A minimal Git guide

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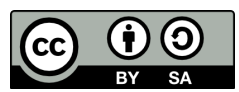
https://virtuale.unibo.it/course/view.php?id=18455

https://baltig.infn.it/giaco/pf2020



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Also known as Version Control

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- The repository (or 'repo' for short) is a folder in a working directory in which Git tracks all changes made to files and builds a history of those changes.

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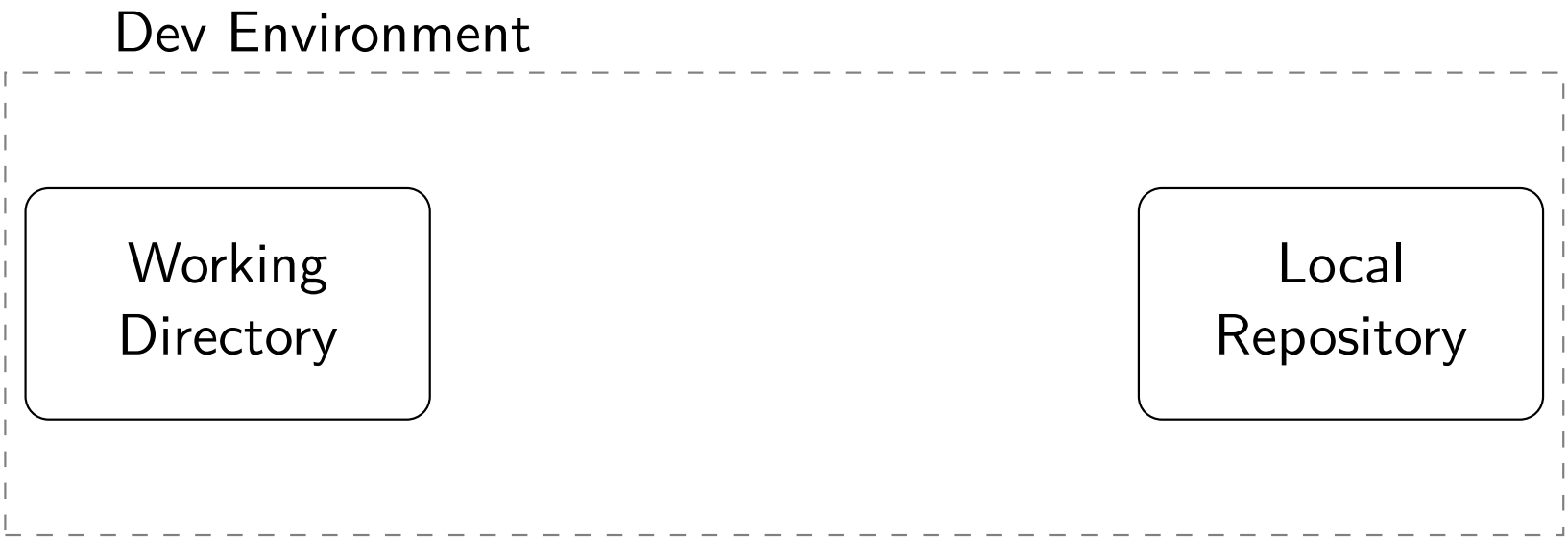
~/workspace$ git status↵
fatal: not a git repository (or any of the parent directories): .git
```

Local Workflow



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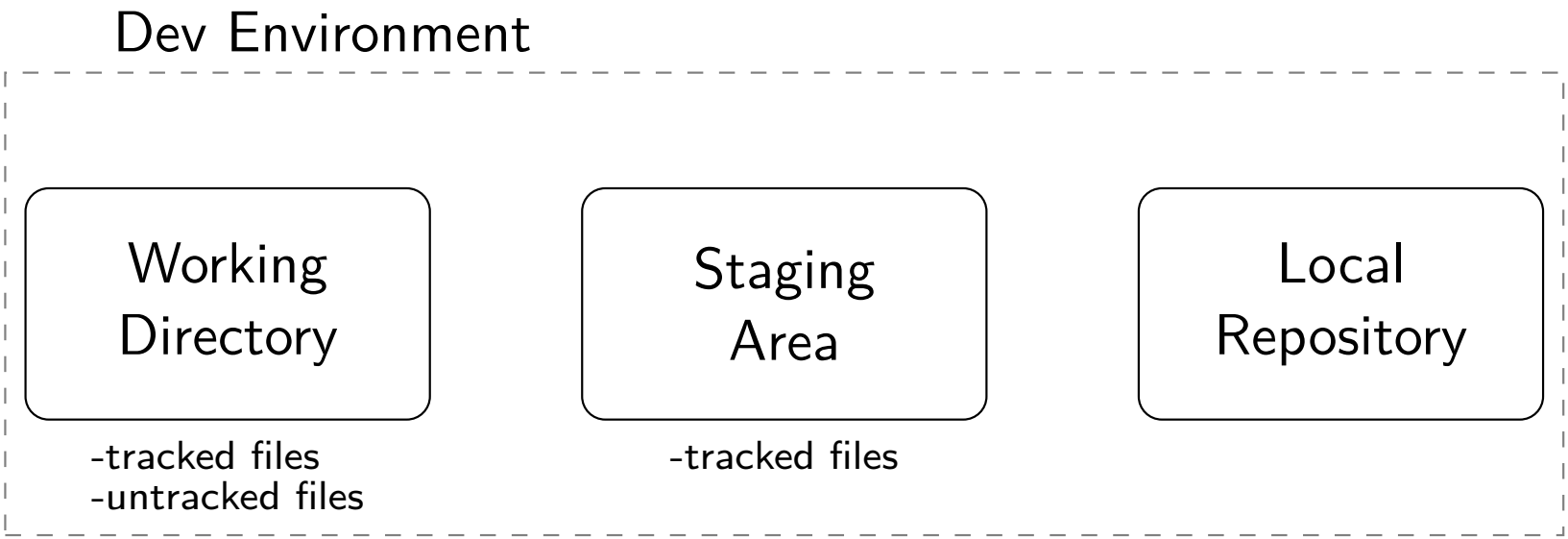
On branch master

No commits yet

Untracked files:
    (use "git add <file>..." to include in what will be committed)
        main.cpp

nothing added to commit but untracked files present (use "git add" to
track)
```

Local Workflow



git add

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On branch master

No commits yet

Changes to be committed:
    (use "git rm --cached <file>..." to unstage)
        new file:   main.cpp
```

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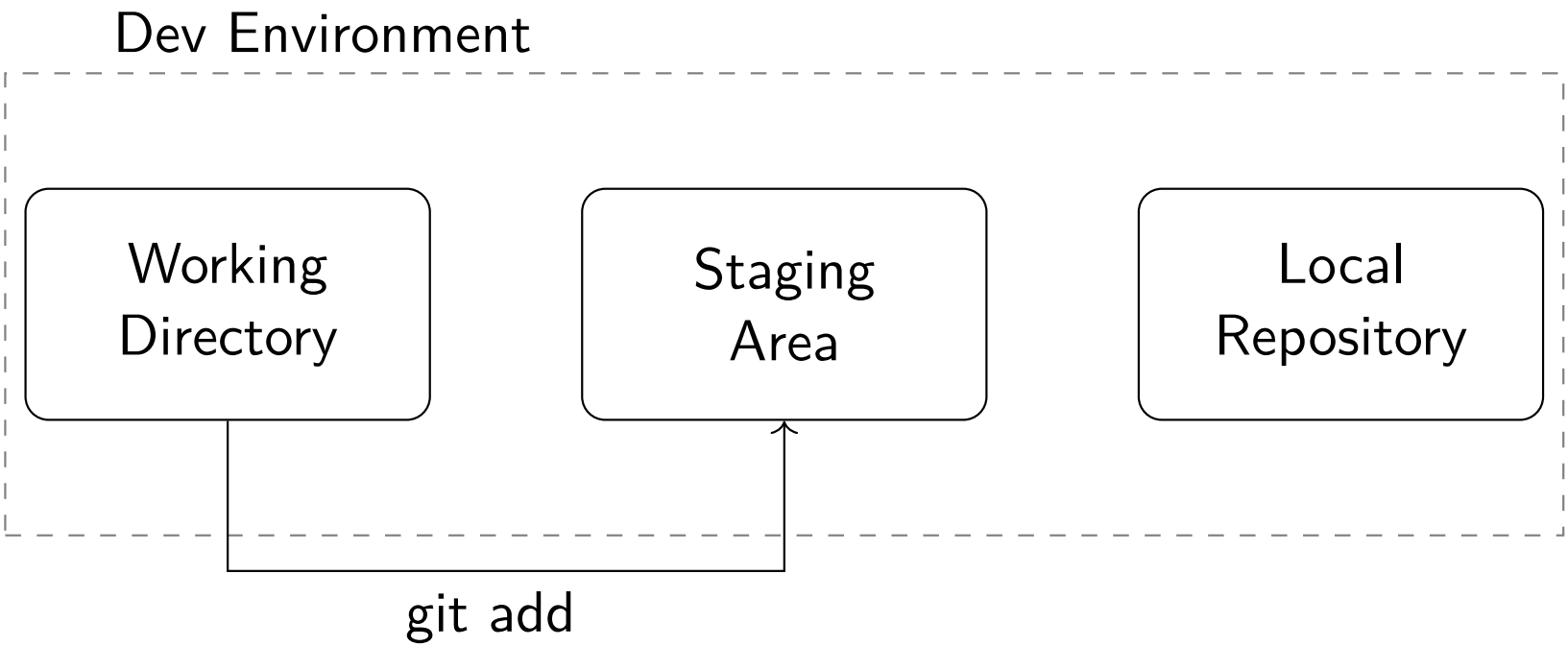
Git is used to track changes in text files.
The functionality of Git is reduced for binary files.

Local Workflow



git commit -m

- Files in the staging area are tracked by Git, but their changes have not been saved into the repository.
- With `git commit` a collection of changes in the staging area is checked into the local repository and inserted into the repo history.
- Each commit should be labelled with a message that clearly describes the changes made.
- The commit message can be specified between quotation marks:

```
git commit -m "Commit message"
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git commit -m (cont.)

- `git commit -m "Commit message"` asks Git to save changes into the local repository history.

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~/workspace$ git commit -m "Initial commit"↵
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~/workspace$ git commit -m "Initial commit"↵
[master (root-commit) 0367896] Initial commit
 1 file changed, 0 insertions(+), 0 deletions(-)
 create mode 100644 main.cpp
/workspace$ git status↵
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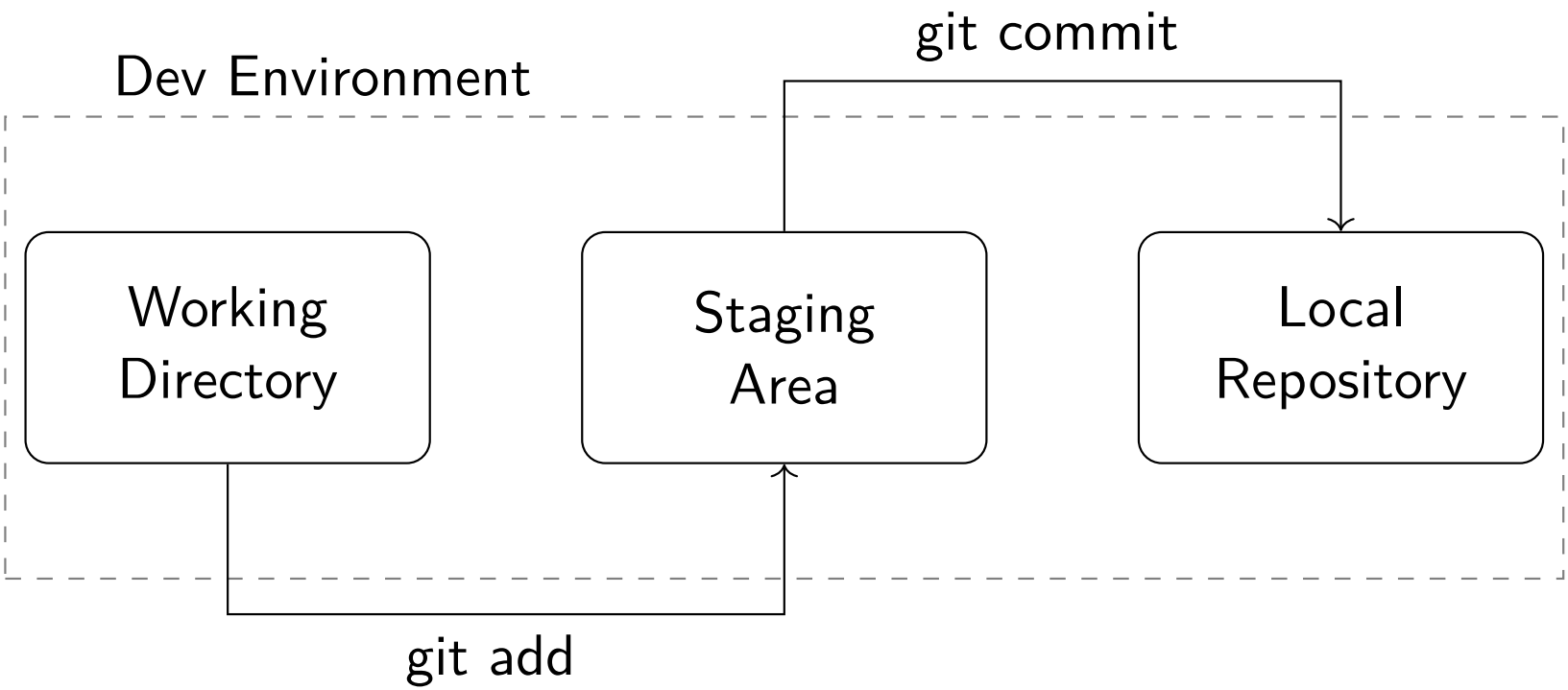
 create mode 100644 main.cpp
/workspace$ git status↵
On branch master
nothing to commit, working tree clean
```

If this is your first time working with Git, you will be prompted to enter your email and name, with which to sign your commits. Follow the instructions, then redo the commit.

Local Workflow



git log

- `git log` shows the local repository history.

```
/workspace$ git log↵
commit 03678964f710e1ef1e9d6c0704e3f02f014109a0 (HEAD -> master)
Author: Simone Rossi Tisbeni <simone.rossitisbeni@unibo.it>
Date:   Fri Jan 29 14:39:12 2021 +0000

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    Initial commit
```

- Each commit has its own unique identifier.

git diff

- `git diff` is used to show the changes in the files.
- When no argument is passed, it shows any uncommitted changes since the last commit.
- When `--staged` is passed as argument, it shows the difference between the last commit and the staged changes.
- When a commit id is passed as argument, it shows the difference between the last commit and the selected commit.

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- It can also keep track of multiple lines of development.
- These are known as branches.

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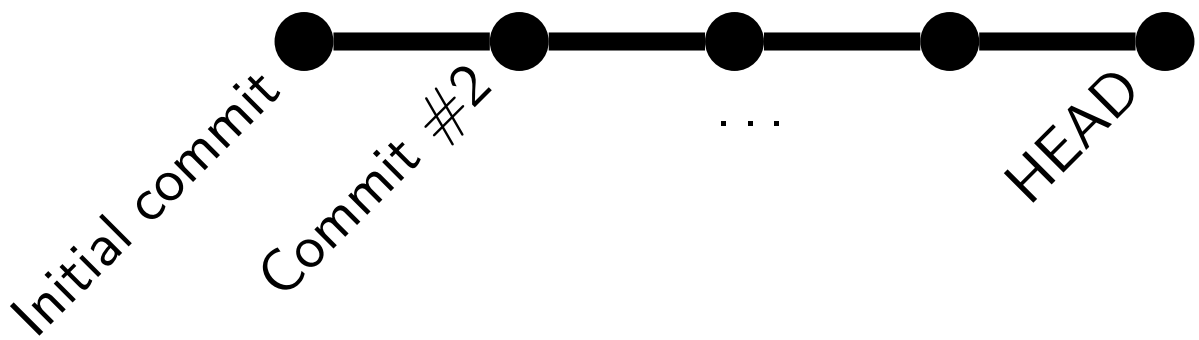
- The current branch is highlighted in green and prefixed with * (asterisk).

History Graph



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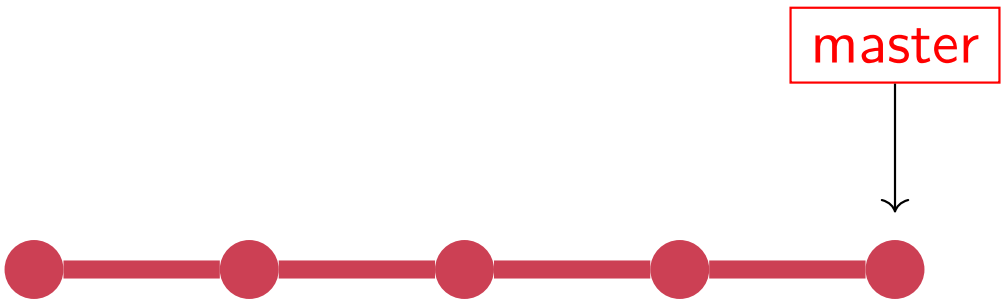

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- The deafult is slowly moving towards a more inclusive denomination.
- Github already started using (Oct 2020) the name main.

```
~/workspace$ git branch -m master main↵
~/workspace$ git branch↵
* main
```

git branch (cont.)

- Additional branches are used to host feature development, bug fixes and beta releases.
- They are meant to have a very brief life.
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- `git log` shows the position of the branches on the commit history.

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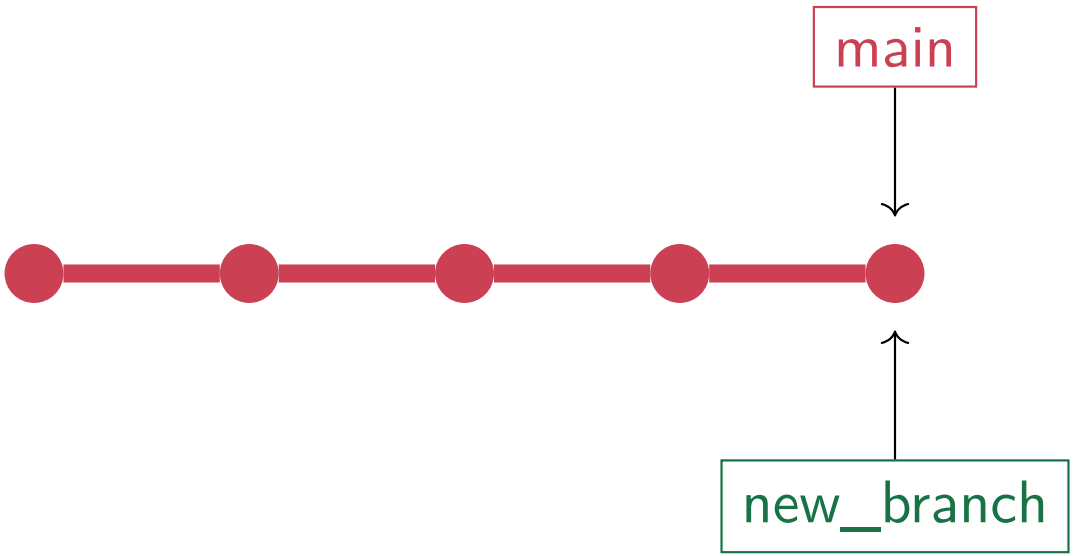

git checkout

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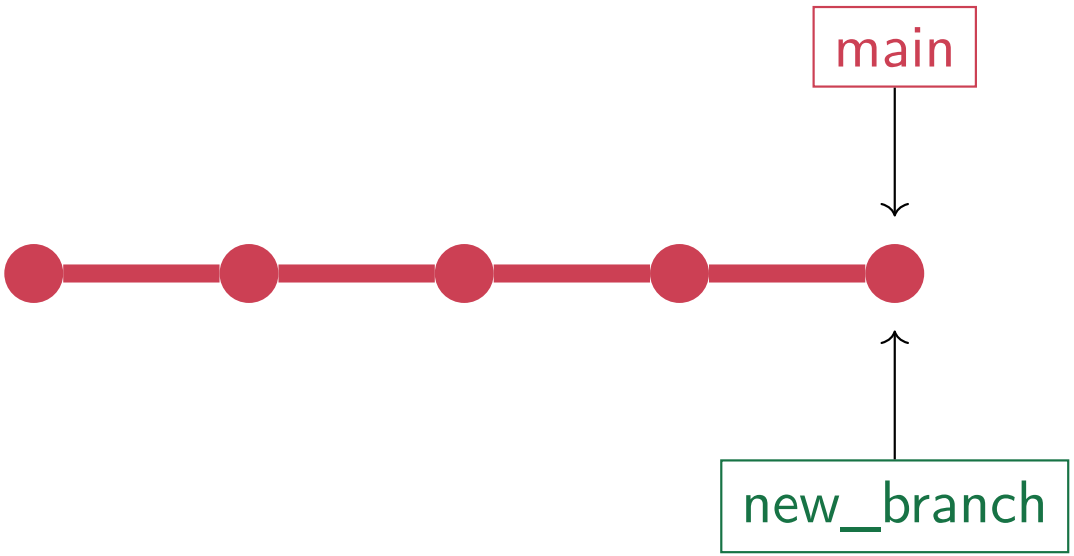

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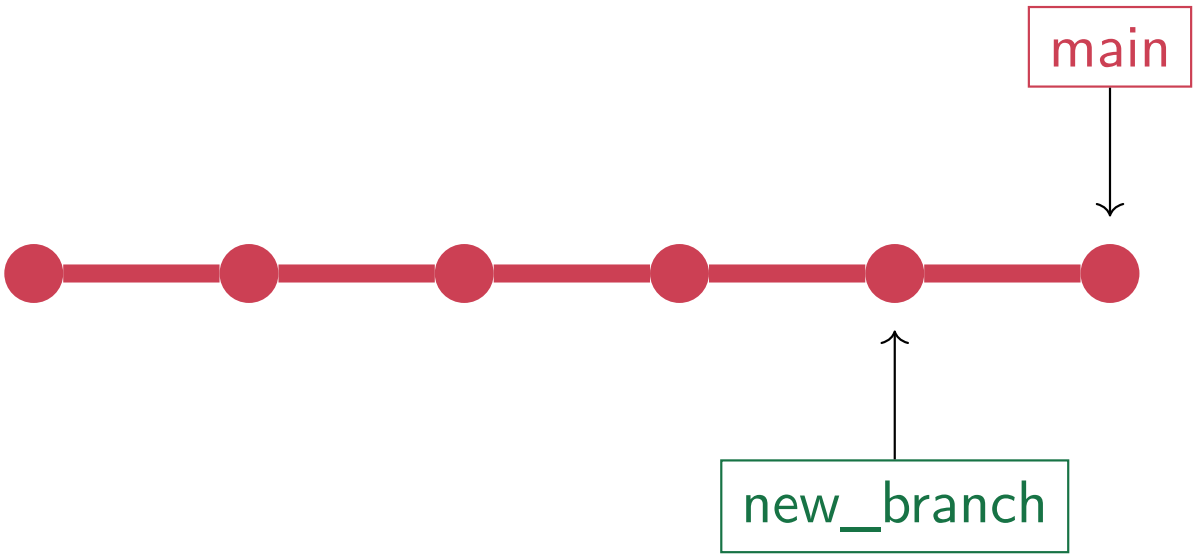

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- To switch branch, you use `git checkout <branch_name>`

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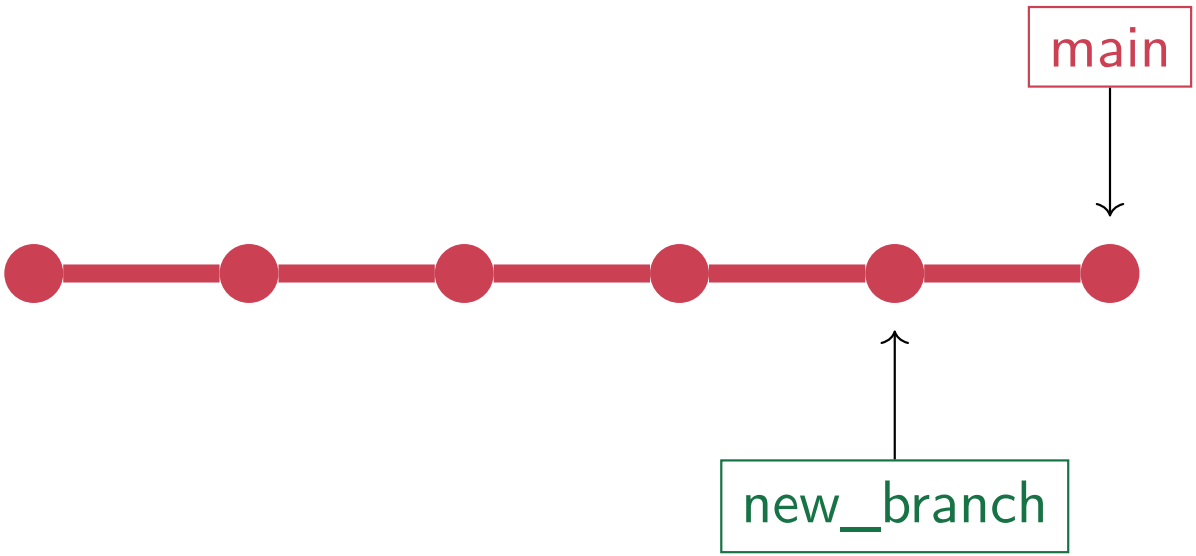

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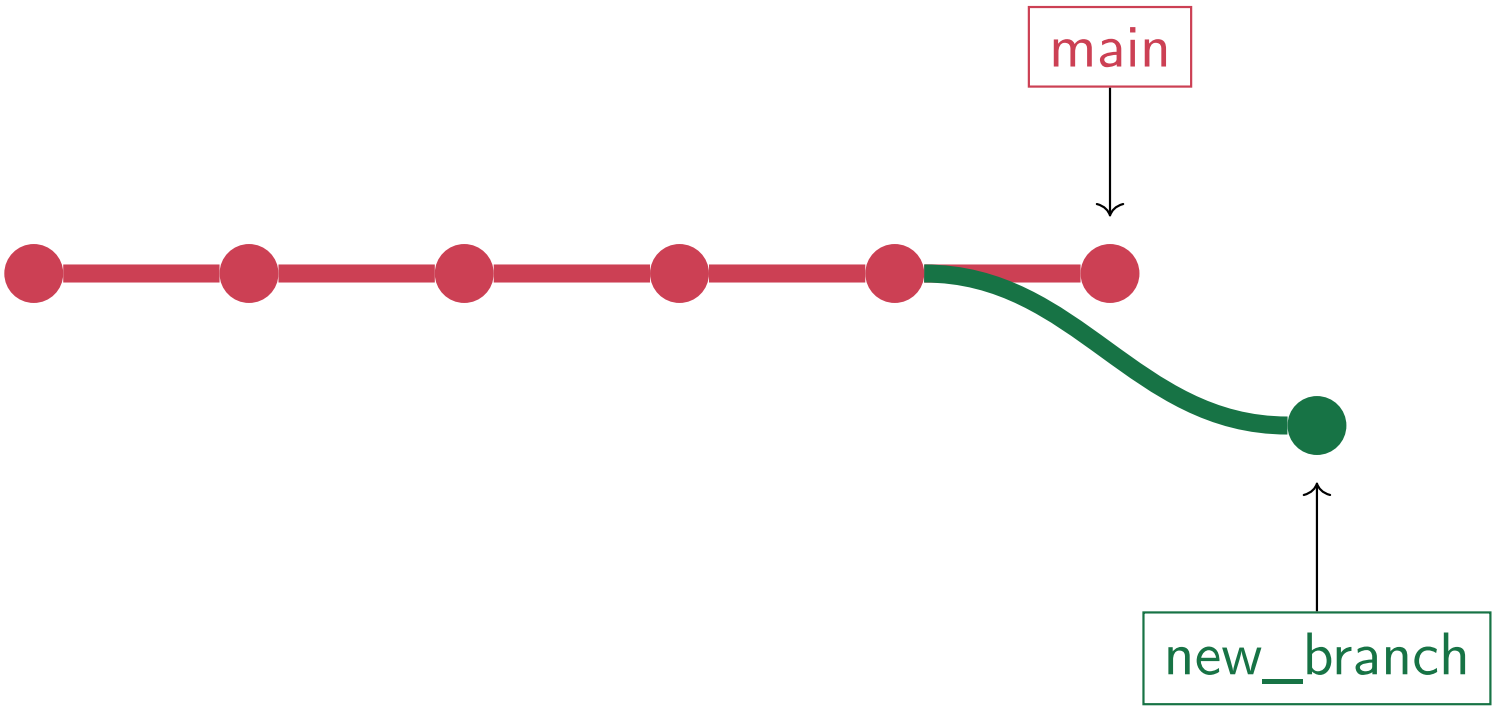

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- Git can automatically merge commits unless there are changes that conflict in both commit sequences.

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

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```
~/workspace$ git status ↵
On branch main
You have unmerged paths.
  (fix conflicts and run "git commit")
  (use "git merge --abort" to abort the merge)

Unmerged paths:
  (use "git add <file>..." to mark resolution)
        both modified:   main.cpp

no changes added to commit (use "git add" and/or "git commit -a")
```

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```
This content is not affected by the conflict
<<<<<<< main
this is conflicting text from main
=======
this is conflicting text from the new branch
>>>>>>> new_branch;
```

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- Finally commit the changes with `git commit`.

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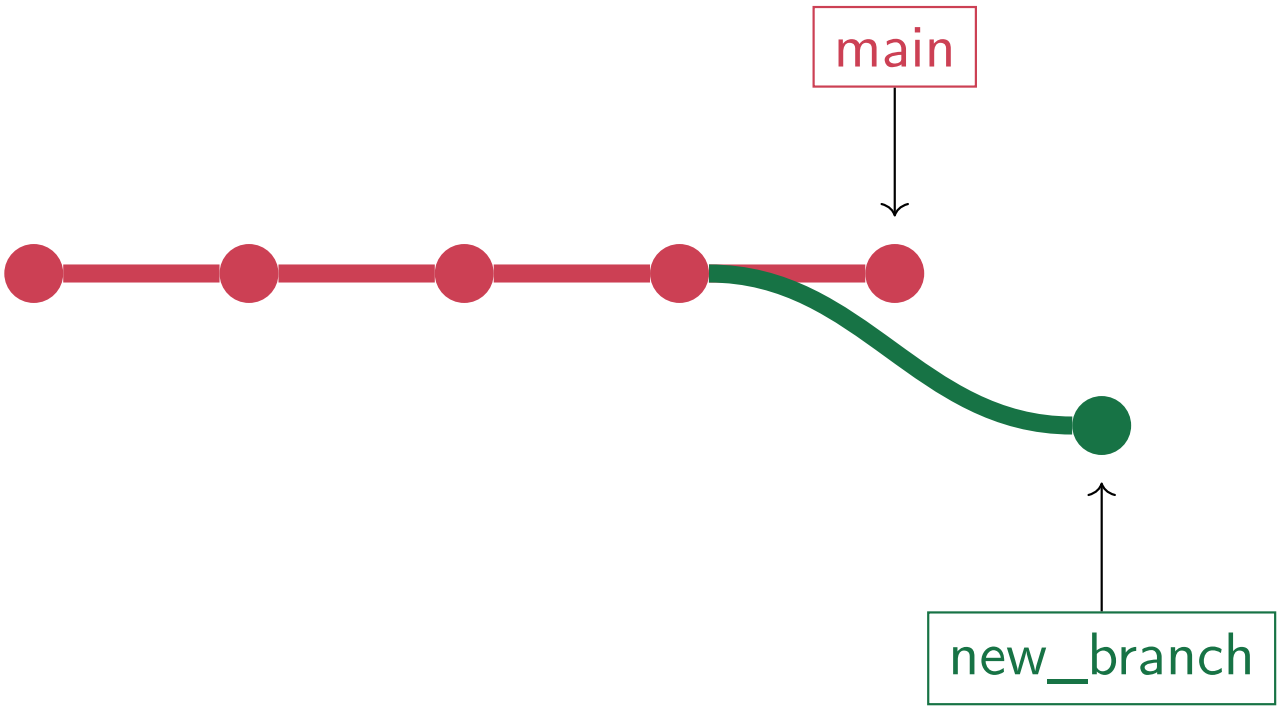

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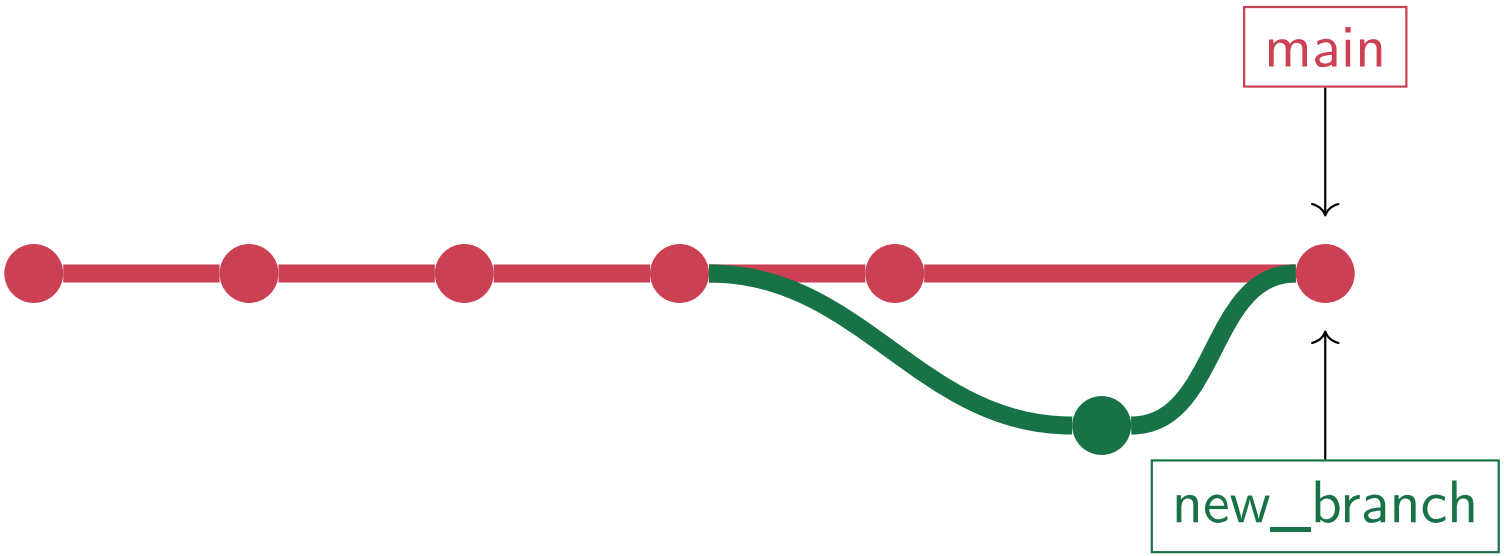

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```
Summarize changes in around 50 characters or less

More detailed explanatory text, if necessary. Wrap it to about 72
characters or so. The blank line separating the summary from the body
is critical. Further paragraphs come after blank lines.

Explain the problem that this commit is solving. Focus on why you
are making this change as opposed to how.

If you use an issue tracker, put references to them at the bottom,
like this:

Resolves: #123
See also: #456, #789
```

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- Directly edit your file, then hit `Ctrl+O` to save and `Ctrl+X` to quit.

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```
export VISUAL=nano
export EDITOR=nano
```

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- If nano is not installed use `sudo apt install nano`
- You can change the default text editor for Git with `git config --global core.editor nano`
- You can also have nano be the default text editor for the OS.
- Use `nano ~/.bashrc` to edit the startup script.
- Add the following lines

```
export VISUAL=nano
export EDITOR=nano
```

- Save and quit with `Ctrl+O` `Ctrl+X`

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```
# Lines starting with # are comments
# Blank lines can be used as separator for readability

# The pattern below match a specific file which will be excluded
exlcuded-file

# The pattern below match a folder and all its content
build/

# The pattern below matches any file with extension .out
*.out
```

references

Git tutorials and guides:

- https://www.atlassian.com/git/tutorials
- https://hsf-training.github.io/analysis-essentials/git/README.html

Git cheatsheet

- http://ndpsoftware.com/git-cheatsheet.html

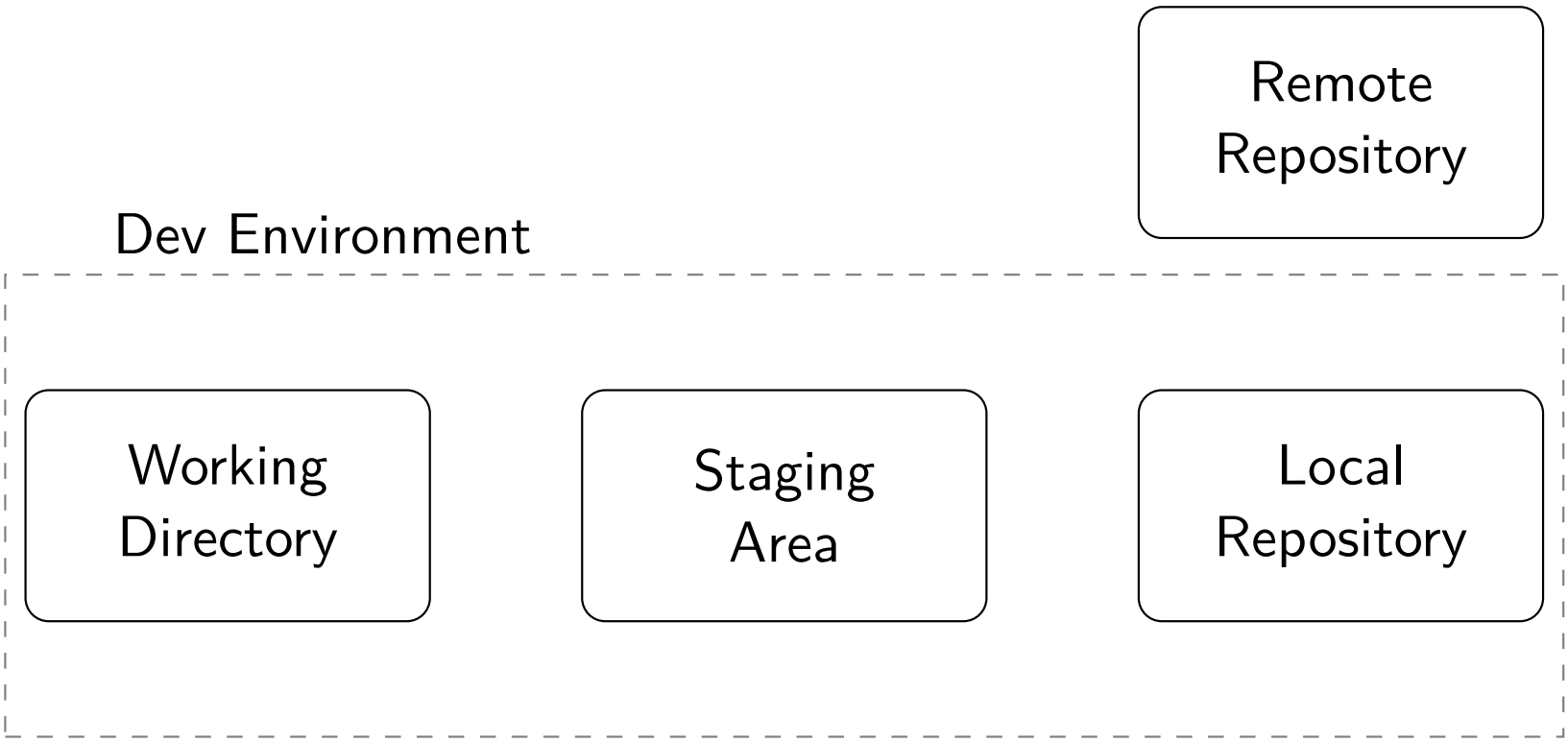
How to write a commit message

- https://chris.beams.io/posts/git-commit/

If you are interested in Vim

- https://www.openvim.com/

Remote Workflow



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- Other provider are available (i.e. Bitbucket, Gitlab, Stash), and the following guide will work similarly for all

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- The public key is shared with the client that would like to identify your device

SSH(cont.)

To create a SSH key pair run the following command on the bash

```
~/workspace$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/demo/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/demo/.ssh/id_rsa.
Your public key has been saved in /home/demo/.ssh/id_rsa.pub.
The key fingerprint is:
4a:dd:0a:c6:35:4e:3f:ed:27:38:8c:74:44:4d:93:67 demo@a
The key's randomart image is:
+--[ RSA 2048]----+
|          .oo.   |
|         .  o.E  |
|        + .  o   |
...
```

Make note of the path to the .pub file.

Github (cont.)

- On Github go to SSH and GPG keys settings page

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- On Github go to SSH and GPG keys settings page
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- Copy the content of the .pub file containing your public key and Add it in the form

git remote add origin

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- If you prefer using HTTPS and 2FA on github, instead of SSH keys visit the official documentation

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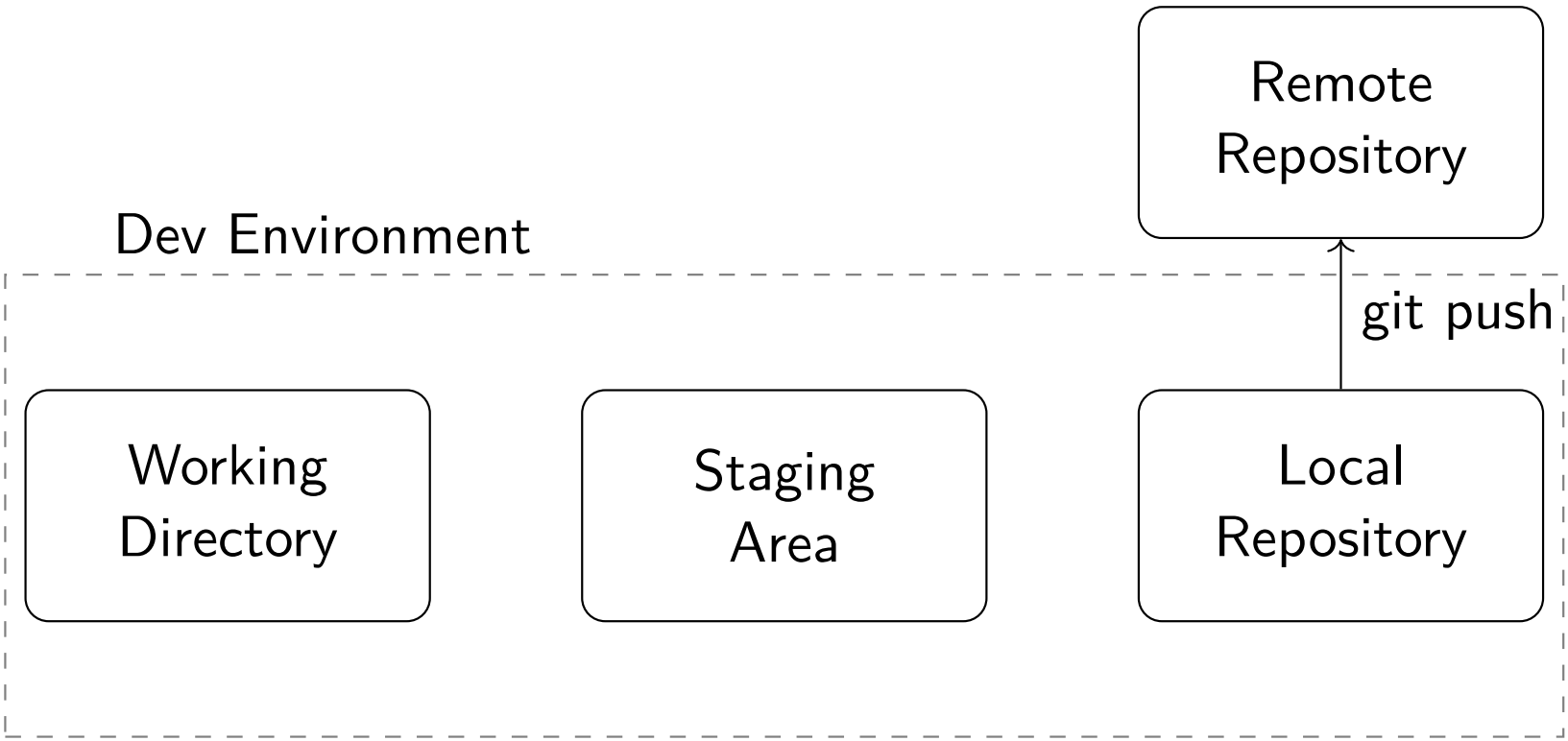
- `git push <remote> <branch>` allows to push the content of a local branch to a matching remote branch (i.e `git push origin main`)

git push (cont.)



git fetch

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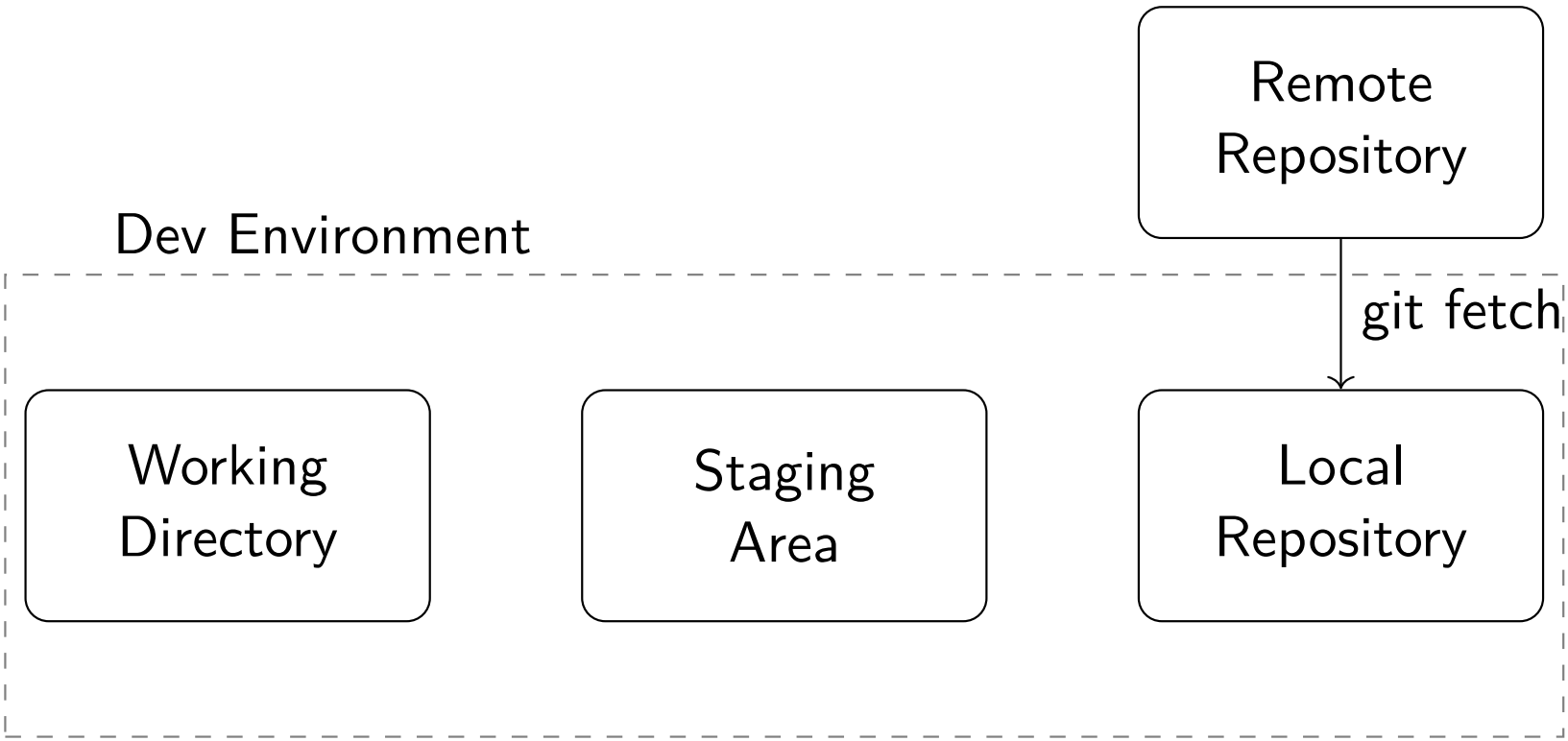
- `git diff <branch> origin/<branch>` will show the difference between a local branch and a remote one, after fetching the metadata

git fetch (cont.)



git pull

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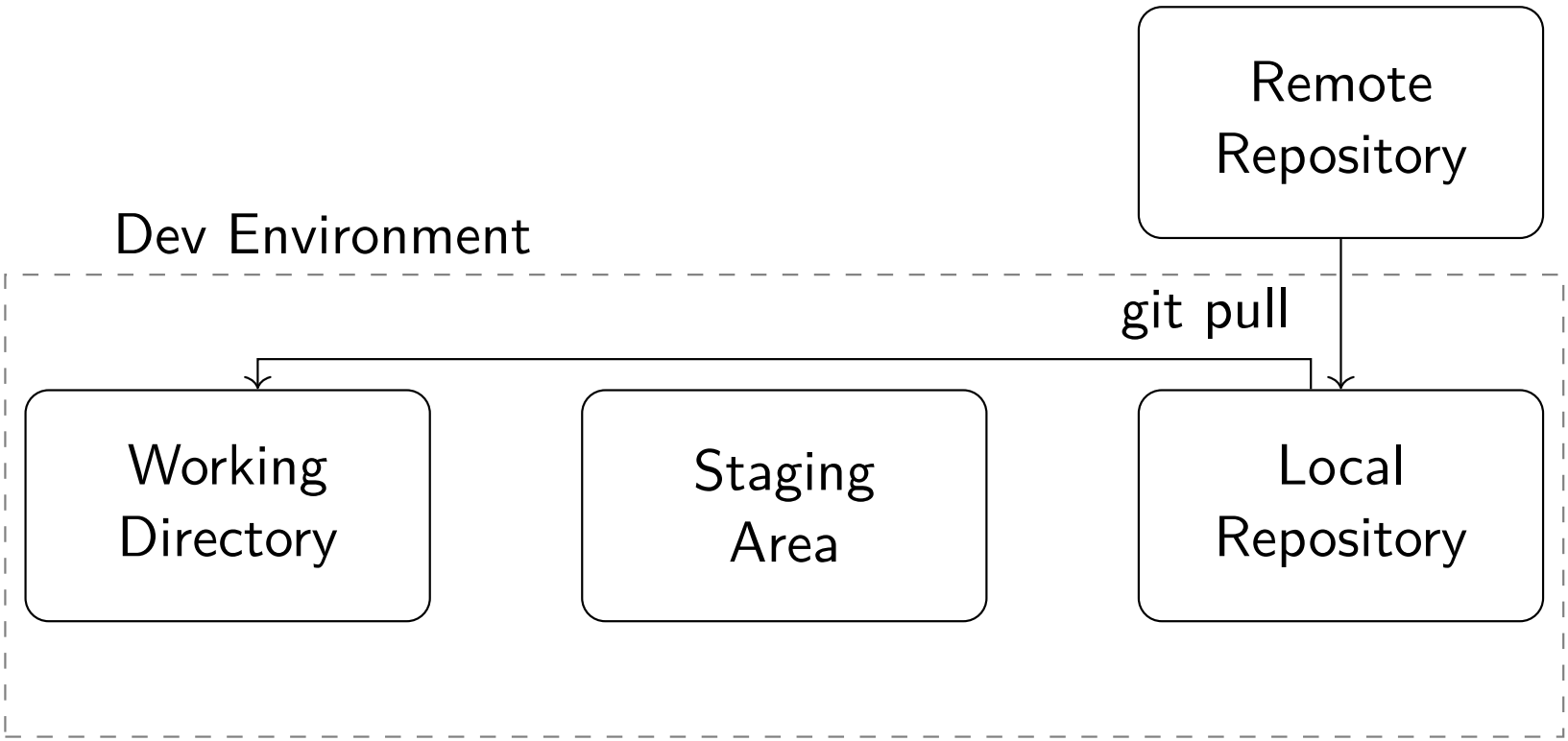
- `git pull` will fetch the files and also merge them with the current state of your workspace
- It can cause Merge conflicts, that need to be fixed before pushing back to the remote
- The complete remote workflow will consist of one or more commits, fetching, pulling and merging conflicts, and finally pushing to the remote

git pull (cont.)



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- From your repository web page go to Settings > Manage access > Invite a collaborator