UNIVERSITÀ DEGLI STUDI DI BERGAMO

Dipartimento
di Ingegneria Gestionale,
dell'Informazione e della Produzione

Esercitazione 01: GIT

INGEGNERIA INFORMATICA

Git

Anno di corso: 1

Anno accademico di offerta: 2022/2023

Crediti: 6

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Dalmine

28 Febbraio 2023
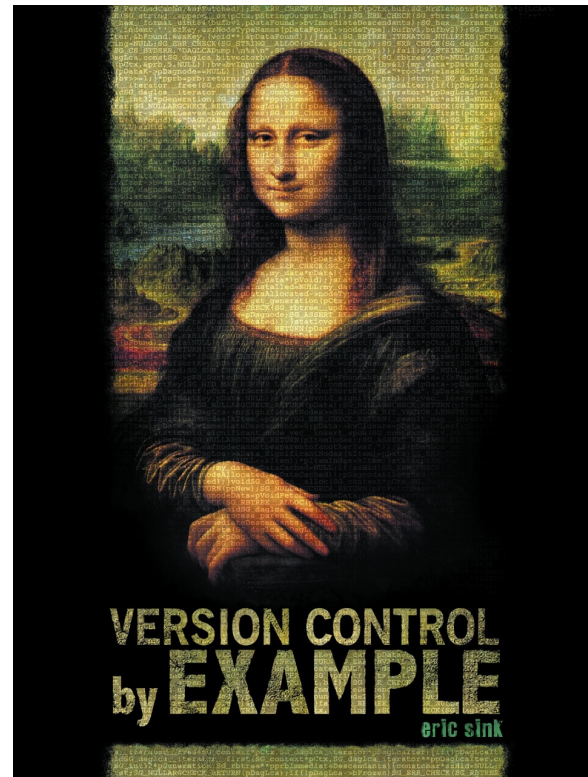
Outline

Outline

- Basics of GIT

- GIT for collaboration Basics

- Branches in GIT Basics

User 1 & User 2 & User 3: Action

git clone https://github.com/ProgrammazioneAdOggetti/ ProgrammazioneAdOggetti.git

User 1 & User 2 & User 3: Action

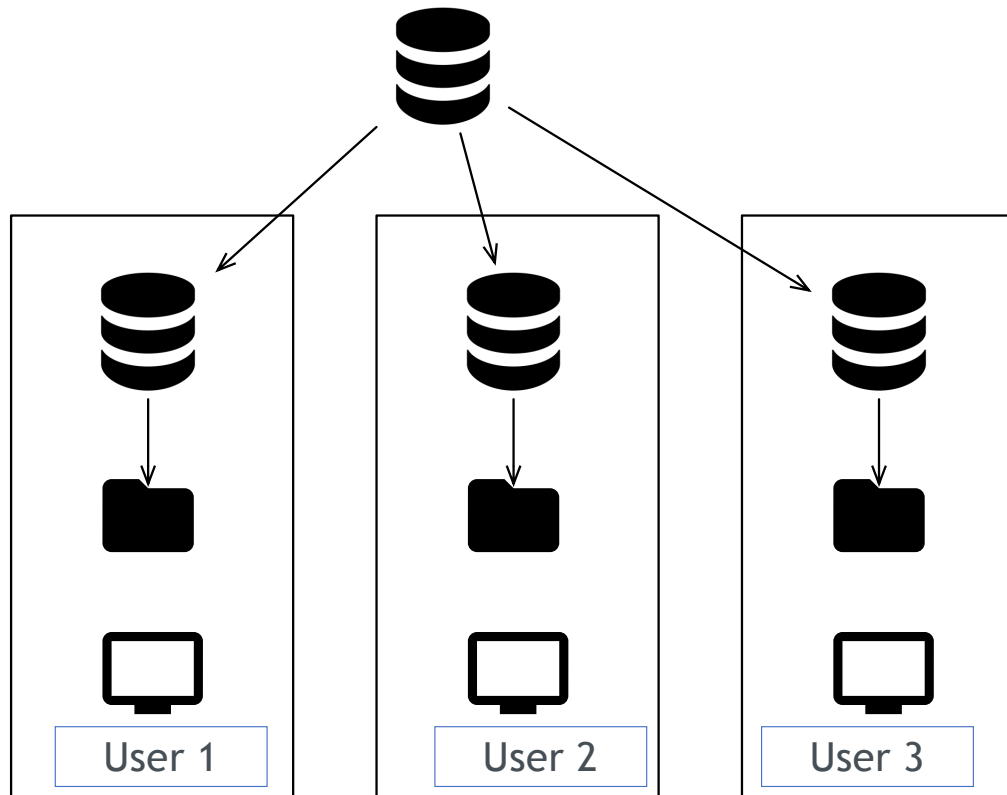**git clone** https://github.com/ProgrammazioneAdOggetti/ProgrammazioneAdOggetti.git

```
Cloning into '3K04'...
warning: You appear to have cloned an empty repository.
```

User 1 & User 2 & User 3: Explanation

User 1 & User 2 & User 3: Action

cd ProgrammazioneAdOggetti

Basics

User 1: Action

creare un file .txt file chiamato L_infinito.txt

ls -la

User 1: Response

creare un file .txt file chiamato L_infinito.txt

ls -la

```
total 24
drwxr-xr-x   5 admin   staff    160 Sep 11 19:27 .
drwxr-xr-x   3 admin   staff     96 Sep 11 06:50 ..
-rw-r--r--@  1 admin   staff   6148 Sep 11 06:50 .DS_Store
drwxr-xr-x  14 admin   staff    448 Sep 10 23:05 .git
-rw-r--r--   1 admin   staff    205 Sep 10 22:53 L_infinito.txt
```

User 1: Explanation

ProgrammazioneAdOggetti

.git

L_infinito.txt

L_infinito.txt

User 1

User 1: Action

git status

User 1: Response

```
On branch master

No commits yet

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

nothing added to commit but untracked files present (use "git add" to track)
```
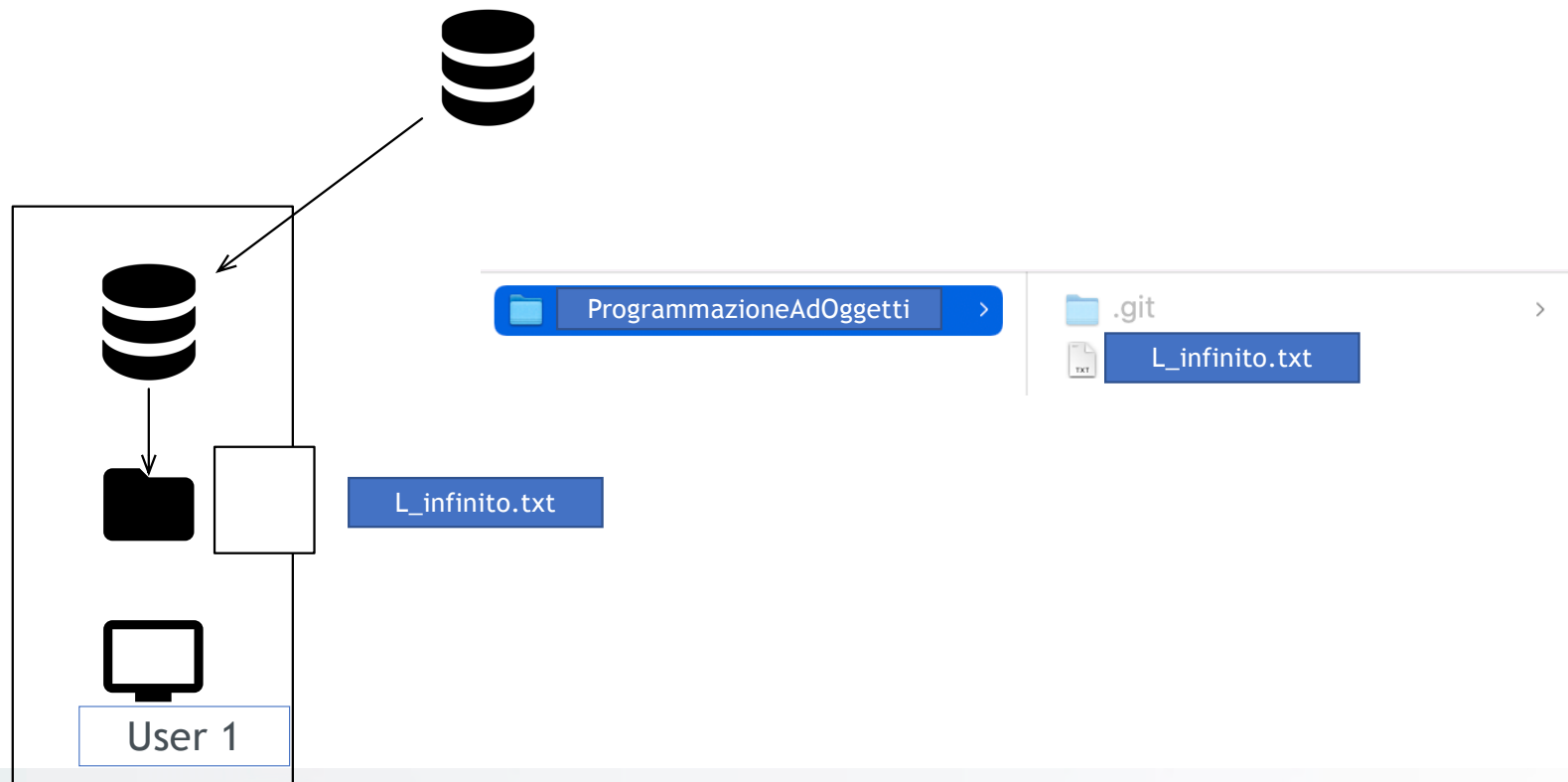
User 1: Explanation

ProgrammazioneAdOggetti

.git

L_infinito.txt

L_infinito.txt

User 1

User 1: Action

git add L_infinito.txt

git status

User 1: Response

```
On branch master

No commits yet

Changes to be committed:
  (use "git rm --cached <file>..." to unstage)
        new file:    L_infinito.txt
```
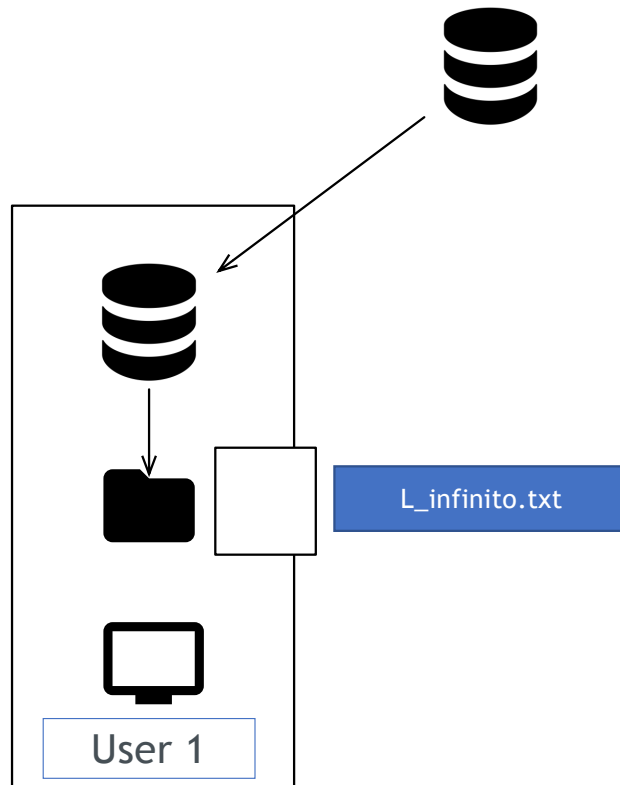
User 1: Explanation

L_infinito.txt

User 1

User 1: Action

git commit –m "Adds the file L_ infinito.txt"

User 1: Response

[master (root-commit) faddcbf] Adds the file L_infinito.txt
1 file changed, 0 insertions(+), 0 deletions(-)
create mode 100644 L_infinito.txt
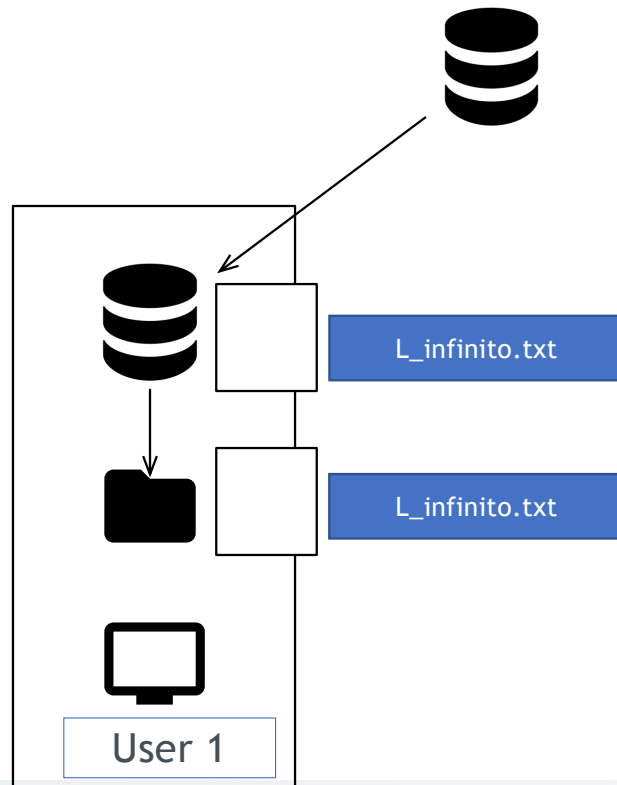
User 1: Explanation

User 1: Action

git push

User 1: Response

```
Enumerating objects: 3, done.
Counting objects: 100% (3/3), done.
Writing objects: 100% (3/3), 229 bytes | 229.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
To https://github.com/ProgrammazioneAdOggetti/ ProgrammazioneAdOggetti
 * [new branch]      master -> master
```
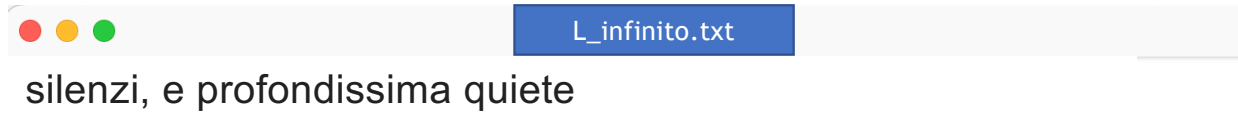
User 1: Explanation
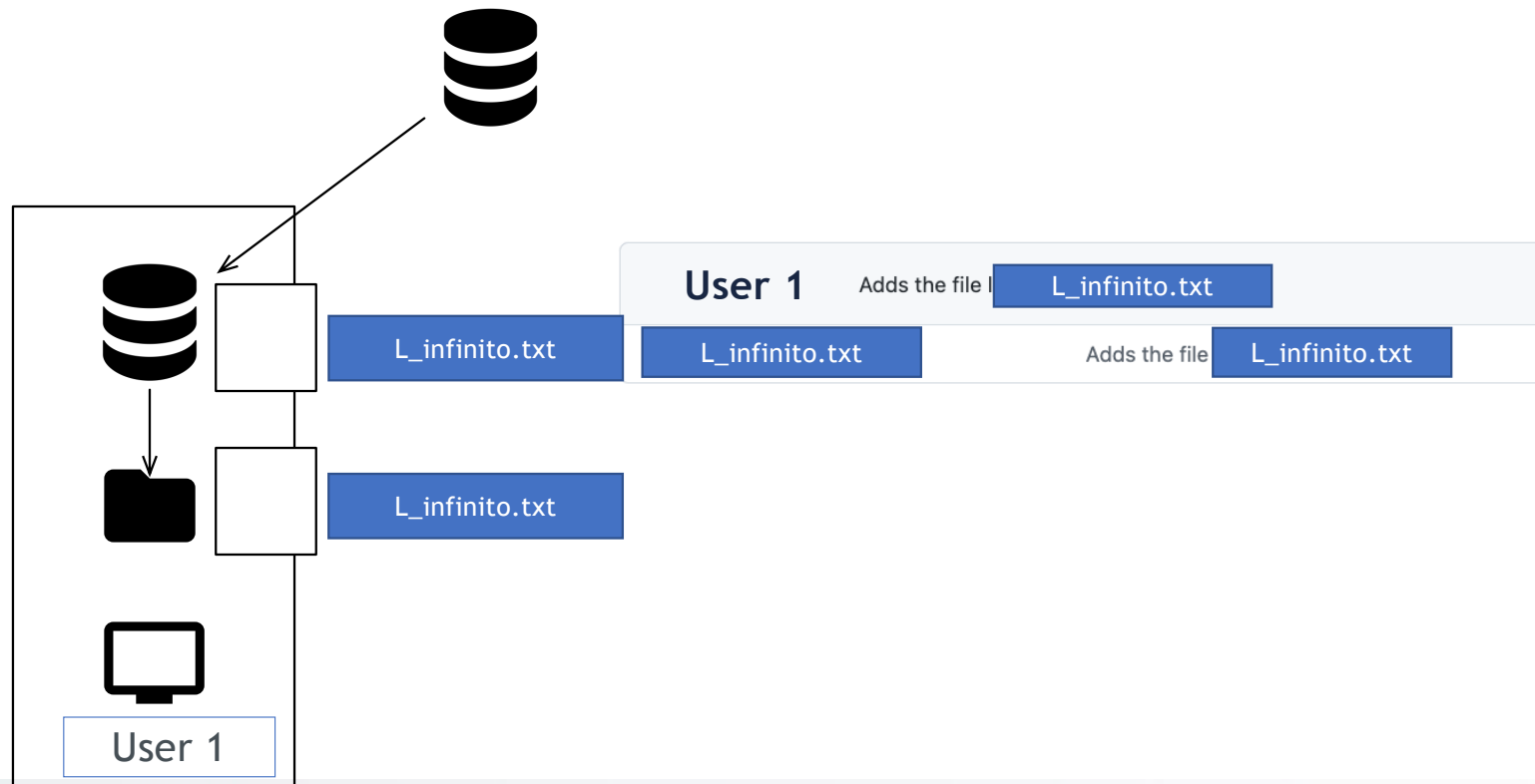
User 1: Action

L_infinito.txt

silenzi, e profondissima quiete

User 1: Action

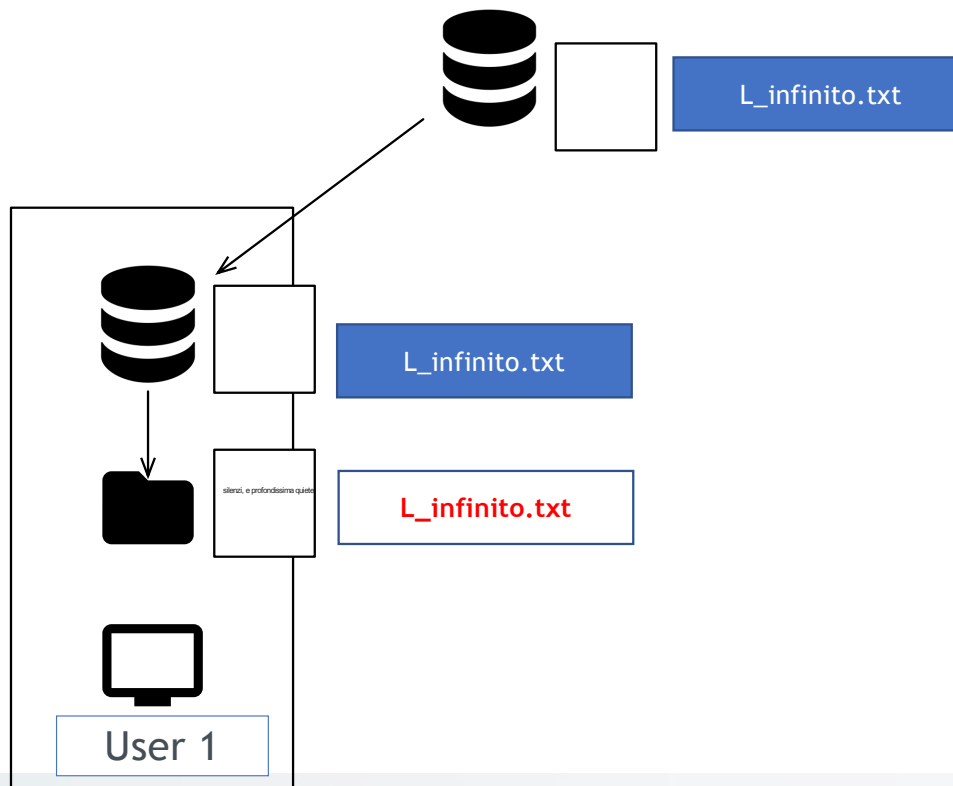**git status**

User 1: Response

```
On branch master
Your branch is up to date with 'origin/master'.

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
        modified:   L_infinito.txt

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

User 1: Explanation

User 1: Action

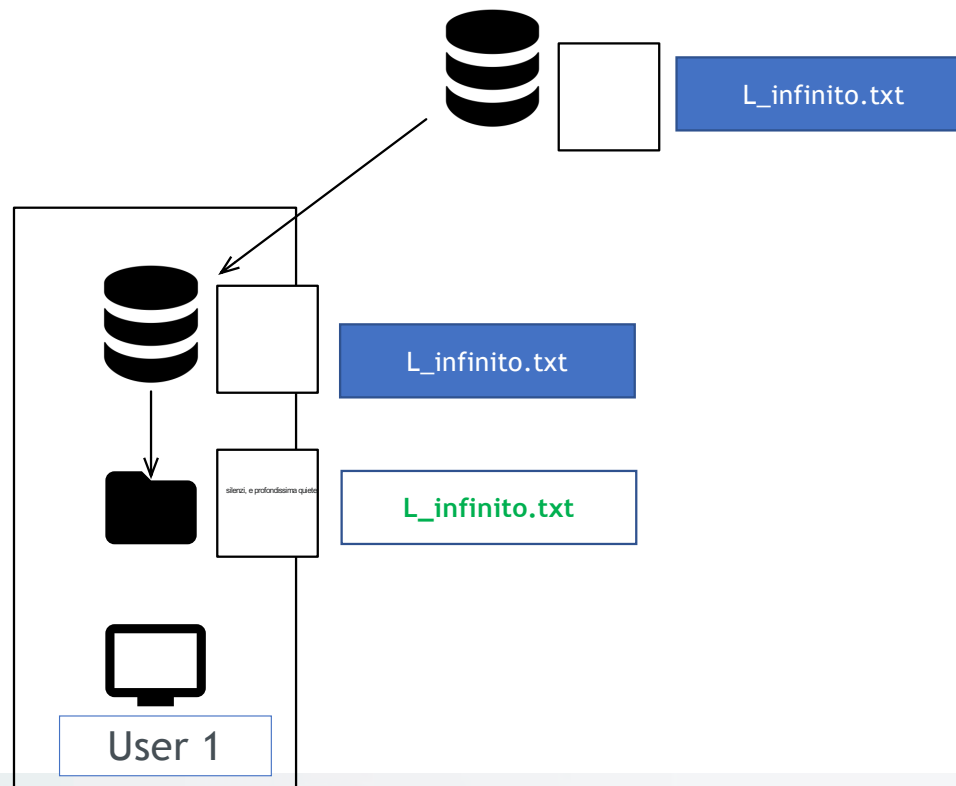git add L_infinito.txt

git status

User 1: Response

```
On branch master
Your branch is up to date with 'origin/master'.

Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        modified:    L_infinito.txt
```

User 1: Explanation

User 1: Action

git commit –m "Adds the sixth line of the lyrics"

User 1: Response

```
[master 2ef25cd] Adds
 1_file changed, 1 insertion(+)
```

User 1: Explanation

L_infinito.txt

L_infinito.txt

L_infinito.txt
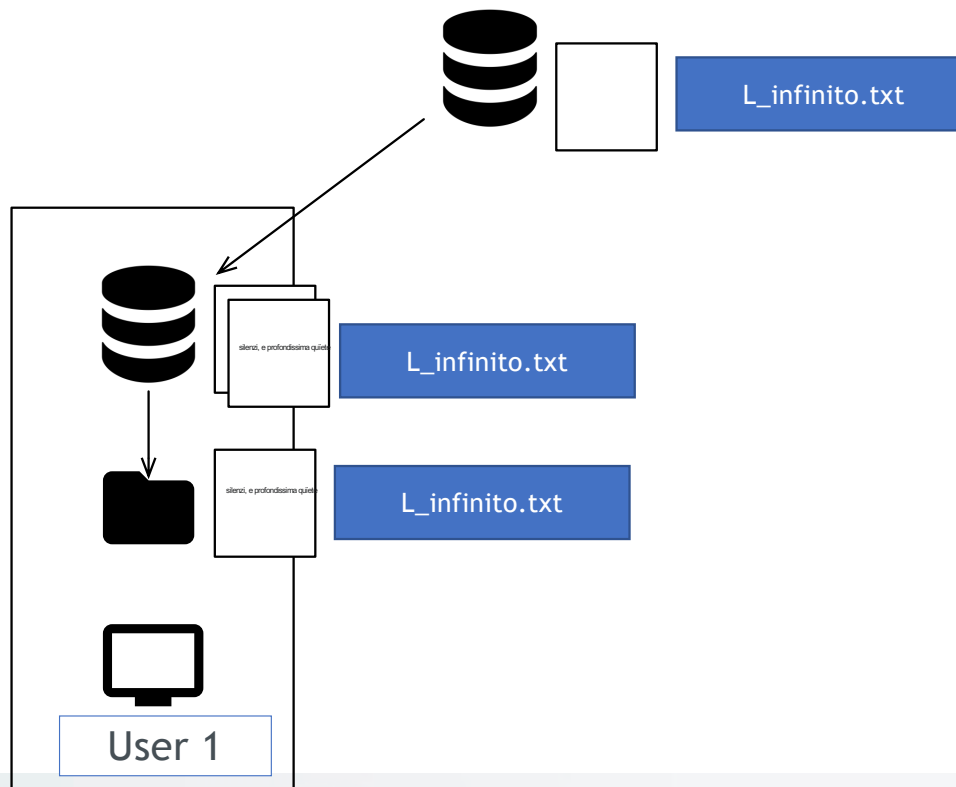
User 1

User 1: Action

git status

User 1: Response

```
On branch master
Your branch is ahead of 'origin/master' by 1 commit.
  (use "git push" to publish your local commits)

nothing to commit, working tree clean
```

User 1: Explanation
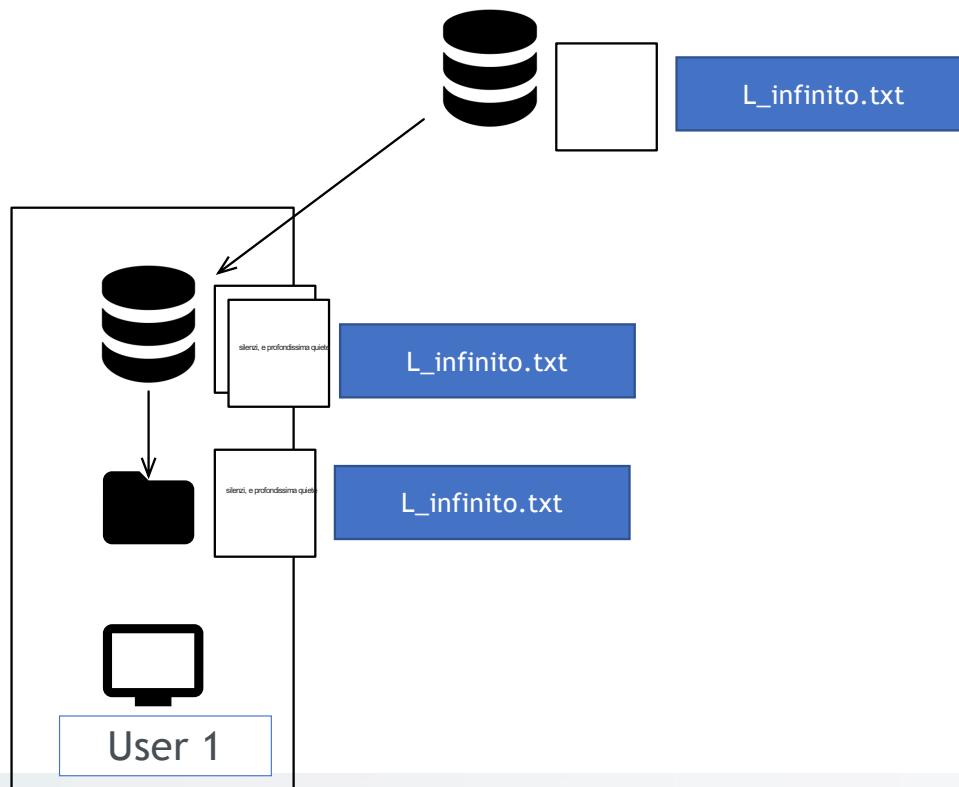
User 1: Action

git push

User 1: Action

```
Enumerating objects: 5, done.
Counting objects: 100% (5/5), done.
Writing objects: 100% (3/3), 285 bytes | 285.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
To https://github.com/ProgrammazioneAdOggetti/ ProgrammazioneAdOggetti
   faddcbf..2ef25cd  master -> master
```

User 1: Explanation
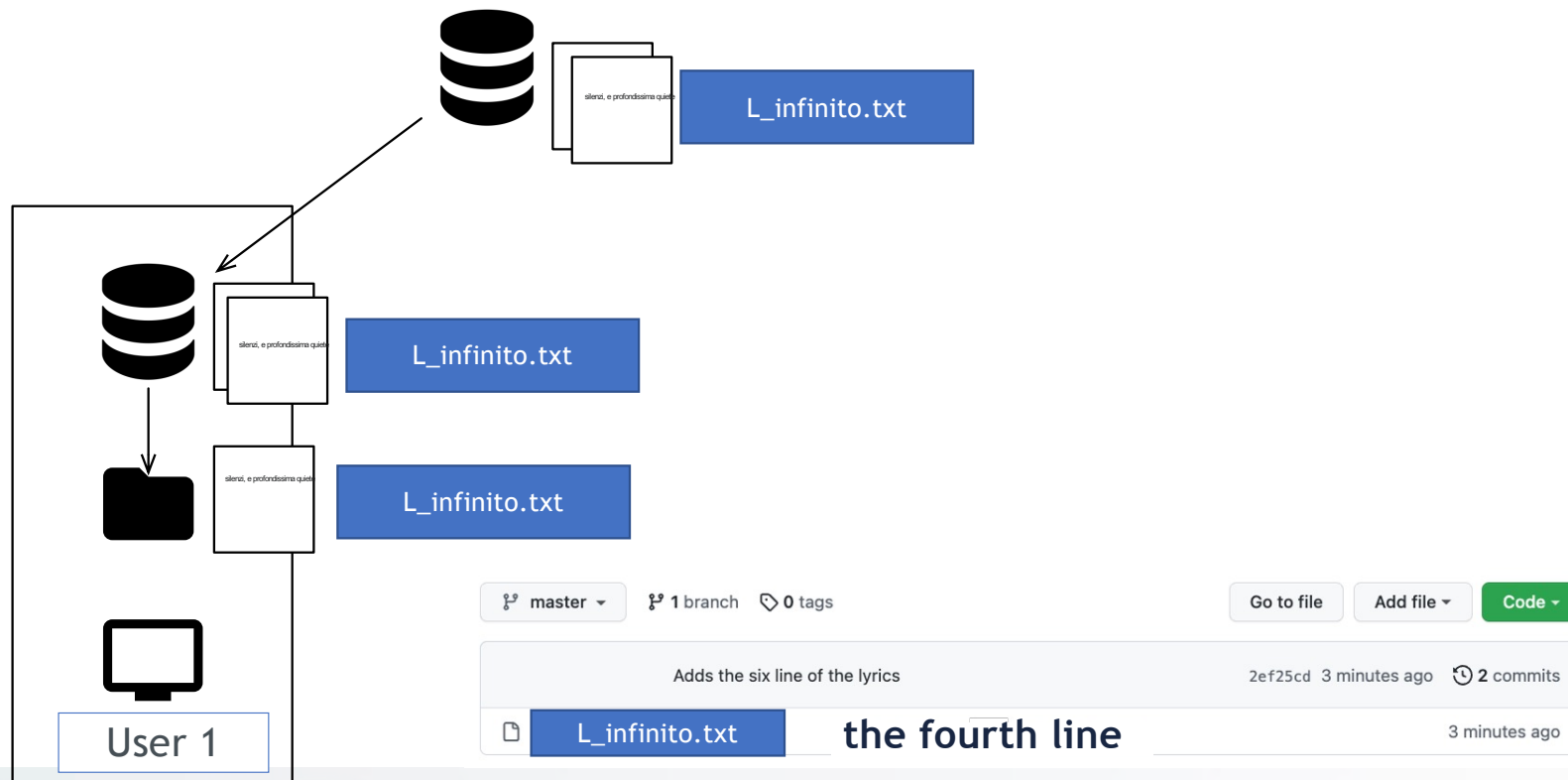
User 1: Action

git status

silenzi, e profondissima quiete
il cor non si spaura. E come il vento

User 1: Response

```
On branch master
Your branch is up to date with 'origin/master'.

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
        modified:   L_infinito.txt
```

User 1: Explanation

User 1: Action

git add L_infinito.txt

git status

User 1: Response

```
On branch master
Your branch is up to date with 'origin/master'.

Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        modified:    L_infinito.txt
```

User 1: Explanation

User 1: Action

git commit –m "Adds the eighth line of the lyrics"

User 1: Response

```
[master 4ce1196] Adds the line eighth of the lyrics
 1 file changed, 2 insertions(+), 1 deletion(-)
```

User 1: Explanation

User 1: Action

git push

User 1: Response

```
Enumerating objects: 5, done.
Counting objects: 100% (5/5), done.
Delta compression using up to 8 threads
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 315 bytes | 315.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
To https://github.com/ProgrammazioneAdOggetti/ ProgrammazioneAdOggetti
 _2ef25cd..4ce1196  master -> master
```

User 1: Explanation
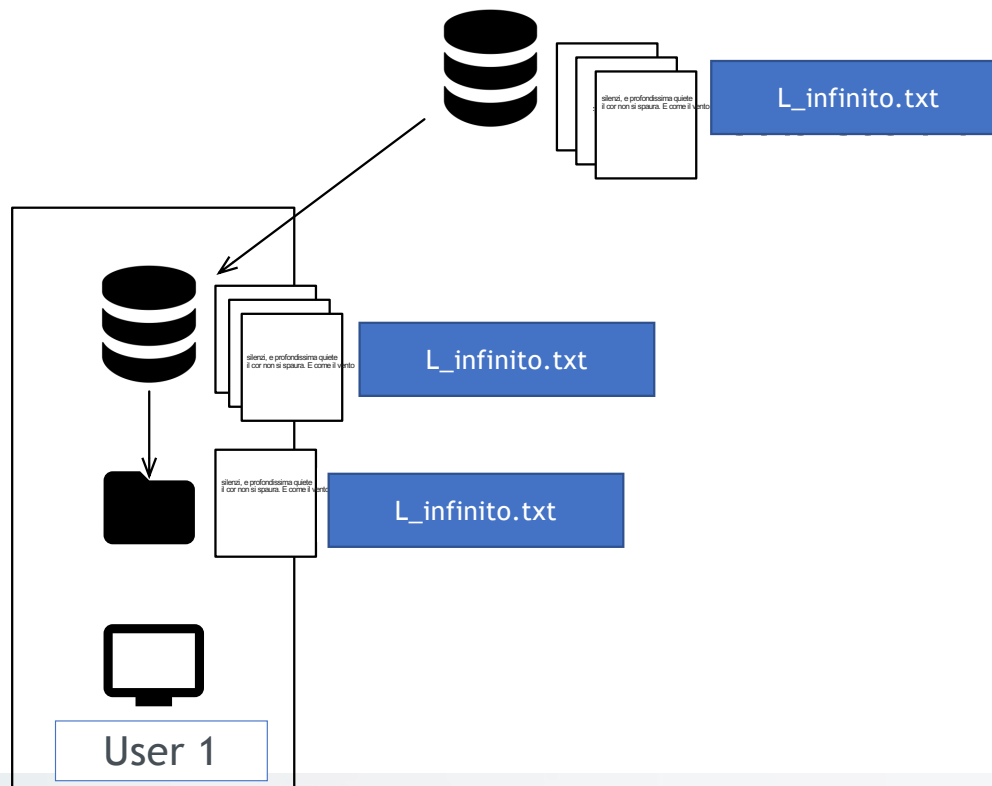
User 1: Action

git log

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User 1: Response

```
commit 4ce1196dcdc58910bdad7ca41486a9ffe84a1a4e (HEAD -> master, origin/master)
Author:          <                    >
Date:    Sat Sep 10 22:31:04 2022 -0400

    Adds the line eighth  of the lyrics

commit 2ef25cdc01ad9cfe25c2185947d49964e6ea0db1
Author:          <                    >
Date:    Sat Sep 10 22:16:23 2022 -0400

    Adds the sixth  line of the lyrics

commit faddcbffc4b489490b63c25318b39b1f4e4f5ac9
Author:          <                    >
Date:    Sat Sep 10 21:49:20 2022 -0400

    Adds the file
```
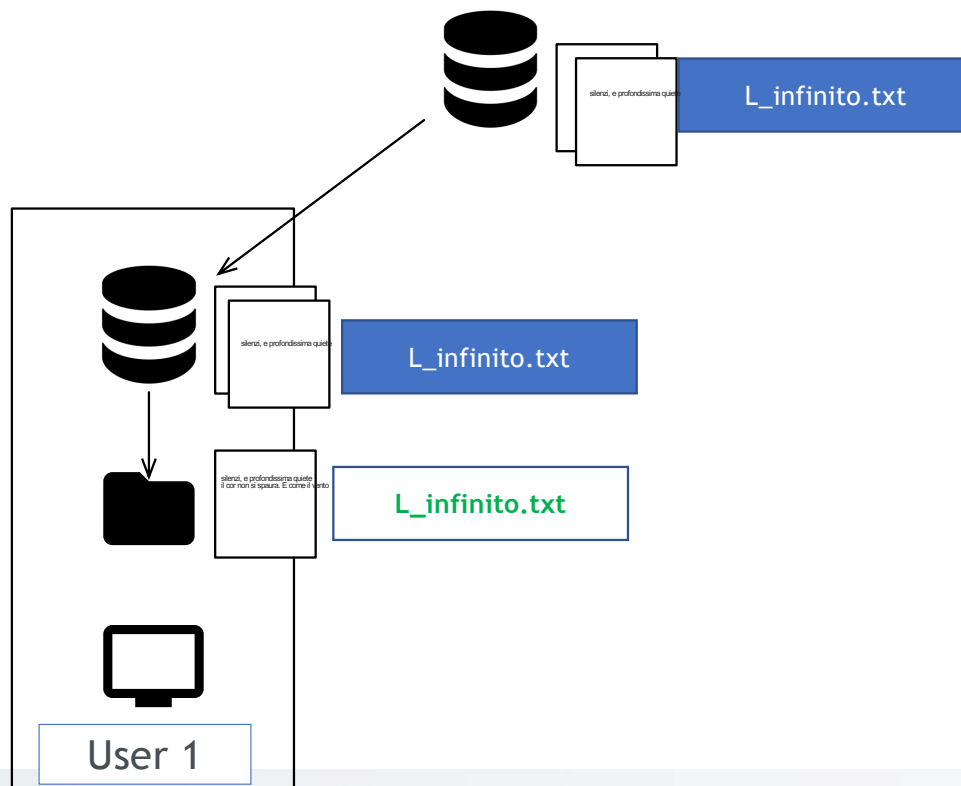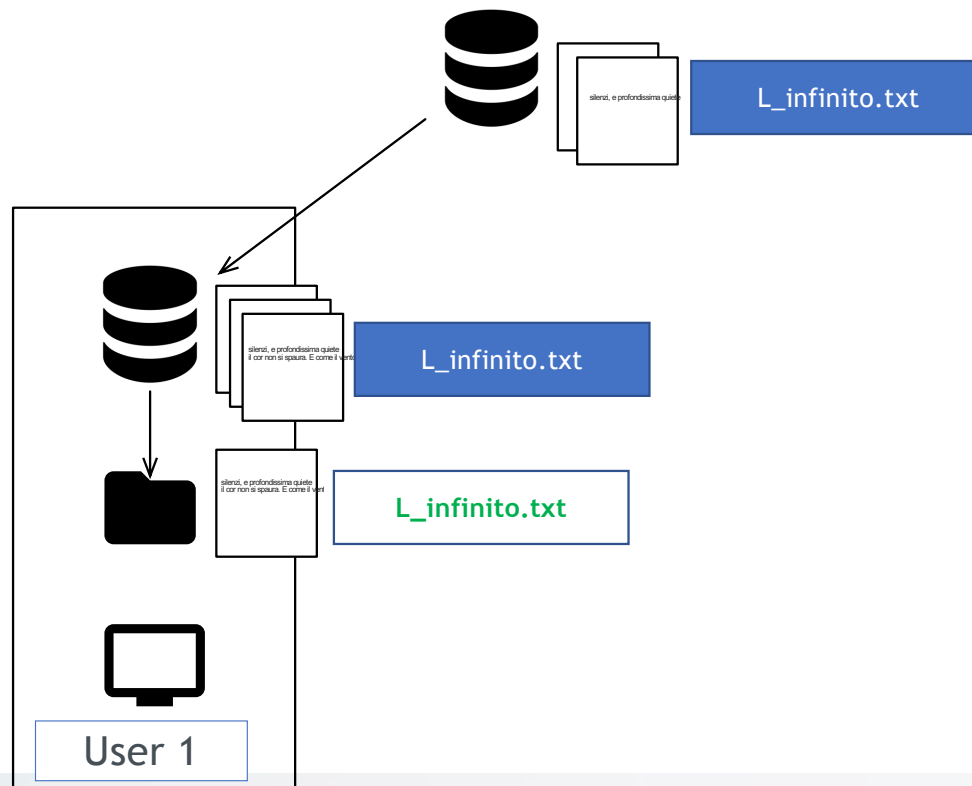
L_infinito.txt

Collaboration

User 2: Action

git pull

OR

git fetch origin

git merge origin/master

User 2: Response

```
remote: Enumerating objects: 5, done.
remote: Counting objects: 100% (5/5), done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 3 (delta 1), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (3/3), 664 bytes | 664.00 KiB/s, done.
From https://github.com/ ProgrammazioneAdOggetti/ ProgrammazioneAdOggetti
   f13c40d..5aaf45a  master     -> origin/master
Updating f13c40d..5aaf45a
Fast-forward
                        | 2 +-
 1 file changed, 1 insertion(+), 1 deletion(-)
```

User 2: Explanation

User 2: Action

dell'ultimo orizzonte il guardo esclude.
silenzi, e profondissima quiete
il cor non si spaura. E come il vento

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DI BERGAMO
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di Ingegneria Gestionale,
dell'Informazione e della Produzione

User 3: Action

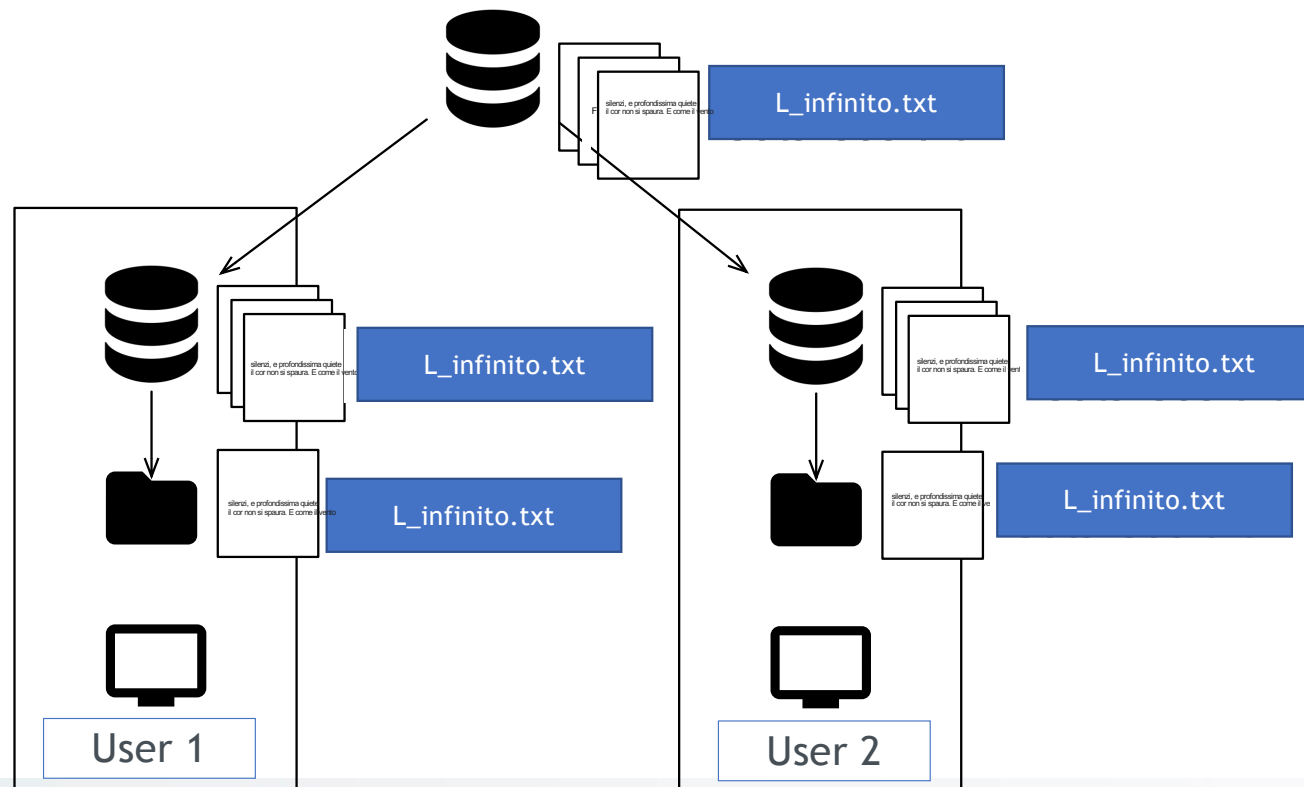Ma sedendo e mirando, interminati
silenzi, e profondissima quiete
il cor non si spaura. E come il vento

User 2 and 3: Explanation
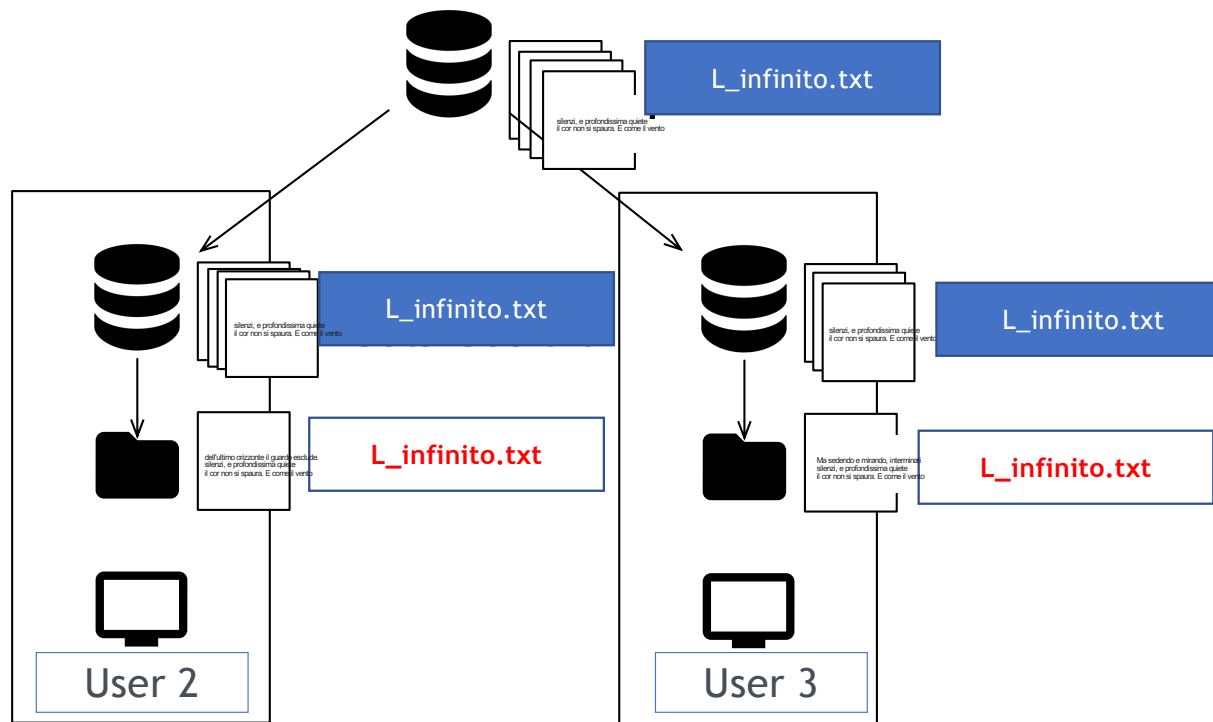
User 2: Action

git add L_infinito.txt

git commit –m "Adds the third line of the lyrics"

git push

User 2: Explanation
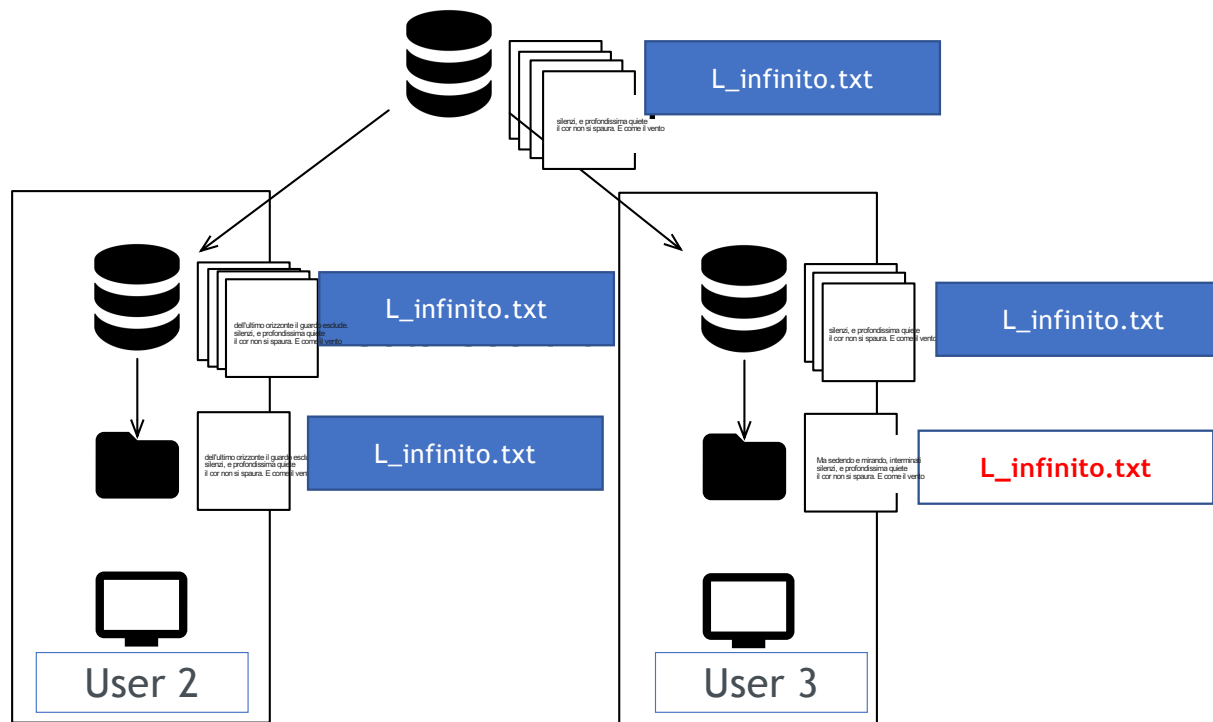
User 3: Action

git add L_infinito.txt
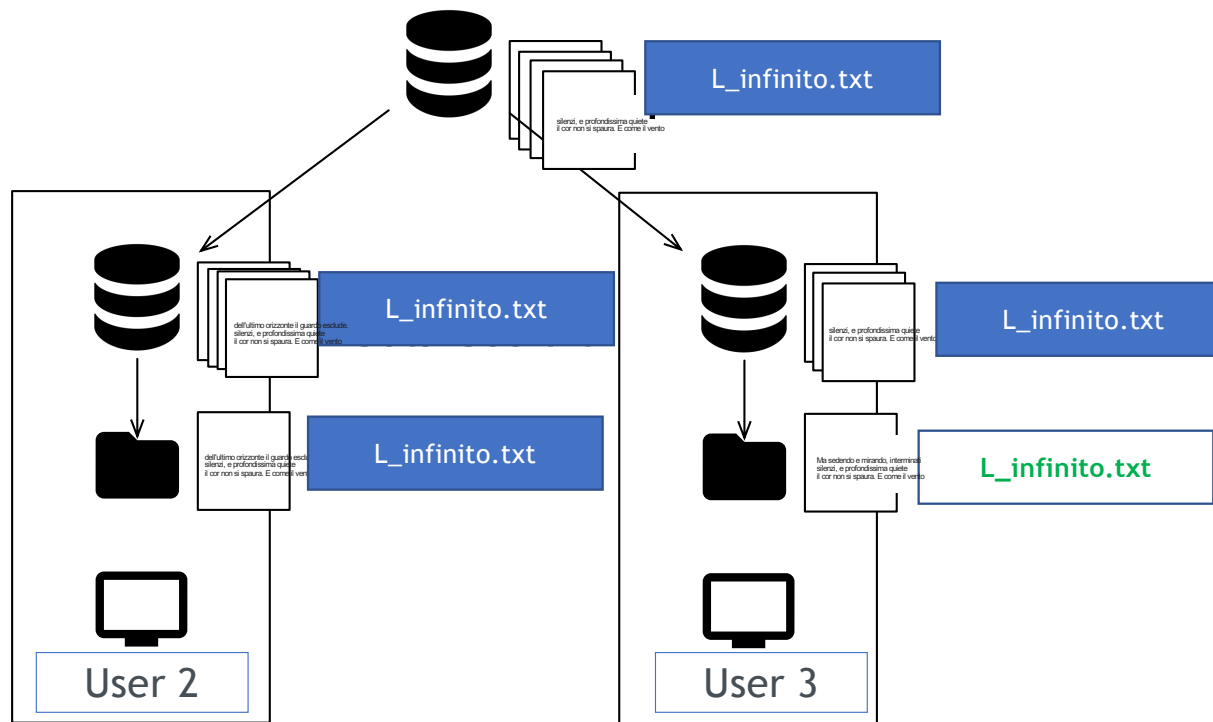
User 3: Explanation

User 3: Action

git commit –m "Adds the fourth line of the lyrics"
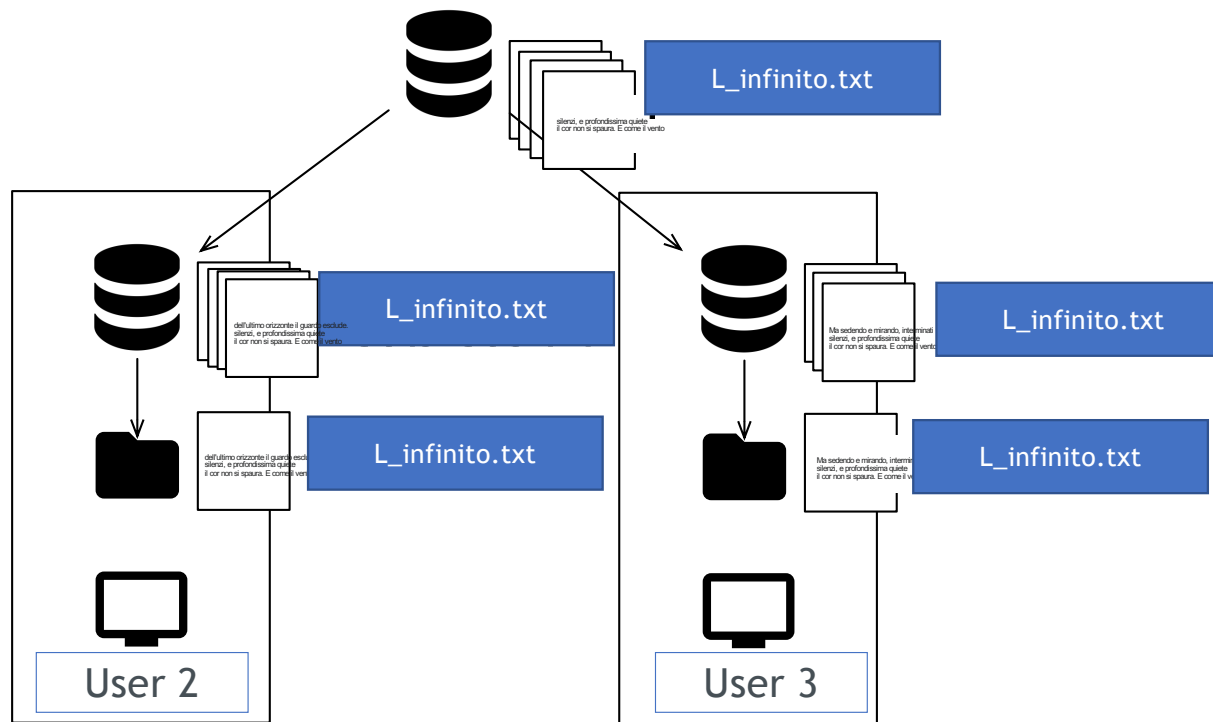
User 3: Explanation

User 2: Action

git push

User 3: Explanation
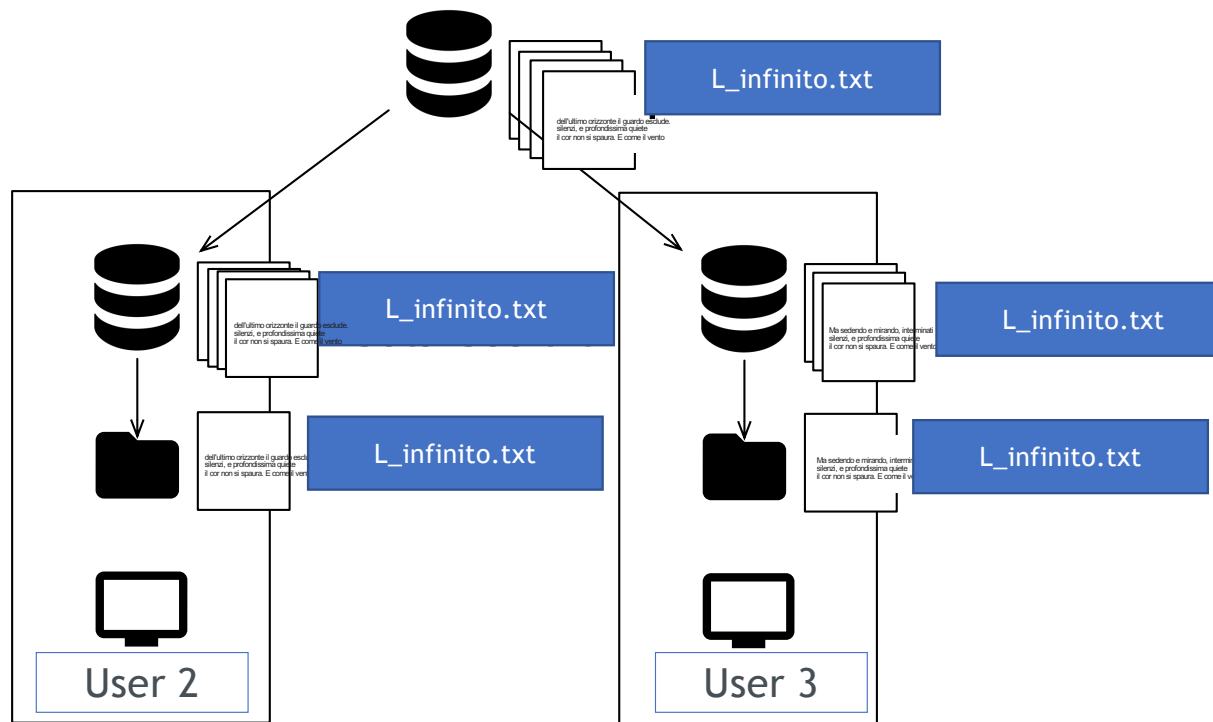
User 3: Action

git push

User 3: Response

```
To https://github.com/3K04/3K04.git
 ! [rejected]        master -> master (fetch first)
error: failed to push some refs to 'https://github.com/   ProgrammazioneAdOggetti/ ProgrammazioneAdOggetti
hint: Updates were rejected because the remote contains work that you do
hint: not have locally. This is usually caused by another repository pushing
hint: to the same ref. You may want to first integrate the remote changes
hint: (e.g., 'git pull ...') before pushing again.
hint: See the 'Note about fast-forwards' in 'git push --help' for details.
```

User 3: Explanation
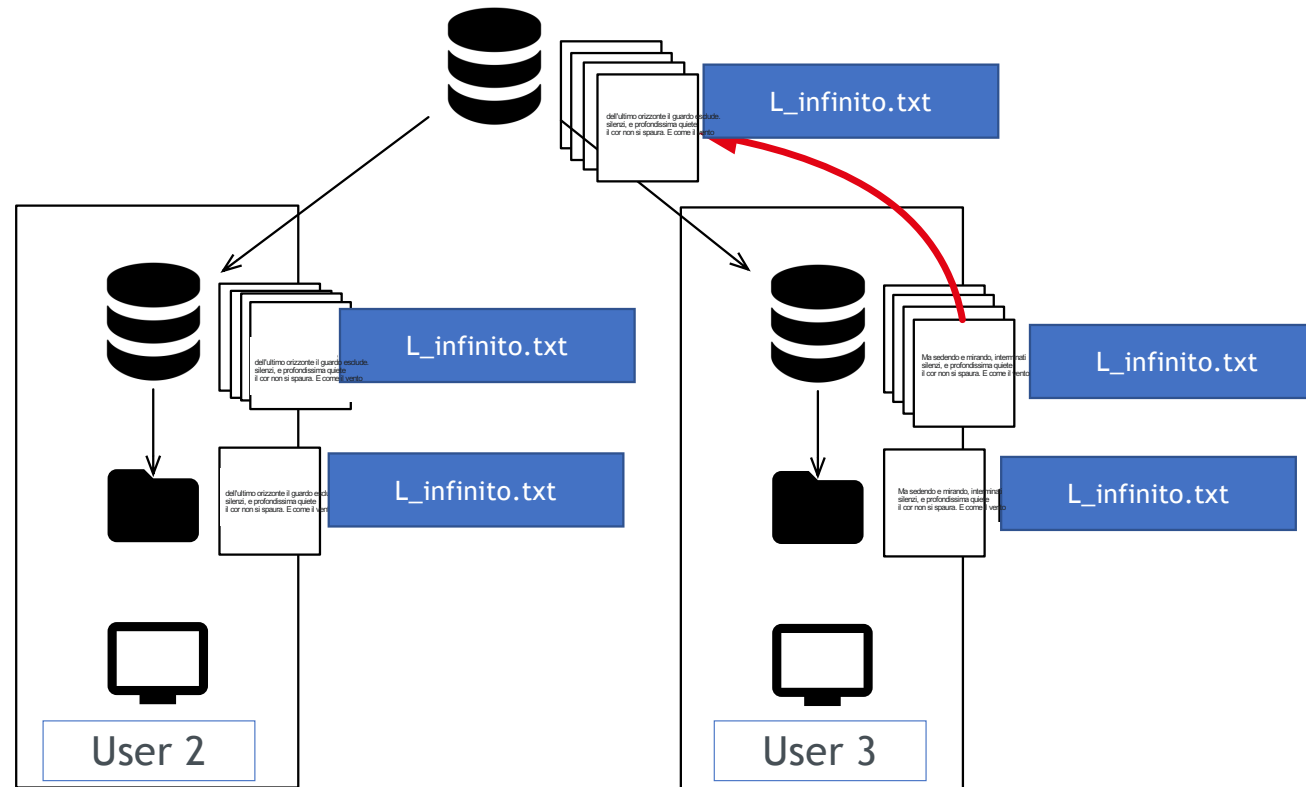
User 3: Action

git pull

User 3: Response

```
remote: Enumerating objects: 5, done.
remote: Counting objects: 100% (5/5), done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (3/3), 707 bytes | 353.00 KiB/s, done.
From https://github.com/ ProgrammazioneAdOggetti/ ProgrammazioneAdOggetti
   4ce1196..9c63f92  master      -> origin/master
Auto-merging L_infinito.txt
CONFLICT (content): Merge conflict in  L_infinito.txt
Automatic merge failed; fix conflicts and then commit the result.
```

User 3: Explanation
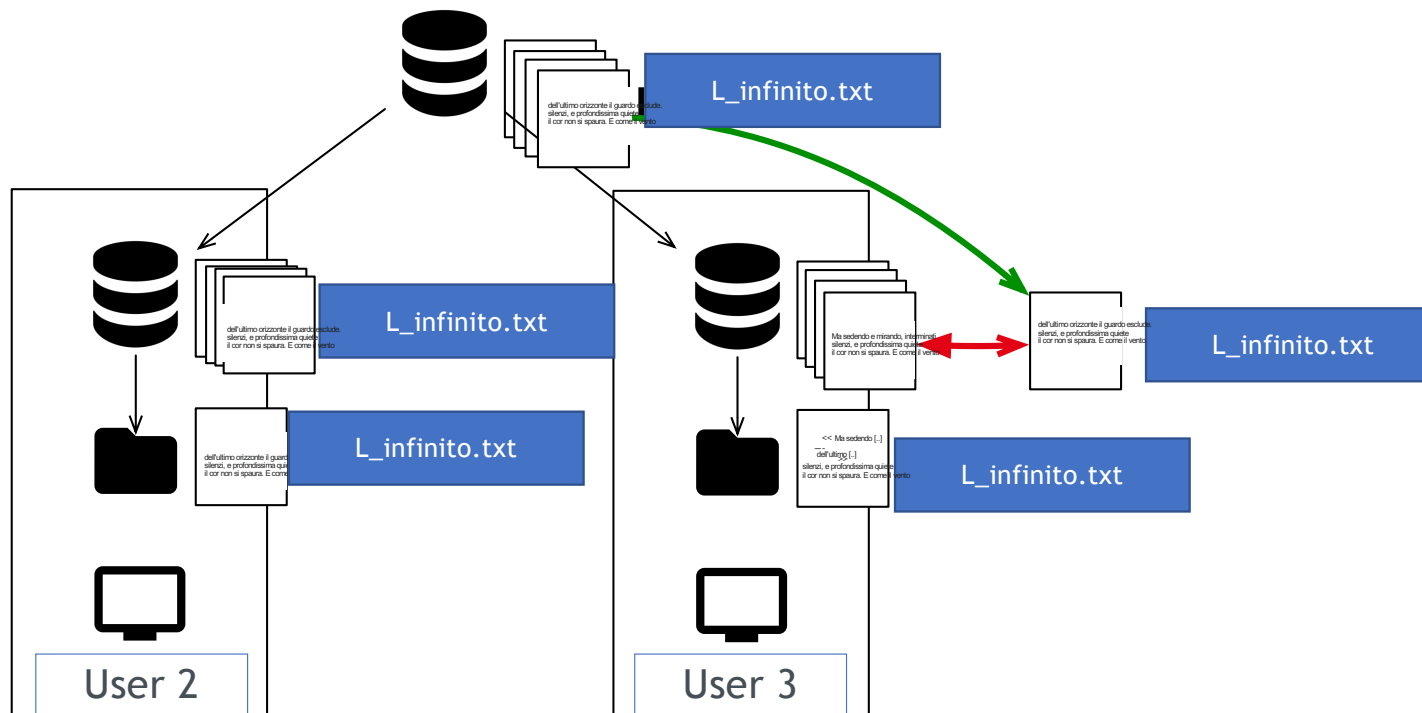
User 3: Explanation
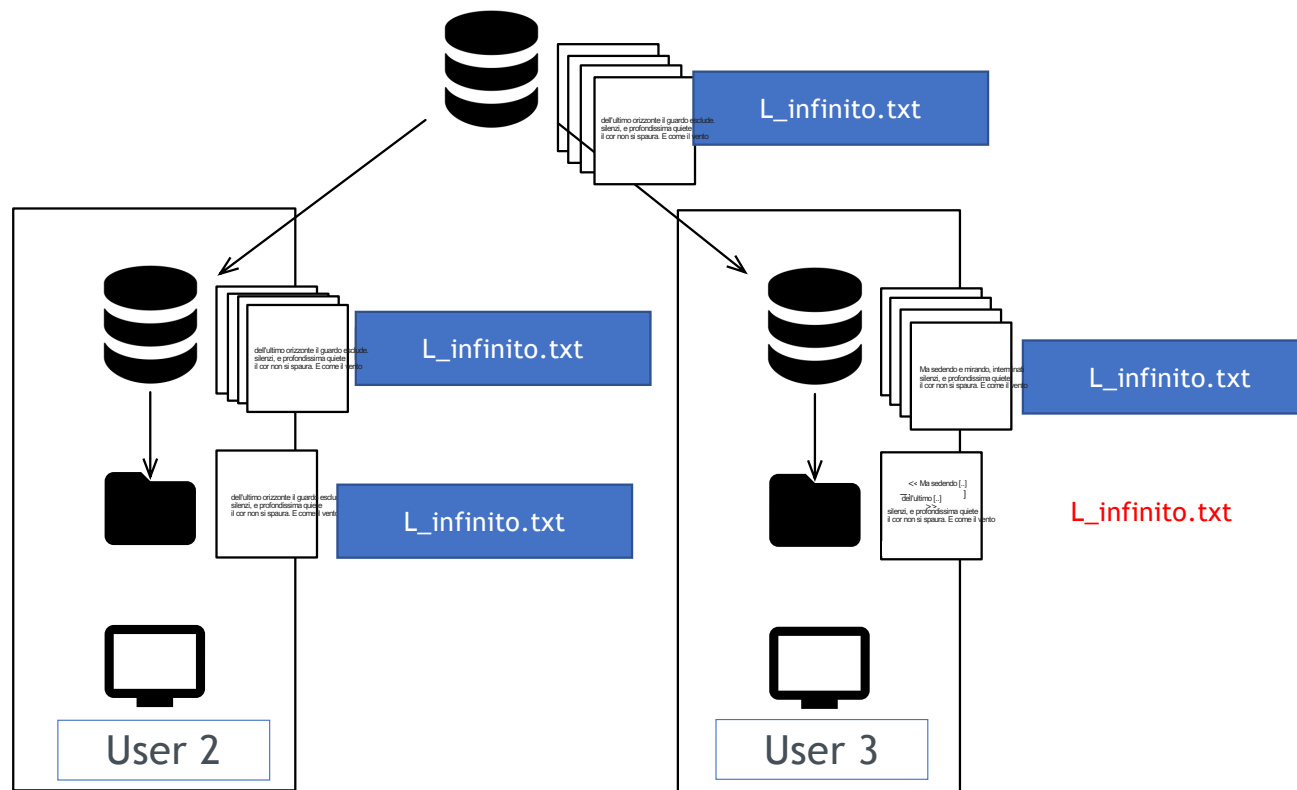
User 3: Action

git status

User 3: Response

```
On branch master
Your branch and 'origin/master' have diverged,
and have 1 and 1 different commits each, respectively.
  (use "git pull" to merge the remote branch into yours)

You have unmerged paths.
  (fix conflicts and run "git commit")
  (use "git merge --abort" to abort the merge)

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

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

User 3: Explanation

```
●●●                                    L_infinito.txt

<<<<<<< HEAD
Ma sedendo e mirando, interminati
=======
dell'ultimo orizzonte il guardo esclude.
>>>>>>> 9c63f920924a68f701cad615b11d18d8a30e52bf
silenzi, e profondissima quiete
il cor non si spaura. E come il vento
```
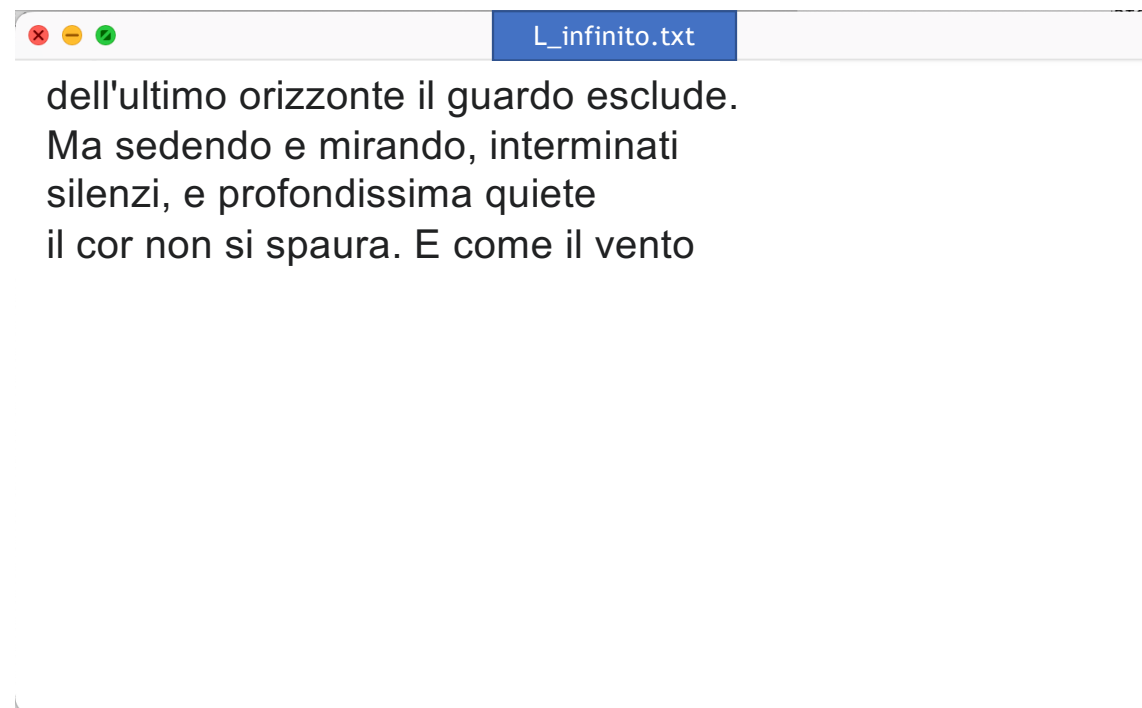
User 3: Action

L_infinito.txt

dell'ultimo orizzonte il guardo esclude.
Ma sedendo e mirando, interminati
silenzi, e profondissima quiete
il cor non si spaura. E come il vento

User 3: Action

git add L_infinito.txt

git status

User 3: Response

```
On branch master
Your branch and 'origin/master' have diverged,
and have 1 and 1 different commits each, respectively.
  (use "git pull" to merge the remote branch into yours)

All conflicts fixed but you are still merging.
  (use "git commit" to conclude merge)

Changes to be committed:
        modified:   L_infinito.txt
```
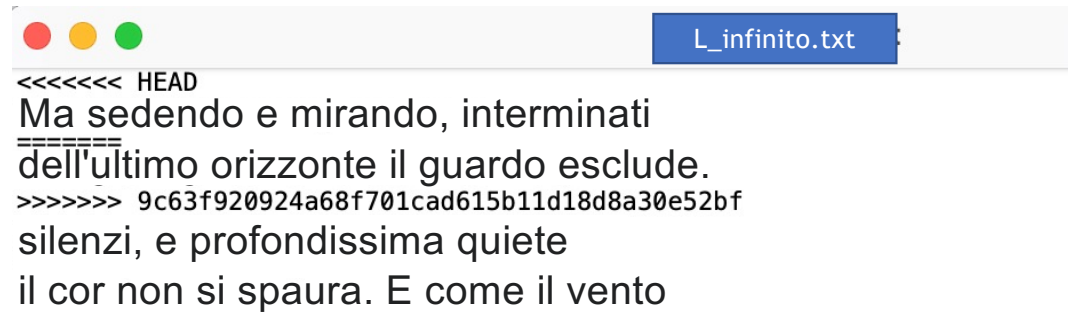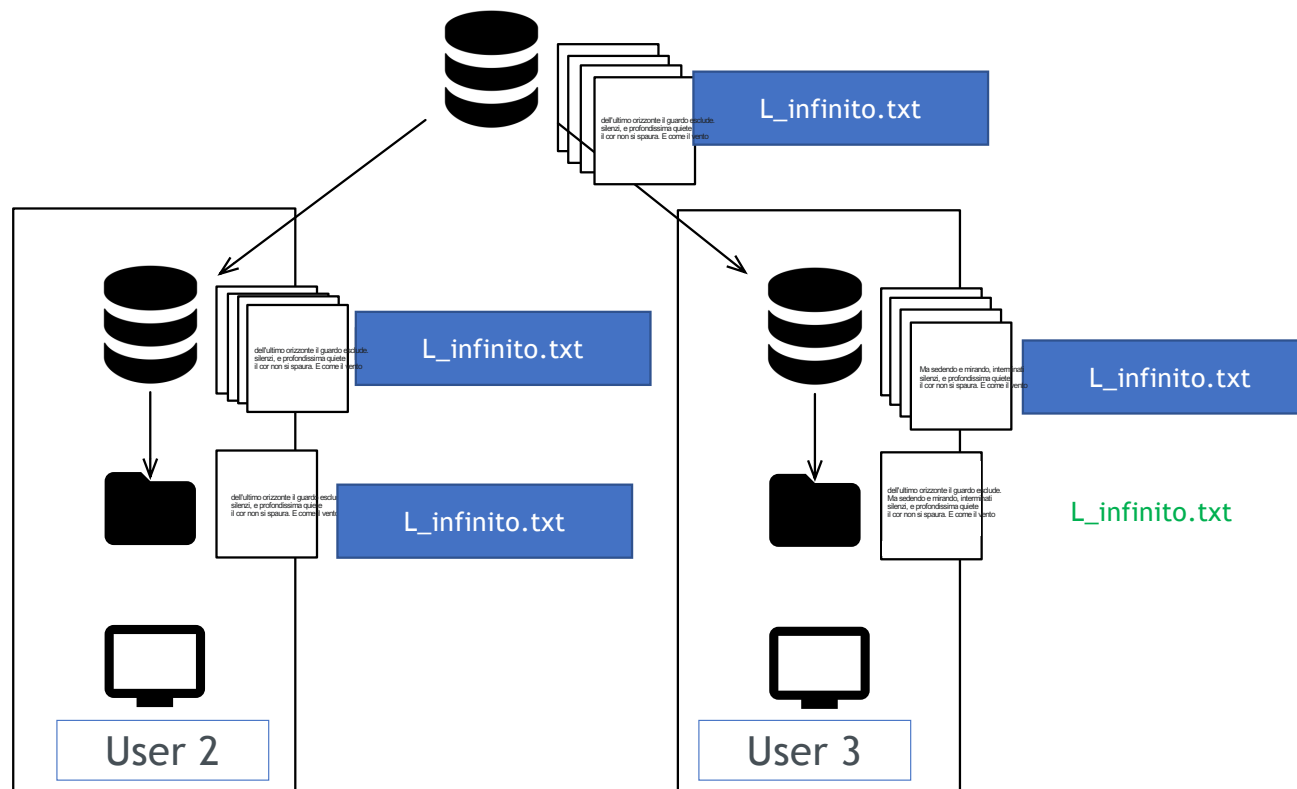
User 3: Explanation

User 3: Action

git commit –m "orders the line in conflict"

User 3: Explanation

User 3: Action

git push

User 3: Response

```
Enumerating objects: 10, done.
Counting objects: 100% (10/10), done.
Delta compression using up to 8 threads
Compressing objects: 100% (4/4), done.
Writing objects: 100% (6/6), 682 bytes | 682.00 KiB/s, done.
Total 6 (delta 0), reused 0 (delta 0), pack-reused 0
To https://github.com/ ProgrammazioneAdOggetti/ ProgrammazioneAdOggetti
   9c63f92..8a82aea  master -> master
```

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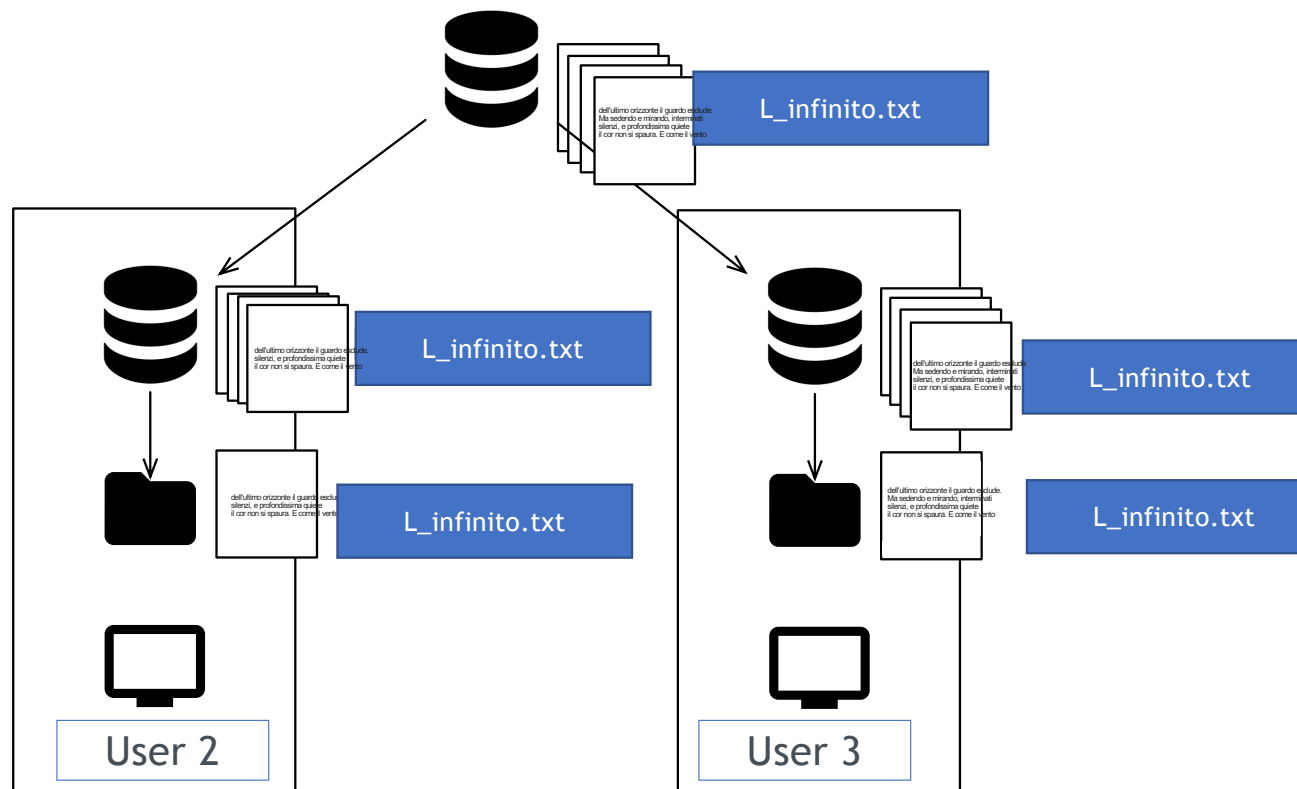
Dipartimento
di Ingegneria Gestionale,
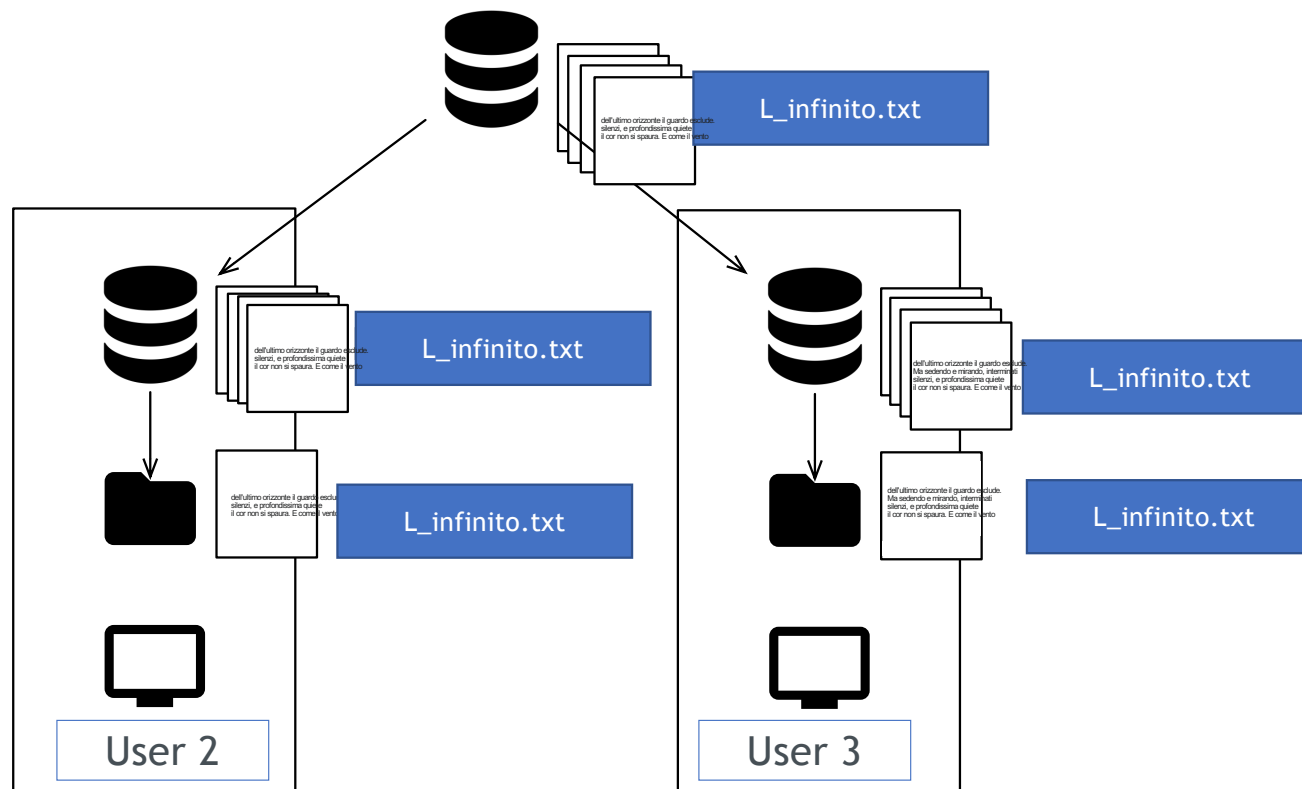dell'Informazione e della Produzione
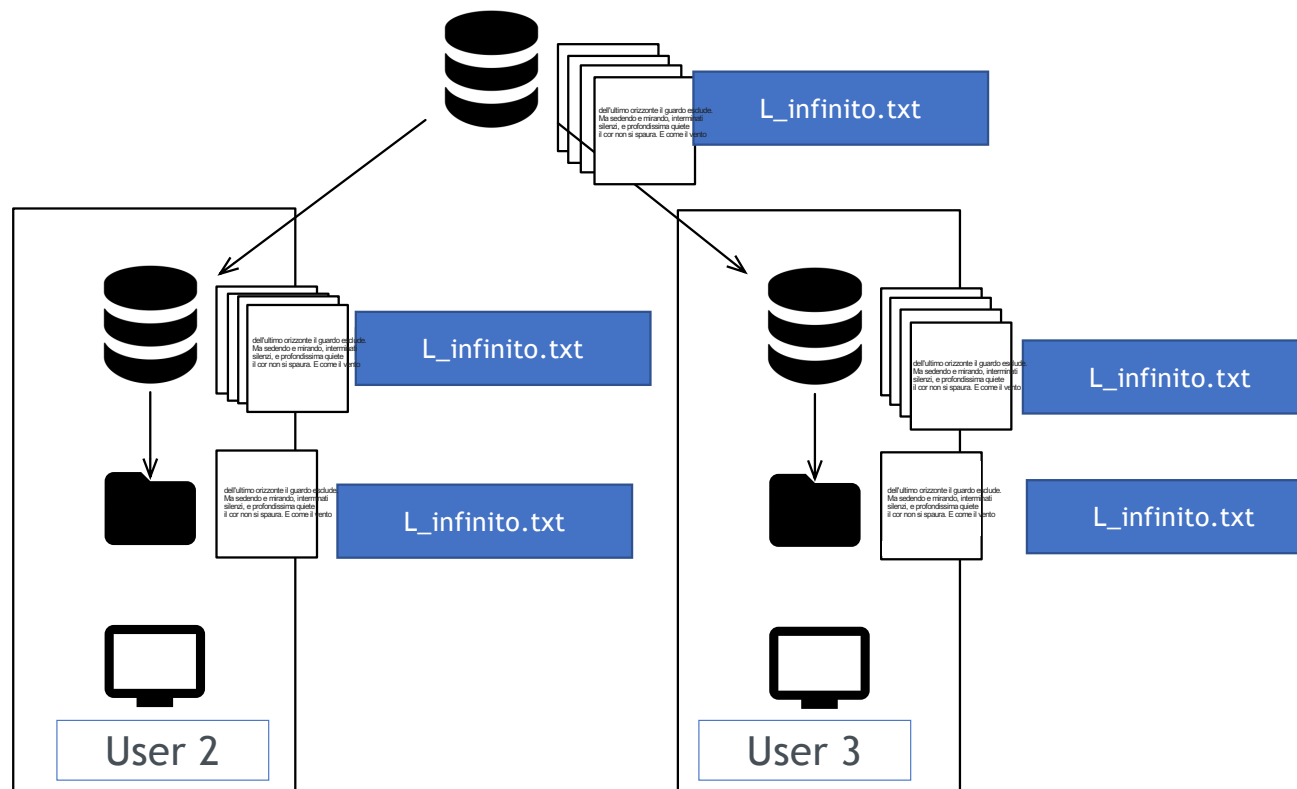
User 3: Explanation

User 2: Action

git pull

User 2: Explanation

User 2: Action

L_infinito.txt — Edited

e questa siepe, che da tanta parte
dell'ultimo orizzonte il guardo esclude.
Ma sedendo e mirando, interminati
silenzi, e profondissima quiete
il cor non si spaura. E come il vento

User 3: Action

L_infinito.txt — Edited

dell'ultimo orizzonte il guardo esclude.
Ma sedendo e mirando, interminati
silenzi, e profondissima quiete
il cor non si spaura. E come il vento
e il naufragar m'è dolce in questo mare.

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User 2: Action

git add L_infinito.txt

git commit –m "Adds the first line of the lyrics"

git push

User 3: Action

git add L_infinito.txt

git commit –m "Adds the last line of the lyrics"

git push

User 3: Response (one of the users receive this message depending on the order of push)

```
To https://github.com/ ProgrammazioneAdOggetti/ ProgrammazioneAdOggetti
 ! [rejected]        master -> master (fetch first)
error: failed to push some refs to 'https://github.com/ ProgrammazioneAdOggetti/ ProgrammazioneAdOggetti
hint: Updates were rejected because the remote contains work that you do
hint: not have locally. This is usually caused by another repository pushing
hint: to the same ref. You may want to first integrate the remote changes
hint: (e.g., 'git pull ...') before pushing again.
hint: See the 'Note about fast-forwards' in 'git push --help' for details.
```

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User 3

git pull

User 3: Response

```
remote: Enumerating objects: 5, done.
remote: Counting objects: 100% (5/5), done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 3 (delta 1), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (3/3), 689 bytes | 76.00 KiB/s, done.
From https://github.com/ProgrammazioneAdOggetti/ ProgrammazioneAdOggetti
   8a82aea..614ad25  master      -> origin/master
Auto-merging lecture03.txt
Merge made by the 'recursive' strategy.
 lecture03.txt | 1 +
 1 file changed, 1 insertion(+)
```
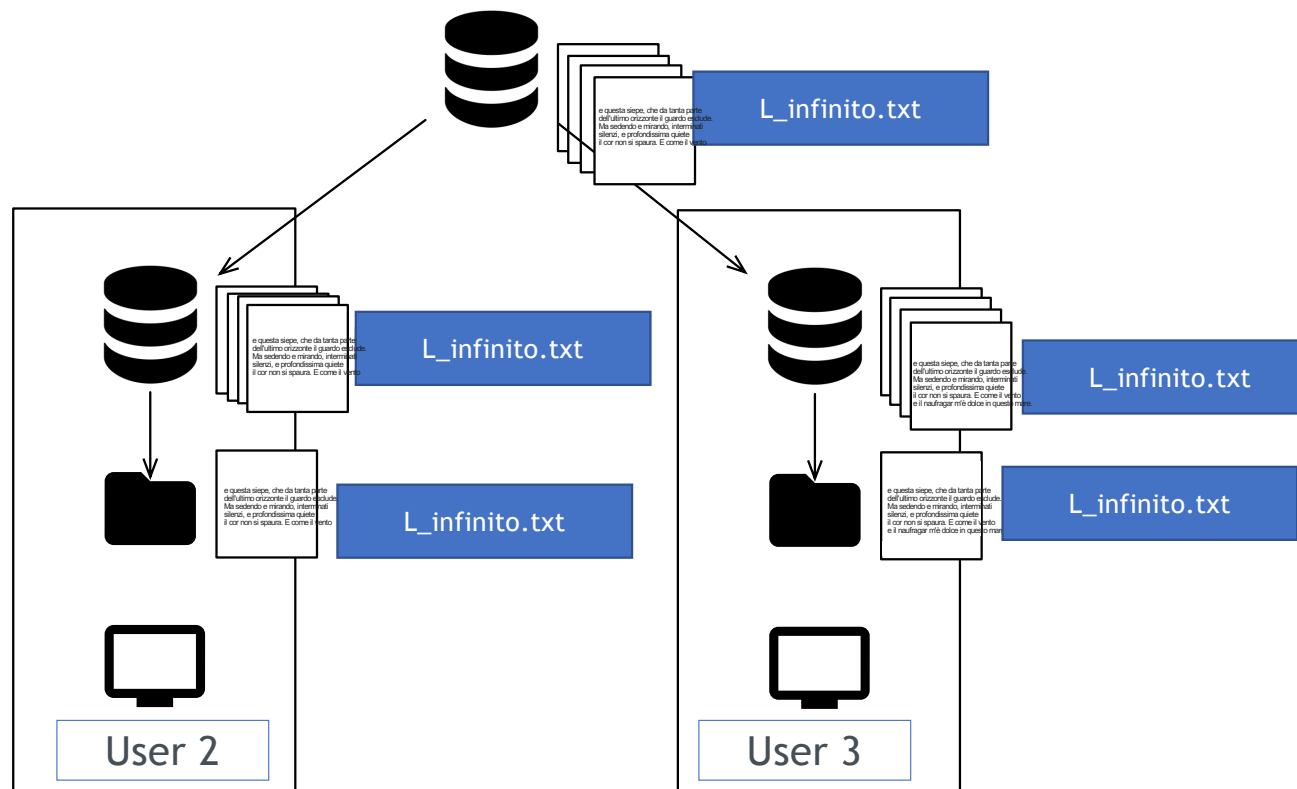
User 3: Response

```
Merge branch 'master' of ProgrammazioneAdOggetti/ ProgrammazioneAdOggetti
# Please enter a commit message to explain why this merge is necessary,
# especially if it merges an updated upstream into a topic branch.
#
# Lines starting with '#' will be ignored, and an empty message aborts
# the commit.
```

User 3: Explanation

User 3: Action

git push

User 3: Response

```
Enumerating objects: 10, done.
Counting objects: 100% (10/10), done.
Delta compression using up to 8 threads
Compressing objects: 100% (4/4), done.
Writing objects: 100% (6/6), 590 bytes | 590.00 KiB/s, done.
Total 6 (delta 2), reused 0 (delta 0), pack-reused 0
remote: Resolving deltas: 100% (2/2), completed with 1 local object.
To https://github.com/ProgrammazioneAdOggetti/ ProgrammazioneAdOggetti
 _614ad25..dc6597c  master -> master
```
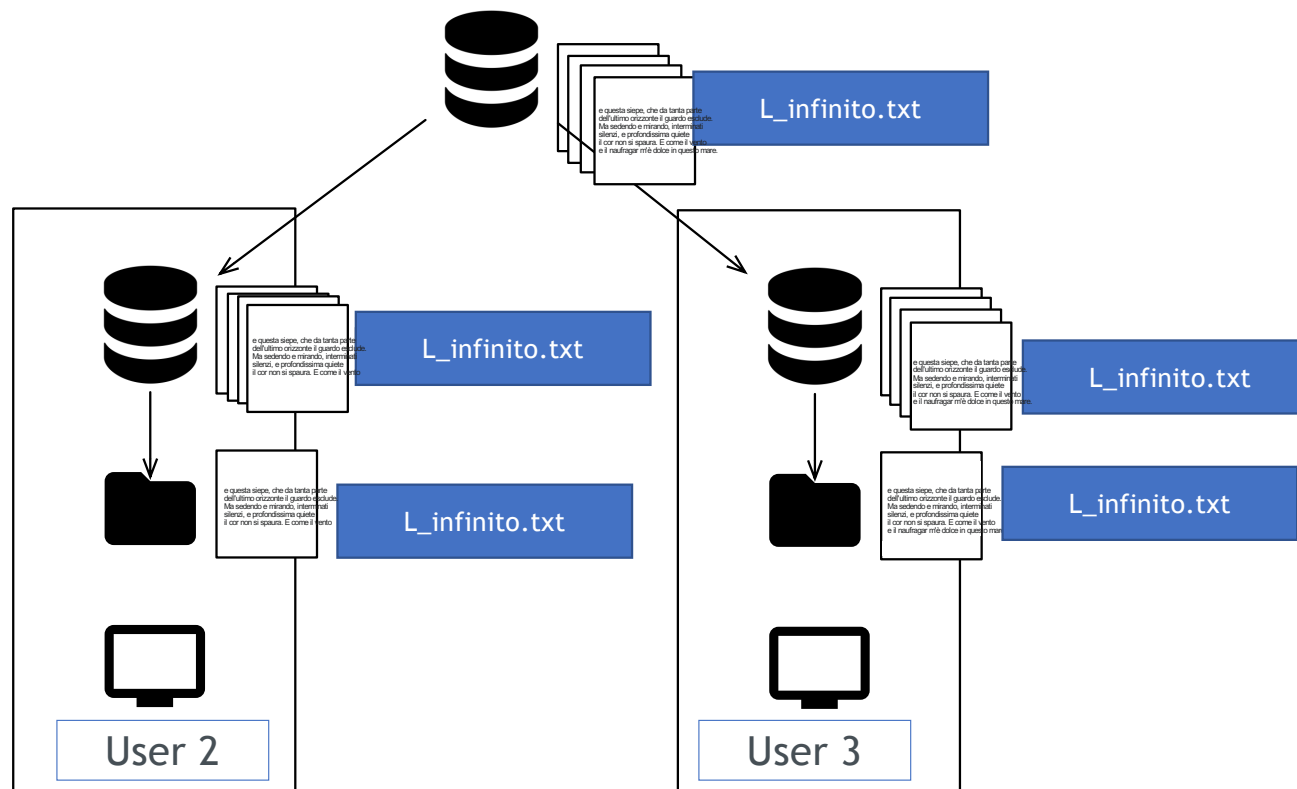
User 3: Explanation

User 3: Action

git log

User 3: Response

```
commit 4ce1196dcdc58910bdad7ca41486a9ffe84a1a4e (HEAD -> master, origin/master)
Author:  [              ] <[                    ]>
Date:    Sat Sep 10 22:31:04 2022 -0400

    Adds the last line of the lyrics

commit 2ef25cdc01ad9cfe25c2185947d49964e6ea0db1
Author:  [              ] <[                    ]>
Date:    Sat Sep 10 22:16:23 2022 -0400

    Adds the first line of the lyrics

commit faddcbffc4b489490b63c25318b39b1f4e4f5ac9
Author:  [              ] <[                    ]>
Date:    Sat Sep 10 21:49:20 2022 -0400

    Orders the line in conflict
```

User 3: Action

git diff oldId newID

```
> git diff 738b0dba06c253bd41095ea6d475523549462f46 dc6597c7011db77bfed8eccccb9c
063fa4c7918a
```

User 3: Response

```
diff --git a/ L_infinito.txt    b/ L_infinito.txt
index 5d4ce3b..fd32469 100644
--- a/lecture03.txt
+++ b/lecture03.txt
@@ -1,3 +1,4 @@
```

+ e questa siepe, che da tanta parte
dell'ultimo orizzonte il guardo esclude.
Ma sedendo e mirando, interminati
silenzi, e profondissima quiete
il cor non si spaura. E come il vento
e il naufragar m'è dolce in questo mare.

User 3: Action

git mv L_infinito.txt Poesia.txt

User 3: Explanation

User 3: Action

git status

User 3: Response

```
On branch master
Your branch is up to date with 'origin/master'.

Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        renamed:    L_infinito.txt  ->  Poesia.txt
```

User 3: Acction

git commit –m "Renames the file"

User 3: Response

```
[master f13c40d] Renames the file
 1 file changed, 0 insertions(+), 0 deletions(-)
rename  L_infinito.txt  =>  Poesia.txt  (100%)
```

User 3: Explanation
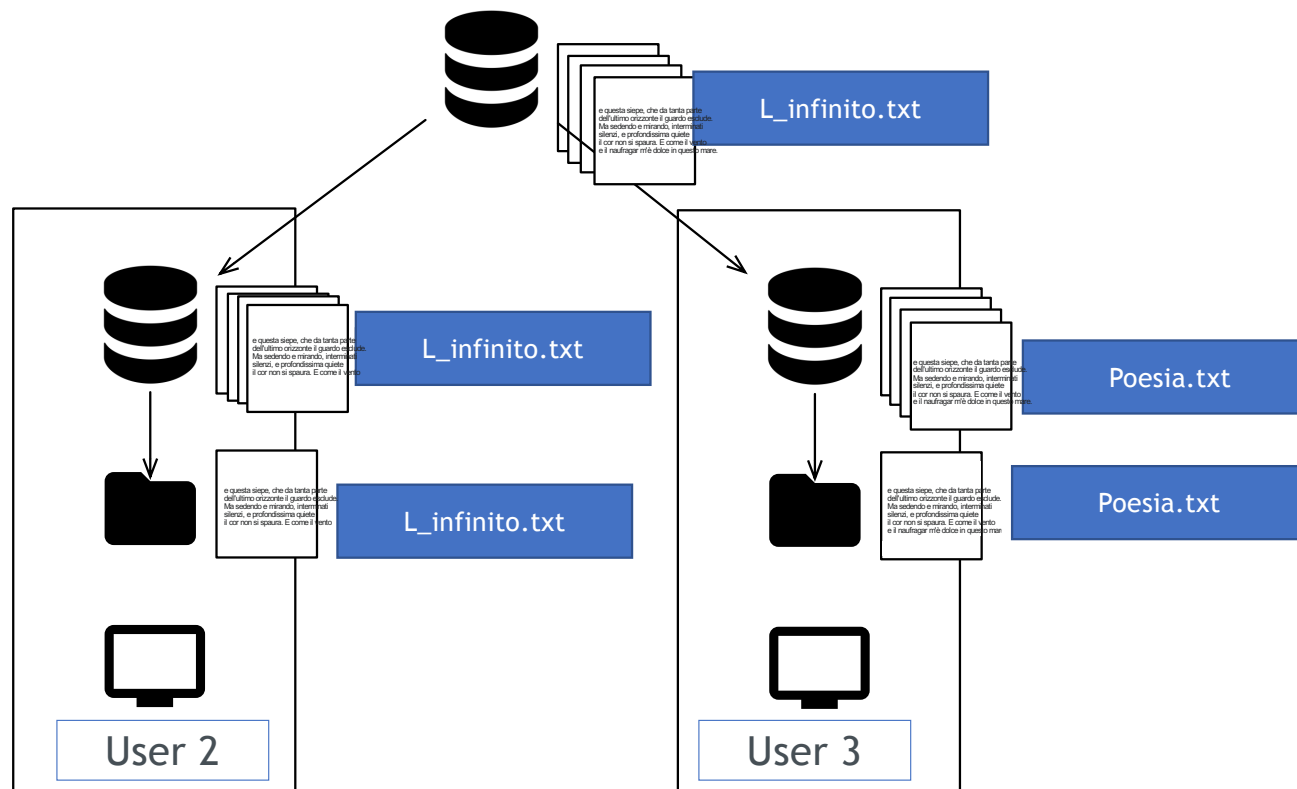
User 3: Action

git push

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Dipartimento
di Ingegneria Gestionale,
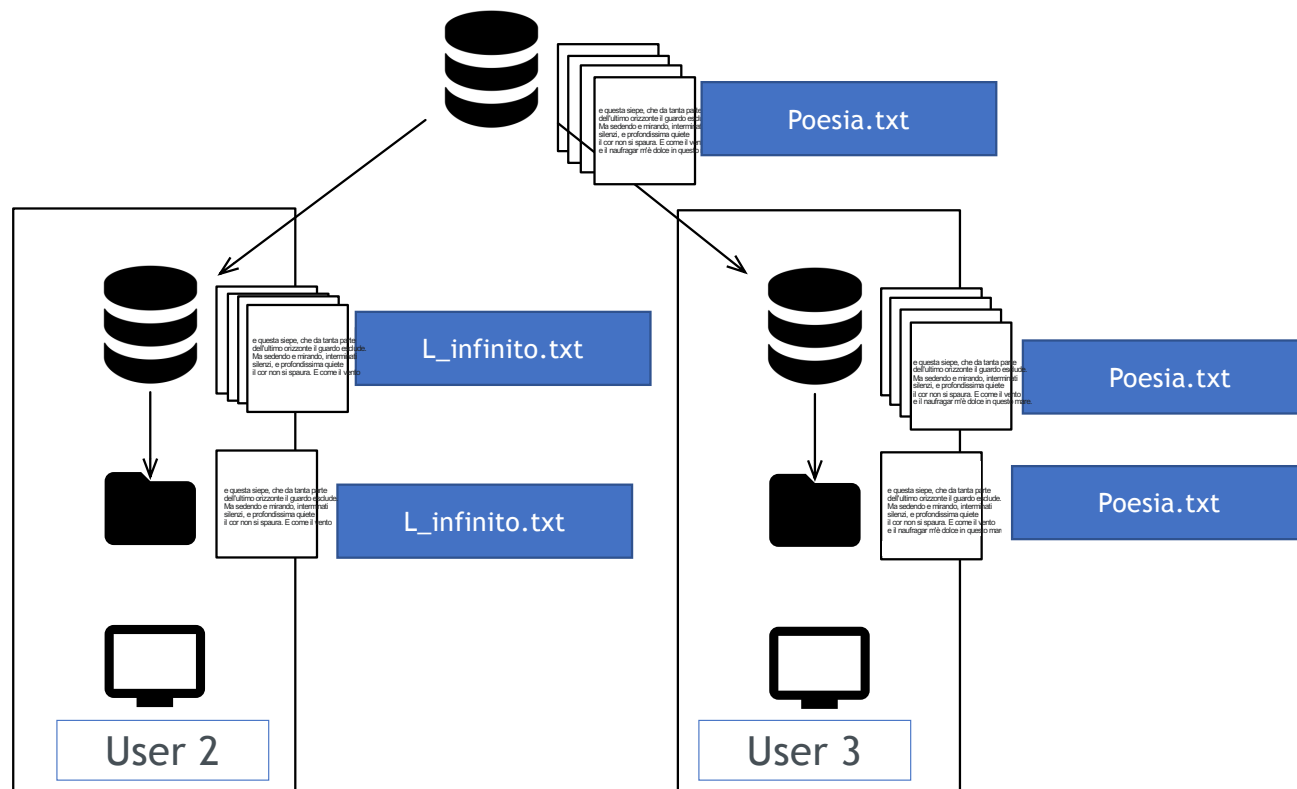dell'Informazione e della Produzione

User 3: Response

```
Enumerating objects: 3, done.
Counting objects: 100% (3/3), done.
Writing objects: 100% (2/2), 248 bytes | 248.00 KiB/s, done.
Total 2 (delta 0), reused 0 (delta 0), pack-reused 0
To https://github.com  ProgrammazioneAdOggetti/ ProgrammazioneAdOggetti
   dc6597c..f1   L_infinito.txt   ->   Poesia.txt
```
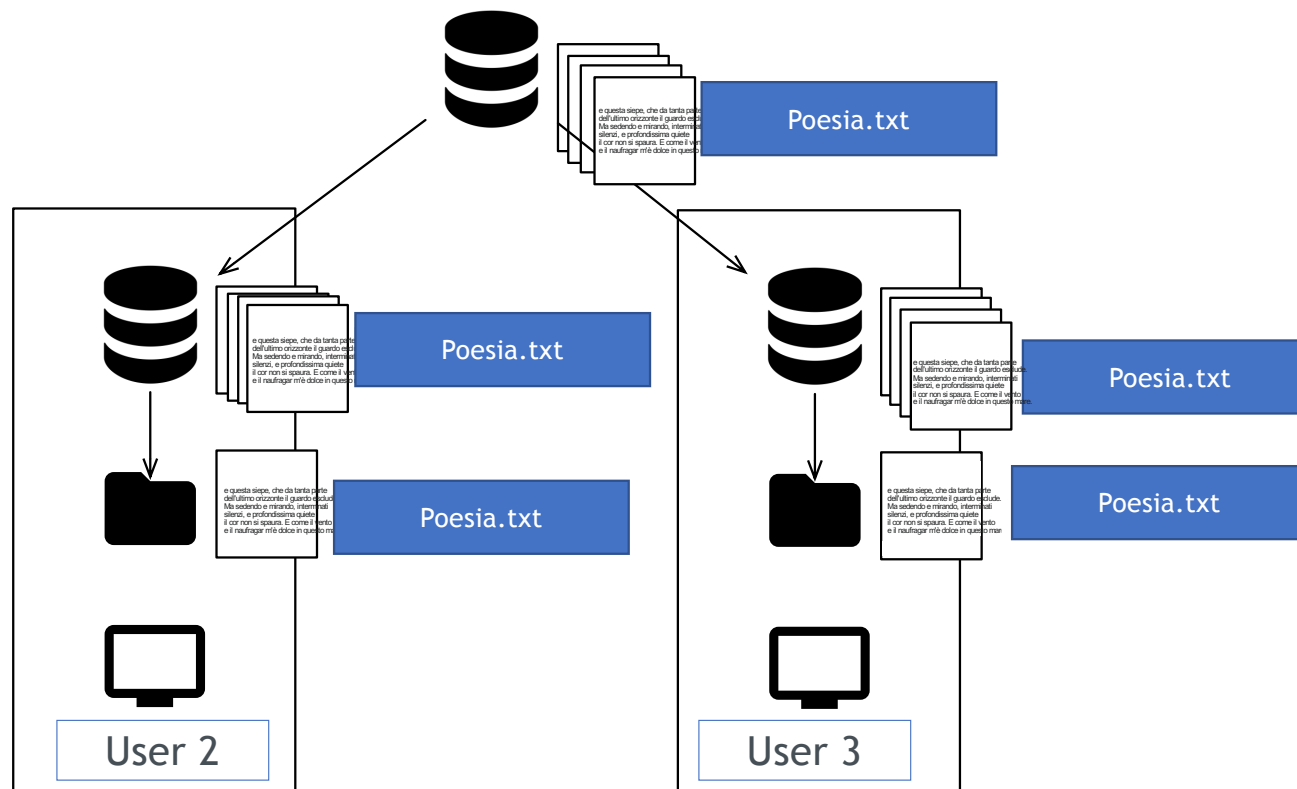
User 3: Explanation

User 2: Action

git pull

User 2: Explanation

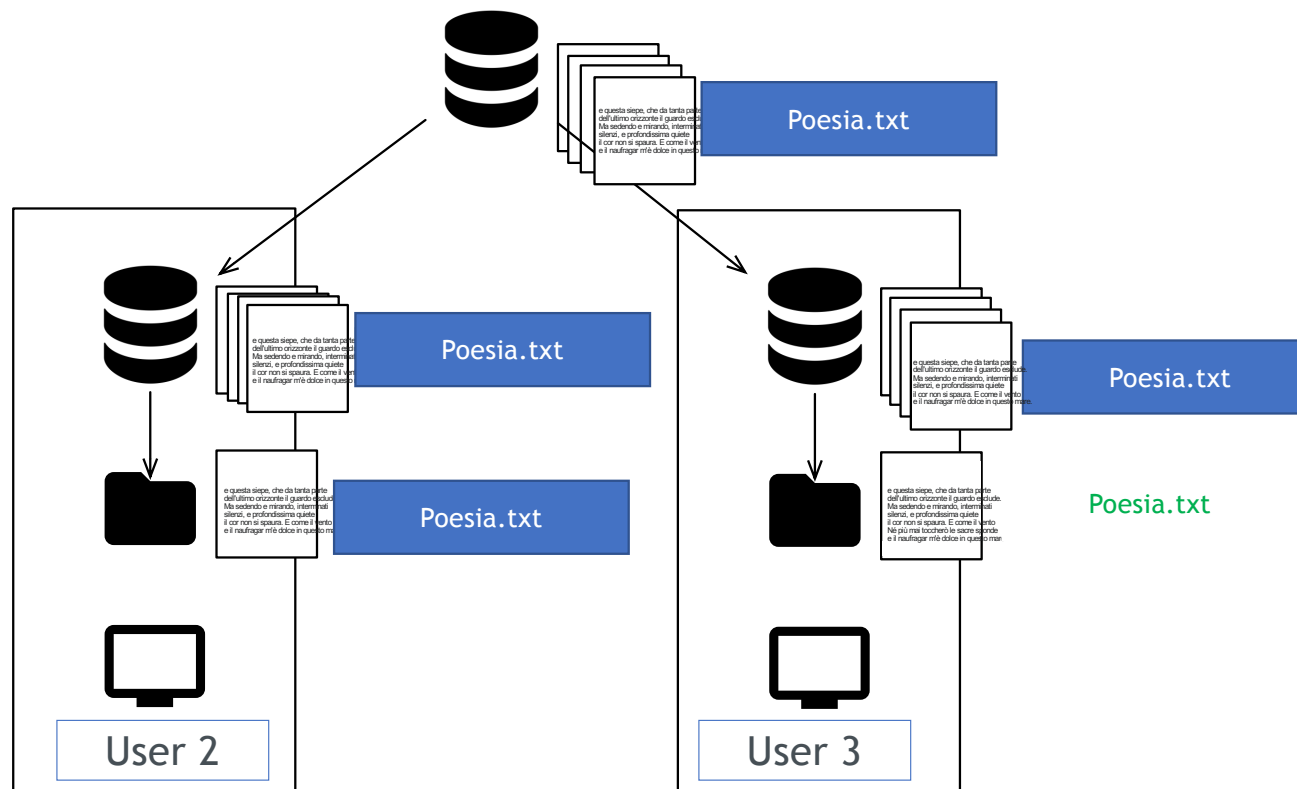# User 3: Action [Fixing Errors: Scenario 1]

L_infinito.txt — Edited

e questa siepe, che da tanta parte
dell'ultimo orizzonte il guardo esclude.
Ma sedendo e mirando, interminati
silenzi, e profondissima quiete
il cor non si spaura. E come il vento
e il naufragar m'è dolce in questo mare.

User 3: Action [Fixing Errors: Scenario 1]

L_infinito.txt — Edited

e questa siepe, che da tanta parte
dell'ultimo orizzonte il guardo esclude.
Ma sedendo e mirando, interminati
silenzi, e profondissima quiete
il cor non si spaura. E come il vento
Né più mai toccherò le sacre sponde
e il naufragar m'è dolce in questo mare.

User 3: Explanation

User 3: How to fix it?

git checkout Poesia.txt

User 3: Action [Fixing Errors: Scenario 2]

e questa siepe, che da tanta parte
dell'ultimo orizzonte il guardo esclude.
Ma sedendo e mirando, interminati
silenzi, e profondissima quiete
il cor non si spaura. E come il vento
Né più mai toccherò le sacre sponde
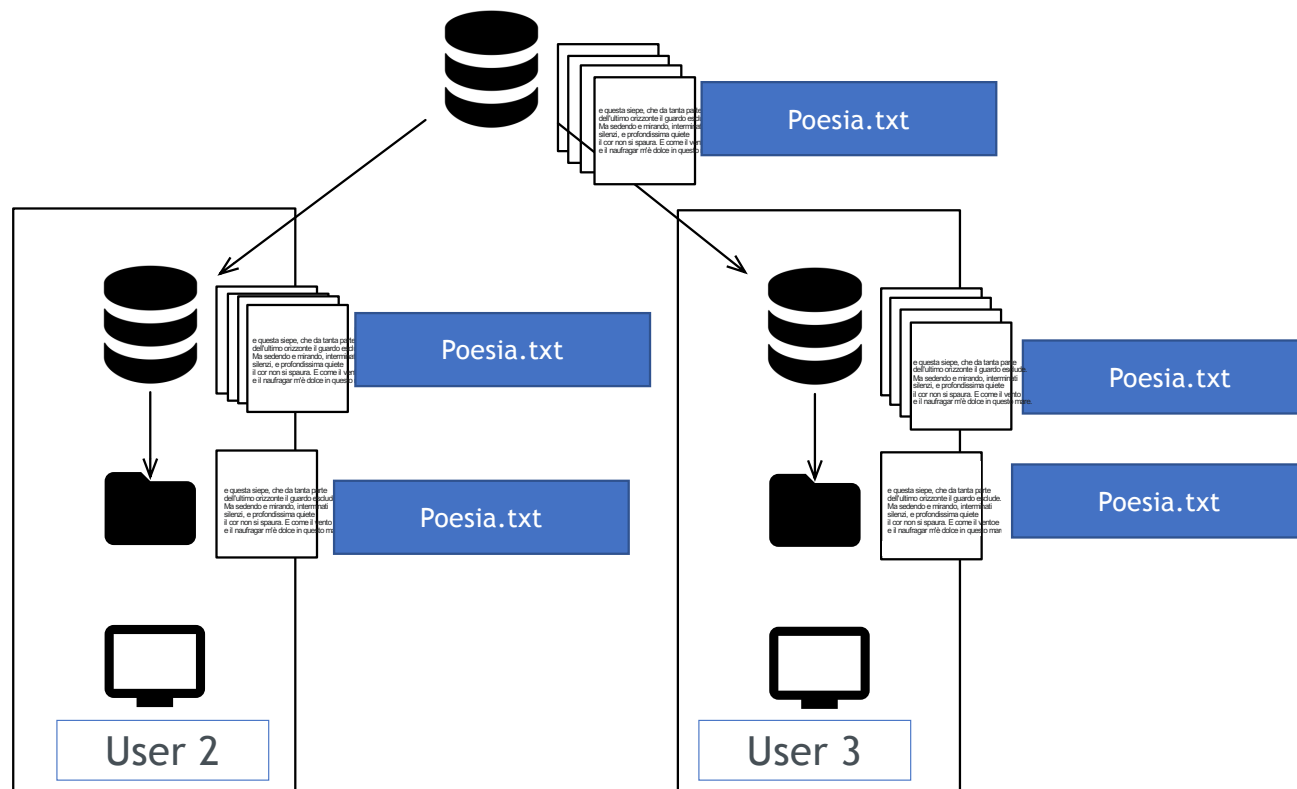e il naufragar m'è dolce in questo mare.

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Dipartimento
di Ingegneria Gestionale,
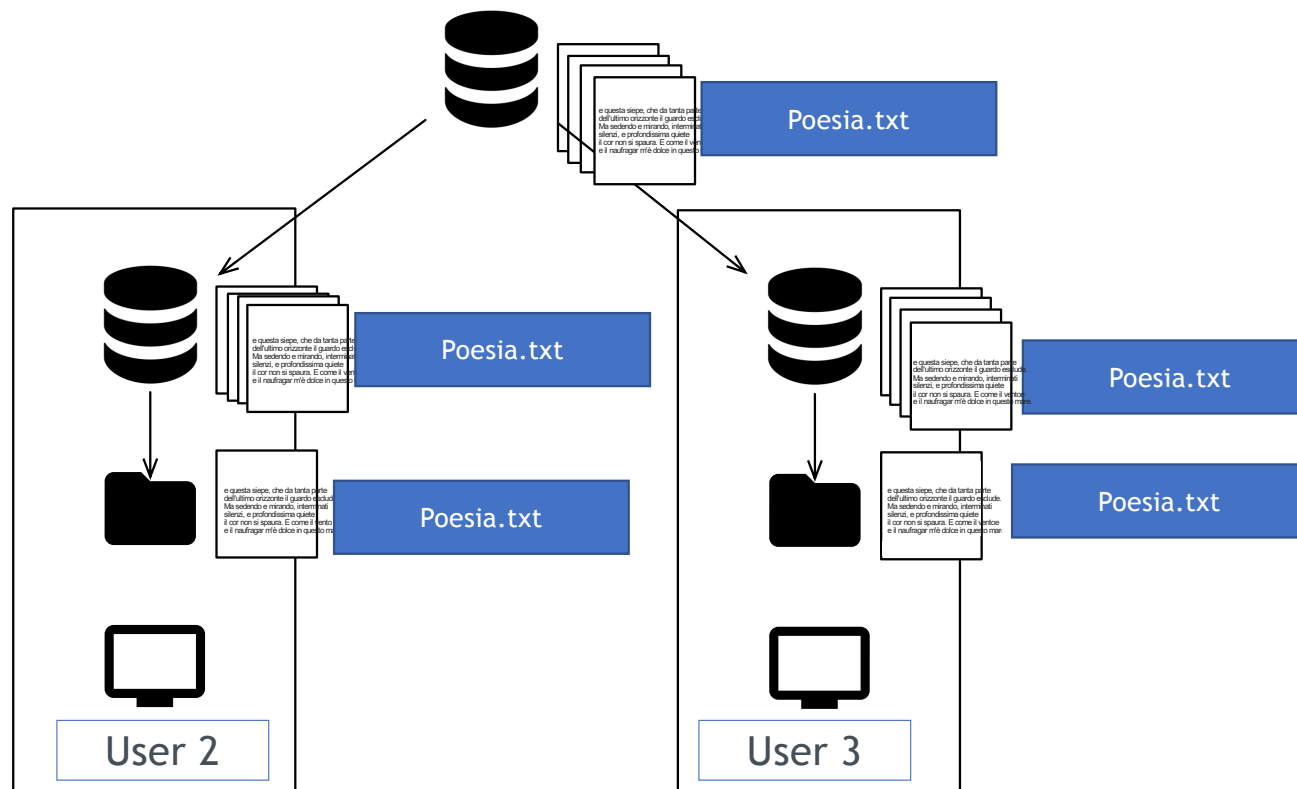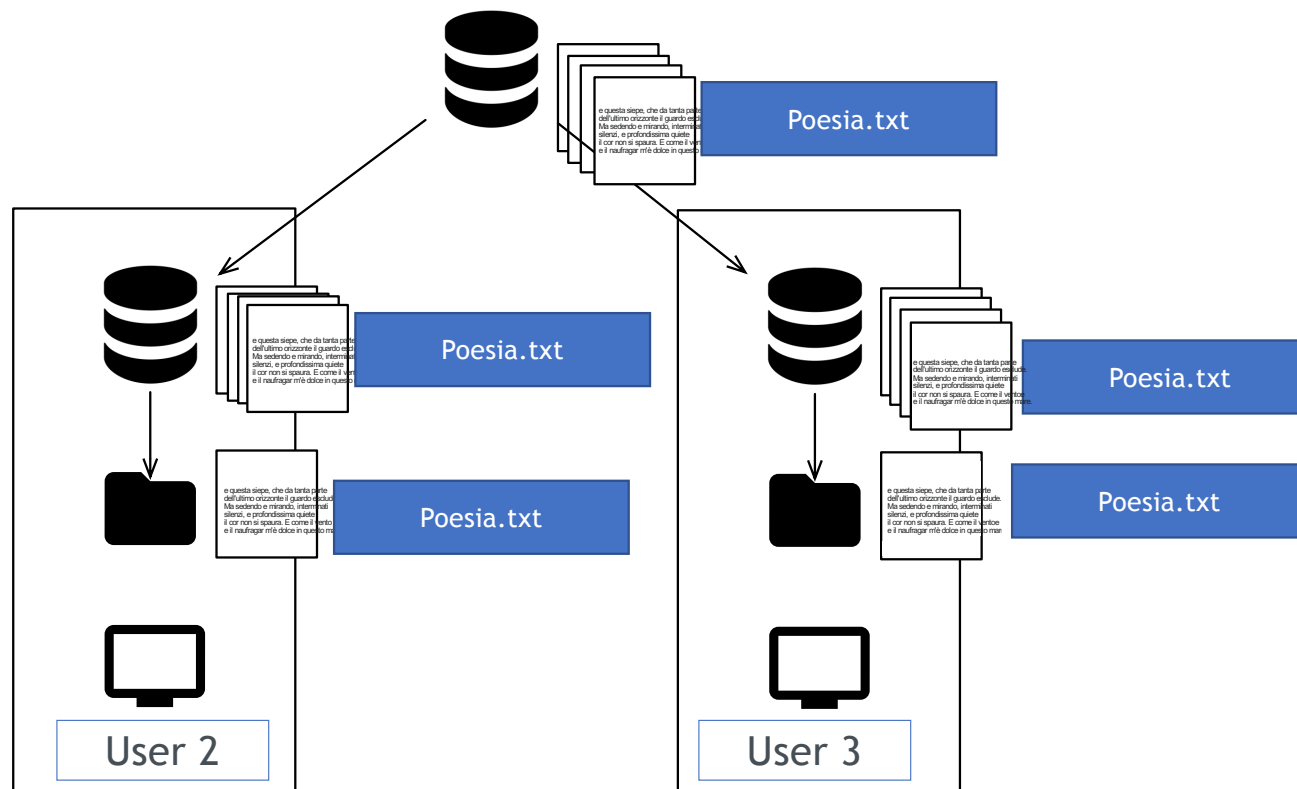dell'Informazione e della Produzione

User 3: Explanation

User 3: Action

git commit –m "Adding a line from A Zacinto"

User 3: Explanation

User 2: Explanation

User 3: Action

git log

User 3: Response

```
commit 1281ce395d8dc55fb2ce4f85672c5cad13499699 (HEAD -> master)
Author:              <            >
Date:    Sun Sep 11 22:38:00 2022 -0400
```

Adding a line from A Zacinto

```
commit 35848ff91f12f97b949ba50eef705b6c3be289f1
Author:              <            >
Date:    Sun Sep 11 22:37:34 2022 -0400

    Renames the file
```

User 3: Action

git revert 35848ff91f12f97b949ba50eef705b6c3be289f1

git push

Summary

GIT enables to

- Version control [keep the history of the changes]
- Collaboration [branches merges]
- Distribution of the databases

Summary

- Why do we have local repositories?

- What if there are many conflicts?