

Git your things done!

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What is Git?

- the most widely used modern version control system
- open source
- actively maintained
- developed by Linus Torvalds
- distributed

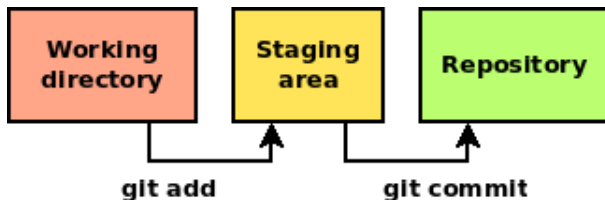
Installation

- Fedora: `sudo dnf install git`
- Debian: `sudo apt-get install git`
- Mac: <http://git-scm.com/download/mac>
- Windows: <http://git-scm.com/download/win>

Configuration

- `git config -global user.name "Your Name"`
- `git config -global user.email "yourname@example.com"`

Basics



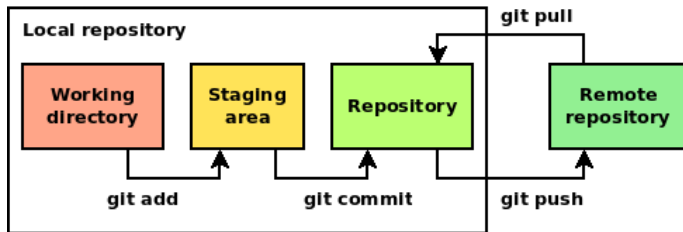
`init` create new Git repository

`status` display the status quo of your local repository

`add` add changes to the staging area

`commit` save the changes into the tree

Remote repository



push send local changes to the server

fetch download newest changes from server

pull a shortcut for *fetch* and *merge*

Terminology 1

clone create a local copy of the repository

fork create a personal copy of the repository on the server

tree a chronological map of changes

branch a development version

commit save the changes into the tree

push send local changes to the server

fetch download newest changes from server

Terminology 2

- status** display the status quo of your local repository
- merge** merge two different branches together and keep chronological order
- rebase** put personal changes on top of other changes, does not keep chronological order
- pull** a shortcut for *fetch* and *merge*
- conflict** a problem that blocks merging of changes
- squash** put two (or more) commits into one
- blame** display the author of a change

Fork the repository

- creates a server-based copy of the repo
- go to your Git forge webUI
- push the **Fork** button

Clone the repository

- creates a local copy of the repository in a new directory
- `git clone <repo-address>`
- `git clone <repo-address> <directory>`

Task 1

- 1 As a group, fork repository
`https://github.com/dokumentarista/trygit.git`.
- 2 Set up commit rights for your members.
- 3 Clone the fork to your machine.
- 4 Go to that directory.
- 5 Display its content (`ls -a`)

Developing the project (adding changes)

- 1 open, edit, save files as you would normally do
- 2 see the new status
 - ▶ `git status`
- 3 add files you want git to start tracking
 - ▶ `git add`
- 4 save the changed files into the git tree
 - ▶ `git commit -m "Explain why"`
- 5 synchronize your git tree with the server version
 - ▶ `git push`

Task 2

- Although a group, work individually
- 1 Open the `names.txt` file in the repo
- 2 Add your name to the list of names
- 3 Commit your changes
- 4 Push them onto the server

Getting the first conflict

Git conflict, sometimes referred to as **merge conflict**, happens when:

- two (or more) versions of one change
- at the same time

When in conflict, you cannot work with the remote repository because Git protects your data from being damaged.

When you try to push

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

When you try to pull

```
remote: Enumerating objects: 8, done.  
remote: Counting objects: 100% (8/8), done.  
remote: Compressing objects: 100% (6/6), done.  
remote: Total 6 (delta 2), reused 0 (delta 0)  
Unpacking objects: 100% (6/6), done.  
From https://github.com/dokumentarista/trygit  
34c12d6..d8a0bea  master    -> origin/master  
Auto-merging names.md  
CONFLICT (content): Merge conflict in names.md  
Automatic merge failed; fix conflicts and then  
commit the result.
```


In the file

```
# Names of login names.
```

```
<<<<<< HEAD
```

```
### Add your login name to the last available slot.
```

```
1. pkratoch
```

```
=====
```

```
### Add your login name to the last available slot.
```

```
1. lruzicka
```

```
>>>>>> d8a0beae9626d523d509b9fc53de06c435999d24
```

```
2.
```

```
3.
```

```
4.
```

```
5.
```

How to solve merge conflicts?

- Open the conflicting file.
- Explore the marked area.
- Your changes are marked **HEAD** above the division line.
- ===== is the division line.
- Remote changes are below the division line.
- Rewrite the file as you want it to be and save it.
- `git add corrected-file.`
- `git merge --continue`
- Edit the commit message if asked.

Conflict fixed

```
# Names of login names.
```

```
### Add your login name to the last available slot.
```

1. pkratoch
2. lruzicka
- 3.
- 4.
- 5.

How to limit conflicts?

- Use the **branch** workflow.
- Use the **fork** workflow.
- Plan with your team.
- Communicate.

Conflicts will always happen, love them, nurture them and fix them carefully.

What is a branch?

- alternate development version
- it checks out from a certain commit
- it can branch from **master** or another branch
- it typically diverges from its origin very quickly
- it allows you to work individually without having to solve many conflicts as you go

How to work in a branch?

- Create a new branch (`git checkout -b new`)
- Write your changes there.
- Fix merge conflicts if any.
- Merge or rebase possible changes in the original branch to your branch to make it merge ready.
- Have it merged (or rebased) back into its origin.

git merge

- Merges two branches into one.
- The checked-out branch will be altered.
- It keeps track of history.
- It is chronological.
- It produces a **merge message**

git rebase

- Merges two branches into one.
- The checked-out branch will be altered.
- It does not keep track of history.
- It is not chronological.
- It accepts foreign commits, merges them to your branch, and puts your commits on top of that.
- It helps to keep the history of the master branch free from merge commits.

Task 3

- 1 Delete the repo files and clone it again.
- 2 Each person in the group creates their own branch.
- 3 Communicate with the team.
- 4 Add your name to the list of names in your branch.
- 5 Merge or rebase the original branch onto your branch.
- 6 Fix conflicts.
- 7 Have it merged.

What if I don't have access to repository?

- Very common in open source world
- Send patch via email?

Fork workflow

- Fork a repository
- Clone a repository
 - ▶ `git clone <repo-address> <directory>`
- See remote repositories
 - ▶ `git remote -v`
- Add the other remote repository
 - ▶ `git remote add <name> <repo-address>`
- Make changes and push them to your fork
 - ▶ `git push -set-upstream <remote> <branch>`
- Make pull request

Changing the history – interactive rebase

- Can change commit messages.
- Can merge two (or more) commits – squash them.
- Can throw away commits.
- Makes severe changes to the repo structure – risky.
- It changes the fundamentals for your collaborators.
- Needs to be force pushed.
- Should only be done in individual branches.

How to recover from interactive rebase?

- Checkout the branch.
- Fetch the new repo data (`git fetch origin`)
- Rebase your branch onto the original branch (`git rebase origin/master`).
- All changes from your branch will appear on top of the original branch.
- Alternatively, you can use `git pull --rebase` which will do the rebase for you, if possible.
- Merging the branch would never work, because the history has been changed.

Undo local changes – reset

- You can reset the HEAD to a previous commit.
- You can either use hashes or HEAD~3
- You can use **soft**, **mixed** or **hard** reset.
- Default is mixed – it changes the HEAD marker and unstages files, but leaves them untouched.
- Hard reset will delete your files – think twice.
- The operation goes back in history – needs rebasing.
- All changes can be recovered until you push to the server.
- Should only be done in individual branches.

Undo local changes – revert

- You can revert to a previous commit.
- You can either use hashes or HEAD~3
- A new commit will be added, that undoes the changes.
- The operation does not go back in history, can be forwarded.
- All changes can be recovered any time locally.
- Can be done in cooperative branches.