pCT Bergen Meeting
Gitlab best-practice

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Outline

- Part 1: A short introduction
- Part 2: Hands on

Very much my personal view and experience. There is a lot of information available and we have to create our strategy and build our knowledge.

Policies

Keep track of your development

- make frequent commits
- write meaningful commit and log messages
- use branches to structure your work, e.g. different features, prototyping, ...

Publish early, publish often

- Make code available to your colleagues
- Participate in and receive code reviews

Git: General Remarks

Versioning system, strong focus on distributed repositories

Git separates a contribution to a project into three stages

1. `git add`: add new files to project or add changed files to be committed
2. `git commit`: check in changes to local working clone
3. `git push`: push status of local clone to a remote repository

... and adds a new concept

- `git pull`: pull updates from (any) remote repository

Gitlab - a smart interface to Git

Gitlab is an interface to `git`
not only repository hosting, but allows efficient collaborative work

- Easy code sharing and discussions
- Code review
- Documentation
- Bug and issue tracking
- Planning
- Distributed maintaining, every developer can take over tasks from the main maintainers
- ... and a lot more

Working with Gitlab

There are two different roles:

- **User role**: A *user* wants to download the code, compile it and use it.
- **Developer role**: A *developer* contributes to the development.

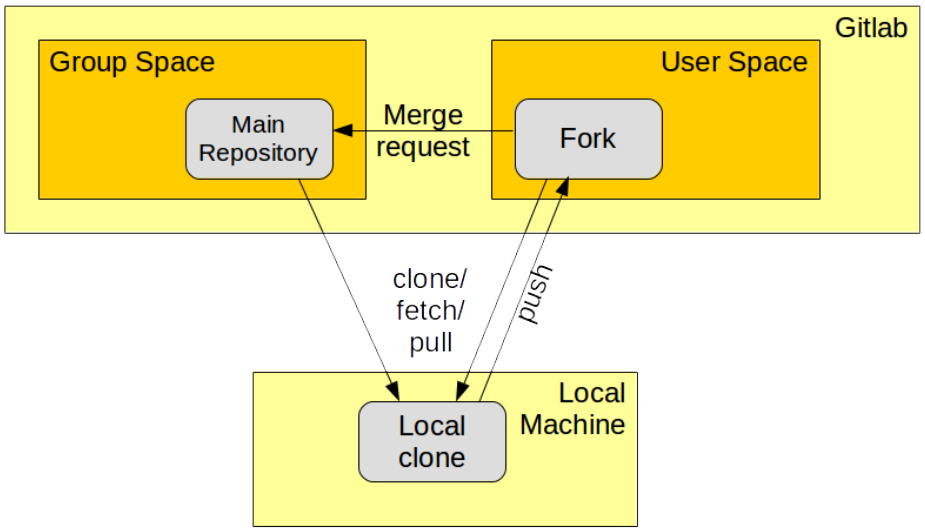
Often one starts as a user and moves to developer role later

Gitlab supports multiple repository copies

- `git` supports/implements distributed repositories copies
- `git` itself does not even make an assumption about a master repository
- It is however good to have such a master repository and dedicated strategy how to contribute to it.

User space in Gitlab/Github

- Every user has his/her own space at the server side, in addition there can be groups with dedicated group space
- A project is created in a user or group space
  This is usually the master repository
- Repositories can be *forked*, this creates a repository copy inside Gitlab with dedicated access rights



The developer fork is the main feature in Gitlabs/Githubs concept of distributed development, code sharing and code review.

The repository copies are synchronized via *merge requests*

The pCT group at UiB Gitlab

https://gitlab.uib.no/pct

Projects in the Gitlab pct group

Initial projects:

- Start with a project per work package (WP*n*)
- There will be significant overlap between work packages, we might want to consider renaming and a different structure early next year
- e.g. WP1 and WP7 call for a common repository (common package dependencies, data formats)

External projects:

- External projects can either be taken directly from a remote repository, or can be imported as a separate project in our Gitlab space
- *"Lyon"*-code imported to https://gitlab.uib.no/pct/mlpTracking (name might change)
- Work-flow proposal on the wiki: https://wiki.uib.no/pct/index.php/Documentation#Importing_an_external_package

Branches in the main repository

Suggestion:

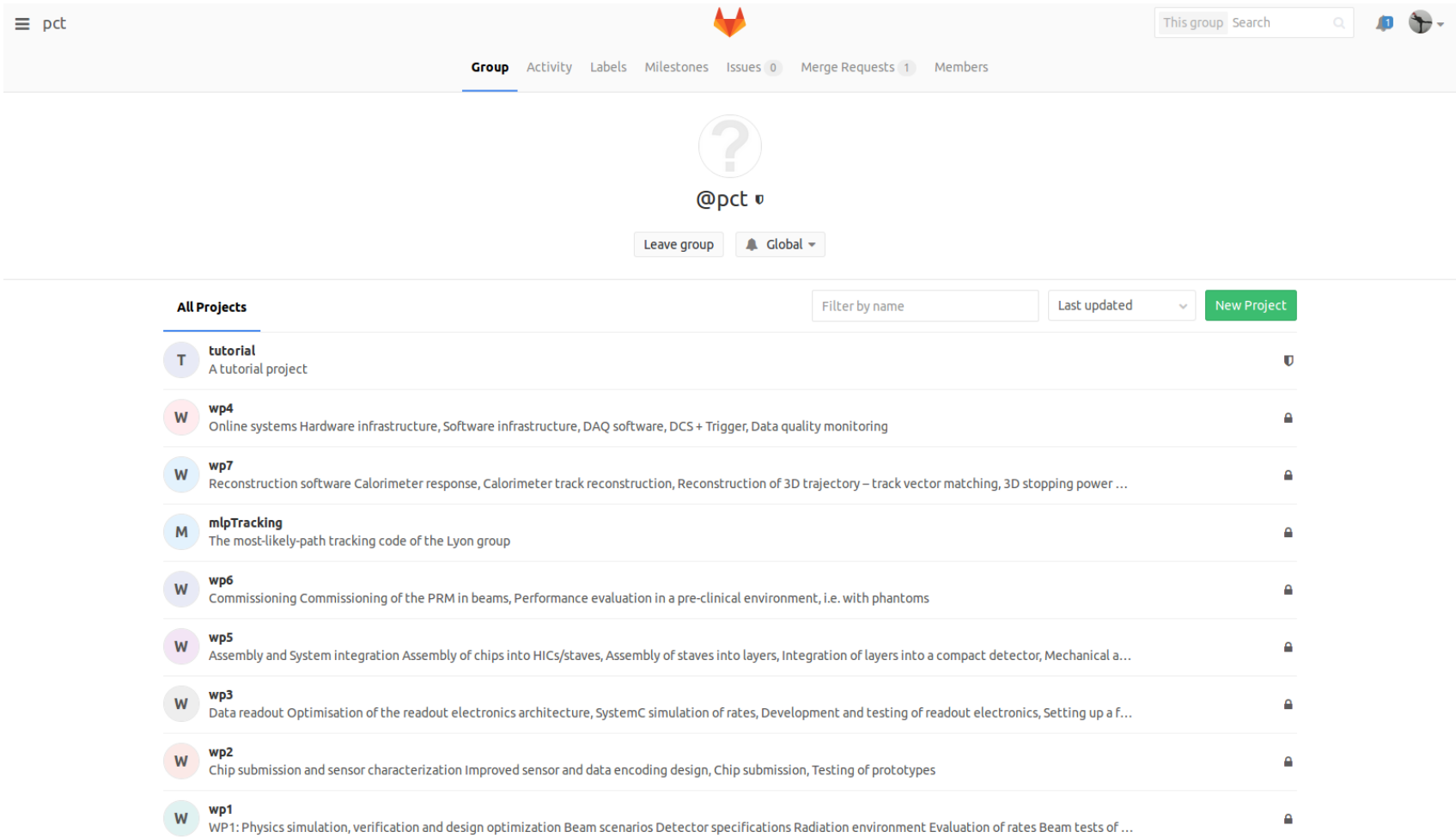
- **production**: the latest production code, in this branch we have release tags
- **master**: the latest stable release
- **dev**: the development branch

In addition to those main branches there can be feature branches where development happens detached from the main branches.
A feature branch is based on the dev branch and has a limited lifetime.

Tutorial

Gitlab group page

https://gitlab.uib.no/pct

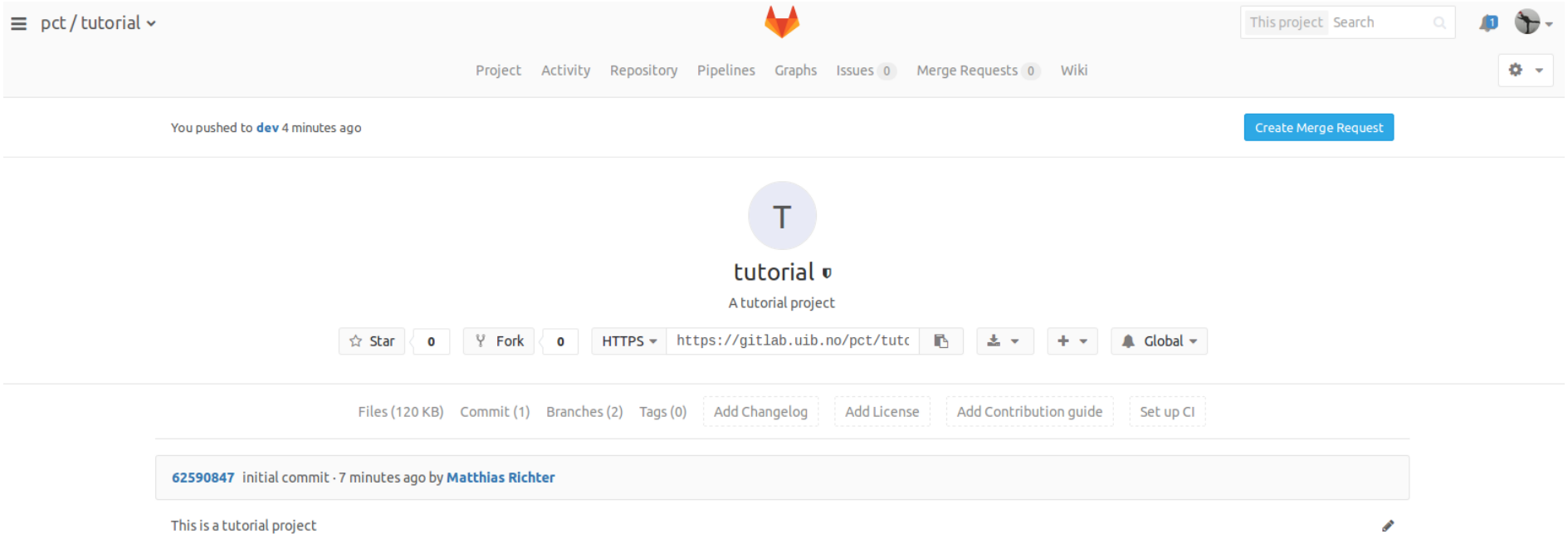


Note:

- Log in with UiB account and request access

Cloning a project

https://gitlab.uib.no/pct/tutorial




```
git clone https://user@gitlab.uib.no/pct/tutorial.git
```

Note:

- make sure to switch the link to `https` before cloning
- currently investigating cloning via ssh

Using the cloned project

Some commands to investigate the project:

```
cd tutorial
git branch
git branch -a # to show all branches
git remote -v # shows the remote repository
```

Example output:

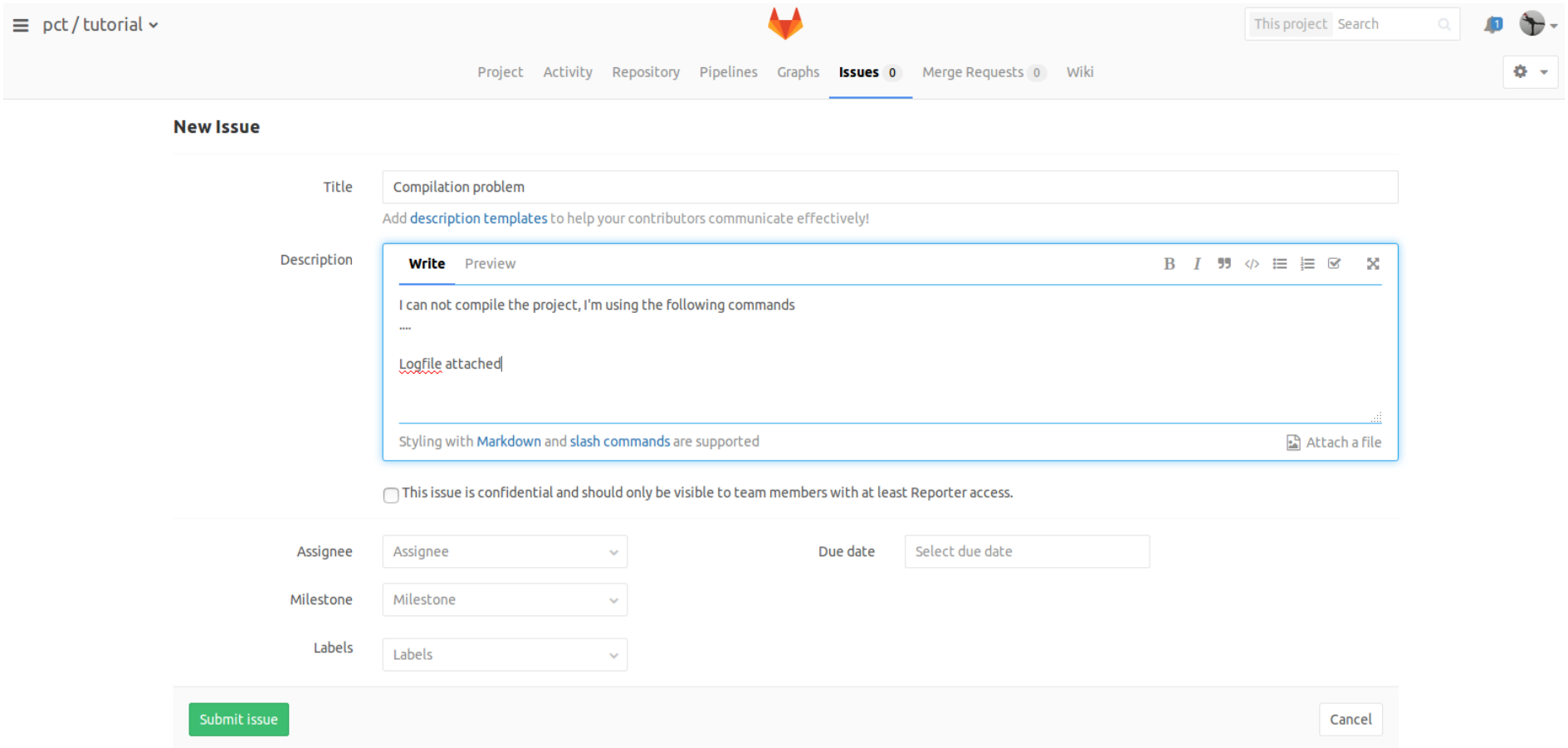
```
richter@workhorse:~/src/pCT$ cd tutorial
richter@workhorse:~/src/pCT/tutorial$ git branch
* master
richter@workhorse:~/src/pCT/tutorial$ git branch -a
* master
remotes/origin/HEAD -> origin/master
remotes/origin/dev
remotes/origin/master
richter@workhorse:~/src/pCT/tutorial$ git remote -v
origin https://gitlab.uib.no/pct/tutorial.git (fetch)
origin https://gitlab.uib.no/pct/tutorial.git (push)
```

Note:

- Git configures the remote upstream repository, the original cloned repository gets identifier *origin*
- Multiple upstream repositories are possible

Found a bug - create an issue

https://gitlab.uib.no/pct/tutorial/issues → New Issue



Note:

- Gitlab issues can also be used for feature requests and ideas

Becoming a developer (1)

Switching roles from *user* to *developer* involves a couple of changes:

- Development involves two "git"-stages:
  1. Local changes to the work clone: `git add/commit`
  2. Publish to server: `git push`
- **Rule**: always use branch `dev` for development or an appropriate feature branch: `git checkout dev`

Example:

```
git checkout dev # a new branch can be created with git checkout -b branchname
# do some modifications to existing file or create new file
echo "this is ${USER}'s new feature" > feature_${USER}.txt
# add to the index for committing
git add feature_${USER}.txt
# commit
git commit -m "A new feature by ${USER}"
```

Note: everything is local until now

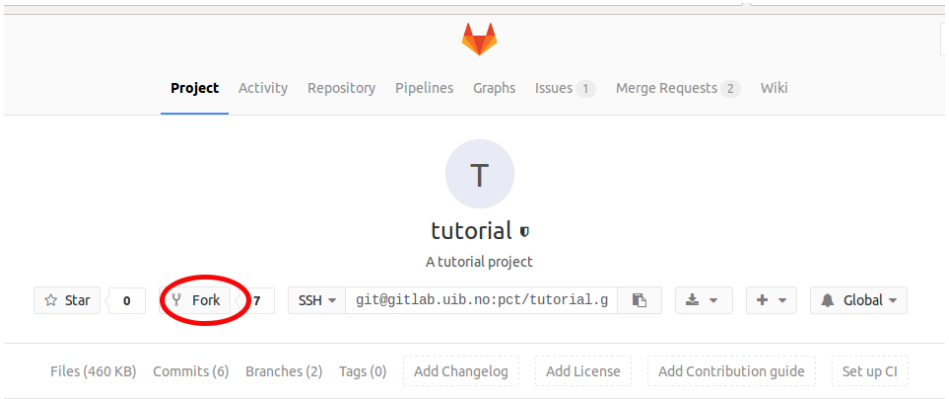
Becoming a developer (2) - Making a fork

A repository fork is a copy of the original repository **within Gitlab**

Why forks?

- a fork is the users workspace in Gitlab (it's not a local clone)
- user has full access to a fork (other than the master repository)
- fork makes development public within the team and makes code sharing and review easy
- fork allows user adjusted code

Looks exactly like master repository, but you have full access and control



Klick "Fork"-button and choose where to fork the project to, in most cases your user space.

Becoming a developer (3) - Adjusting work clone

Your developer space at Gitlab (adjust *user*)

```
https://gitlab.uib.no/user
```

- If your clone was done from the main repository → set upstream repository link to fork (adjust *user*)

```
git remote set-url origin https://user@gitlab.uib.no/user/tutorial.git
git remote update
```

- Or make a clone directly from the fork

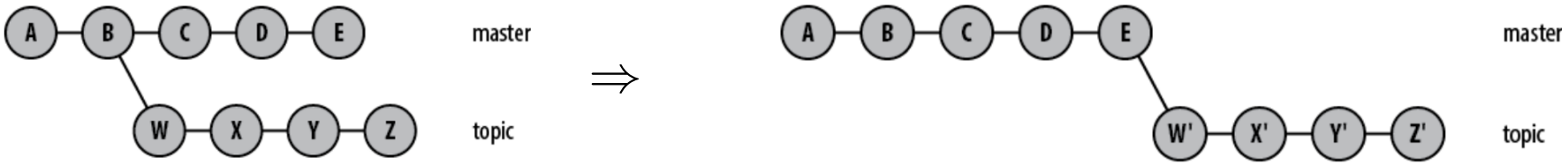
```
git clone https://user@gitlab.uib.no/user/tutorial.git
```

- Make a contribution by pushing code updates to fork

```
git push origin dev
```

Updating the local clone - *rebase*

rebase is a synchronization of branches



Sequence of commits since branching point is "replayed" on top of the base branch.

- This results in a sequence of new commits.
- Linear commit history, no merge commits

Example: Synchronize sequence of development with main repository

- pull latest state of branch *dev* from main repository:

```
git fetch https://gitlab.uib.no/pct/tutorial.git dev
```

- rebase branch *dev* of local clone to the remote branch

```
git rebase FETCH_HEAD dev
```

See also https://wiki.uib.no/pct/index.php/Documentation#Preparation

Rebase: Resolving merge conflicts (1)

A merge conflict arises from conflicting changes from different lines of development, e.g. changes in the same file at the same position.

- Git produces merged version with some special notation
- rebase is stopped, manual intervention is needed.

Example:

```
richter@workhorse:tutorial$ git diff
diff --cc README.md
index 2fdc258,b99ee05..0000000
--- a/README.md
+++ b/README.md
@@@ -1,4 -1,5 +1,9 @@@
  This is a tutorial project

++<<<<<<< 2005439cf1c7250d17dc85281b79b69f56487335
 +THIS NEEDS SOME MORE INFORMATION
++=======
+ some changes by Matthias
+
++>>>>>>> Some changes by Matthias
```

Changed lines are indicated by two columns with +/-, one column for each versions starts with what has changed in the base version and your changes follow after the separator `=======`

Rebase: Resolving merge conflicts (2)

Looking at changes: the `--ours` and `--theirs` options

diff wrt your version

```
richter@workhorse:tutorial$ git diff --theirs
* Unmerged path README.md
diff --git a/README.md b/README.md
...

+<<<<<<< 2005439cf1c7250d17dc85281b79b69f56487335
+THIS NEEDS SOME MORE INFORMATION
+=======
 some changes by Matthias

+>>>>>>> Some changes by Matthias
```

diff wrt base version

```
richter@workhorse:tutorial$ git diff --ours
* Unmerged path README.md
diff --git a/README.md b/README.md
...

+<<<<<<< 2005439cf1c7250d17dc85281b79b69f56487335
 THIS NEEDS SOME MORE INFORMATION
+=======
+some changes by Matthias
+
+>>>>>>> Some changes by Matthias
```

Note: This is a counter-intuitive feature of git, *rebase* is done from the perspective of the base branch, not the developer branch which is rebased. As a consequence, `--ours` refers to the version in the base branch and `--theirs` to the developer version (your version).

Rebase: Resolving merge conflicts (3)

Options to resolve the conflict:

1. Edit the file
2. Take your version

```
git checkout --theirs -- filename
```

3. Discard your version

```
git checkout --ours -- filename
```

Next steps:

- indicate to git that you have done the work by *adding* the file to the index for the commit. Note: don't use `git commit`.

```
git add filename
```

- continue the rebase process (this does the commit)

```
git rebase --continue
```

Emergency:

- you can always abort and restore the original state

```
git rebase --abort
```

Create a merge request

Push the updated version to the fork

- since the commit line has been changed, the local and remote branches are out of sync, option `-f` (force) has to be used

```
git push -f origin dev
```

Merge request is now created on the gitlab web interface of your fork

1. Go to your gitlab user space at https://gitlab.uib.no/user (replace user appropriately).
2. Find the project fork, e.g. in the list of projects associated with you from the upper main menu.
3. In the line with the many columns regarding the repository, click on the "+"-symbol on the right hand side and choose "New merge request"
4. Select project and branch for both source and target, and click "Compare branches and continue". Remember: in almost all cases you have to merge to branch dev or other feature branch, only in very rare cases to branch master
5. Review the list of commits in this merge request, give it a descriptive title and description, pick an assignee
6. Submit the merge request

Additional discussion during the session

Some notes from the discussion

- Guidelines for using Gitlab (*"this is how we use our gitlab space"*)
  There is already some information in the wiki, more work needed to complete the guidelines

  https://wiki.uib.no/pct/index.php/Documentation#Software_repository

  https://wiki.uib.no/pct/index.php/Gitlab_best_practice
- Handling of documentation: MS Word widely used
  Proposal: doc files as binary files, use versioning in the doc files, consider separate project which is not to be forked
- Handling of binary files, in particular large binary files, check what is needed