



# Advanced Git

## IVS demonstration exercise

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Red Hat

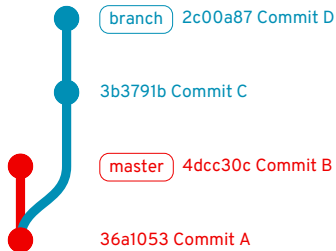
April 22, 2022

# Prerequisites

- Basic knowledge of Git commands for:
  - creating commits (`git add`, `git commit`)
  - inspecting current state (`git status`, `git diff`)
  - inspecting history (`git log`, `git show`)
  - working with remotes (`git pull`, `git push`)
  - working with branches (`git checkout`, `git branch`)
  - merging branches (`git merge`, `git rebase`)
- Git commands cheatsheet:  
<https://www.atlassian.com/git/tutorials/atlassian-git-cheatsheet>

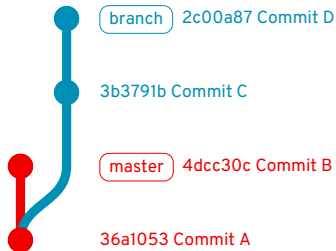
# Git cherry pick

- `git cherry-pick` allows to **copy** a commit from one branch to another



# Git cherry pick

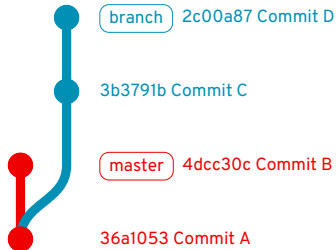
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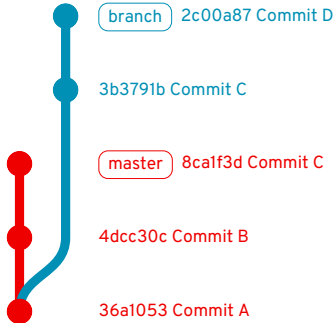
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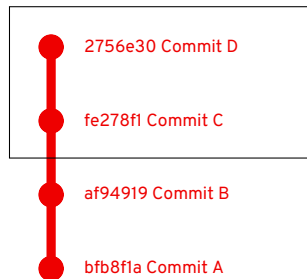


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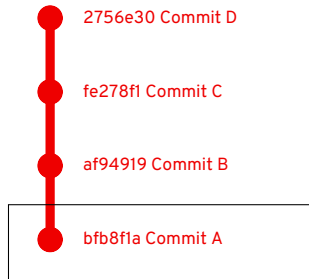
# Git commit ranges

- `2756e30..af94919` selects all commits from *Commit D* (inclusive) to *Commit B* (exclusive)



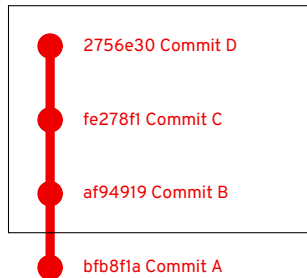
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- `af94919^` gives the parent of *Commit B* (*Commit A*)
- Hence, `2756e30..af94919^` selects the commit range including *Commit B*



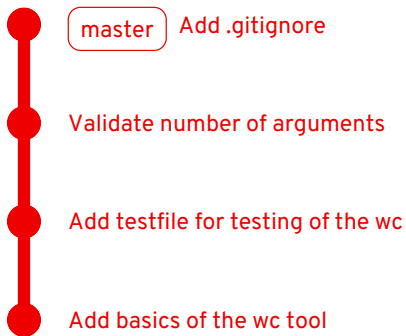


# “Advanced” work with Git

# Let's start

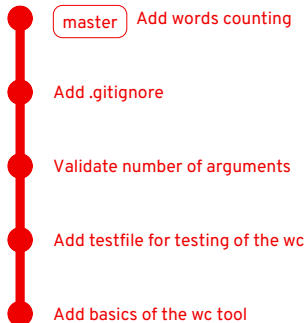
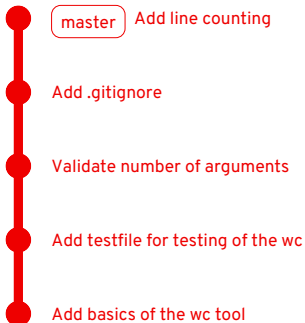
- We'll write a simple tool for counting characters, words, and lines in a file (similar to the `wc` utility)
- We start with a pre-initialized repo containing very basics of the tool:  
`https://github.com/viktormalik/git-workshop`
- The repo contains:
  - source file `wc.c`
  - testing file `testfile`
  - `Makefile`
  - `.gitignore`

# Current status of the repo



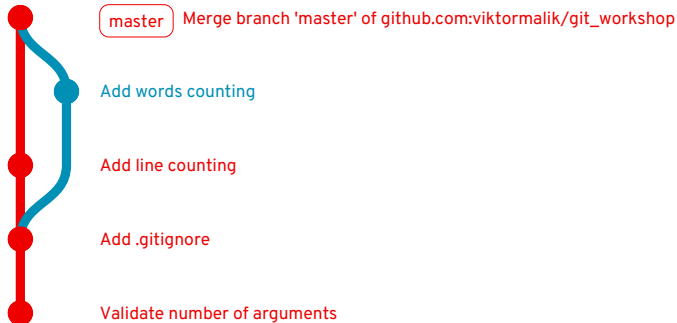
# Basic team synchronisation

Every member implements a different feature in their *master*



# Basic team synchronisation

The second one to push must do a merge (and resolve a merge conflict)

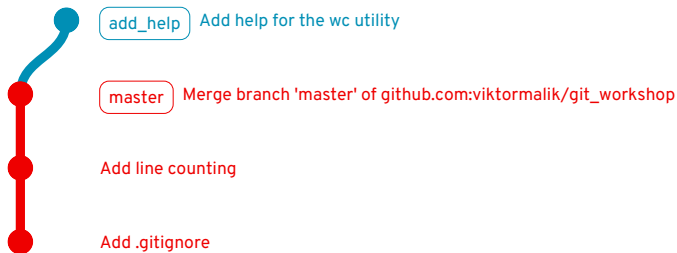


# Better team synchronisation

- **This is not a good practice!**
- Always implement new features in **separate branches**.
- Potential merge conflicts should be resolved in the feature branch.
- Ideally, merging into master should be always done using **pull requests**
  - They allow other team members to comment on the changes
  - Changes can be **reviewed** before they get into master
  - Master always contains a working and approved version of the project

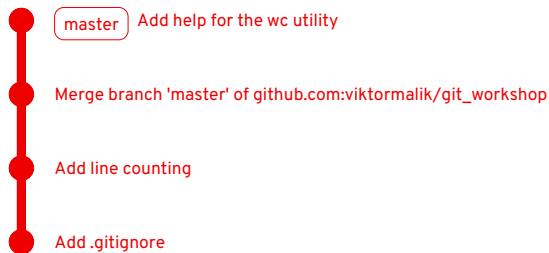
# Using a feature branch

Let us add help into the tool using a separate branch *add\_help*



# Using a feature branch

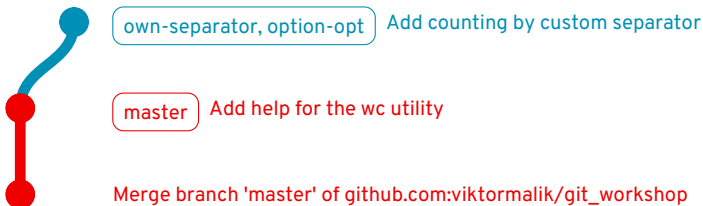
The state of *master* after **rebase**:





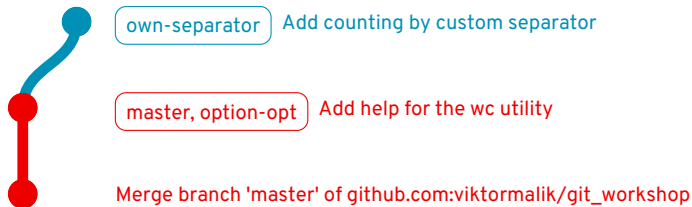
# Moving branches

We have 2 branches pointing to the same commit and we want to move one backwards.



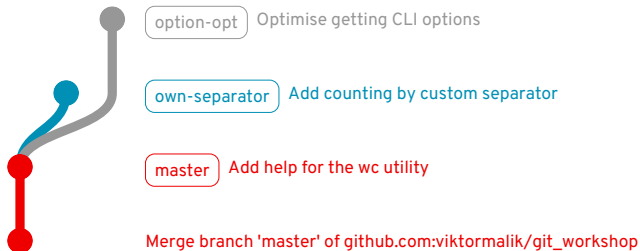
# Moving branches

This can be done using `git reset HEAD^`



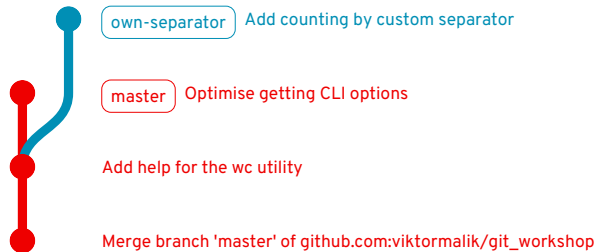
# Moving branches

After adding a new commit to *options-opt*:



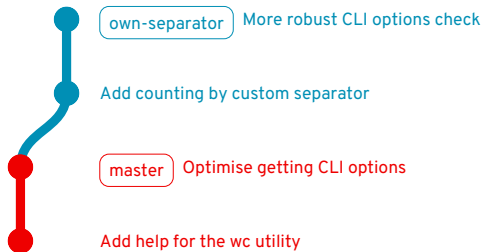
# Moving branches

*options-opt* can be now merged into master while *own-separator* remains a feature branch in development.



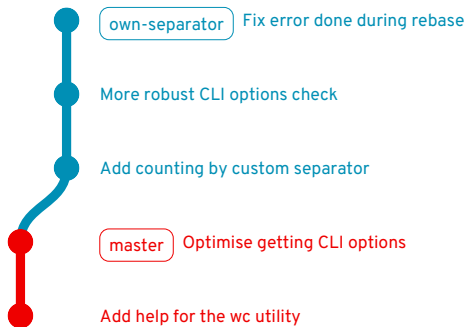
# Rebasing feature branches

We add more commits to the feature branch and then **rebase** it onto *master* (to avoid creation of a merge commit).



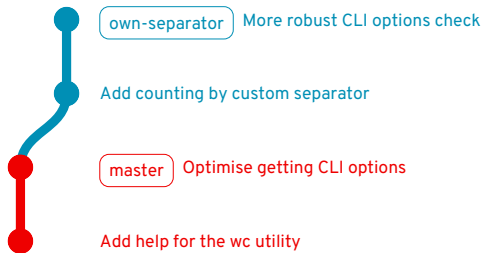
# Rebasing feature branches

We made a mistake during the rebase, which we had to fix with an additional commit.



# Rebasing feature branches

It is possible to merge the “fix commit” into one of the previous commits using **interactive rebase** (`git rebase -i`).



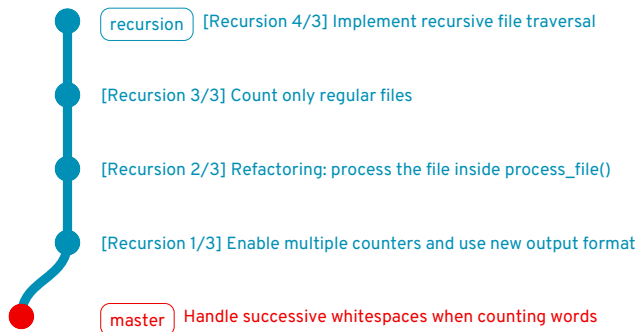
# Interactive rebase

- One of the most important Git features in the modern pull request-based workflow.
- Allows to **edit**, **reorder**, **merge (squash)**, or **drop** commits.
- **Rewrites history** – should be only used on feature branches.
- **Never rewrite history of master!**
  - Other developers would not be able to do `git pull`.



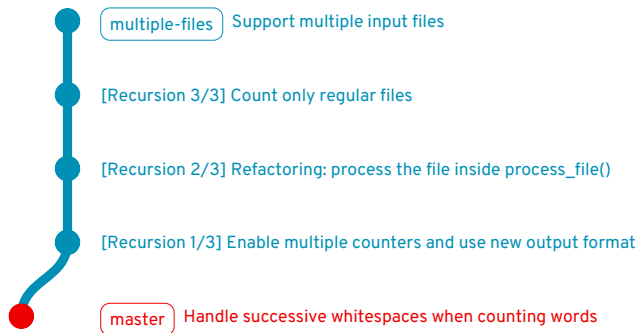
# Copying commits from other branches

It is possible to copy commits from other branches (e.g. commits implementing useful features from co-workers feature branches) using `git cherry-pick`.



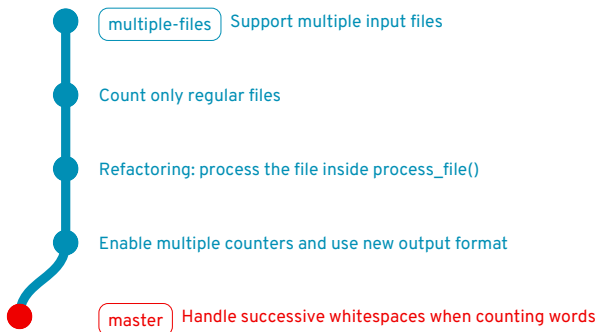
# Copying commits from other branches

After moving 3 commits from *recursion* into *multiple-files*:



# Copying commits from other branches

If the commits are altered in *multiple-files*, it may be needed to use `skip` when rebasing *recursion* onto *multiple-files*.



# Hunting bugs in Git history

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  - There is a revision in the past where certain test works correctly.
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- Git offers `git bisect` that uses **binary search** to localise the commit that caused the bug.
  - `git bisect start` starts bisecting.
  - `git bisect good` marks a commit that does not contain the bug.
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- The process can be **automated** using a script that returns 0 on success and a non-zero result on failure.

# Git tips and tricks

# Cloning repositories with a long history

- If a repo has a long history, it may take long time to clone it.
- If the entire history is no needed, it is possible to use a **shallow copy**:  
`git clone --max-depth N`
- Try it with the Linux kernel:  
`git clone --max-depth 1 https://github.com/torvalds/linux`



# Signing commits

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- To resolve this problem, Git offers **signing commits** using GPG keys.
- GitHub offers a nice tutorial on how to setup commit signing:  
`https://help.github.com/en/github/authenticating-to-github/signing-commits`

# Setup your environment

There are various possibilities on how to ease your life with Git:

- **Git prompt**
  - It is possible to setup Bash prompt such that it shows the current branch, state of the directory, etc.
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- **IDE/Editor support**
  - It is useful to see which lines were added/removed/changed from HEAD.
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- **Use tools for history inspection**
  - There is a number of tools for an easier history traversal
  - E.g. **tig**, gitk, ...

# Setup your environment

- **Command aliases**

- Many Git commands are quite long (or have many options).
- It is possible to setup short aliases for most commonly used commands.

- Git offers a way to set aliases:

```
git config --global alias.co checkout
```

```
...
```

```
or edit $HOME/.gitconfig:
```

```
[alias]
```

```
co = checkout
```

```
...
```

- An alternative is to setup aliases via shell

# Useful links

- Atlassian Advanced Git Tutorials  
<https://www.atlassian.com/git/tutorials/advanced-overview>
- GitHub Guides  
<https://guides.github.com>
- GitHub Help  
<https://help.github.com/en/github>

# TL;DR

What you should take out of this talk:

- Learn and practice **interactive rebase**
- **Read what Git tells you**, there are often good hints (e.g. for undoing things)
- Keep *master* in good shape

**Thank you for the attention!**

Your feedback is welcome!

<https://forms.gle/NUXjKUavqjxP2oU2A>