Some GIT Basics

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Content

Introduction

Introduction

- “Git is a free and open source distributed version control system designed to handle everything from small to very large projects with speed and efficiency. ”
- Version control systems track changes to files and allow you to go back to earlier versions thus creating backups as well.
- Git is not the first or only available version control system (VCS): CVS, Bitbucket, and Subversion are wellknown
- Git was developed by the Linux creator Linus Torvalds to maintain the Linux kernel

Centralized versus Distributed VCS

- Subversion is a centralized vcs, it uses a central server. Only this server has the full history of all files
- All developers get special snapshots from this server.
- Backing up the server is essential!
- Git is a distributed vcs, so all clients (developers) have the complete repository on their machines.
- I personally used Subversion for a long time (and still use it for some projects) but mostly have migrated to Github.
- Github = a central platform where I can put my projects, but not the “central server” like with Subversion

Working with Git

In the following we will look as various use cases for working with Git

- Create new repositories[1]
- Add files to the repository
- Making changes to the repository
-

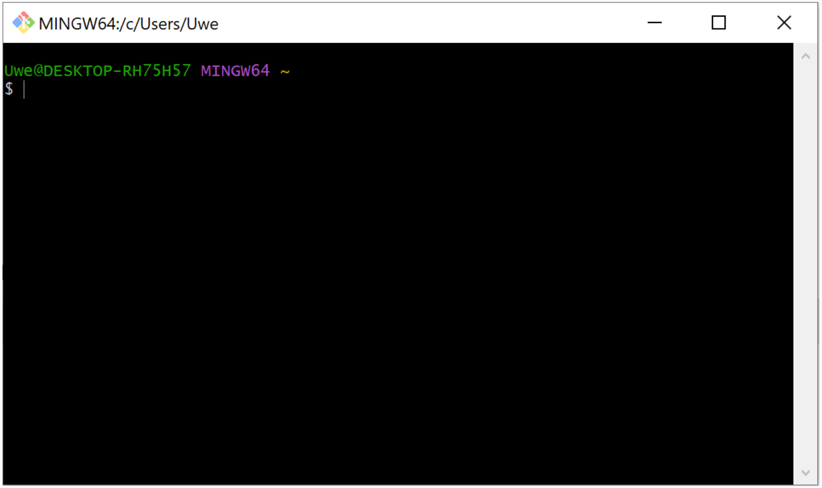
Remark: Git can be quite complex, but normally you need only a few commands.

[1] The project structure you manage with Git

MinGW Basics

Running Git

- You find Git 2.28 on your desktop
- When you start it you land here:



```
Uwe@DESKTOP-RH75H57 MINGW64 ~
$ 
```

MinGW

- MinGW = Minimal GNU[2] for Windows
- A shell that ports many Unix/Linux tools to Windows
- This is not Git, Git is just a commandline tool that can be used within MinGW
- It contains a few Linux tools as well
- To move in this MinGW environment you need to use Linux commands

[2]“GNU is not Unix” = Open-Source stuff

Basic MinGW commands

pwd	In which directory are we?
ls	List all files and folders
cd	go to some specific directory
mkdir	create a new directory

Remarks:

- There are no drive letters in MinGW
- / is the root directory
- Windows drive letters are (invisible) directories below this root directory
- so `cd /c` takes you to the C:\directory

Git

Create new Repositories

Create a directory, change to that directory and init the repository. The directory may already contains some files

```
cd /e # go to the e: drive

mkdir myfirstgitrepo # create empty directory

cd myfirstgitrepo #  go to the directory

git init . # create repo (with a 'master' branch)
```

git status

Use `git status` whenever you want to know something about the current state of the repository

```
Uwe@DESKTOP MINGW64 /e/myfirstgitrepo (master)
$ git status
On branch master

No commits yet

nothing to commit (create/copy files and use
"git add" to track)
```

Adding files to the Repository 1

```
$ touch README.MD # creates an empty file

$ git status
On branch master

No commits yet

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

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

Adding files to the Repository 2

```
$ git add README.MD # add file to staging area

$ git add -A # add all files to staging area
# not added to repository

$ git reset # remove everything from the
# staging area

$ git commit -m "My message" # Don't forget!!!
```

Adding files to the Repository 3

```
$ git commit -m "Initial commit"
Author identity unknown

*** Please tell me who you are.

Run

  git config --global user.email "you@examp.de"
  git config --global user.name "Your Name"

to set your account's default identity.
Omit --global to set the identity only in this
repository.

fatal: unable to auto-detect email address (got
'Uwe@DESKTOP-RH75H57.(none)')
```

Adding files to the Repository 4

```
Uwe@DESKTOP MINGW64 /e/myfirstgitrepo (master)
$ git config --global user.email "ziegenhagen@gmail.com"

Uwe@DESKTOP MINGW64 /e/myfirstgitrepo (master)
$ git config --global user.name "Uwe Ziegenhagen"

Uwe@DESKTOP MINGW64 /e/myfirstgitrepo (master)
$ git commit -m "Initial commit"
[master (root-commit) acb9d75] Initial commit
 1 file changed, 0 insertions(+), 0 deletions(-)
 create mode 100644 README.MD

Uwe@DESKTOP MINGW64 /e/myfirstgitrepo (master)
$ git status
On branch master
nothing to commit, working tree clean
```

Now we have a file under version control! Yippie!

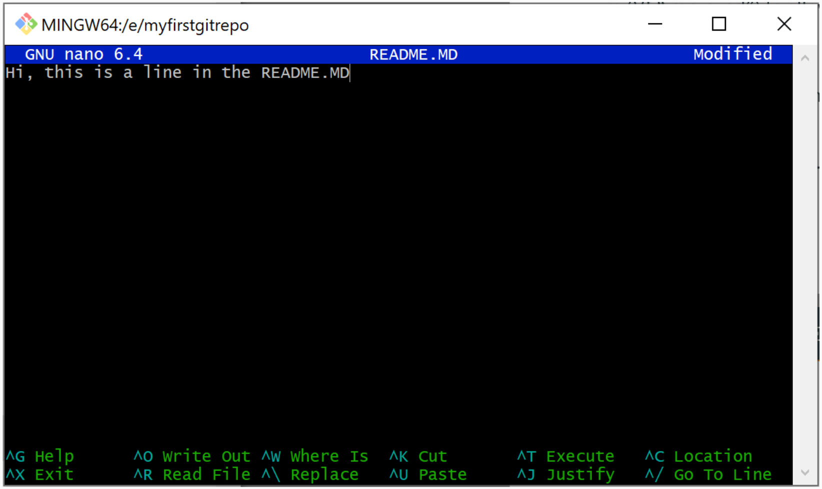
A Word of Warning!

- When you omit the commit message, Git takes you to vim (VI “improved”) to allow you to enter it
- VIM = very powerful editor with strange user interface
- VIM uses special modes and is (almost) keyboard-only

Let’s edit our file and commit it…

You can use e. g. `nano` the edit the file.

Editing the file with `nano README.MD`



```
  GNU nano 6.4                 README.MD                          Modified
Hi, this is a line in the README.MD



^G Help      ^O Write Out ^W Where Is  ^K Cut       ^T Execute   ^C Location
^X Exit      ^R Read File ^\ Replace   ^U Paste     ^J Justify   ^/ Go To Line
```

- The circumflex means the Ctrl-key
- So Ctrl-O saves the file, Ctrl-X exits `nano`

Escape from VIM Hell. . . – Part 1

```
Uwe@DESKTOP MINGW64 /e/myfirstgitrepo (master)
$ git status
On branch master
Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working
  directory)
        modified:   README.MD

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

Git notices that we changed a file, that is under version control

Escape from VIM Hell. . . – Part 2

- We add the file to the commit stage
- you can ignore the LF warning. It just means that `nano` used Unix-style line endings (`\n`) in the file, for the repository however Windows line endings (`\r\n`)

```
Uwe@DESKTOP-RH75H57 MINGW64 /e/myfirstgitrepo (master)
$ git add README.MD
warning: in the working copy of 'README.MD', LF will be
replaced by CRLF the next time Git touches it
```

Remarks: `\n` means Line Feed-Character, `\r\n` means Carriage Return + Line Feed. Helpful to know when working with text files.

Escape from VIM Hell. . . – Part 3

We briefly check the status

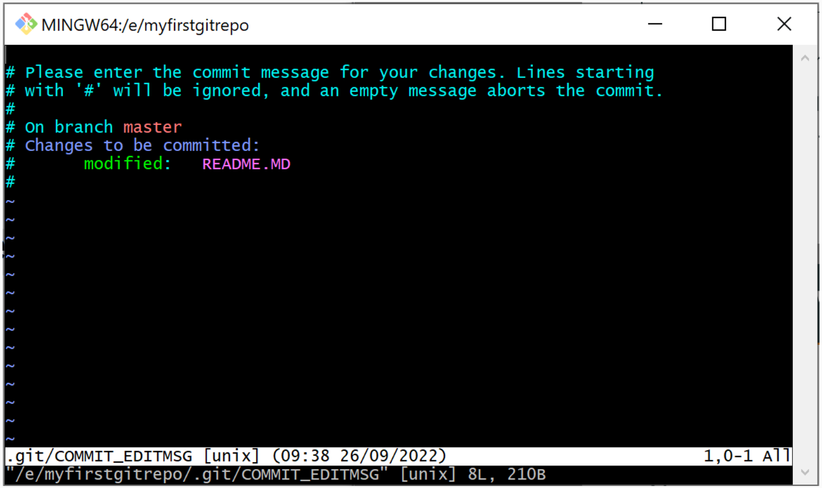
```
$ git status
On branch master
Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        modified:   README.MD
```

and commit it without specifying the message parameter

```
$ git commit
```

Which takes us to eternal pain, the VIM!!!

Escape from VIM Hell… – Part 4



MINGW64:/e/myfirstgitrepo

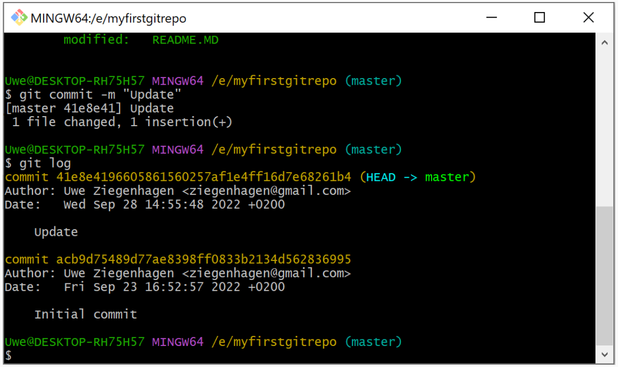
```
# Please enter the commit message for your changes. Lines starting
# with '#' will be ignored, and an empty message aborts the commit.
#
# On branch master
# Changes to be committed:
#       modified:   README.MD
#
~
~
~
~
~
~
~
~
~
~
~
~
~
~
.git/COMMIT_EDITMSG [unix] (09:38 26/09/2022)                   1,0-1 All
"/e/myfirstgitrepo/.git/COMMIT_EDITMSG" [unix] 8L, 210B
```

Escape from VIM Hell. . . – Part 5

- `ESC : q` lets you exit without specifying a message, but you do not commit then.
- `ESC : q !` lets you exit without specifying a message if you typed anything, but you do not commit then.

Display the commit history with `git log`

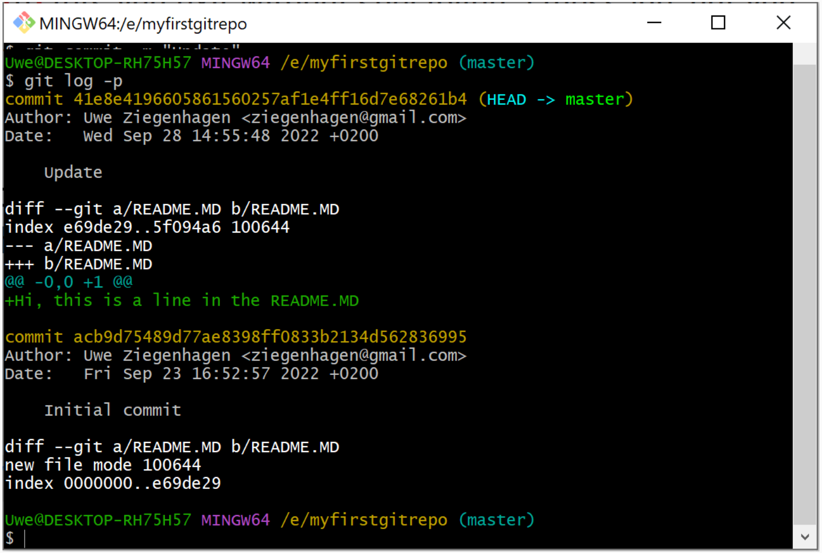
- `git log` for the history of commits
- `git log -p` including the the full diff[3]



```
        modified:   README.MD


Uwe@DESKTOP-RH75H57 MINGW64 /e/myfirstgitrepo (master)
$ git commit -m "Update"
[master 41e8e41] Update
 1 file changed, 1 insertion(+)

Uwe@DESKTOP-RH75H57 MINGW64 /e/myfirstgitrepo (master)
$ git log
commit 41e8e4196605861560257af1e4ff16d7e68261b4 (HEAD -> master)
Author: Uwe Ziegenhagen <ziegenhagen@gmail.com>
Date:   Wed Sep 28 14:55:48 2022 +0200

    Update

commit acb9d75489d77ae8398ff0833b2134d562836995
Author: Uwe Ziegenhagen <ziegenhagen@gmail.com>
Date:   Fri Sep 23 16:52:57 2022 +0200

    Initial commit

Uwe@DESKTOP-RH75H57 MINGW64 /e/myfirstgitrepo (master)
$
```

[3] diff = differences between file in the `diff` format

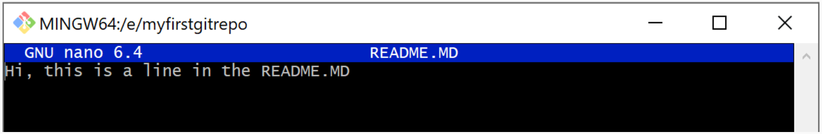
Example for `git log -p`


MINGW64:/e/myfirstgitrepo

```
Uwe@DESKTOP-RH75H57 MINGW64 /e/myfirstgitrepo (master)
$ git log -p
commit 41e8e41966058615602S7af1e4ff16d7e68261b4 (HEAD -> master)
Author: Uwe Ziegenhagen <ziegenhagen@gmail.com>
Date:   Wed Sep 28 14:55:48 2022 +0200

    Update

diff --git a/README.MD b/README.MD
index e69de29..5f094a6 100644
--- a/README.MD
+++ b/README.MD
@@ -0,0 +1 @@
+Hi, this is a line in the README.MD

commit acb9d75489d77ae8398ff0833b2134d562836995
Author: Uwe Ziegenhagen <ziegenhagen@gmail.com>
Date:   Fri Sep 23 16:52:57 2022 +0200

    Initial commit

diff --git a/README.MD b/README.MD
new file mode 100644
index 0000000..e69de29

Uwe@DESKTOP-RH75H57 MINGW64 /e/myfirstgitrepo (master)
$
```

Get back to earlier versions 1

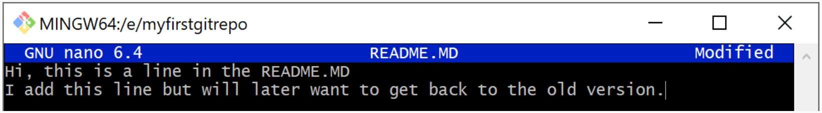
- Let us assume we have this line in the old file



MINGW64:/e/myfirstgitrepo

```
  GNU nano 6.4                        README.MD
Hi, this is a line in the README.MD
```

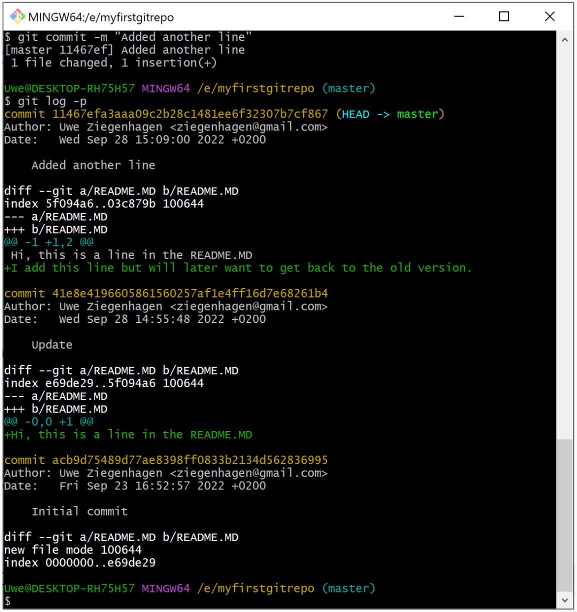
and have changed it (and added it to the staging area and commited it)



MINGW64:/e/myfirstgitrepo

```
  GNU nano 6.4                        README.MD                         Modified
Hi, this is a line in the README.MD
I add this line but will later want to get back to the old version.
```

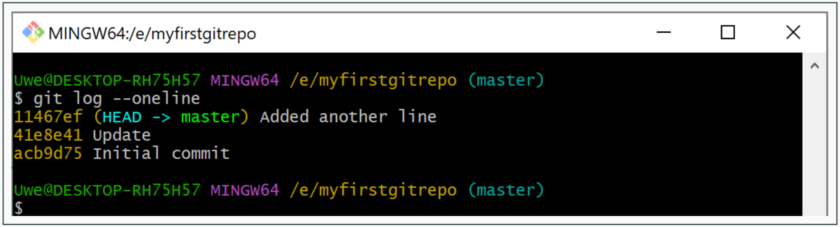
Get back to earlier versions 2


MINGW64:/e/myfirstgitrepo

```
$ git commit -m "Added another line"
[master 11467ef] Added another line
 1 file changed, 1 insertion(+)

Uwe@DESKTOP-RH75H57 MINGW64 /e/myfirstgitrepo (master)
$ git log -p
commit 11467efa3aaa09c2b28c1481ee6f32307b7cf867 (HEAD -> master)
Author: Uwe Ziegenhagen <ziegenhagen@gmail.com>
Date:   Wed Sep 28 15:09:00 2022 +0200

    Added another line

diff --git a/README.MD b/README.MD
index 5f094a6..03c879b 100644
--- a/README.MD
+++ b/README.MD
@@ -1 +1,2 @@
 Hi, this is a line in the README.MD
+I add this line but will later want to get back to the old version.

commit 41e8e4196605861560257af1e4ff16d7e68261b4
Author: Uwe Ziegenhagen <ziegenhagen@gmail.com>
Date:   Wed Sep 28 14:55:48 2022 +0200

    Update

diff --git a/README.MD b/README.MD
index e69de29..5f094a6 100644
--- a/README.MD
+++ b/README.MD
@@ -0,0 +1 @@
+Hi, this is a line in the README.MD

commit acb9d75489d77ae8398ff0833b2134d562836995
Author: Uwe Ziegenhagen <ziegenhagen@gmail.com>
Date:   Fri Sep 23 16:52:57 2022 +0200

    Initial commit

diff --git a/README.MD b/README.MD
new file mode 100644
index 0000000..e69de29

Uwe@DESKTOP-RH75H57 MINGW64 /e/myfirstgitrepo (master)
$
```

Get back to earlier versions 3

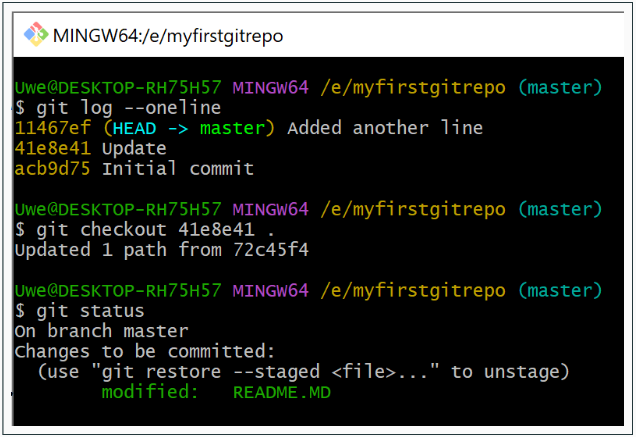
To which version you want to go?



```
Uwe@DESKTOP-RH75H57 MINGW64 /e/myfirstgitrepo (master)
$ git log --oneline
11467ef (HEAD -> master) Added another line
41e8e41 Update
acb9d75 Initial commit

Uwe@DESKTOP-RH75H57 MINGW64 /e/myfirstgitrepo (master)
$
```

- `git checkout 41e8e41 .`
- Do not forget the dot at the end, otherwise you end in `detached head state`, which you can/need to fix by `git checkout master`

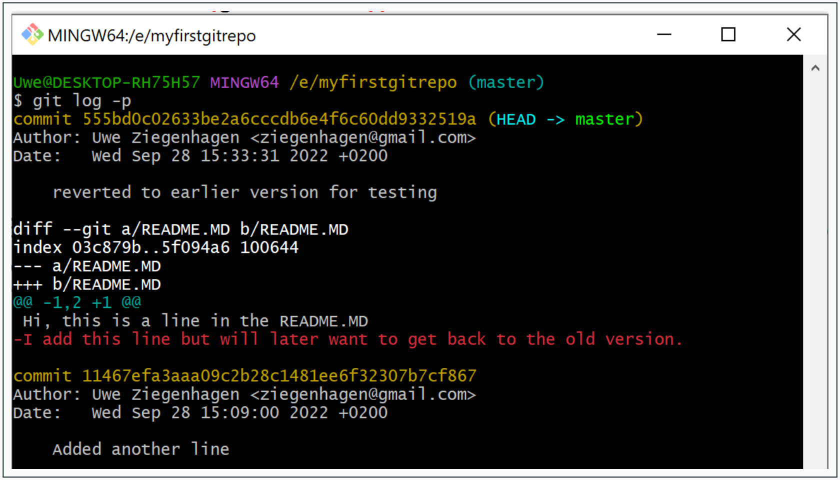
Get back to earlier versions 4



```
Uwe@DESKTOP-RH75H57 MINGW64 /e/myfirstgitrepo (master)
$ git log --oneline
11467ef (HEAD -> master) Added another line
41e8e41 Update
acb9d75 Initial commit

Uwe@DESKTOP-RH75H57 MINGW64 /e/myfirstgitrepo (master)
$ git checkout 41e8e41 .
Updated 1 path from 72c45f4

Uwe@DESKTOP-RH75H57 MINGW64 /e/myfirstgitrepo (master)
$ git status
On branch master
Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        modified:   README.MD
```

Commit this version as well and note in the message why you reverted!

Get back to earlier versions 5



```
Uwe@DESKTOP-RH75H57 MINGW64 /e/myfirstgitrepo (master)
$ git log -p
commit 555bd0c02633be2a6cccdb6e4f6c60dd9332519a (HEAD -> master)
Author: Uwe Ziegenhagen <ziegenhagen@gmail.com>
Date:   Wed Sep 28 15:33:31 2022 +0200

    reverted to earlier version for testing

diff --git a/README.MD b/README.MD
index 03c879b..5f094a6 100644
--- a/README.MD
+++ b/README.MD
@@ -1,2 +1 @@
 Hi, this is a line in the README.MD
-I add this line but will later want to get back to the old version.

commit 11467efa3aaa09c2b28c1481ee6f32307b7cf867
Author: Uwe Ziegenhagen <ziegenhagen@gmail.com>
Date:   Wed Sep 28 15:09:00 2022 +0200

    Added another line
```

Cloning and pulling repositories

- Imagine the production stuff sits in one git repository and you want to have a local copy: `git clone /e/myfirstgitrepo`
- Now we make changes in the original repository (`nano secondfile.txt`, add to staging, commit)
- In the local repository run `git pull` to get the file into your local repo

Next steps...

- How to push the changes to the upstream repository
- And much, much more!