

#### **Advanced Git**

IVS demonstration exercise

Viktor Malík Petr Stodůlka Pavel Odvody

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

• Questions during the demo? Join at sli.do with code #845194



#### Git cherry pick

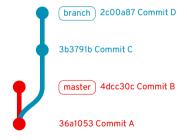
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### Git cherry pick

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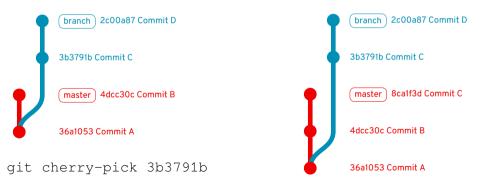


git cherry-pick 3b3791b



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### Git commit ranges

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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

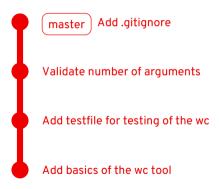


#### Let's start

- 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



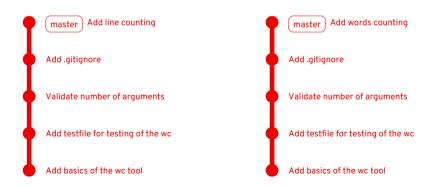
# Current status of the repo





### 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**:

master Add help for the wc utility

Merge branch 'master' of github.com:viktormalik/git\_workshop

Add line counting

Add .gitignore



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





This can be done using git reset HEAD^



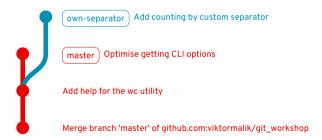


After adding a new commit to options-opt:





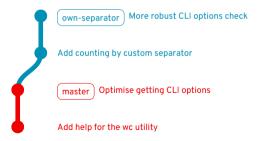
options-opt can be now merged into master while own-separator remains a feature branch in development.





#### 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

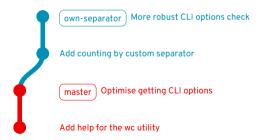
We made a mistake during the rebase, which we had to fix with an additional commit.





#### Rebasing feature branches

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





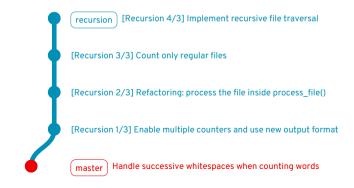
#### Interactive rebase

- 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

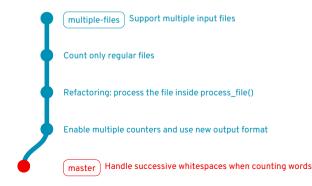
After moving 3 commits from recursion into multiple-files:





## 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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- 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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- Theoretically, anyone can set your name and email as theirs and commit on your behalf.
- 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



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.
  - There are many tutorials on how to set the prompt
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#### Use tools for history inspection

- There is a number of tools for an easier history traversal
- E.g. **tig**, gitk, ...



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  - Git blame for each line
  - Commit, push, pull etc.



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#### Vim

- git-gutter
  - Display line status on the side
- vim-fugitive
  - Full fledged TUI for Git right in your Vim
  - Commit, push, pull etc.
  - <Esc>:G-cciExample commit<Esc>:x-



#### 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

