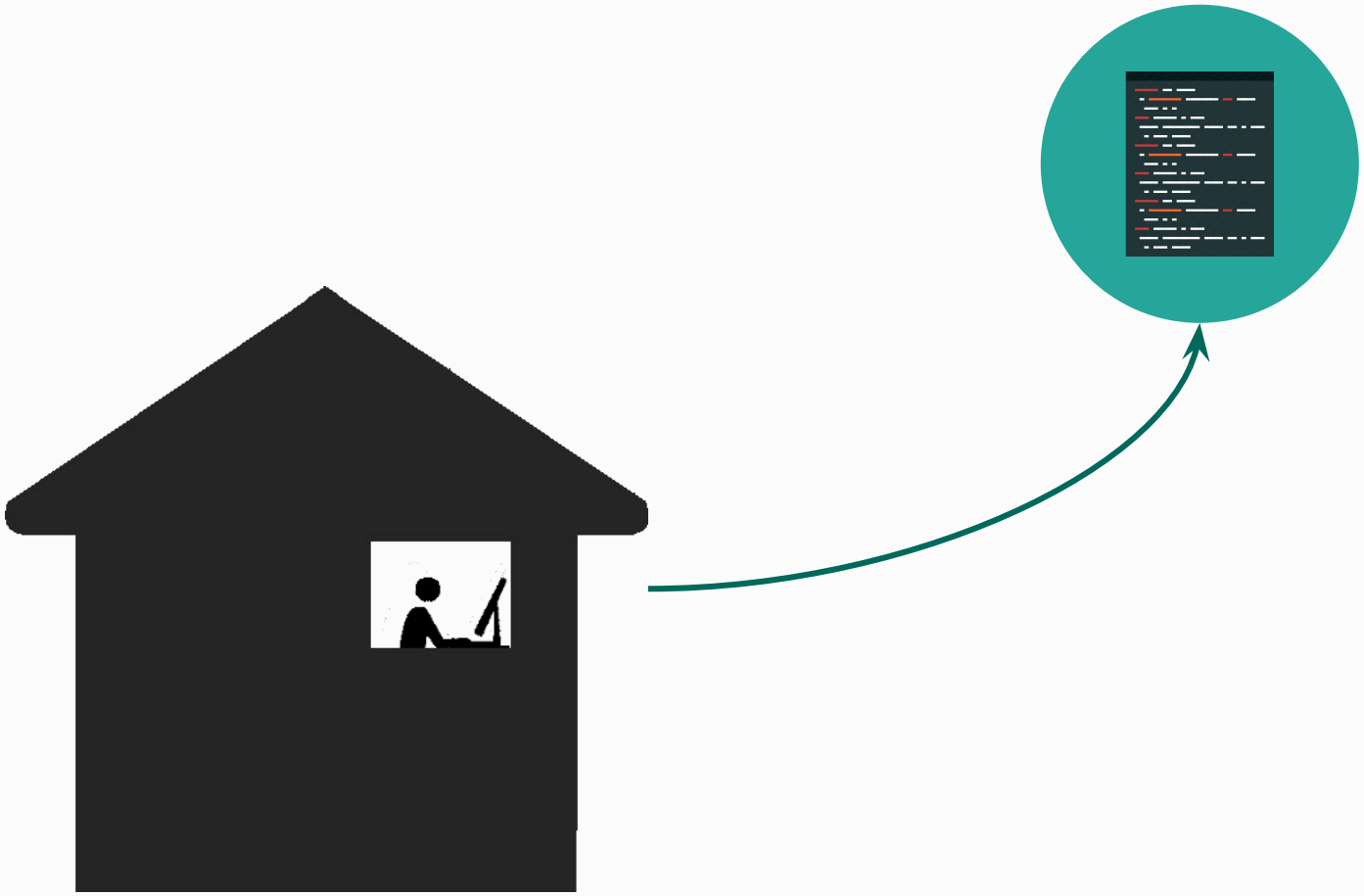
Qui êtes-vous?

https://goo.gl/forms/

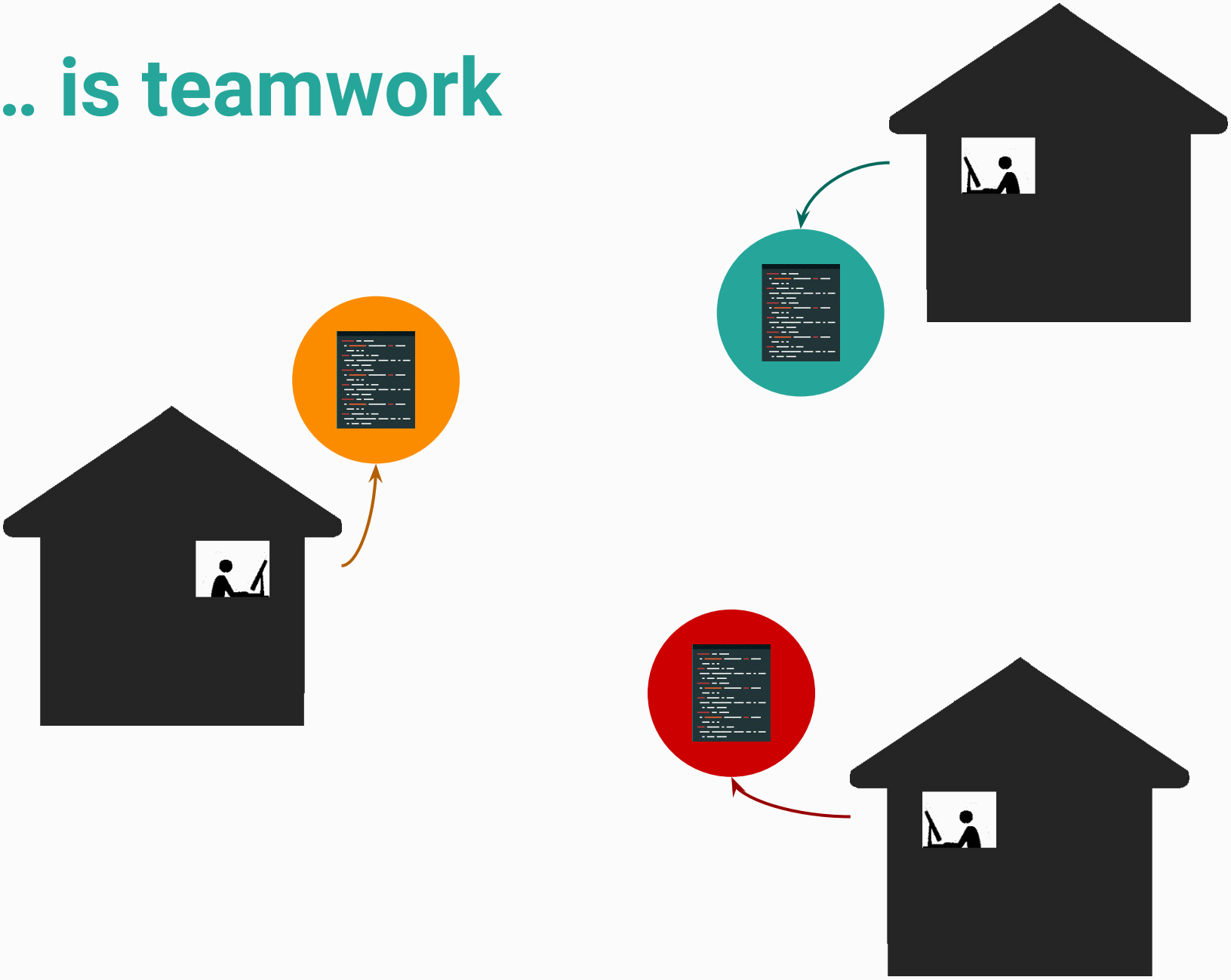
euUsh0wCFsepHZD82

Discuss !

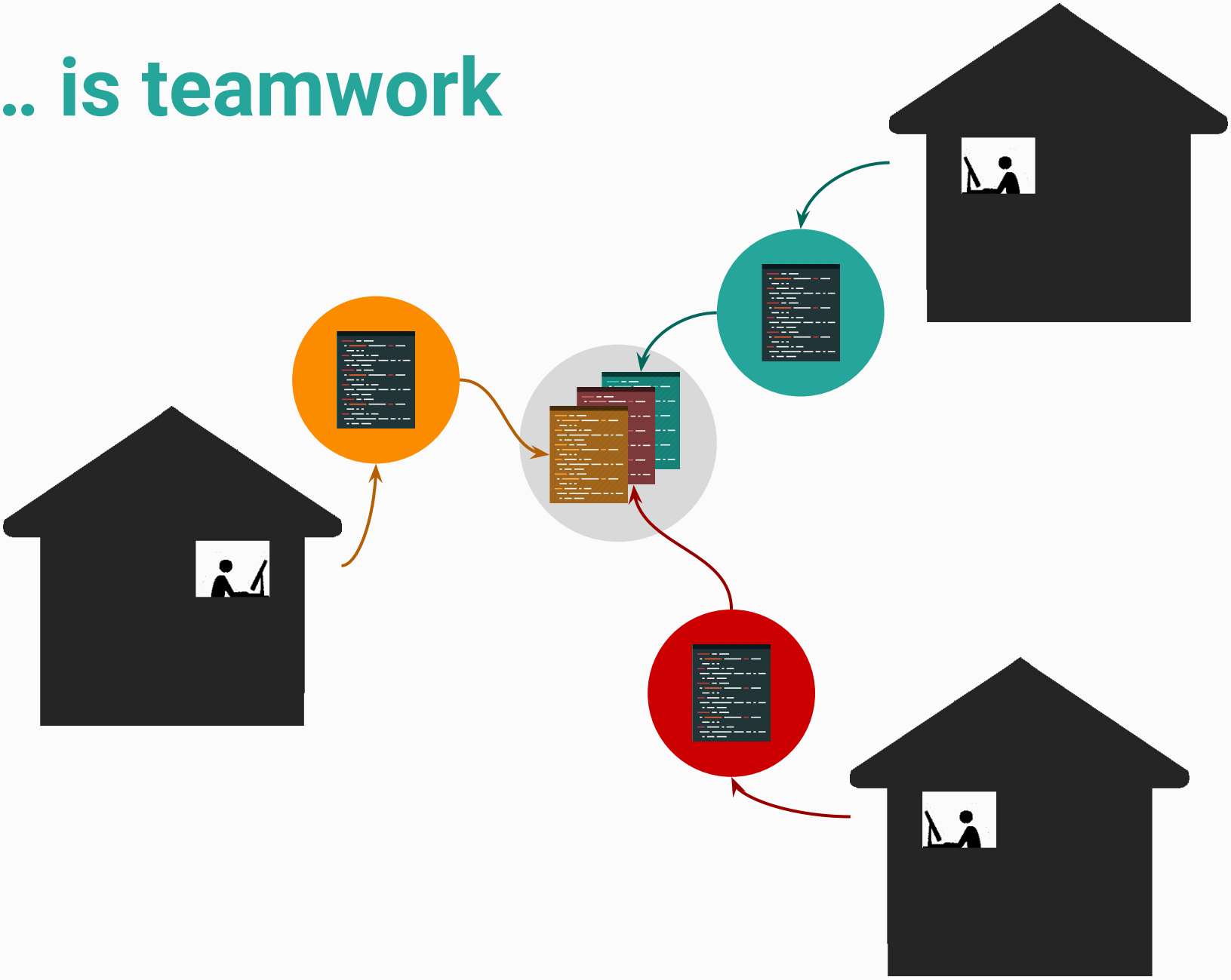
Software development...



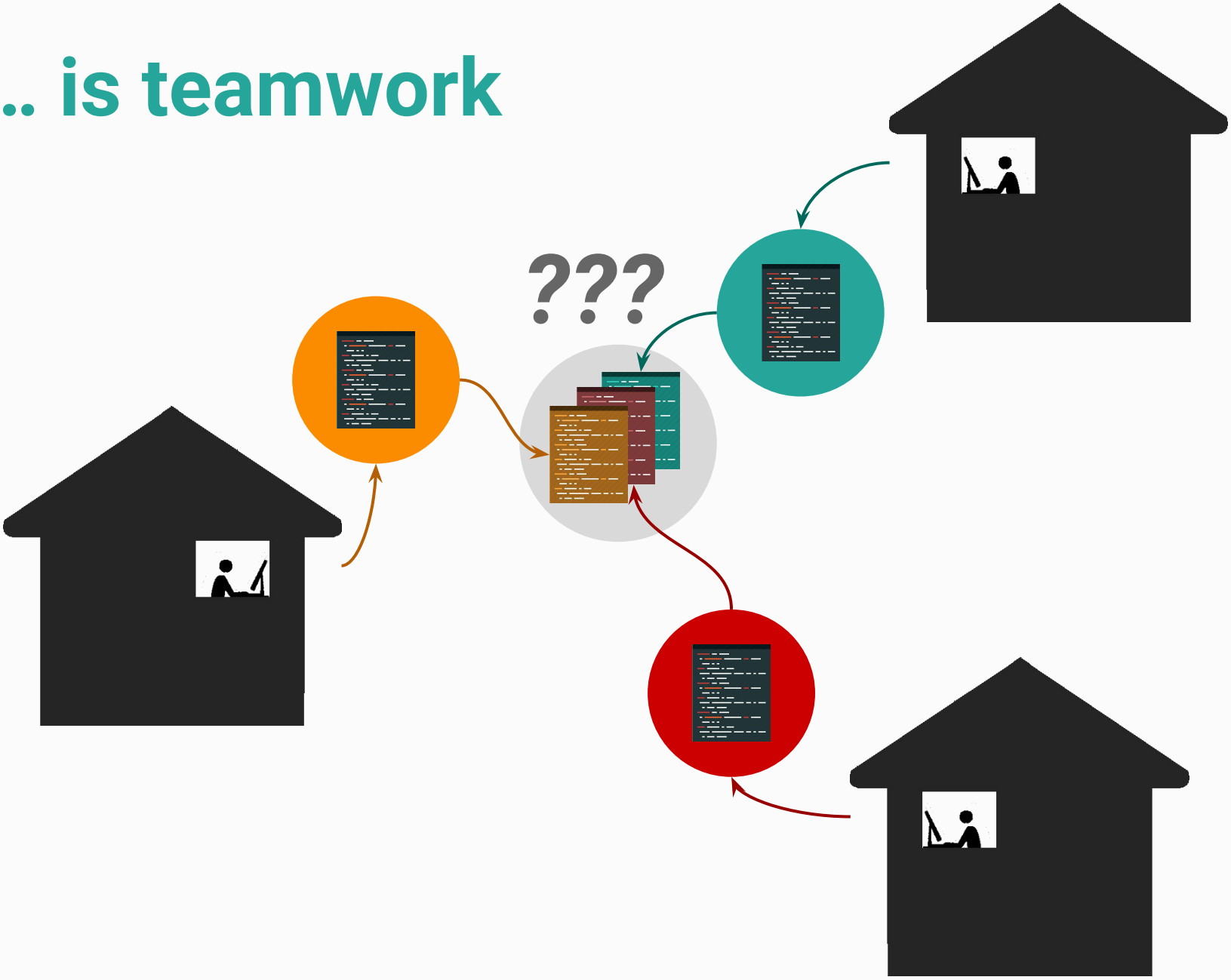
… is teamwork



… is teamwork



… is teamwork



Sharing What?

NOPE

~~Code~~

Changes
(in code)

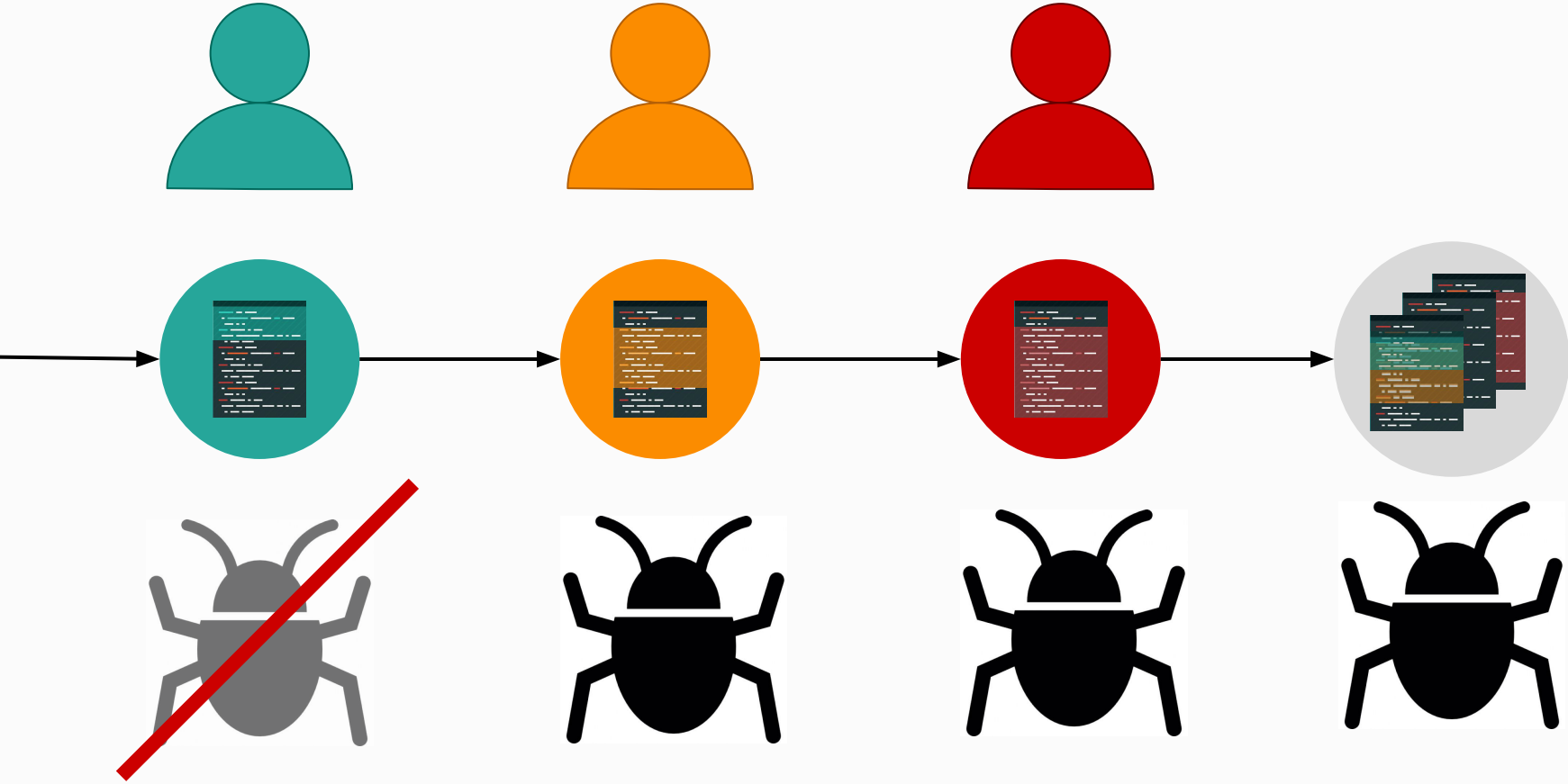
Collaborative work, Real Life edition

BUG !

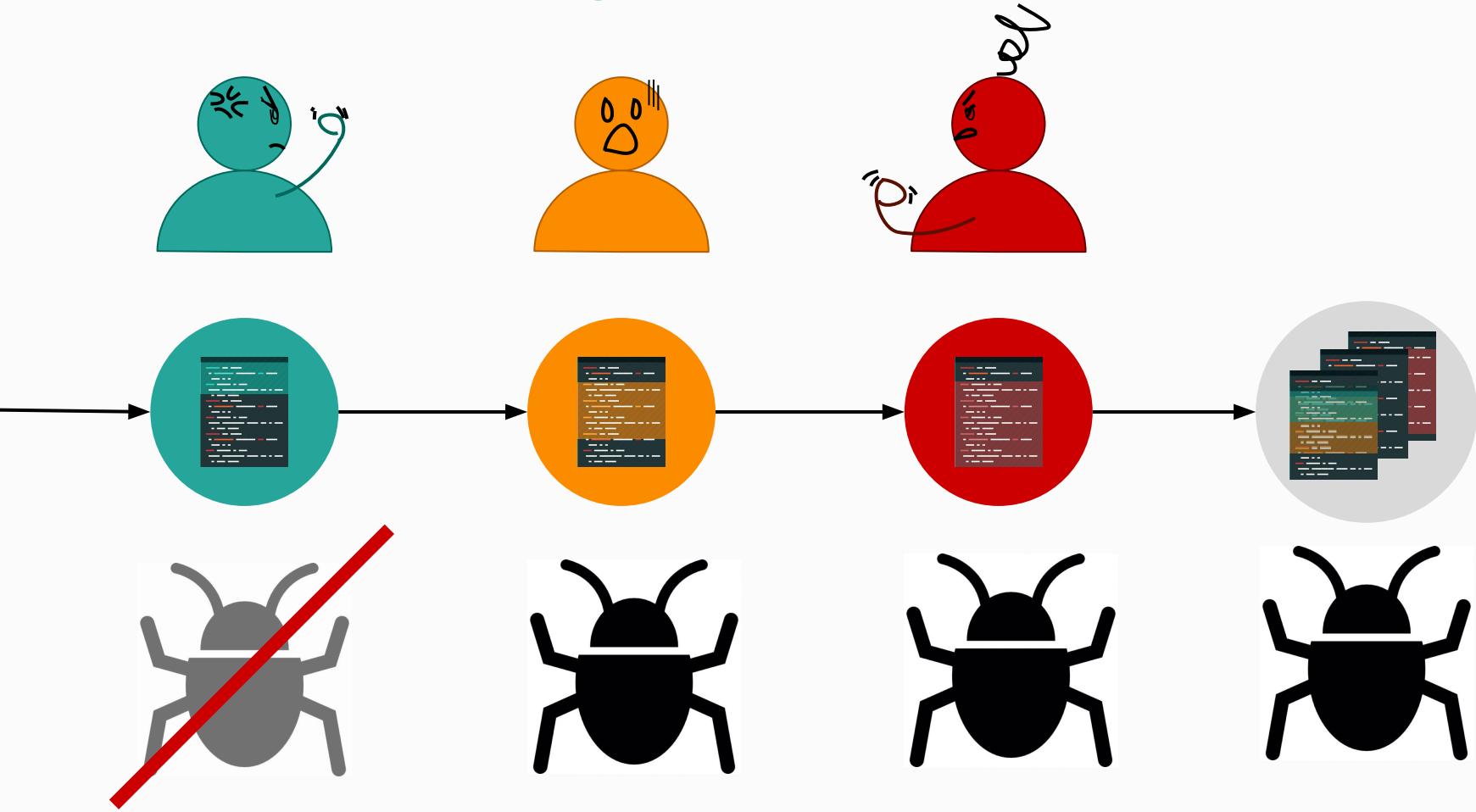
When did it happen?

Where is it coming from?

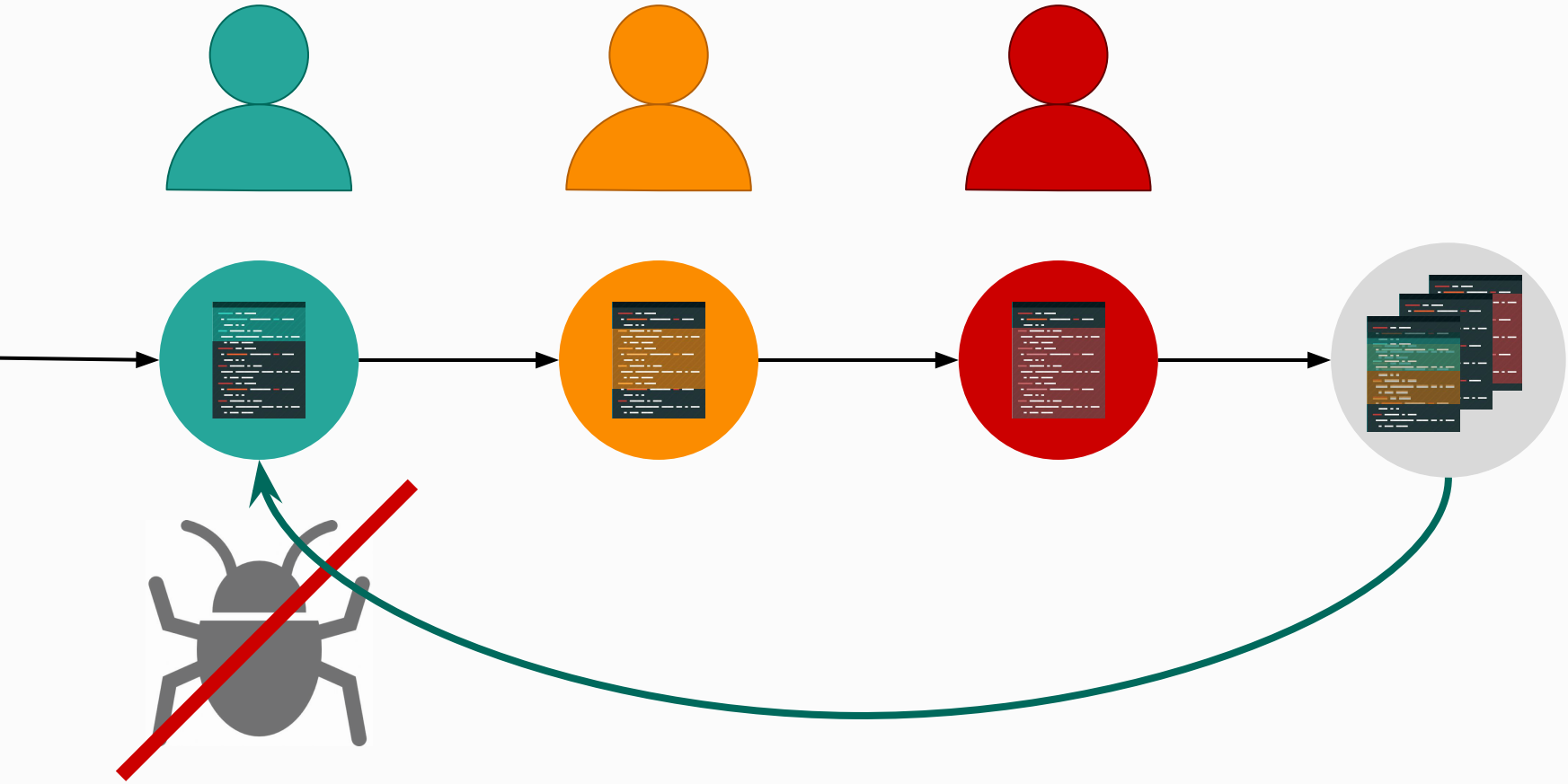
TRACE changes



TRACE changes



ROLLBACK changes

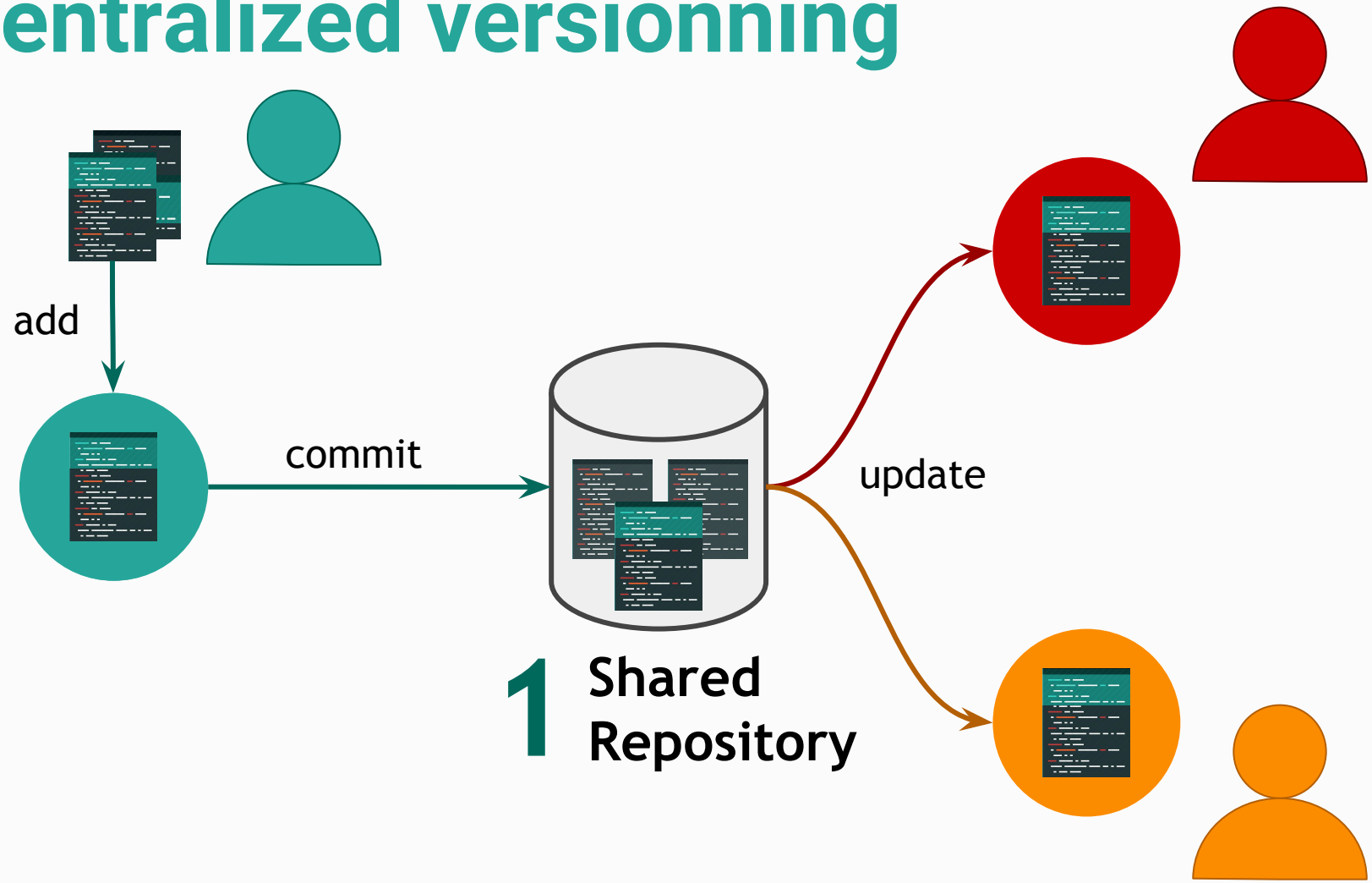


And yes… SHARE changes

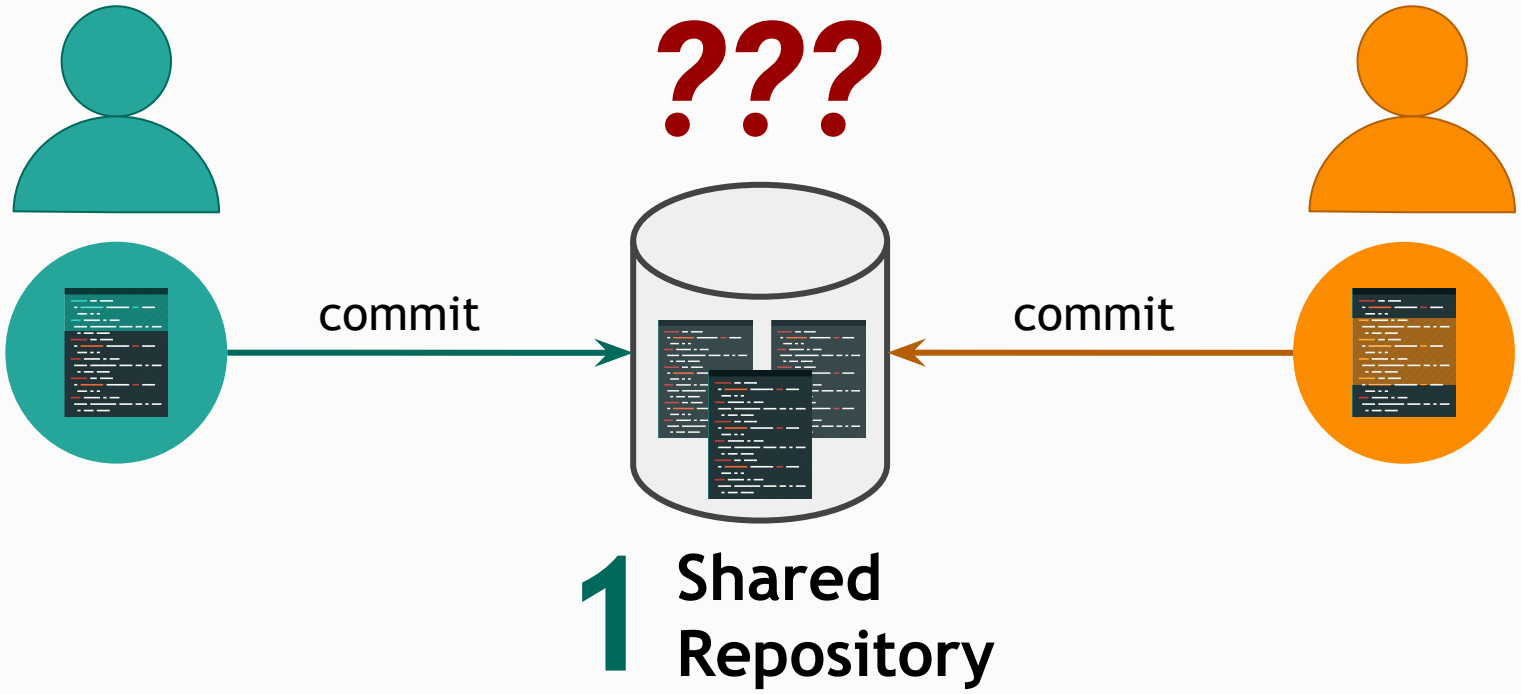
(source: biz3.0)

Centralized versionning

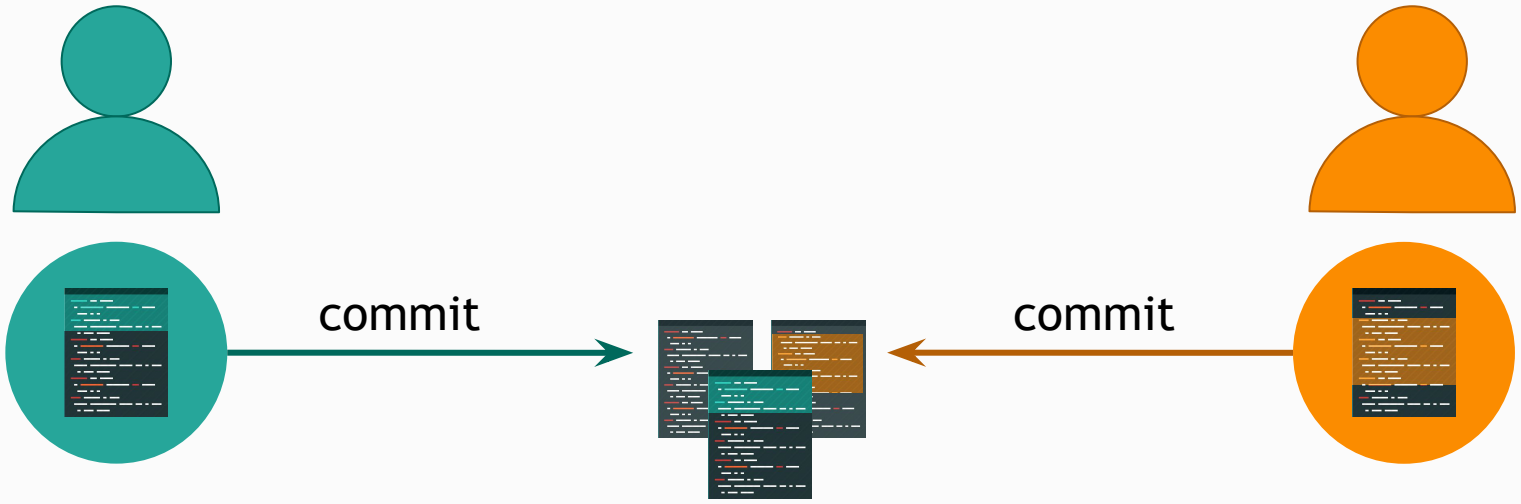
Centralized versionning



Centralized versionning



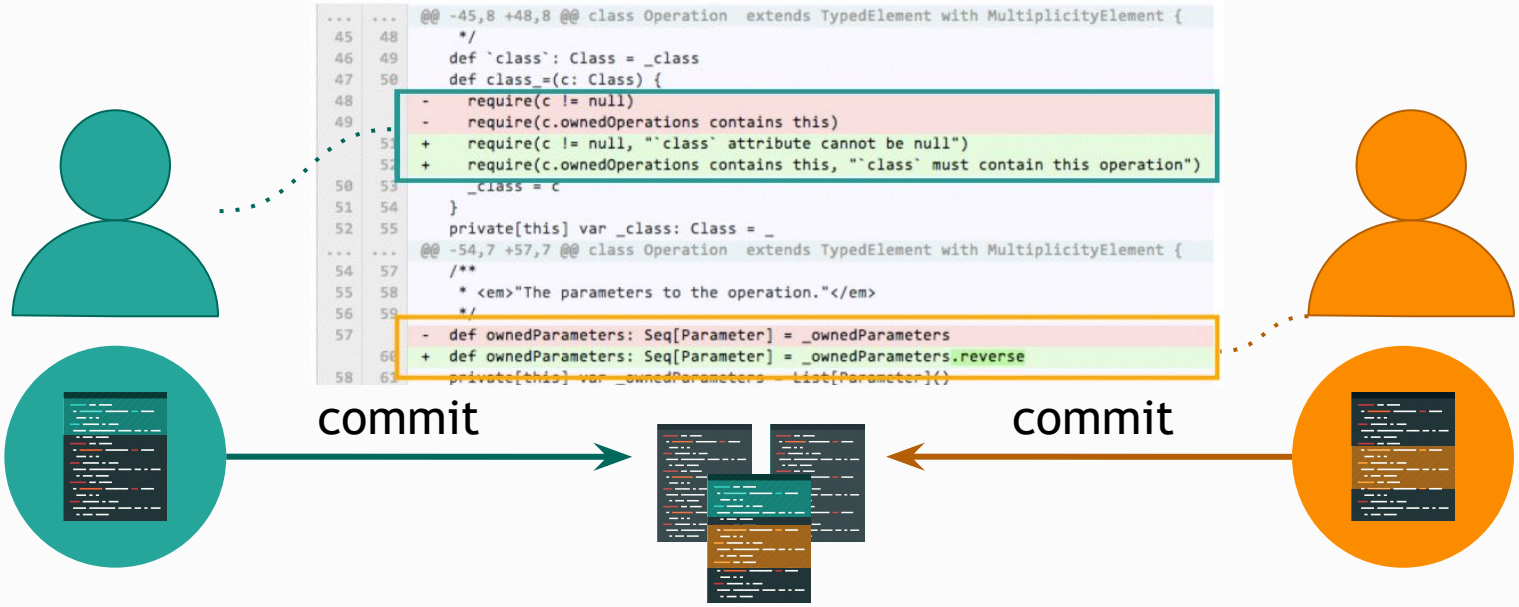
Handling conflicts



Different files

=> No problem

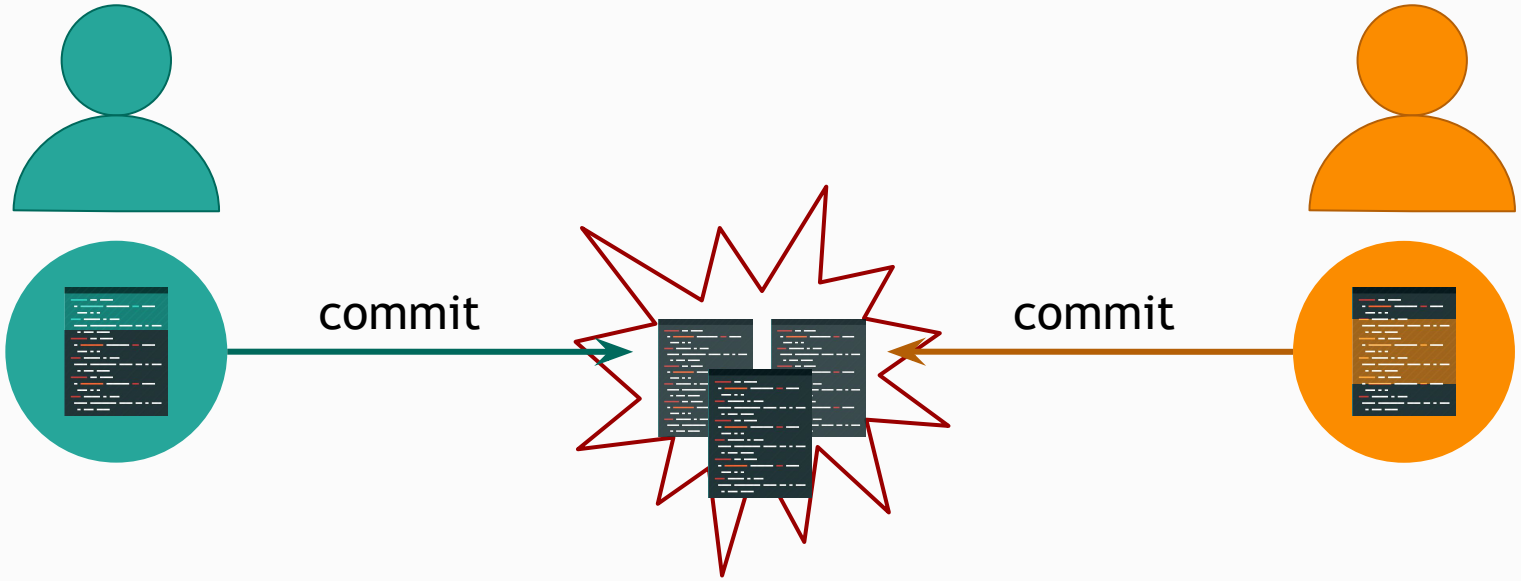
Handling conflicts



Different parts of the same file

=> Automatic merge

Handling conflicts

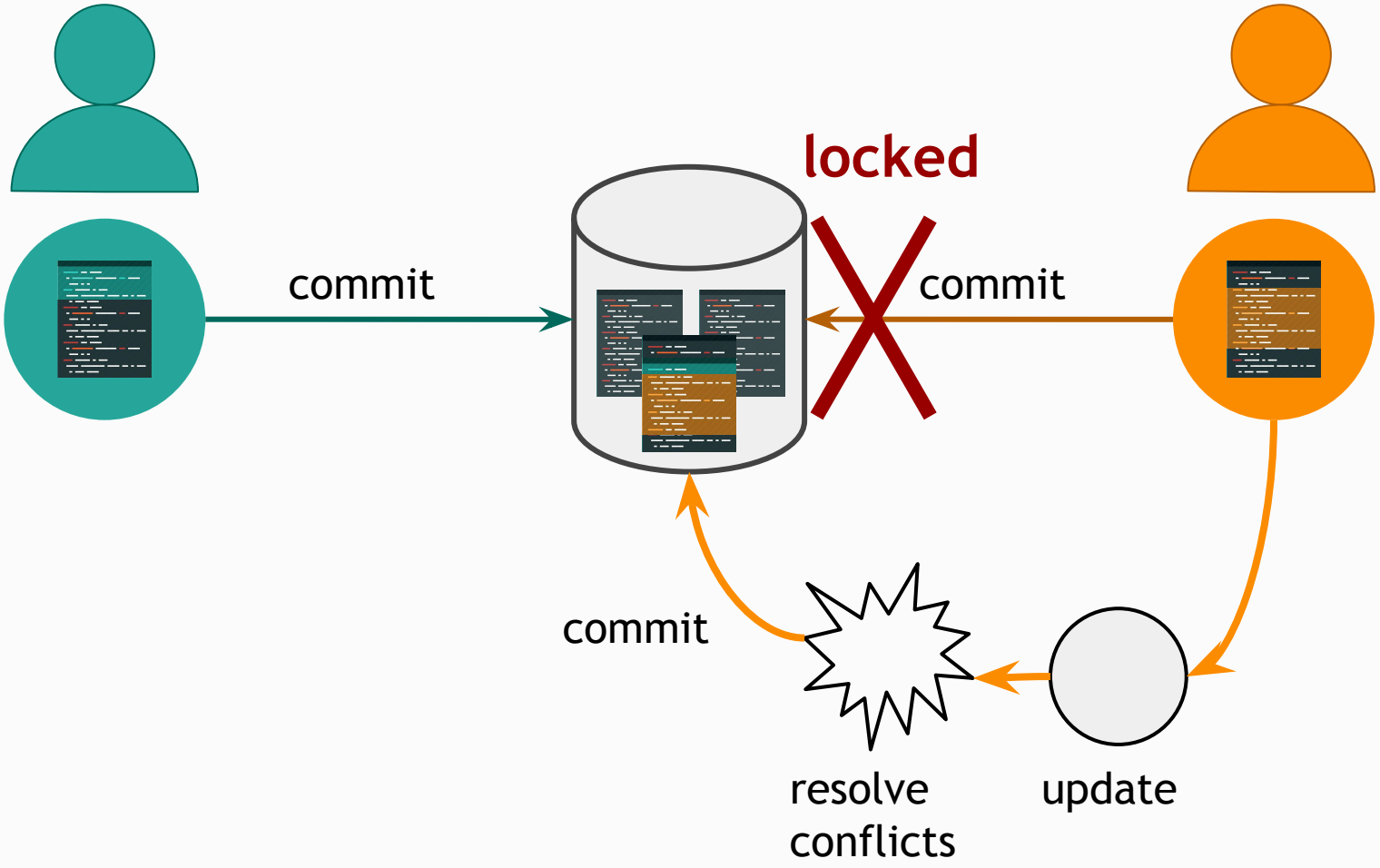


Same part of the same file

=> **Conflict**

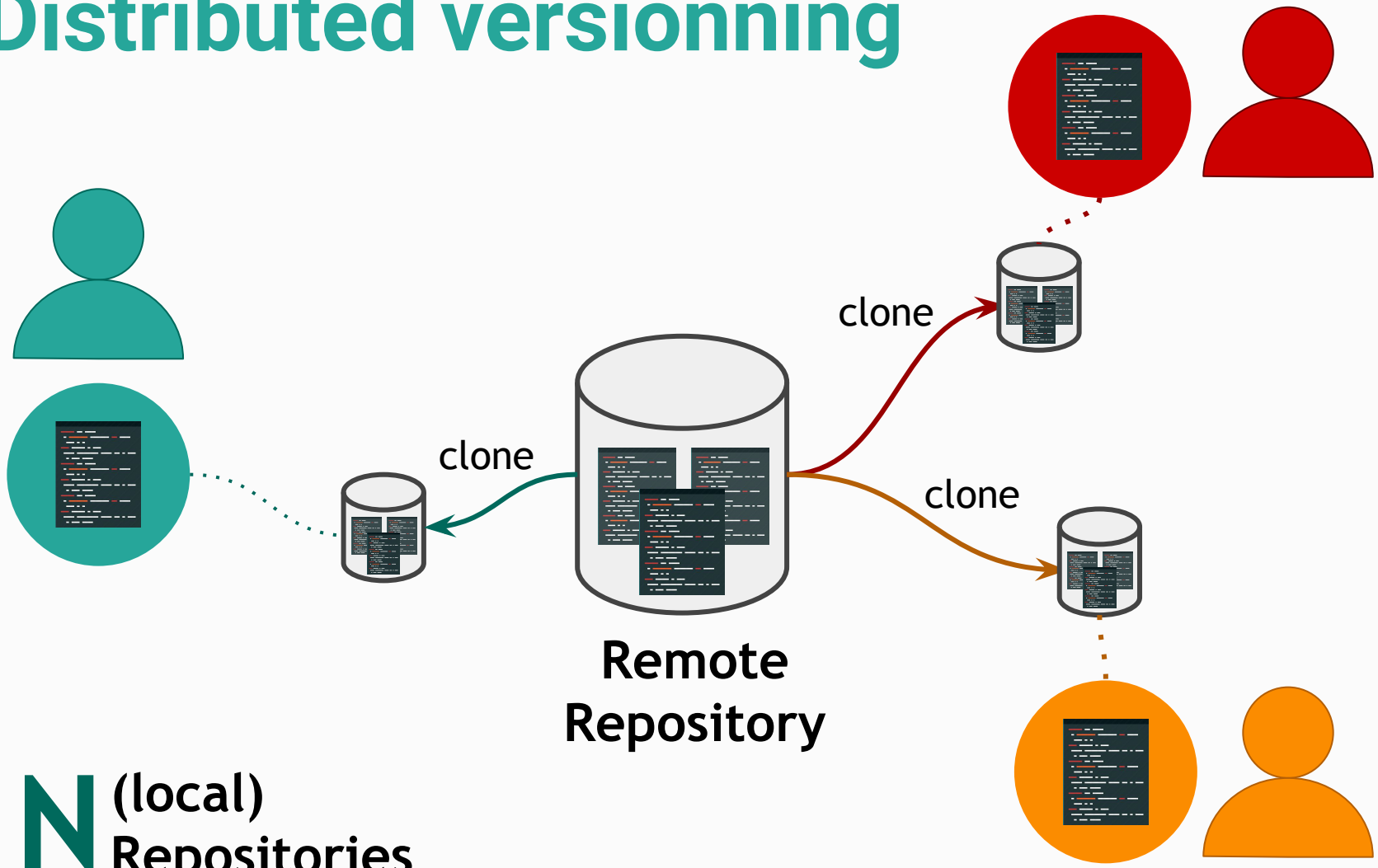
Back to...

Centralized versionning

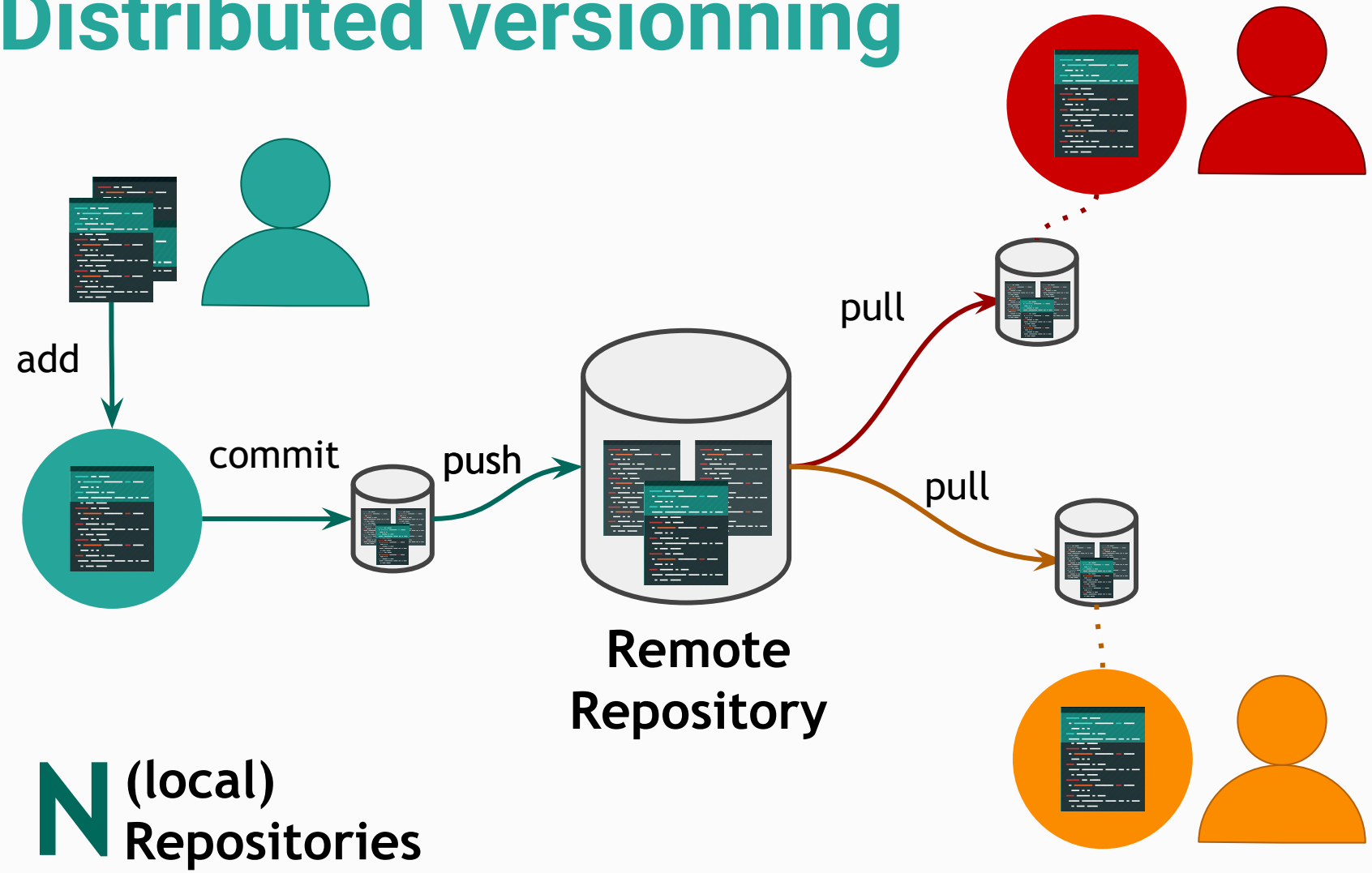


Distributed versionning

Distributed versionning



Distributed versionning



Sum-up

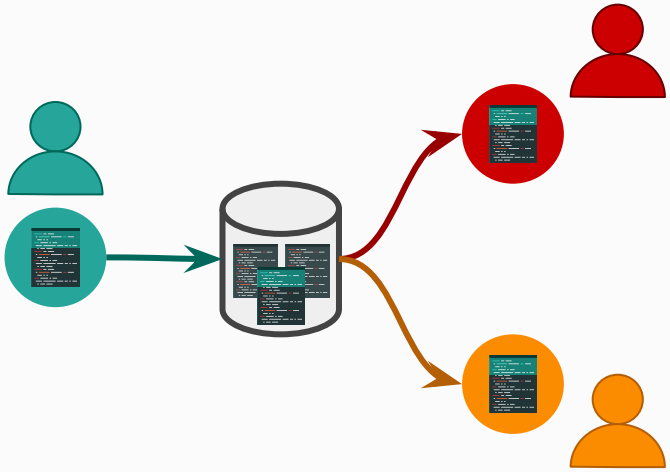
Source Code Versioning

Share changes

Trace changes

Rollback changes

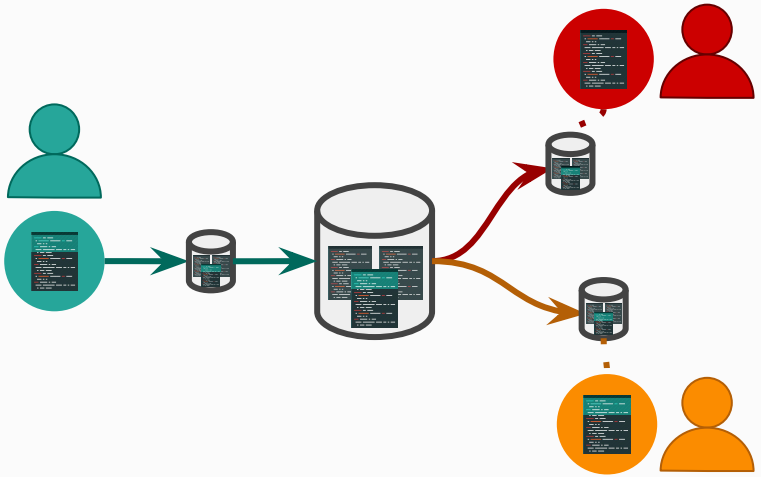
Centralized vs Distributed



add -> commit

1 Repository

> CVS, SVN, ...



add -> commit -> **push**

N repositories : 1 per user

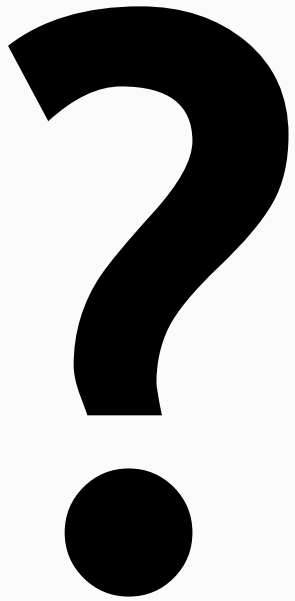
Offline work, branches, and more...

> Git, Mercurial, ...

For the project?

We go for

git



http://rafstoryart.deviantart.com

Advanced versioning

Using **git** (101)

Handling **conflicts**

Using **branches**

Git 101

Git basic commands

- git clone {url} -> Get an existing git repository
- git init -> Create a new local repository

```
glc@Stagiaire-PC MINGW64 ~/Desktop/git101
$ git clone https://github.com/[redacted]/lp-geo-shapes-ws.git
Cloning into 'lp-geo-shapes-ws'...
remote: Counting objects: 79, done.
remote: Total 79 (delta 0), reused 0 (delta 0), pack-reused 79
Unpacking objects: 100% (79/79), done.
Checking connectivity... done.

glc@Stagiaire-PC MINGW64 ~/Desktop/git101
$ cd lp-geo-shapes-ws/

glc@Stagiaire-PC MINGW64 ~/Desktop/git101/lp-geo-shapes-ws
$ ls -a
./  ../  .git/  .gitignore  pom.xml  site/  src/
```

clone

init

```
glc@Stagiaire-PC MINGW64 ~/Desktop/git101/newrepo
$ git init
Initialized empty Git repository in C:/Users/glc/Desktop/git101/newrepo/.git/

glc@Stagiaire-PC MINGW64 ~/Desktop/git101/newrepo
$ ls -a
./  ../  .git/
```

All information about the repository

Git basic commands

- git **add** {file} -> Stage a file for the next commit
- git **status** -> Status of the local repository

```
glc@Stagiaire-PC MINGW64 ~/Desktop/git101/lp-geo-shapes-ws
$ git add pom.xml

glc@Stagiaire-PC MINGW64 ~/Desktop/git101/lp-geo-shapes-ws
$ git add newFile.txt

glc@Stagiaire-PC MINGW64 ~/Desktop/git101/lp-geo-shapes-ws
$ git add site/script.js
```

add

status

Up to date with remote

Added for next commit

Not added for next commit

Not known by git and not added for next commit

```
glc@Stagiaire-PC MINGW64 ~/Desktop/git101/lp-geo-shapes-ws
$ git status
On branch master
Your branch is up-to-date with 'origin/master'.
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

        new file:   newFile.txt
        modified:   pom.xml
        deleted:    site/script.js

Changes not staged for commit:
  (use "git add/rm <file>..." to update what will be committed)
  (use "git checkout -- <file>..." to discard changes in working directory)

        modified:   pom.xml
        deleted:    site/index.html
        modified:   src/main/java/fr/unice/iut/shapes/services/ShapesService.java

Untracked files:
  (use "git add <file>..." to include in what will be committed)

        newFile2.txt
```

Git basic commands

- git **add** {file} -> Stage a file for the next commit
- git **status** -> Status of the local repository

```
glc@Stagiaire-PC MINGW64 ~/Desktop/git101/lp-geo-shapes-ws
$ git add pom.xml

glc@Stagiaire-PC MINGW64 ~/Desktop/git101/lp-geo-shapes-ws
$ git add newFile.txt

glc@Stagiaire-PC MINGW64 ~/Desktop/git101/lp-geo-shapes-ws
$ git add site/script.js
```

add

status

```
glc@Stagiaire-PC MINGW64 ~/Desktop/git101/lp-geo-shapes-ws
$ git status
On branch master
Your branch is up-to-date with 'origin/master'.
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

        new file:   newFile.txt
        modified:   pom.xml
        deleted:    site/script.js

Changes not staged for commit:
  (use "git add/rm <file>..." to update what will be committed)
  (use "git checkout -- <file>..." to discard changes in working directory)

        modified:   pom.xml
        deleted:    site/index.html
        modified:   src/main/java/fr/unice/iut/shapes/services/ShapesService.java

Untracked files:
  (use "git add <file>..." to include in what will be committed)

        newFile2.txt
```

Can add only part of a file

Git basic commands

- git **commit** -m {msg} -> Create a new (local) commit
- git **push** -> Send commits to the remote repository
- git **pull** -> Get changes from the remote repository

One commit to push →

```
glc@Stagiaire-PC MINGW64 ~/Desktop/git101/lp-geo-shapes-ws
$ git commit -m "an example commit"
[master 396d291] an example commit
 3 files changed, 1 insertion(+), 226 deletions(-)
 create mode 100644 newFile.txt
 delete mode 100644 site/script.js

glc@Stagiaire-PC MINGW64 ~/Desktop/git101/lp-geo-shapes-ws
$ git status
On branch master
Your branch is ahead of 'origin/master' by 1 commit.
  (use "git push" to publish your local commits)
Changes not staged for commit:
  (use "git add/rm <file>..." to update what will be committed)
  (use "git checkout -- <file>..." to discard changes in working directory)

        deleted:    site/index.html
        modified:   src/main/java/fr/unice/iut/shapes/resources/Point.java

Untracked files:
  (use "git add <file>..." to include in what will be committed)

        newFile2.txt

no changes added to commit (use "git add" and/or "git commit -a")
```

Git basic commands

- git log -> See commits history (local)

```
glc@Stagiaire-PC MINGW64 ~/Desktop/git101/lp-geo-shapes-ws
$ git log
commit 9e21c9a2ec3aed06e98c64f6232ffacea19eedc5
Author: Cecile Camillieri [redacted]
Date:   Mon Sep 26 14:08:51 2016 +0200

    some commit

commit 396d29160a02aa34d0445bd4373c24a19422cc01
Author: Cecile Camillieri [redacted]
Date:   Mon Sep 26 13:56:00 2016 +0200

    an example commit
```

Git basic commands

- git **clone** {url} -> Get an existing git repository
- git **init** -> Create a new local repository

- git **add** {file} -> Stage a file for the next commit
- git **commit** -m {msg} -> Create a new (local) commit
- git **push** -> Send commits to the remote repository
- git **pull** -> Get changes from the remote repository

- git **status** -> Status of the local repository
- git **log** -> See commits history of the local repository

For more : **http://git-scm.com**

Only commit what is necessary

- .gitignore file to define files ignored by git

  -> not shown when doing ‘git status’

- Should ignore :

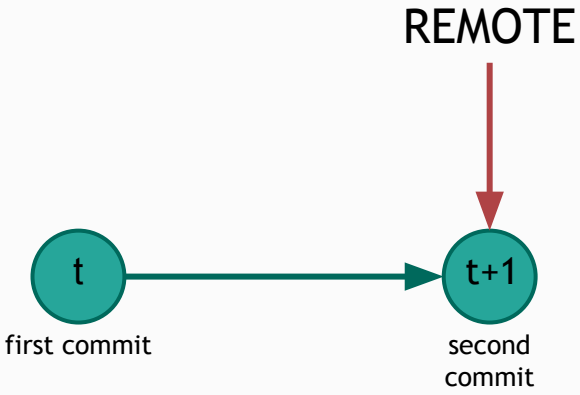
  - hidden files (most of the time) .*
  - compiled code *.class bin/ target/ etc.
  - IDE settings .eclipse/ *.iml etc.

- Should share :

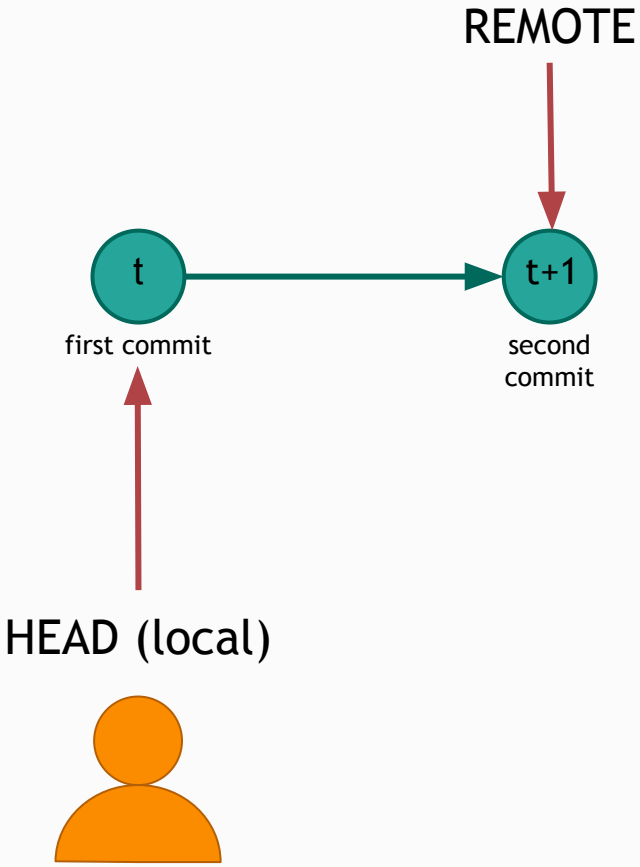
  - your gitignore file
  - source, resources, doc, etc.

Remote vs local

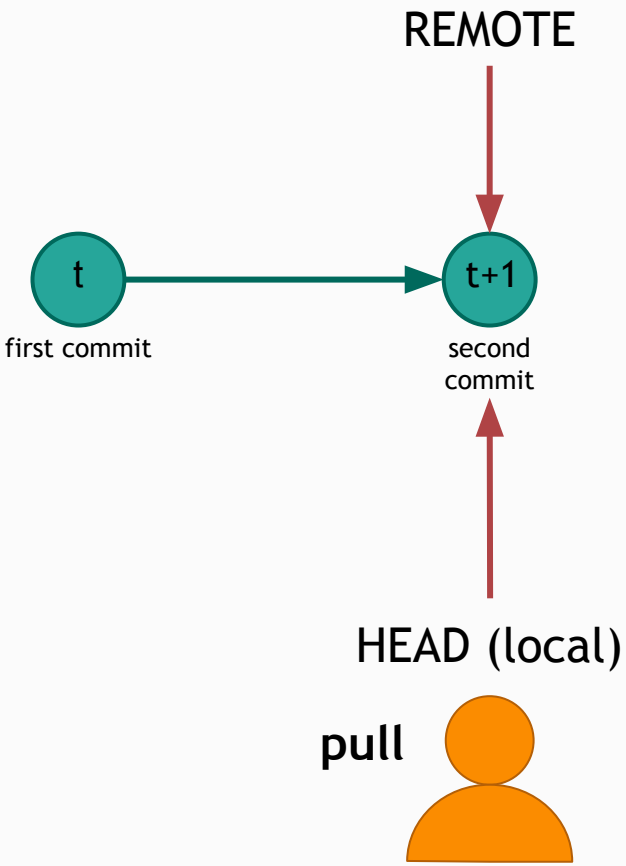
History



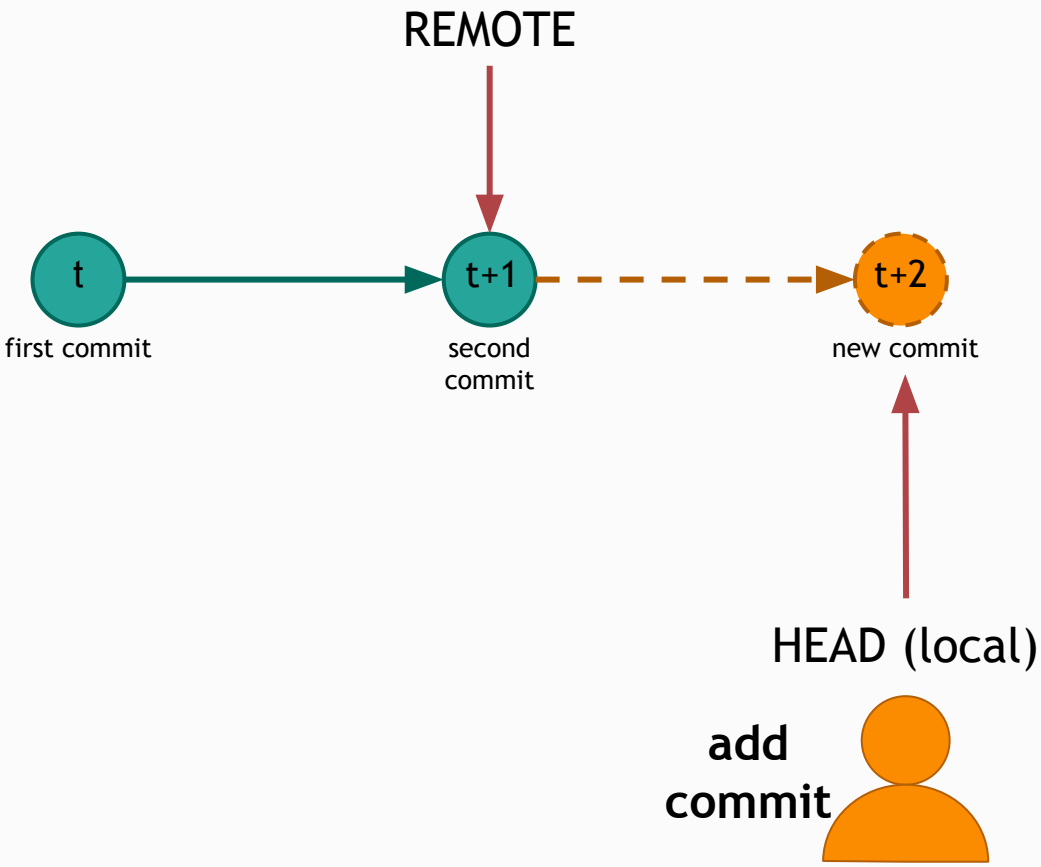
History



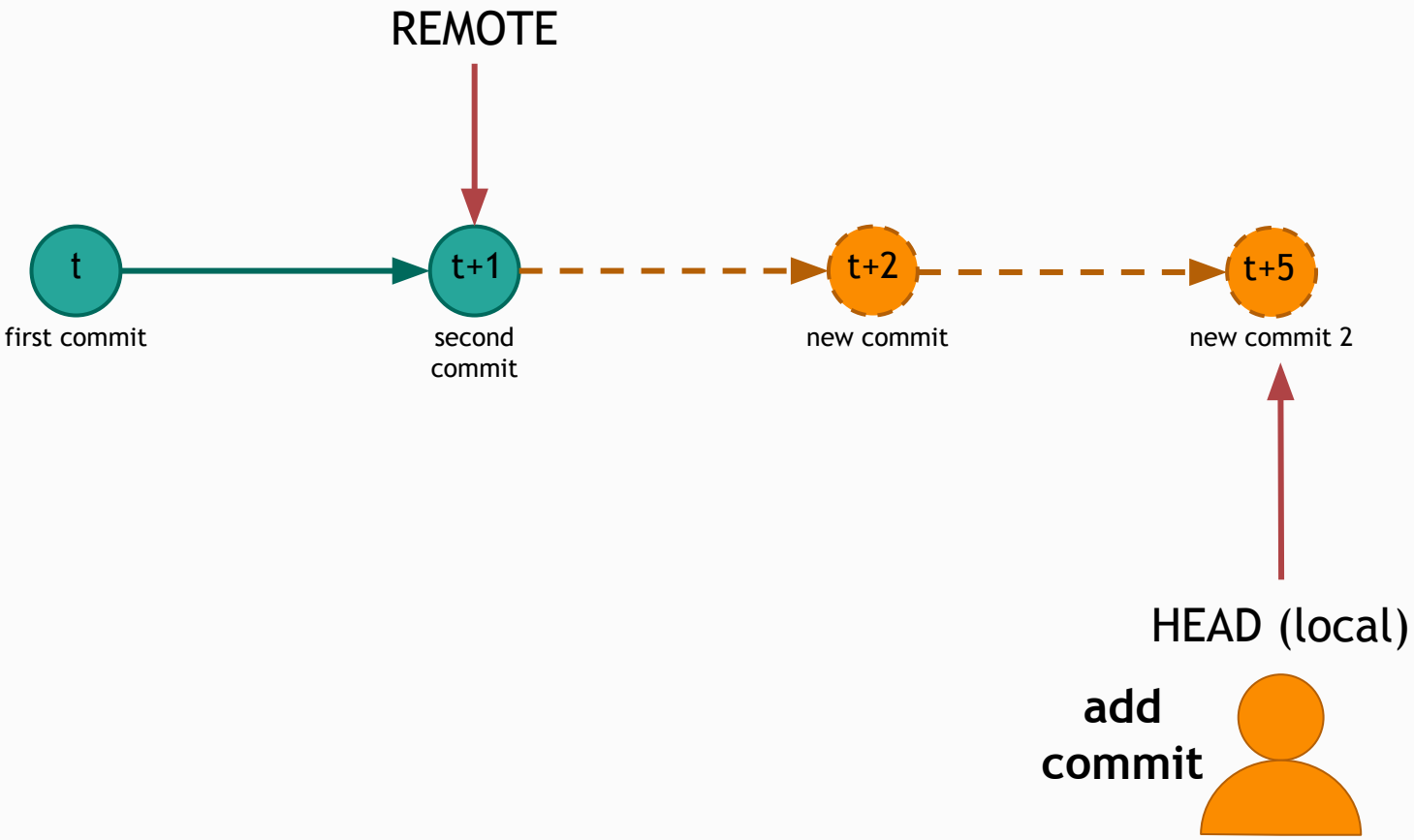
History



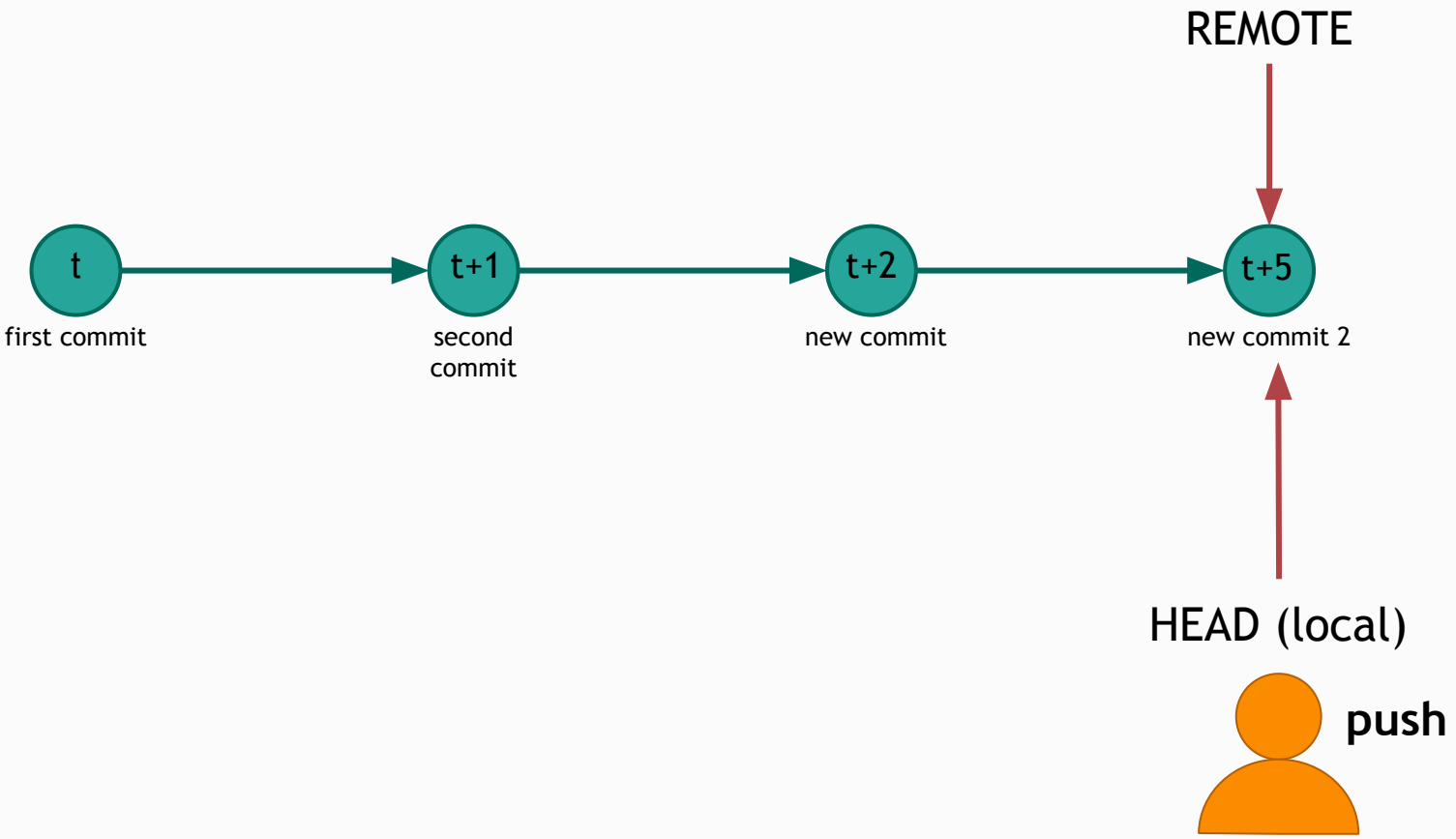
History


REMOTE
t
t+1
t+2
first commit
second commit
new commit
HEAD (local)
add commit

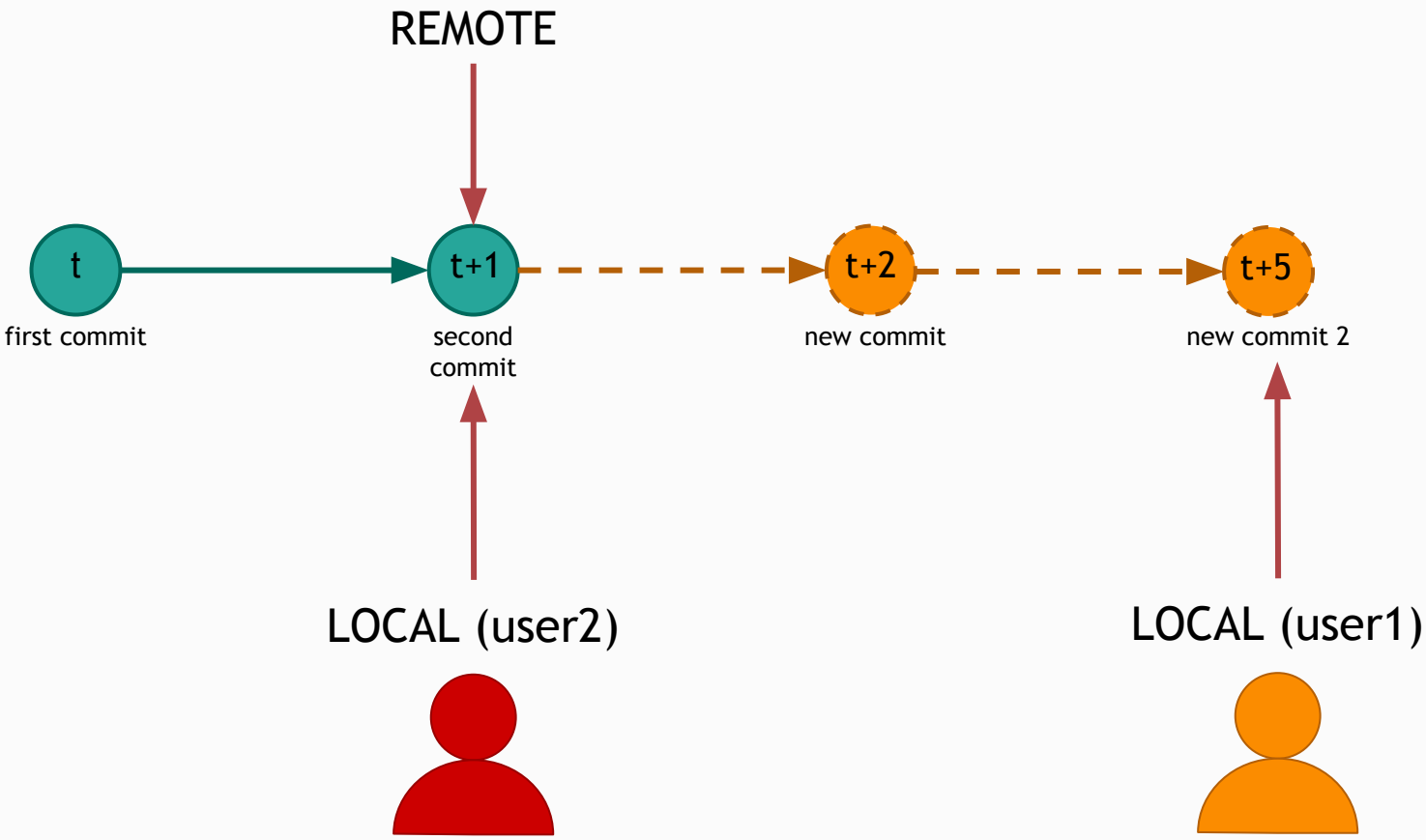
History


REMOTE
t
first commit
t+1
second commit
t+2
new commit
t+5
new commit 2
HEAD (local)
add commit

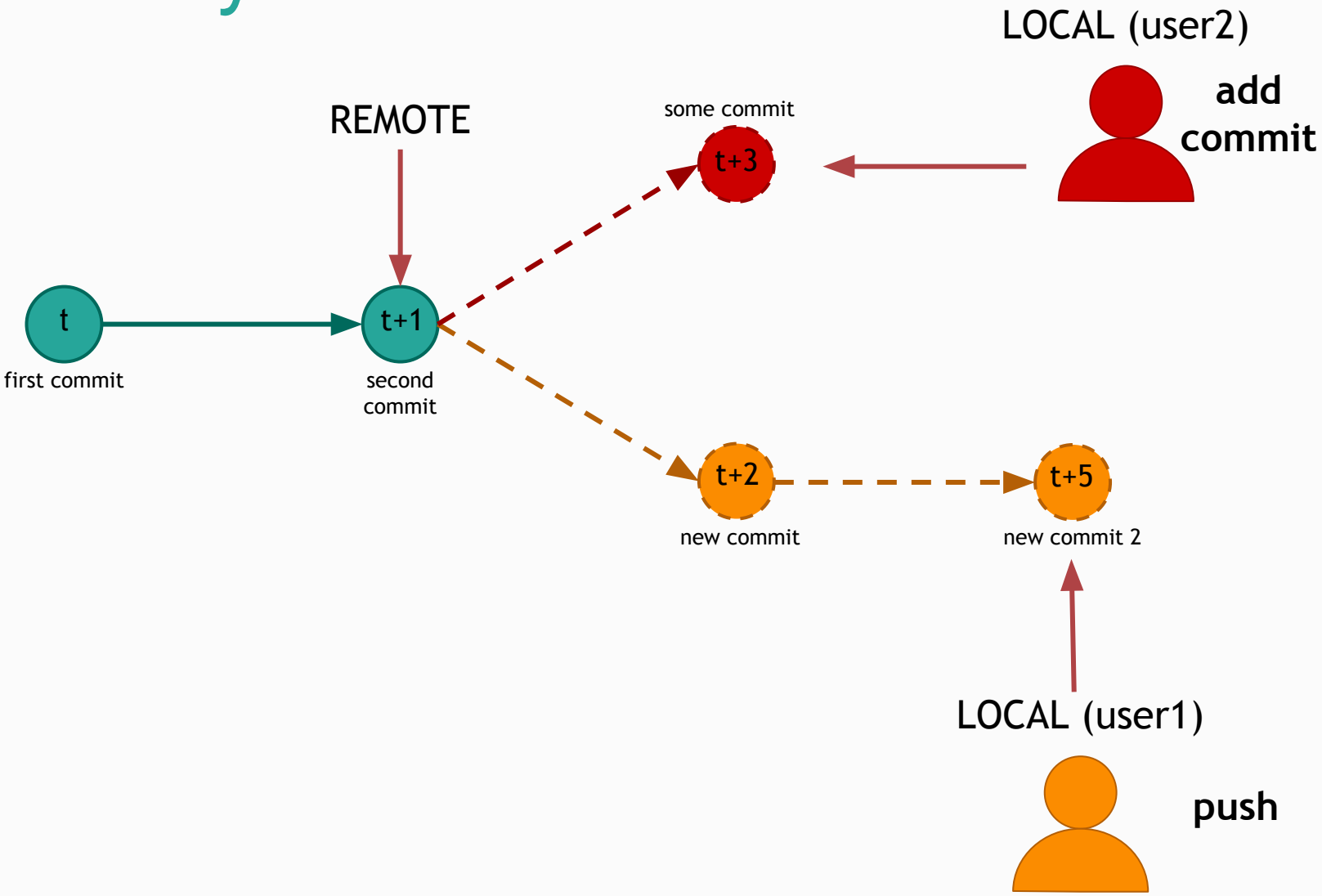
History


REMOTE
t
first commit
t+1
second commit
t+2
new commit
t+5
new commit 2
HEAD (local)
push

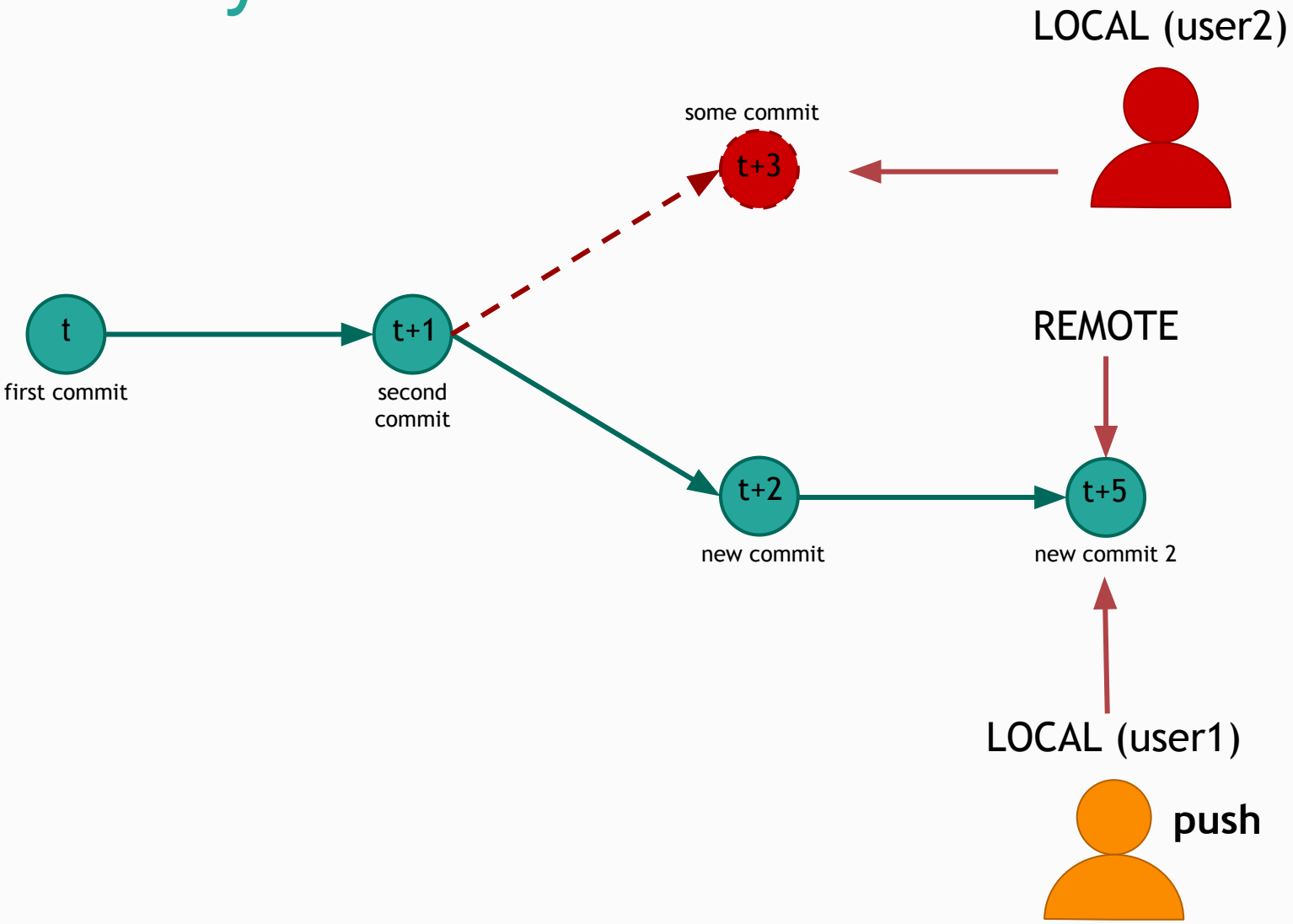
History


REMOTE
t
t+1
t+2
t+5
first commit
second commit
new commit
new commit 2
LOCAL (user2)
LOCAL (user1)

History

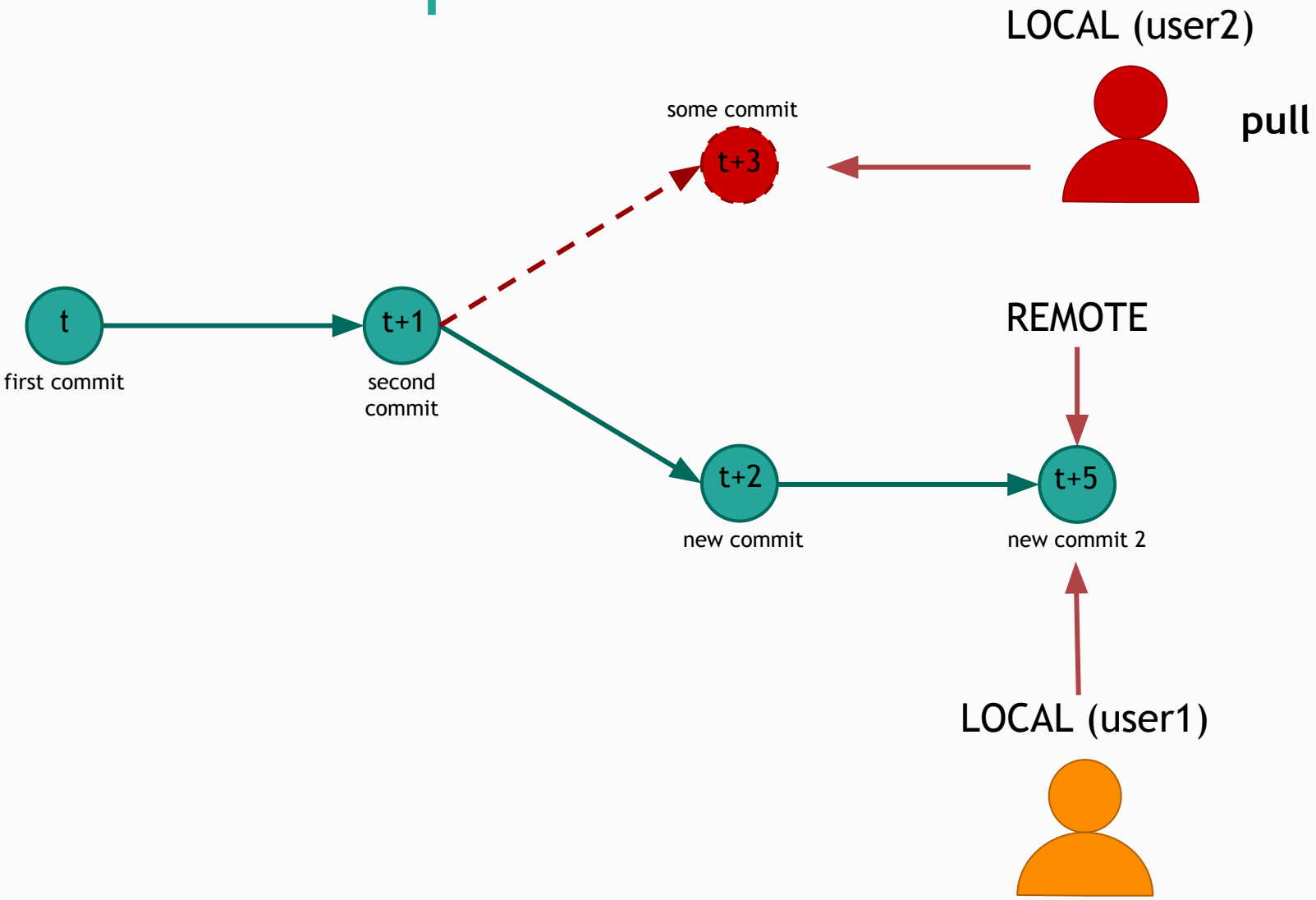

LOCAL (user2)
add commit
REMOTE
some commit
t+3
t
t+1
first commit
second commit
t+2
t+5
new commit
new commit 2
LOCAL (user1)
push

History


LOCAL (user2)
some commit
t+3
t
first commit
t+1
second commit
REMOTE
t+2
new commit
t+5
new commit 2
LOCAL (user1)
push

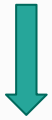
Handling conflicts

Pull before push

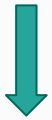


Auto merging

Different files OR
Different part of same file



Automatic Merge



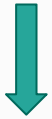
Merge commit is created automatically

```
glc@Stagiaire-PC MINGW64 ~/
$ git pull
remote: Counting objects: 116, done.
remote: Compressing objects: 100% (14/14), done.
remote: Total 116 (delta 18), reused 15 (delta 15), pack-reused 86
Receiving objects: 100% (116/116), 91.36 MiB | 2.43 MiB/s, done.
Resolving deltas: 100% (37/37), completed with 7 local objects.
From https://github.com/[redacted]
 * branch            master     -> FETCH_HEAD
   8d1af7b..d33cf6f  master     -> origin/master
Auto-merging models16-me-workshop/sig-alternate.cls
Auto-merging models16-me-workshop/paper.tex
Auto-merging models16-me-workshop/biblio.bib
Removing WorkshopModels/figures/archi-bp.png
Merge made by the 'recursive' strategy.
```

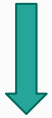
```
glc@Stagiaire-PC MINGW64 ~/
$ git log
commit 404eb88a7b2caad3fb214495e2a5d92f9d6432f6
Merge: 37a0bb7 d33cf6f
Author: Cecile Camillieri <cecile.camillieri@gmail.com>
Date:   Mon Sep 26 16:09:35 2016 +0200

    Merge branch 'master' of https://github.com/[redacted]

commit 37a0bb7ddd008df52254e843d76adfe1cc3fb28e
Author: Cecile Camillieri <[redacted]>
Date:   Mon Sep 26 16:07:59 2016 +0200

    test commit 2

commit 2d3b7cb24041a5eb449d87c9cc427ba4155f8991
Author: Cecile Camillieri <[redacted]>
Date:   Mon Sep 26 16:07:05 2016 +0200

    test commit

commit d33cf6f258921ff266068660c5cb2ca01142247e
```

Merge conflicts

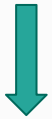
Same part of same file



Automatic Merge fail



Need to Resolve conflicts manually



Add and create merging commit

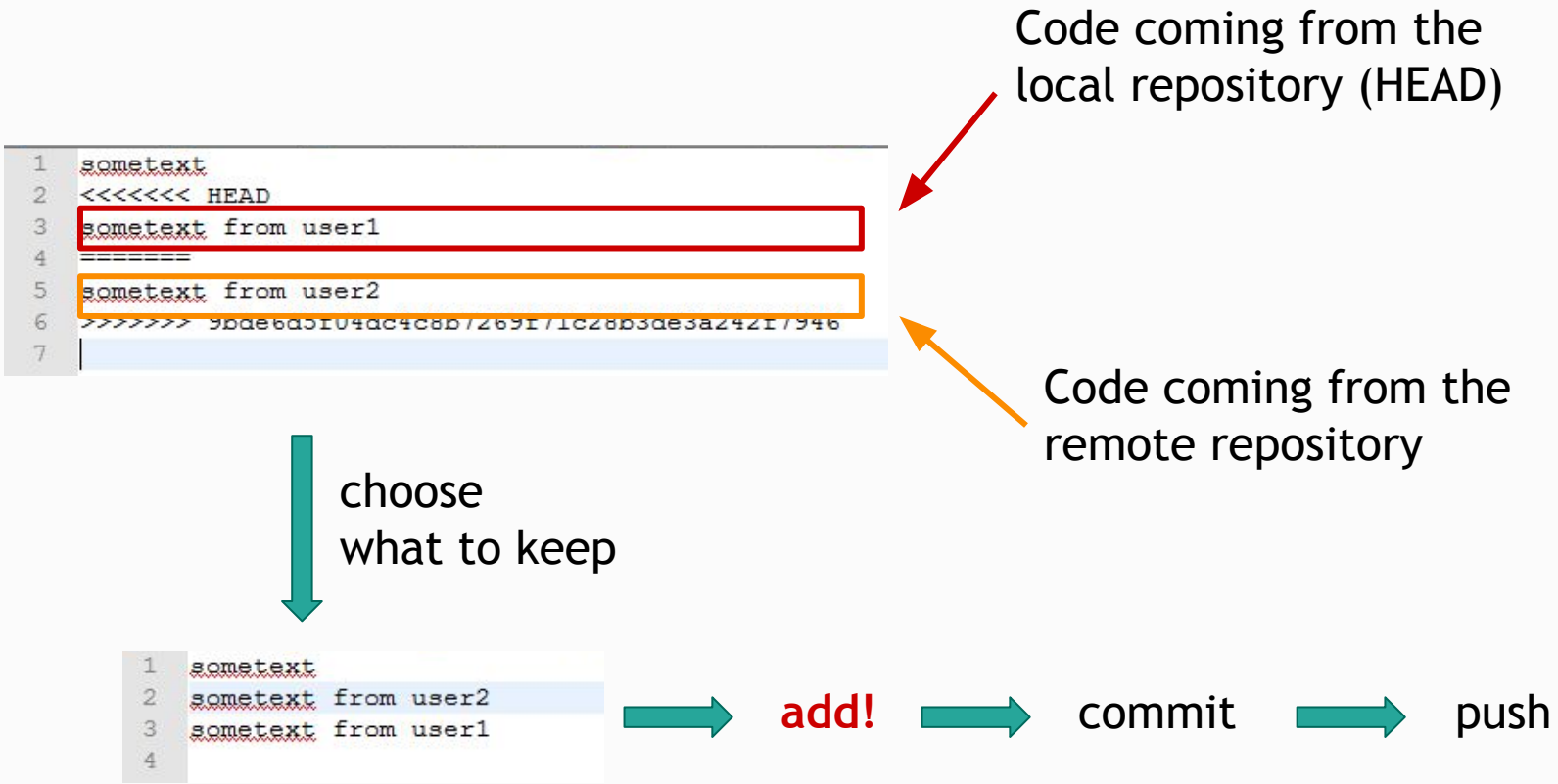
```
glc@Stagiaire-PC MINGW64 ~/Desktop/git101/newrepo
$ git pull
Auto-merging somefile.txt
CONFLICT (content): Merge conflict in somefile.txt
Automatic merge failed; fix conflicts and then commit the result.
```

No conflicts →

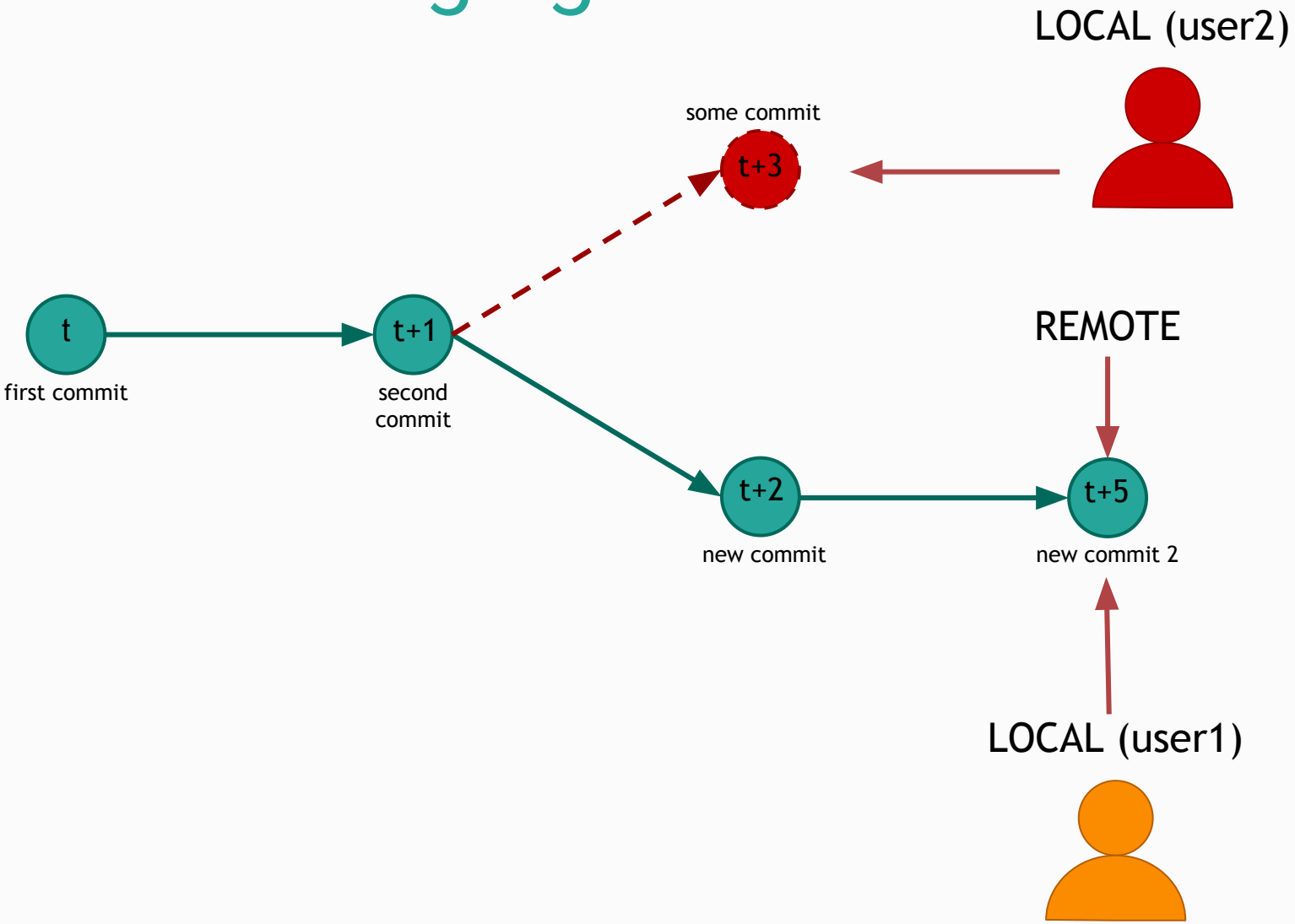
```
glc@Stagiaire-PC MINGW64 ~/Desktop/git101/newrepo
$ git status
On branch newbranch
You have unmerged paths.
  (fix conflicts and run "git commit")

Changes to be committed:

        new file:   newfile.txt

Unmerged paths:
  (use "git add <file>..." to mark resolution)

        both modified:   somefile.txt
```

Conflicts

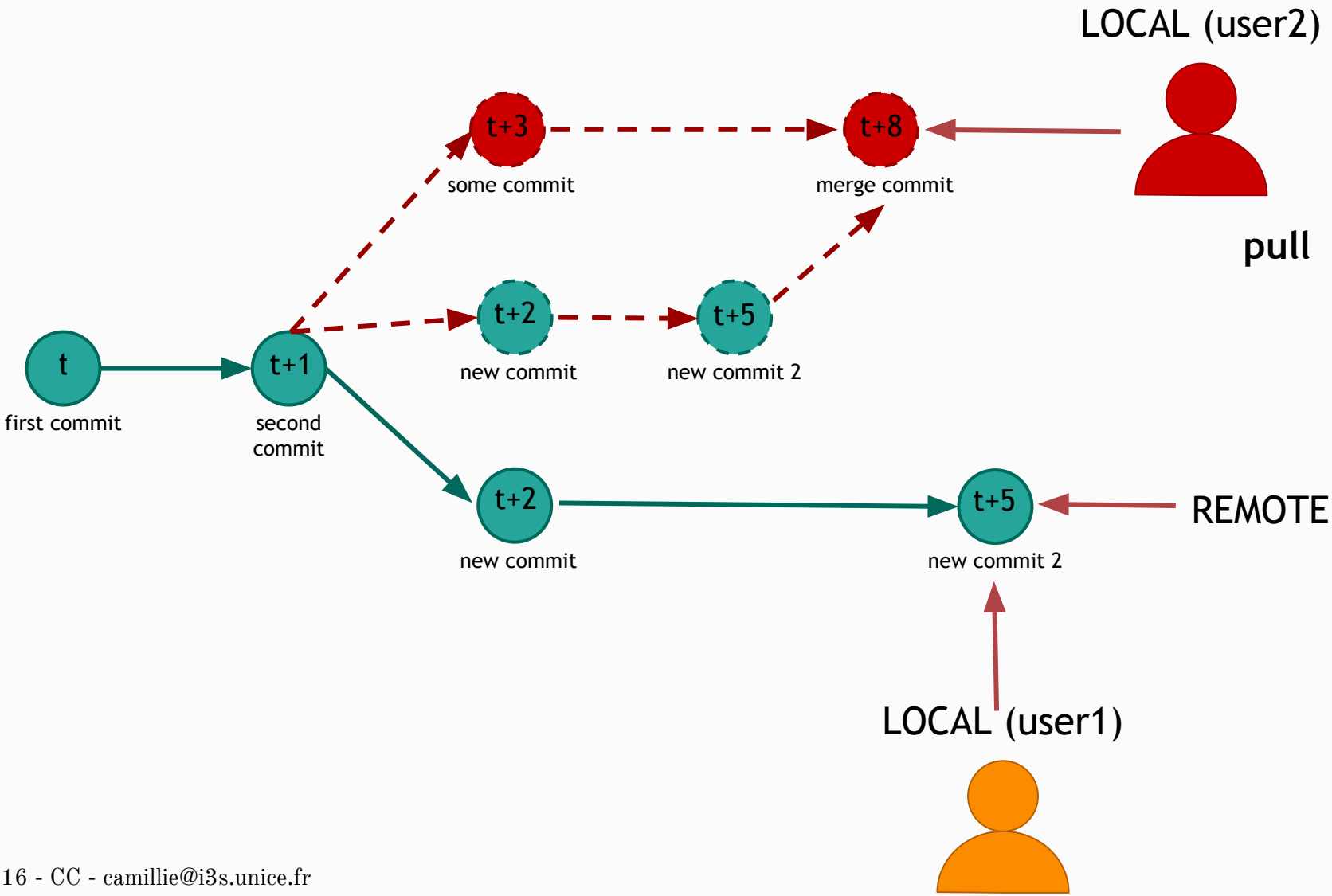
Resolving conflicts



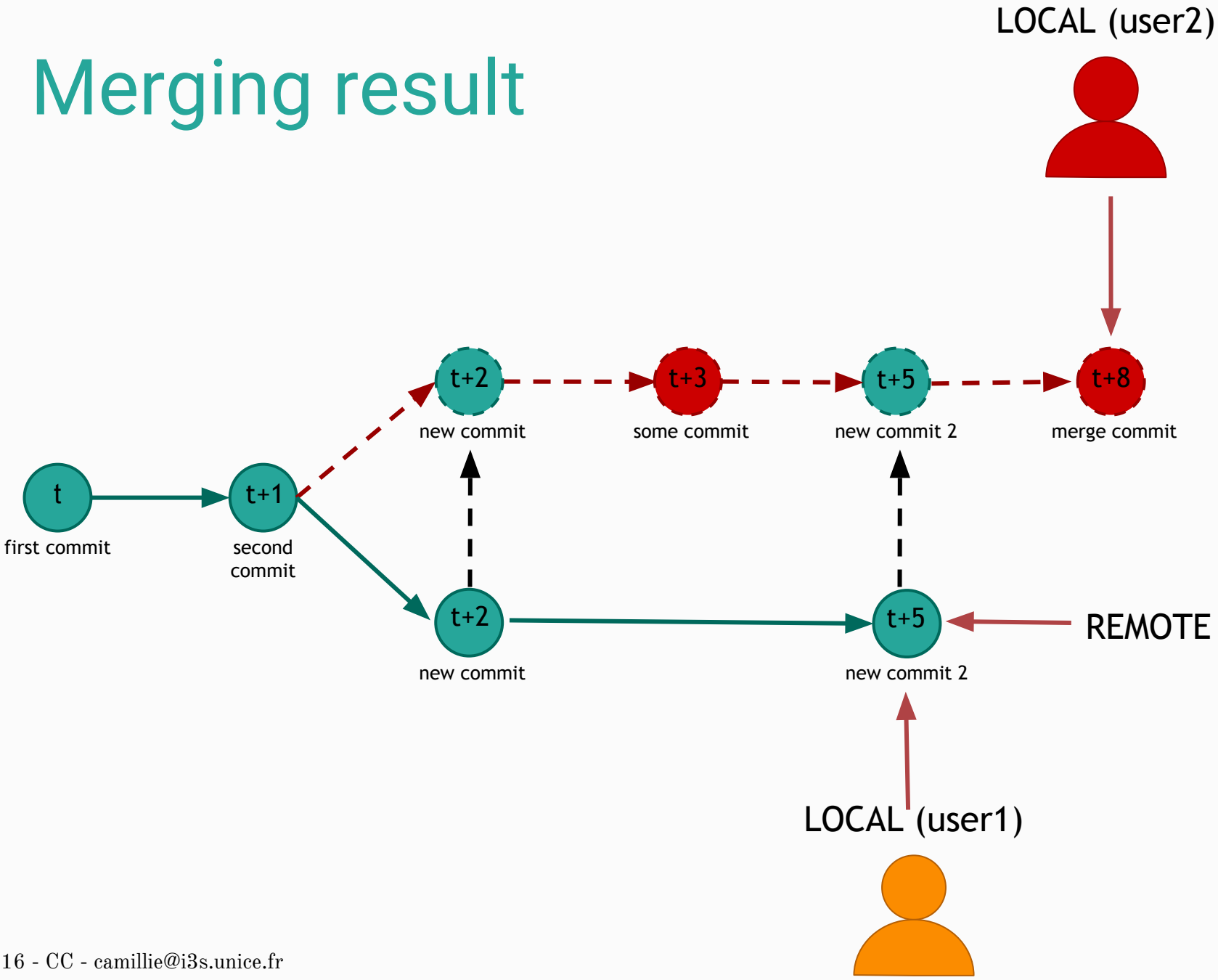
Before merging



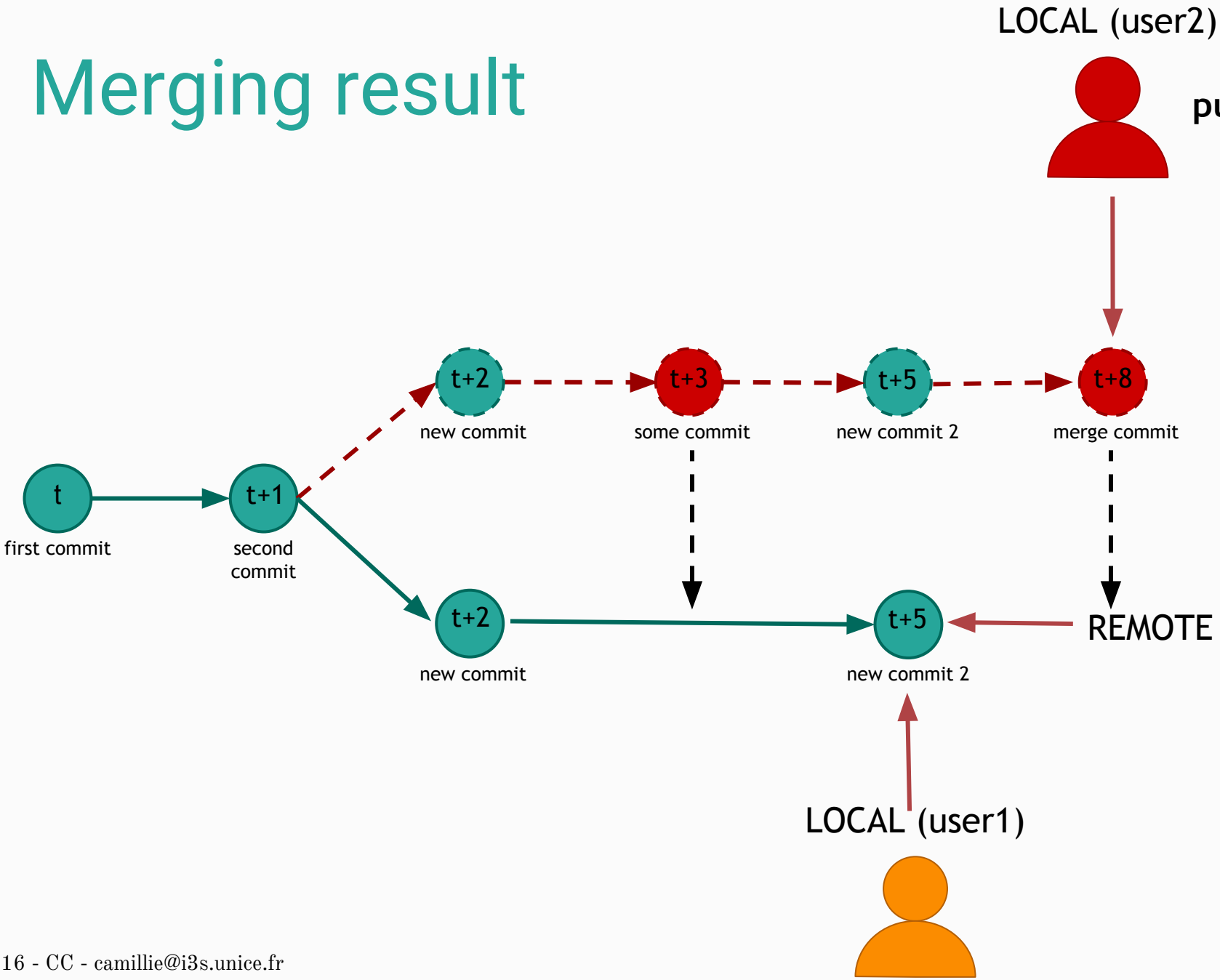
Merging result



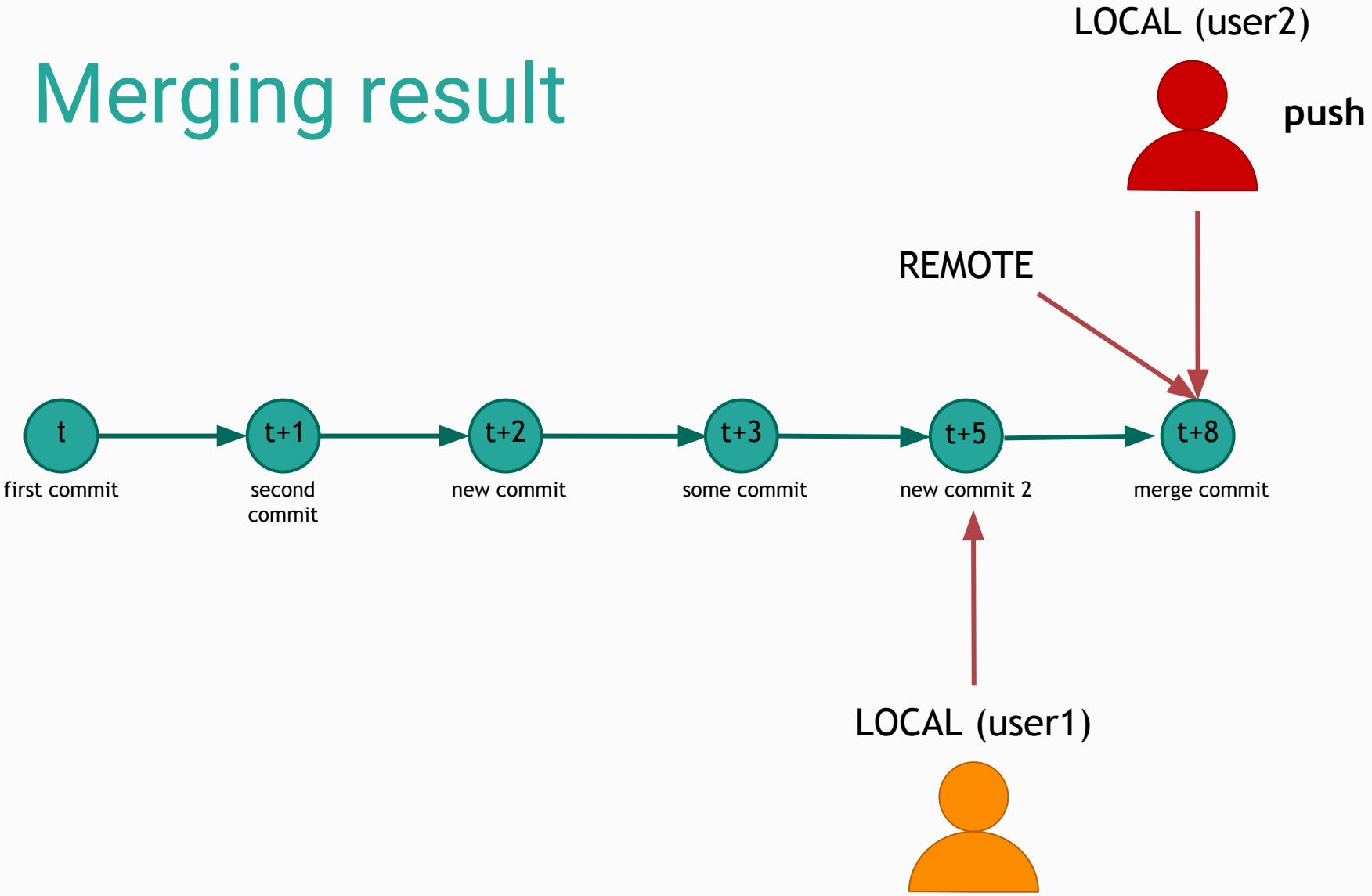
Merging result



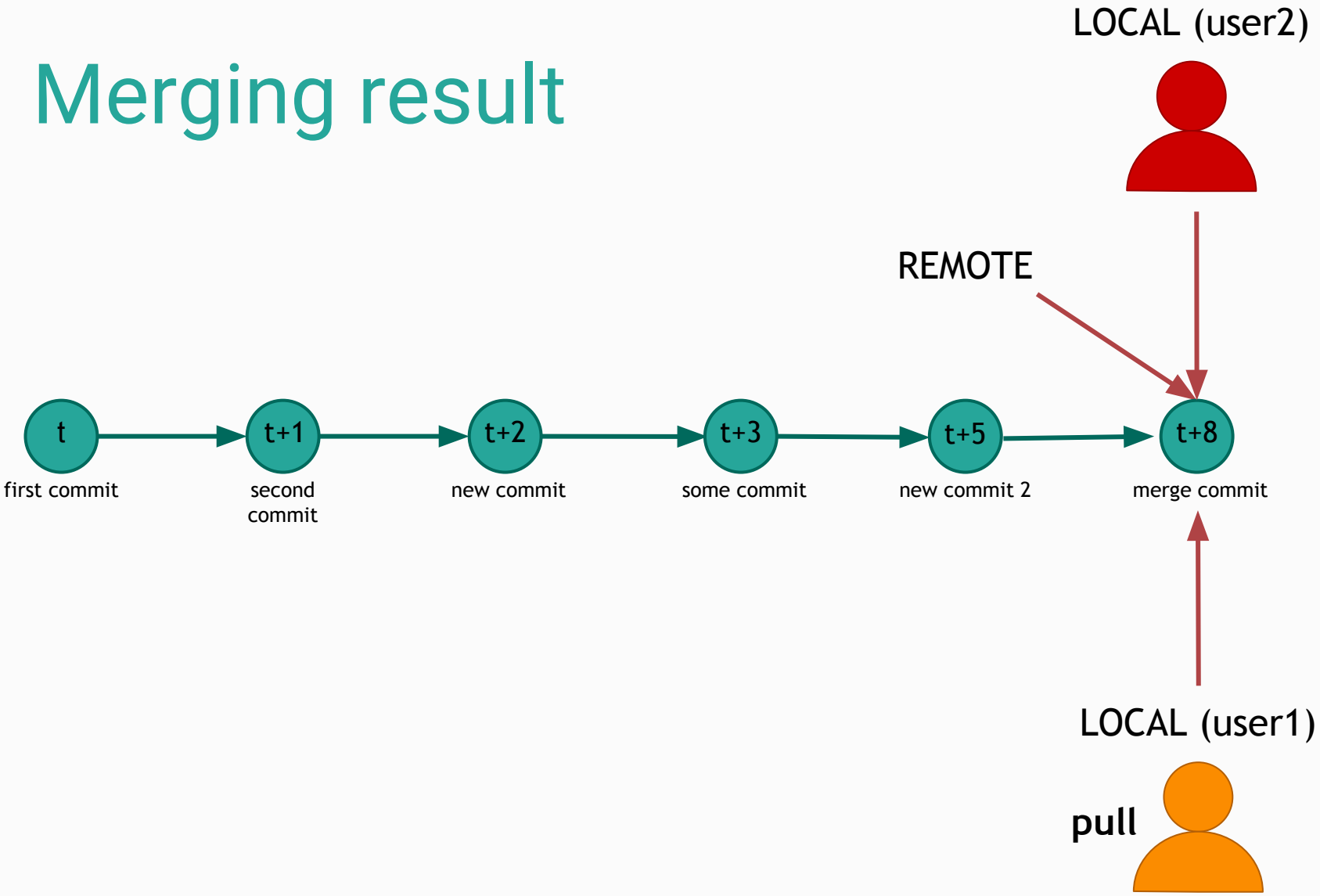
Merging result



Merging result

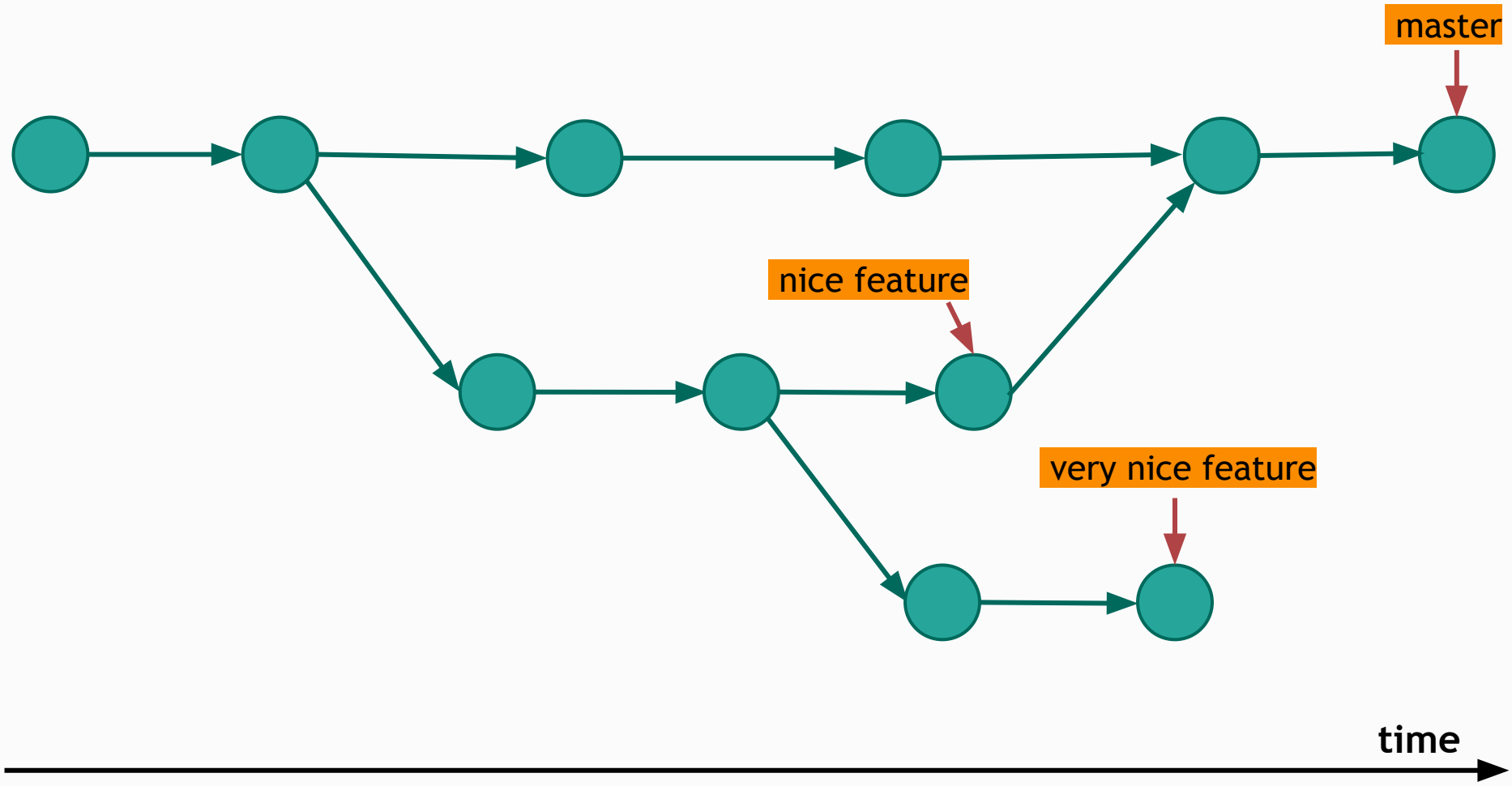


Merging result



Branches & Tags

Branches



Branches

- Work on different features at the same time
- Switch between features/versions/releases
- Merge all changes on the same branch in the end
- Always have a stable version

Git basic commands (continued)

- git **checkout** -> Switch to a different branch/version
- git **branch** -> Manage branches

On branch master

Create and switch to new branch

Go back to master

See all branches

```
glc@Stagiaire-PC MINGW64 ~/Desktop/git101/newrepo (master)
$ git checkout -b new
Switched to a new branch 'new'

glc@Stagiaire-PC MINGW64 ~/Desktop/git101/newrepo (new)
$ git checkout master
Switched to branch 'master'

glc@Stagiaire-PC MINGW64 ~/Desktop/git101/newrepo (master)
$ git branch
* master
  new
  newbranch
```

Git basic commands (continued)

- git merge {branch} -> Merge the given branch into the current one

Create commit on ‘new’ →

Go back to master →

Merge ‘new’ into ‘master’ →

Updated history →

```
glc@Stagiaire-PC MINGW64 ~/Desktop/git101/newrepo (new)
$ git commit -m "added new file"
[new 8e14aee] added new file
 1 file changed, 1 insertion(+), 1 deletion(-)

glc@Stagiaire-PC MINGW64 ~/Desktop/git101/newrepo (new)
$ git checkout master
Switched to branch 'master'

glc@Stagiaire-PC MINGW64 ~/Desktop/git101/newrepo (master)
$ git merge new
Updating 28ca35f..8e14aee
Fast-forward
 newfile.txt | 2 +-
 1 file changed, 1 insertion(+), 1 deletion(-)

glc@Stagiaire-PC MINGW64 ~/Desktop/git101/newrepo (master)
$ git log
commit 8e14aee3a0947bf0044f43a95ac8bcad72849ddf
Author: Cecile Camillieri
Date:   Mon Sep 26 17:23:36 2016 +0200

    added new file
```

Git basic commands (updated)

pull = merge remote branch into current local branch

git **push origin master**

= merge **local branch** into the **remote** (origin) **master** branch

git **pull origin master**

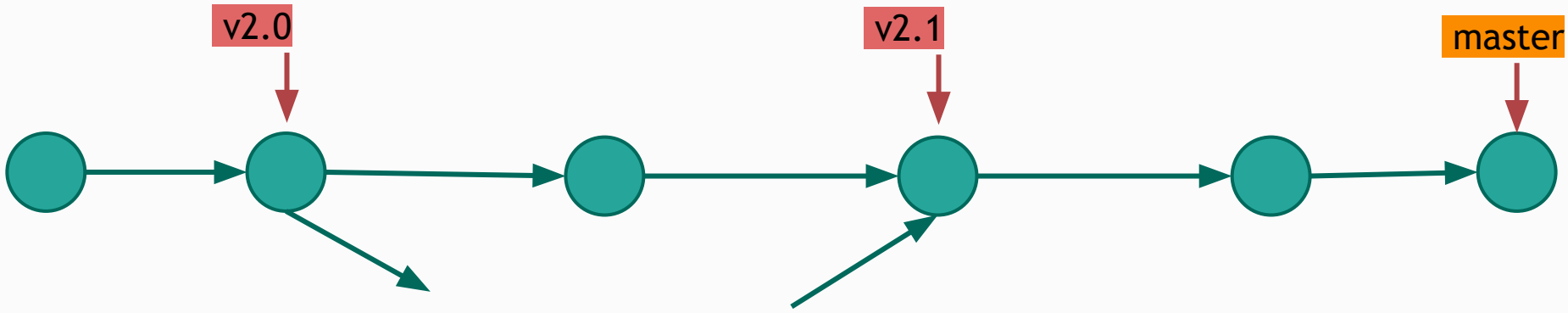
= merge the **remote** (origin) **master** branch into **local branch**

Tagging & releases

- git **tag** -a v2.1 -> Create tag at current commit

- git **push** origin v2.1 -> push tag v2.1
- git **push** *origin* --tags -> push all tags

- git **checkout** -b version2-1 v2.1
  -> switch to a new branch at tag v2.1



Some branching solutions

Basic branching

- **master** branch should always be **stable:** releases
- Development on a **develop** branch
- **Hotfixes** can be made on master

More advanced branches

- **master** branch for **releases**
- Development on a **develop** branch
- A branch for the **most important/risky features**
- **Hotfixes** can be made on master

Git flow

- **master** branch for **releases**
- Development on a **develop** branch
- A branch for important **features** (from develop)
- Branches to **prepare for releases** (from develop)
- Branches for **hotfixes** (from master)

Git flow

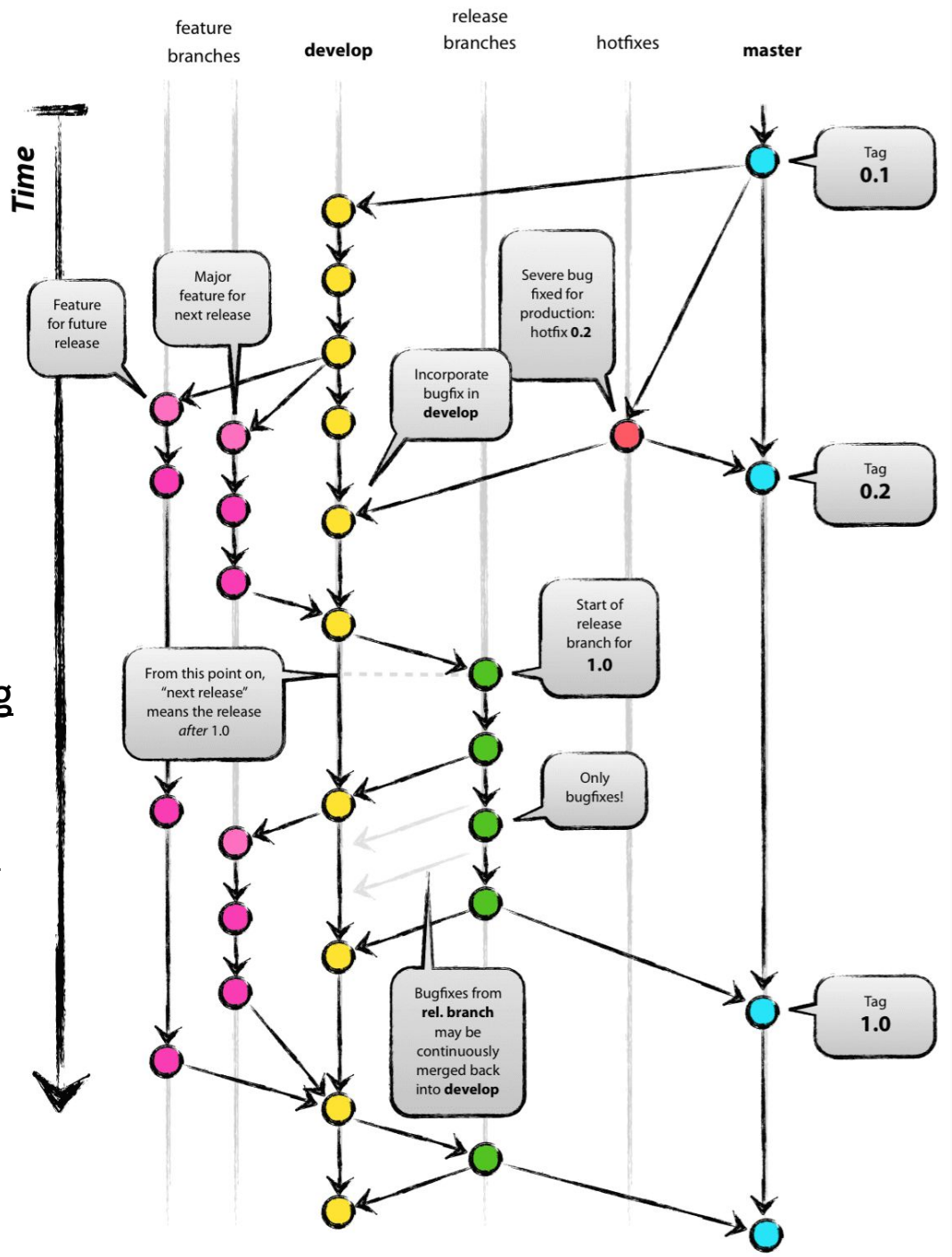
- A set of commands to create, merge, push, etc… branches

```
git flow feature start MYFEATURE
git flow feature finish  MYFEATURE
git flow feature publish  MYFEATURE
```

- Syntaxic sugar

http://danielkummer.github.io/git-flow-cheatsheet/

https://github.com/nvie/gitflow



Still no trick that solves everything

Sum-up

Source Code Versioning

Share changes

Trace changes

Rollback changes

Git basic commands

- git **clone** {url} -> Get an existing git repository
- git **init** -> Create a new local repository

- git **add** {file} -> Stage a file for the next commit
- git **commit** -m {msg} -> Create a new (local) commit
- git **push** origin {branch} -> Send commits to the remote repository
- git **pull** origin {branch} -> Get changes from the remote repository

- git **checkout** -> Switch to a different branch/version
- git **branch** -> Manage branches
- git **merge** {branch} -> Merge the given branch into the current one
- git **tag** -a {name} -m {msg} -> Create tag

- git **status** -> Status of the local repository
- git **log** -> See commits history of the local repository

Best practices

- **Commit** often, small.
- Always add **understandable** **commit messages.**
- **Reference Jira tasks** in commit messages.
- **.gitignore:** don’t commit unnecessary files.
- Don’t forget to **add** files after resolving merge conflicts.
- Don’t forget to **push** branches and tags
- Use **branches** (at least the master/develop model).