

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

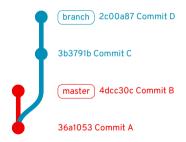
• git cherry-pick allows to **copy** a commit from one branch to another





Git cherry pick

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



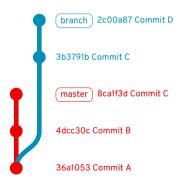
git cherry-pick 3b3791b



Git cherry pick

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







Git commit ranges

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





Git commit ranges

- 2756e30..af94919 selects all commits from Commit D (inclusive) to Commit B (exclusive)
- af94919^ gives the parent of Commit B (Commit A)





Git commit ranges

- 2756e30..af94919 selects all commits from Commit D (inclusive) to Commit B (exclusive)
- af94919^ gives the parent of Commit B (Commit A)
- Hence, 2756e30..af94919^ selects the commit range including *Commit B*





"Advanced" work with Git

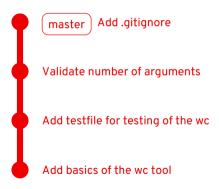


Let's start

- 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



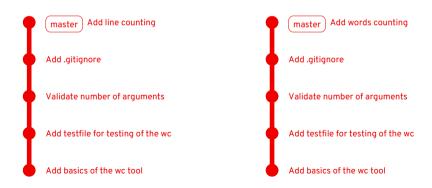
Current status of the repo





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)





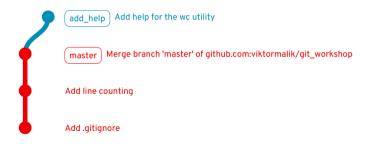
Better team synchronisation

- 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**:





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





This can be done using git reset HEAD^



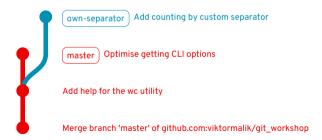


After adding a new commit to options-opt:





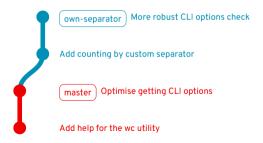
options-opt can be now merged into master while own-separator remains a feature branch in development.





Rebasing feature branches

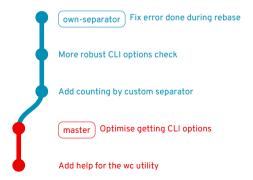
We add more commits to the feature branch and then **rebase** it onto *master* (to avoid creation of a merge commit).





Rebasing feature branches

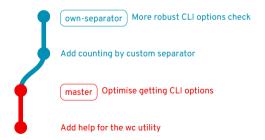
We made a mistake during the rebase, which we had to fix with an additional commit.





Rebasing feature branches

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





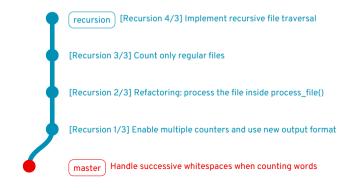
Interactive rebase

- 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

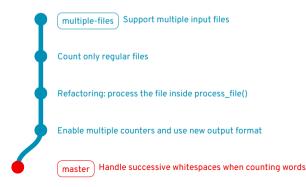
After moving 3 commits from recursion into multiple-files:





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

- We often discover a bug that was certainly introduced somewhere in the Git history.
 - There is a revision in the past where certain test works correctly.
 - However, the test does not work now.



Hunting bugs in Git history

- We often discover a bug that was certainly introduced somewhere in the Git history.
 - There is a revision in the past where certain test works correctly.
 - However, the test does not work now.
- 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.
 - git bisect bad marks a commit contains the bug.
 - git bisect skip marks a commit that cannot be evaluated.



Hunting bugs in Git history

- We often discover a bug that was certainly introduced somewhere in the Git history.
 - There is a revision in the past where certain test works correctly.
 - However, the test does not work now.
- 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.
 - git bisect bad marks a commit contains the bug.
 - git bisect skip marks a commit that cannot be evaluated.
- 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

- By default, it is not possible to verify that a certain commit was truly created by the person who is stated as the author.
- Theoretically, anyone can set your name and email as theirs and commit on your behalf.



Signing commits

- By default, it is not possible to verify that a certain commit was truly created by the person who is stated as the author.
- 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
 - Some alternative shells (e.g. Fish, zsh) include Git prompt by default



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
- Some alternative shells (e.g. Fish, zsh) include Git prompt by default

IDE/Editor support

- It is useful to see which lines were added/removed/changed from HEAD.
- Most IDEs and editors offer a way to setup this.



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
- Some alternative shells (e.g. Fish, zsh) include Git prompt by default

IDE/Editor support

- It is useful to see which lines were added/removed/changed from HEAD.
- Most IDEs and editors offer a way to setup this.

Use tools for history inspection

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



Git and IDEs/Editors

Overcome The Doorway Effect of switching to your terminal, examples:



Git and IDEs/Editors

Overcome The Doorway Effect of switching to your terminal, examples:

- VSCode
 - Highlight added/changed/removed lines
 - Git blame for each line
 - Commit, push, pull etc.



Git and IDEs/Editors

Overcome The Doorway Effect of switching to your terminal, examples:

- VSCode
 - Highlight added/changed/removed lines
 - Git blame for each line
 - Commit, push, pull etc.
- 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

