

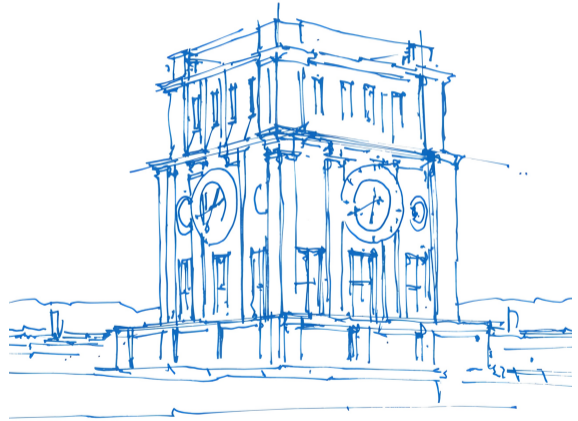
Open Source Lab

Git Advanced

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Uhrenturm der TUM

Summary

1. a) Create a repository

```
git init
```

1. b) Clone repository

```
git clone <remote>
```

2. Make changes

3. Add changes

```
git add <file>
```

3. Commit changes

```
git commit -m "Some message."
```

4. Done? No - Go back to 2. Yes - Continue

5. Rebase

```
git pull --rebase
```

6. Push

```
git push
```

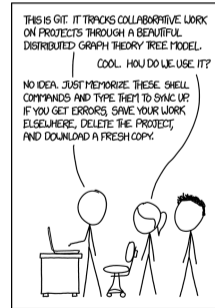


Figure 1 "Git" by xkcd

And now let's continue...

(With some advanced stuff.)

Dealing with Merge Conflicts

Merge conflicts occur when `git` is unable to merge changes from two commits since both change the same lines in a file. They can happen when...

- `merging` a branch.
- `rebasing` a branch.
- `cherry picking` a commit.

Now **you** have to decide which code to keep!

Example

```
$ git merge feature-main
Auto-merging reader.cpp
CONFLICT (content): Merge conflict in reader.cpp
Automatic merge failed; fix conflicts and then commit the result.
```

Dealing with Merge Conflicts

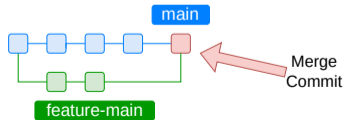
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Dealing with Merge Conflicts

Git changed the `reader.cpp` file in a way, so now have to decide what to keep.

```
<<<<<< HEAD
int main(int /*argc*/, char** /*argv*/) { }
=====
int main(void) { }
>>>>>> feature-main
```

Once we are done, we can commit our decision.

```
git commit -m "Merged feature-main into main"
```

Cherry Picking

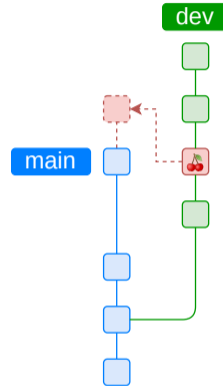
Useful when you committed changes to the **wrong branch** or for **backporting** features to other versions.

Allows you to apply the changes from one commit to your current branch.

Use sparingly to prevent **duplicate commits**, which will result in merge conflicts later on.

```
git cherry-pick <commit-hash>
```

Sometimes merging or rebasing is more appropriate.



Exercise

- Check for changes on your remote `git fetch`.
- Cherry-pick the commit "e7d6aea" (Updated the second maintainer).
- Use `git status` to get a list of conflicts. Resolve them.
- Continue your cherry-pick with the commands suggested to you by git.
- Push your new branch to origin (`git push --set-upstream origin 1.10.x_YourName`).

In case you deleted your state from last week:

```
git clone git@gitlab.lrz.de:open-source-lab/git-demo-cpr.git
cd git-demo-cpr
git checkout origin/1.10.x
git branch 1.10.x_YourName
git switch 1.10.x_YourName

nano README.md
git add README.md # Replace Fabian Sauter with your name as maintainer
git commit -m "Updated the maintainer"
```


Worktree

Motivation: It's often necessary to quickly switch between branches. This can be a bit of a hassle.

```
git stash
git switch <new_branch>
... # Possibly stashing of new changes and commits in our branch.
git switch <old_branch> # Switch back to the previous branch.
git stash pop
```

`git worktree` helps manage multiple worktrees and therefore simplifies the workflow when constantly switching branches.

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You can start from an existing repository and create/add a new worktree in a specified directory.

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# Creates a new directory that contains the <branch>.
git worktree add <directory> <branch>
# List all worktrees for the current repository.
git worktree list
```

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Alternatively, you can start from a `bare` repository to avoid the initial checked-out working tree.

```
git clone --bare <repo> <directory>
```

Bisect

Problem: In large projects, it can be really difficult to find a commit that introduced a bug.

⇒ Use `git bisect` to find the commit that introduced the bug via a [binary search](#).

Example

```
git bisect start # Start the bisect session.
git bisect good <commit> # Mark a commit as good.
git bisect bad <commit> # Mark a commit as bad.
git bisect bad/good <commit> # Continue marking commits until search terminates.
...
git bisect reset # End bisect session and reset branch.
```

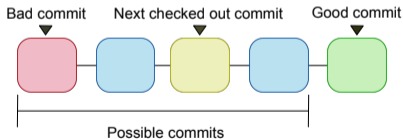
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Exercise

- Clone: `https://gitlab.lrz.de/open-source-lab/bisect-example.git`
- Use `git-bisect` to find the commit, that broke the HTML formatting.
- You know the first (oldest) commit is good and the last (newest) is bad.
- Use `git checkout <hash>` to switch between commits.

Creating and Merging a PR Demo

(With some `git` best practices.)

Exercise

- In GitLab create a PR from your branch and resolve all issues by rebasing onto the latest 1.10.x branch.