# GIT

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# Content

1. CERN‘s Controls Goup
2. What is Git
3. Using Git for modern software development
4. CI & CD

# Controls System Architecture

## Presentation Layer

- Graphical interactive applications

## Business Layer

- General purpose and specific applications server


## Embedded Layer

- Real-time services providing access to hardware

# What is GIT?

- Version Control System
  - Track changes on files
  - Allows to revert to any previous version
- Basic Concepts
  - Files are organised in a `Repository`
  - `commit` saves a state of a file
  - `checkout` reverts
- **Local** repository may be a copy of a **remote** one
- De-facto  standard in modern software development
- Invented by Linus Torvalds -> inventor of Linux

# Example

- Create Repository and add 2 files

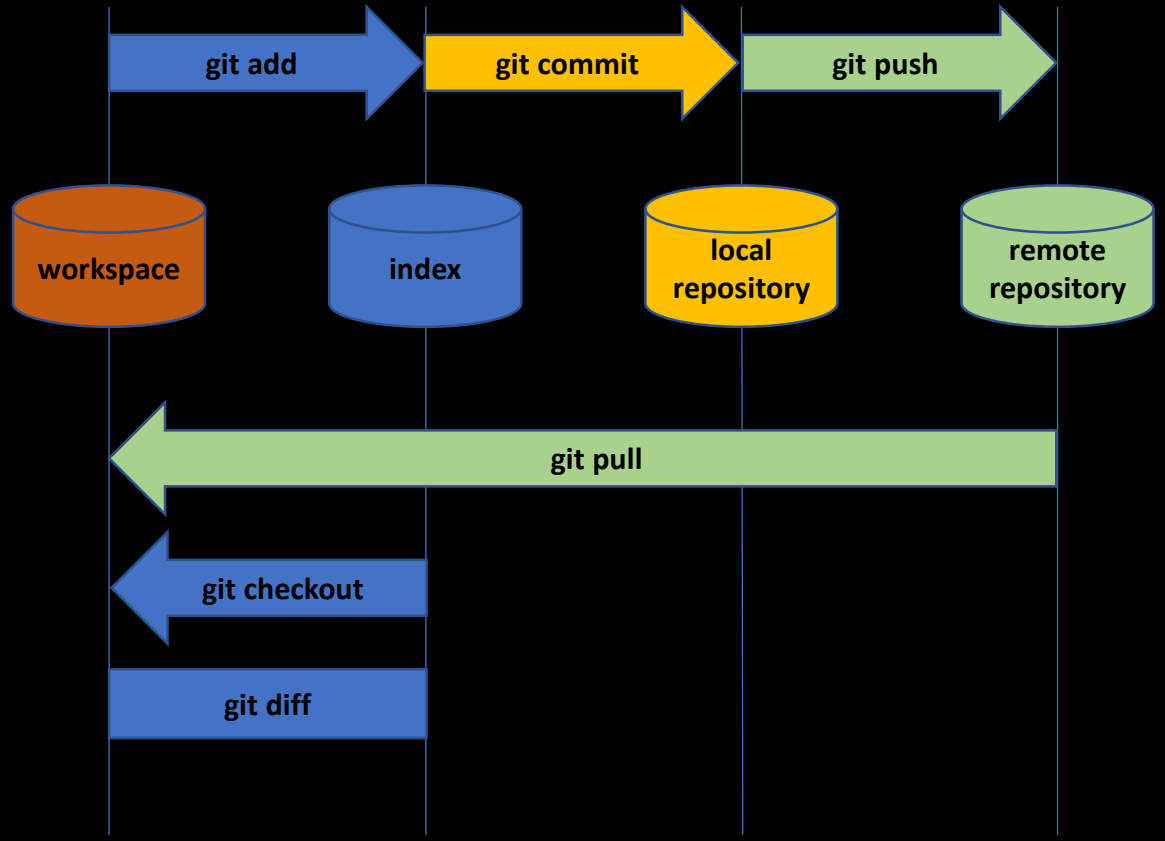
```
git init
git add myfile
git add myfile2
git commit -m 'initial files‘
```

- Do changes and revert it to last state

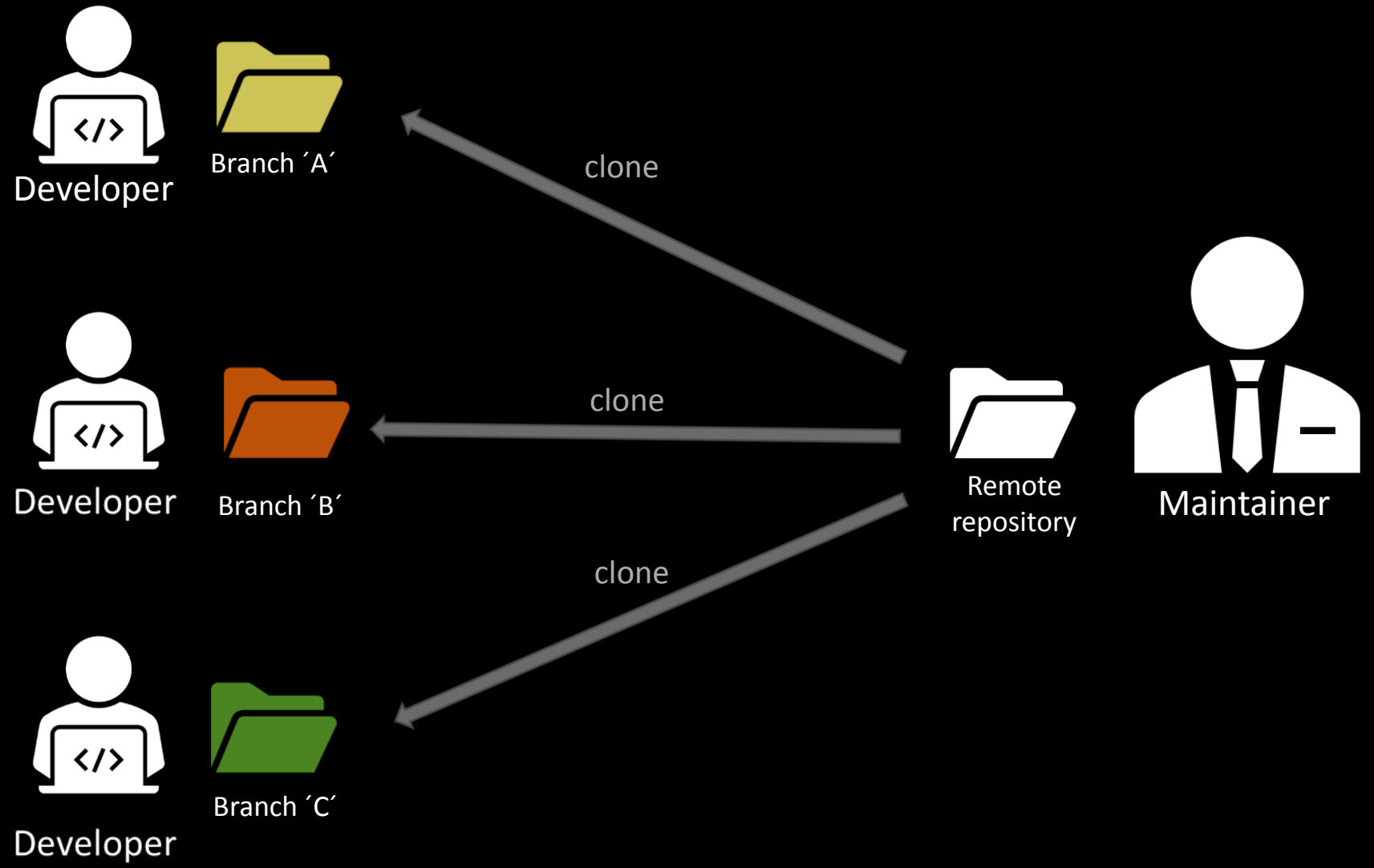
```
rm myfile              # delete file
git checkout myfile    # restore file
```

# Remote Repository Example

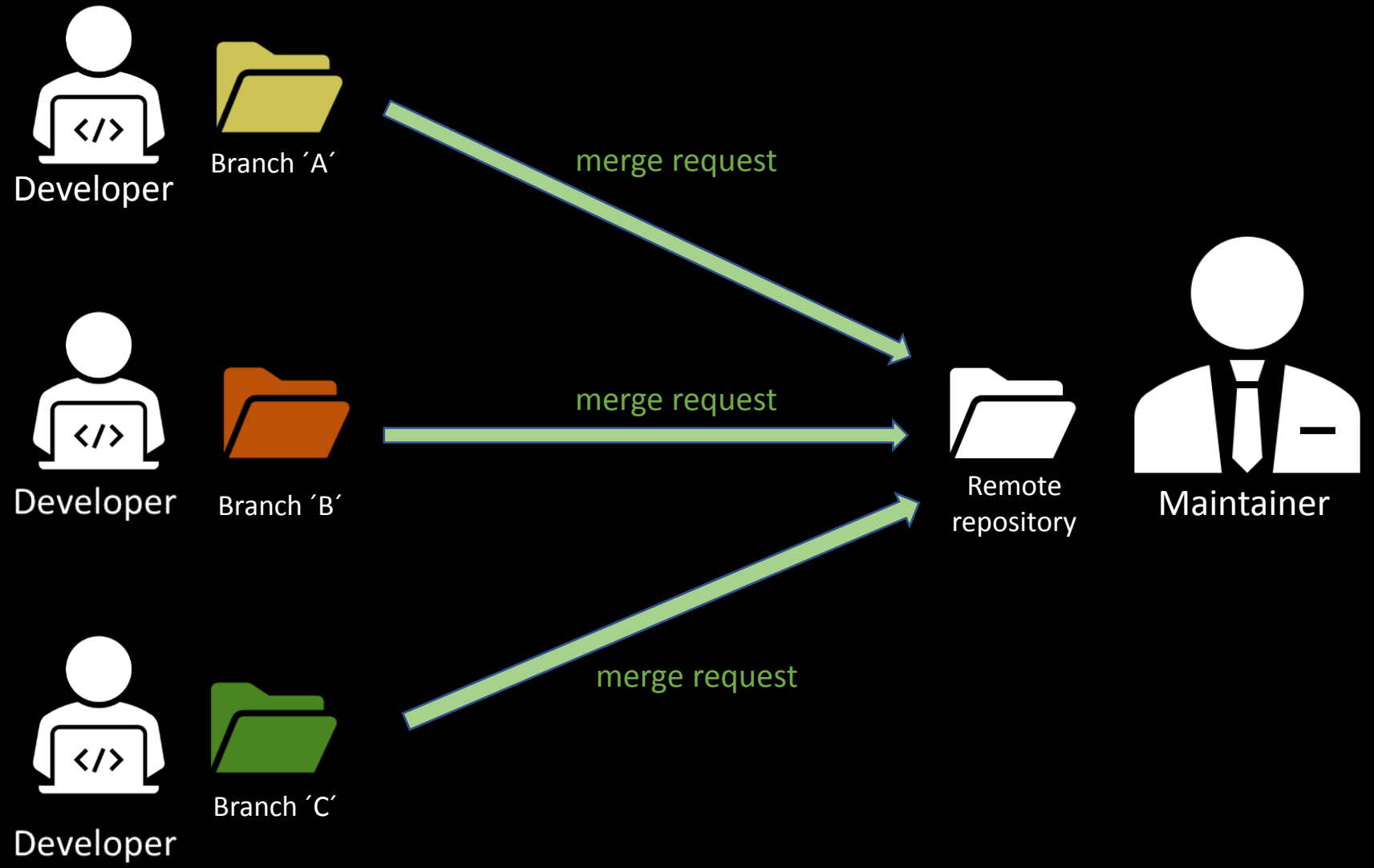
- We have a remote repository (e.g. gitlab.cern.ch/example-project)



# Branching & Merge Request & Code Review



# Branching & Merge Request & Code Review



# Merge Conflicts

- Changes within a file come together
- Often differences are resolved automatically
- Sometimes conflicts need to be resolved manually

```
C:\Users\bxhar\firstproject>git merge testbranch
Auto-merging testfile.txt
CONFLICT (content): Merge conflict in testfile.txt
Automatic merge failed; fix conflicts and then commit the result.
```

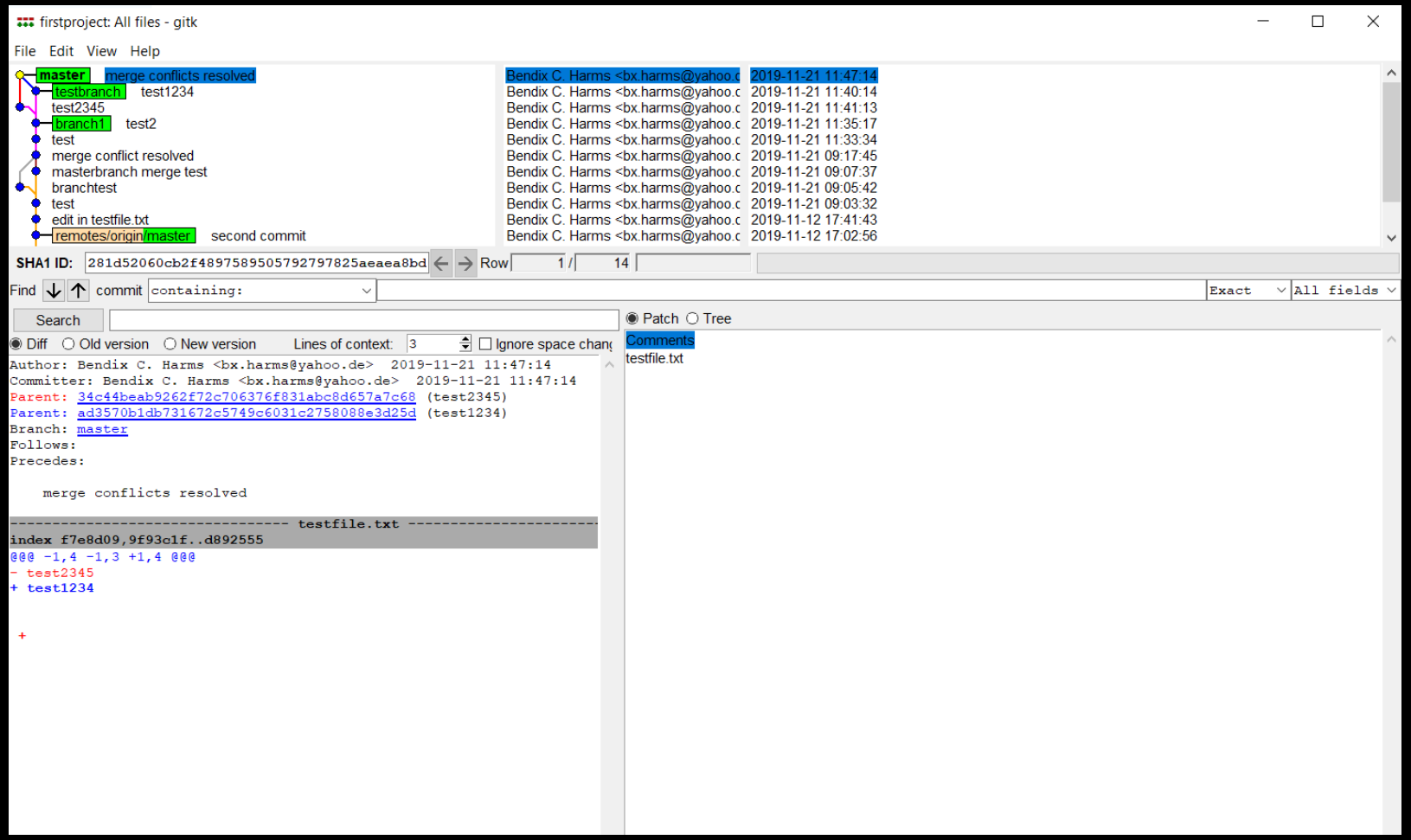
```
<<<<<<< HEAD
test2345

=======
test1234
>>>>>>> testbranch
```

Example: failed merge

- Delete the conflict markers and incorporate changes

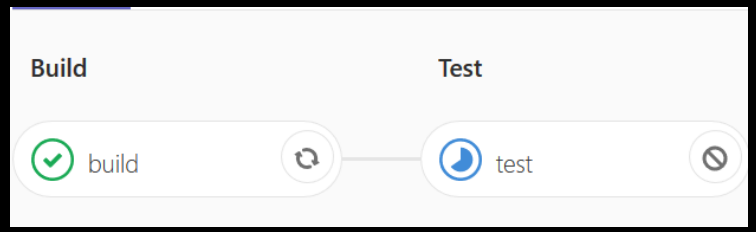
# Git GUI Example

- Open GUI with „gitk“
- There are plenty of others

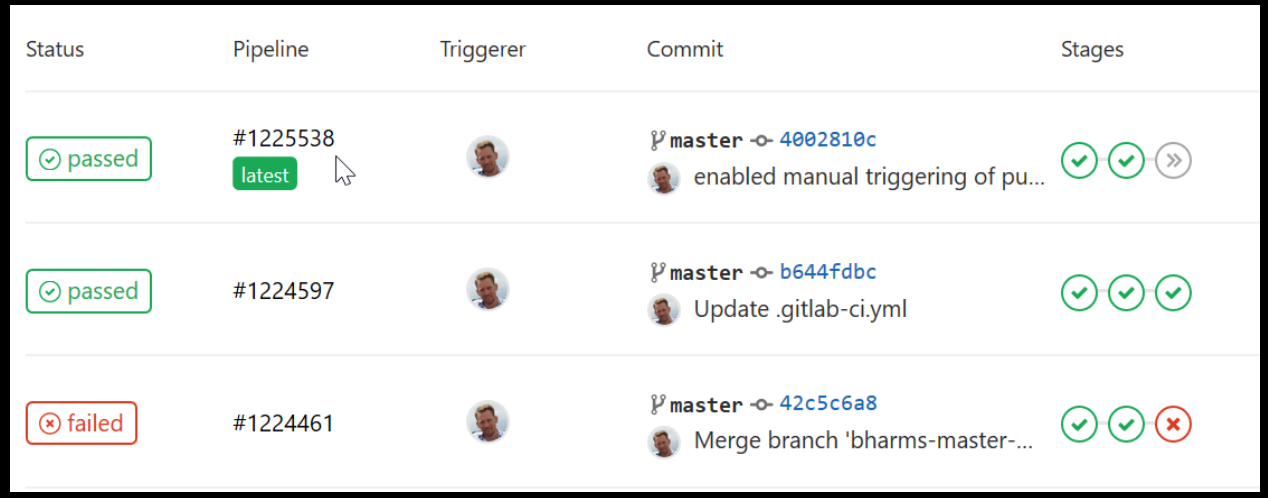


# CI & CD Example

- Automatic building and testing of code: (ERROR = mail)




- History of CI builds:



# How is Git used ?

- Track changes on text files + revert to previous version
- Improve software quality
  - encourages **review** of code via merge request
  - Changes are cleanly separated in branches
  - Git CI can run code tests for you on commit
- Developers can push their changes to central as **merge requests**
- CERN‘s Controls System is critical => is developed using Git