



INTRODUCTION TO GIT & GITHUB

by Bobby Ilier



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About the book

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This is an open-source introduction to Git and GitHub guide that will help you learn the basics of version control and start using Git for your SysOps, DevOps, and Dev projects. No matter if you are a DevOps/SysOps engineer, developer, or just a Linux enthusiast, you can use Git to track your code changes and collaborate with other members of your team or open source maintainers.

The guide is suitable for anyone working as a developer, system administrator, or a DevOps engineer and wants to learn the basics of Git and GitHub.

About the author

My name is Bobby Iliev, and I have been working as a Linux DevOps Engineer since 2014. I am an avid Linux lover and supporter of the open-source movement philosophy. I am always doing that which I cannot do in order that I may learn how to do it, and I believe in sharing knowledge.

I think it's essential always to keep professional and surround yourself with good people, work hard, and be nice to everyone. You have to perform at a consistently higher level than others. That's the mark of a true professional.

For more information, please visit my blog at <https://bobbyiliev.com>, follow me on Twitter [@bobbyiliev_](#) and [YouTube](#).

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Introduction to Git

Welcome to this Git and GitHub basics training guide! In this **Git crash course**, you will learn the **basics of Git** so you can use Git to track your code changes and collaborate with other members of your team or open source maintainers.

Whether you are a newcomer to programming, or an experienced one, you have to know how to use Git. Most of the projects that a small or big group of developers work on are done through GitHub or GitLab.

It makes working with other developers so much more exciting and enjoyable, just by creating a new branch, adding all your brilliant ideas to the code that can help the project, committing it, and then pushing it to GitHub or GitLab. Then after the PR(pull request) has been opened, reviewed, and then merged, you can get back to your code and continue adding more awesome stuff. After pulling the changes from the main/master branch, of course.

If what you just read doesn't make any sense to you, don't worry. Everything will be explained in this eBook!

This eBook will show you the basics of how to start using Git and try to help you get more comfortable with it.

It does look a bit scary in the beginning, but don't worry. It's not as frightening as it seems, and hopefully, after reading this eBook, you can get a bit more comfortable with Git.

Learning Git is essential for every programmer. Even some of the biggest companies use GitHub for their projects. Remember that the more you use it, the more you're going to get used to it.

Git is without a doubt the most popular open-source version control system for tracking changes in source code out there.

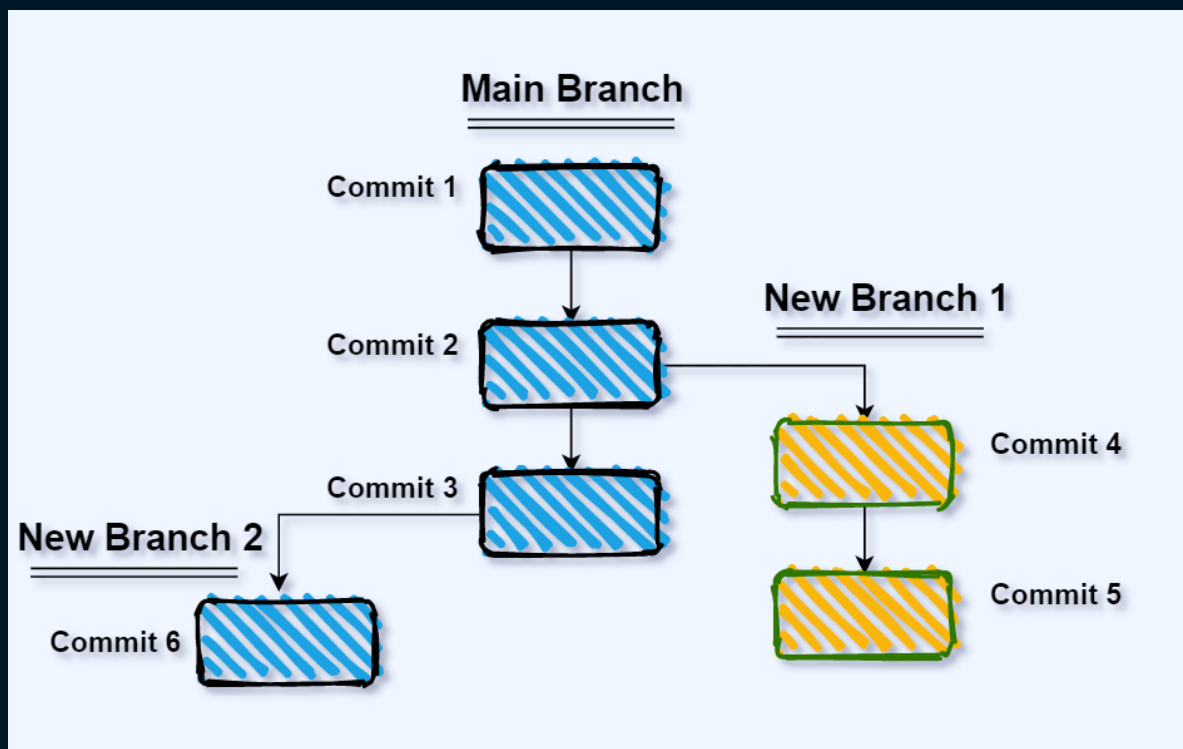
The original author of git is Linus Torvalds, who is also the creator of **Linux**.

Git is designed to help programmers coordinating work with each other. Its goals include speed, data integrity, and support for distributed workflows.

Version Control

Version control, also called *Source control*, allows you to track and manage all of the changes to your code.

The main benefit of version control is that multiple people could work on the same project simultaneously. With version control tools like Git, you can track all of the changes to your code, and in case of any problems, you could easily revert back to a working state of your source code.



With distributed version control systems like Git, you would have your source code stored on a remote repository like GitHub and also a local repository stored on your computer.

You will learn more about remote and local repositories in the next few

chapters. Still, one of the main points for the moment is that your source code would be stored on a remote repository, so in case that something goes wrong with your laptop, you would not lose all of your changes, but they will be safely stored on GitHub.

Installing Git

In order for you to be able to use Git on your local machine, you would need to install it.

Depending on the operating system that you are using, you can follow the steps here.

Install Git on Linux

With most Linux distributions, the Git command-line tool comes installed out of the box.

If this is not the case for you, you can install Git with the following command:

- On RHEL Linux:

```
sudo dnf install git-all
```

- On Debian based distributions including Ubuntu:

```
sudo apt install git-all
```

Install Git on Mac

If you are using Mac, Git should be available out of the box as well. However, if this is not the case, there are 2 main ways of installing Git on your Mac:

- Using Homebrew: in case that you are using Homebrew, you can open your terminal and run the following:

```
brew install git
```

- Git installer: Alternatively, you could use the following installer:

[git-osx-installer](#)

I would personally stick to Homebrew.

Install Git on Windows

If you have a Windows PC, you can follow the steps on how to install Git on Windows here:

[Install Git on Windows](#)


During the installation, make sure to choose the Git Bash option, as this would provide you with a Git Bash terminal which you will use while following along.

Check Git version

Once you have installed Git, in order to check the version of Git that you have installed on your machine, you could use the following command:

```
git --version
```

Example output:



```
git version 2.25.1
```

In my case, I have Git 2.25.1 installed on my laptop.

Basic Shell Commands

As throughout this eBook, we will be using mainly Git via the command line. It is important to know basic shell commands so that you could find your way around the terminal.

So before we get started, let's go over a few basic shell commands!

The `ls` command

The `ls` command allows you to list the contents of a folder/directory. All that you need to do in order to run the command is to open a terminal and run the following:

```
ls
```

The output will show you all of the files and folders that are located in your current directory. In my case, the output is the following:

```
CONTRIBUTING.md ebook README.md
```

For more information about the `ls` command, make sure to check out this page [here](#).

Note: This will work on a Linux/UNIX based systems. If you are on Windows and if you are using the built-in CMD, you would have to use the `dir` command.

The `cd` command

The `cd` command stands for **C**hange **D**irectory and allows you to navigate through the filesystem of your computer or server. Let's say that I wanted to go inside the `ebook` directory from the output above. What I would need to do is to run the `cd` command followed by the directory that I want to access:

```
cd ebook
```

If I wanted to go back one level up, I would use the `cd ..` command.

The `pwd` command

The `pwd` command stands for **P**rint **W**orking **D**irectory which essentially means that when you run the command, it will show you the current directory that you are in.

Let's take the example from above. If I run the `pwd` command, I would get the full path to the folder that I'm currently in:

```
pwd
```

Output:

```
/home/bobby/introduction-to-git
```

Then I could use the `cd` command and access the `ebook` directory:

```
cd ebook
```

And finally, if I was to run the `pwd` command again, I would see the

following output:

```
/home/bobby/introduction-to-git/ebook
```

Essentially what happened was that thanks to the `pwd` command, I was able to see that I'm at the `/home/bobby/introduction-to-git` directory and then after accessing the `ebook` directory, again by using `pwd` I was able to see that my new current directory is `/home/bobby/introduction-to-git/ebook`.

The `rm` command

The `rm` command stands for `remove` and allows you to delete files and folders. Let's say that I wanted to delete the `README.md` file, what I would have to do is run the following command:

```
rm README.md
```

In case that I had to delete a folder/directory, I would need to specify the `-r` flag:

```
rm -r ebook
```

Note: keep in mind that the `rm` command would completely delete the files and folders, and the action is irreversible, meaning that you can't get them back.

One thing that you need to keep in mind is that all shell commands are case sensitive, so if you type `ls` it would not work.

With that, now you know some basic shell commands which will be beneficial for your day-to-day activities.

Git Configuration

The first time you set up Git on your machine, you would need to do some initial configuration.

There are a few main things that you would need to configure:

- Your details: like your name and email address
- Your Git Editor
- The default branch name: we will learn more about branches later on

We can change all of those things by using the `git config` command.

Let's get started with the initial configuration!

The `git config` command

In order to configure your Git details like your user name and your email address, you need to use the following command:

- Configuring your Git user name:

```
git config --global user.name "Your Name"
```

- Configuring your Git email address:

```
git config --global user.email johndoe@example.com
```

Usually, it is good to have a matching user name and email for your local Git configuration and your GitHub profile details

- Configuring your Git default editor

In some cases, when running Git commands via your terminal, an editor will open where you could type a commit message, for example. To specify your default editor, you need to run the following command:

```
git config --global core.editor nano
```

You can change the **nano** editor with another editor like **vim** or **emacs** based on your personal preferences.

- Configuring the default branch name

Whenever creating a new repository on your local machine, it gets initialized with a specific branch name which might be different from the default branch on GitHub. To make sure that the branch name on your local machine matches the default branch name on GitHub, you can use the following command:

```
git config --global init.defaultBranch main
```

Finally, once you are done with all changes, you can check your current Git configuration with the following command:

```
git config --list
```

Example output:

```
user.name=Bobby Iliev
user.email=bobby@bobbyiliev.com
core.repositoryformatversion=0
core.filemode=true
core.bare=false
core.logallrefupdates=true
```

The ~/.gitconfig file

As we used the `--global` command, all of those Global Git settings would be stored in a `.gitconfig` file inside your home directory.

We can use the `cat` command to check the content of the file:

```
cat ~/.gitconfig
```

Example output:

```
[user]
  name = Bobby Iliev
  email = bobby@bobbyiliev.com
```

You can even change the file manually with your favorite text editor, but I personally prefer to use the `git config` command to prevent any syntax problems.

The .git directory

Whenever you initialize a new project or clone one from GitHub, it would have a `.git` directory where all of the Git commits would be recorded at and also a `config` file where the configuration settings for the particular project would be stored at.

You could use the `ls` command to check the contents of the `.git` folder:

```
ls .git
```

Output:

```
COMMIT_EDITMSG HEAD branches config description hooks  
index info logs objects refs
```

Note: Before running the command, you would need to be inside your project's directory. We will learn about this in the next chapters when we learn more about the `git init` command and cloning an existing repository from GitHub with the `git clone` command.

Introduction to GitHub

Before we deep dive into all of the various Git commands, let's quickly get familiar with GitHub.

Git is essentially the tool that you use to track your code changes, and GitHub, on the other side, is a website where you can push your local projects to.

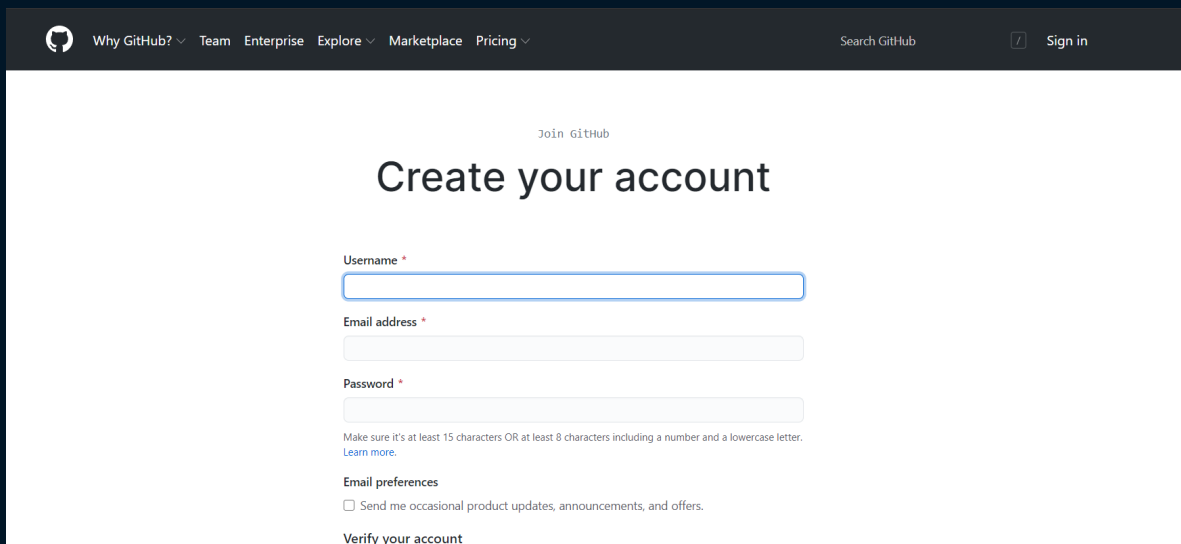
This is essentially needed as it would act as a central hub where you would store your project at and all of your teammates or other people working on the same project as you would push their changes to.

GitHub Registration

Before you get started, you would need to create an account with GitHub. You can do so via this link here:

- [Join GitHub](#)

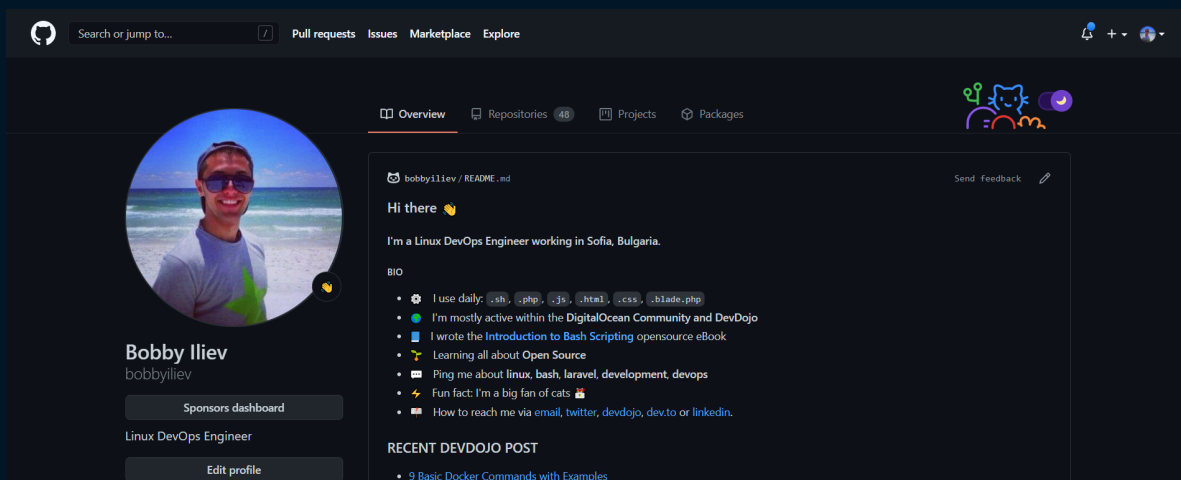
You would get to the following page where you would need to add your new account details:



The screenshot shows the GitHub registration page. At the top is a dark navigation bar with the GitHub logo, links for 'Why GitHub?', 'Team', 'Enterprise', 'Explore', 'Marketplace', and 'Pricing', a search bar, and a 'Sign in' link. The main content area is white and titled 'Join GitHub' followed by 'Create your account'. It contains three input fields for 'Username', 'Email address', and 'Password', each with an asterisk indicating it's required. Below the password field is a note: 'Make sure it's at least 15 characters OR at least 8 characters including a number and a lowercase letter. [Learn more.](#)'. There is an 'Email preferences' section with a checkbox for 'Send me occasional product updates, announcements, and offers.' and a 'Verify your account' link at the bottom.

GitHub Profile

Once you've registered, you can go to https://github.com/YOUR_USER_NAME, and you would be able to see your public profile where you could add some information about yourself. Here is an example profile which you could check: [GitHub Profile](#)



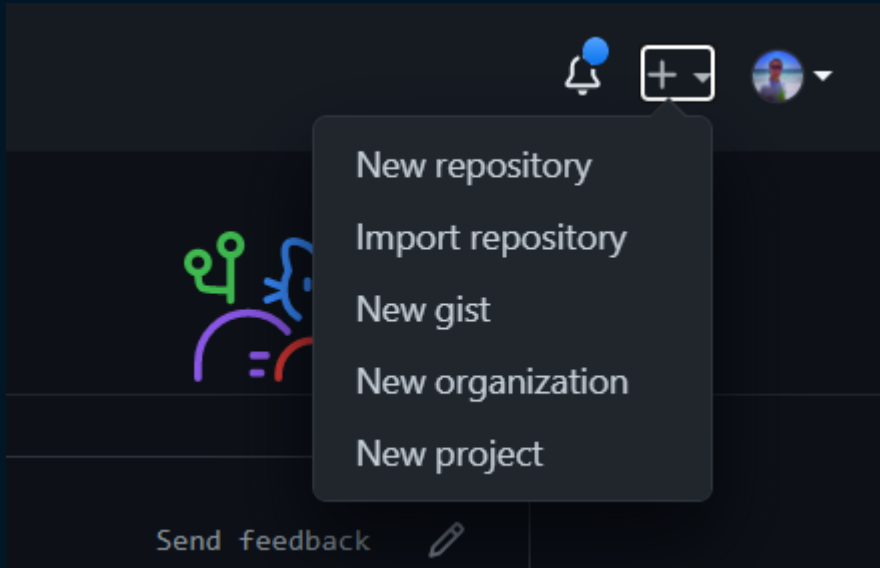
The screenshot shows a GitHub user profile for 'bobbyiliev'. The profile includes a circular profile picture of a man with sunglasses. To the right of the picture are buttons for 'Sponsors dashboard', 'Linux DevOps Engineer', and 'Edit profile'. The main content area shows the user's bio: 'Hi there 🍌 I'm a Linux DevOps Engineer working in Sofia, Bulgaria.' Below the bio is a 'BIO' section with a list of interests and achievements, including 'I use daily: .sh, .php, .js, .html, .css, .blade.php', 'I'm mostly active within the DigitalOcean Community and DevDojo', 'I wrote the Introduction to Bash Scripting opensource eBook', 'Learning all about Open Source', 'Ping me about linux, bash, laravel, development, devops', 'Fun fact: I'm a big fan of cats 🐱', and 'How to reach me via email, twitter, devdojo, dev.to or linkedin.' At the bottom, there is a 'RECENT DEVDOJO POST' section with a link to '9 Basic Docker Commands with Examples'.

Creating a new repository

If you are not familiar with the word repository, you could think of it as a project. It would hold all of the files of your application or website that you are building. In many cases, people would use repo instead of a

repository for short.

To create a new repository on GitHub, you have to click on the + sign on the top right and then click on the **New Repository** button:

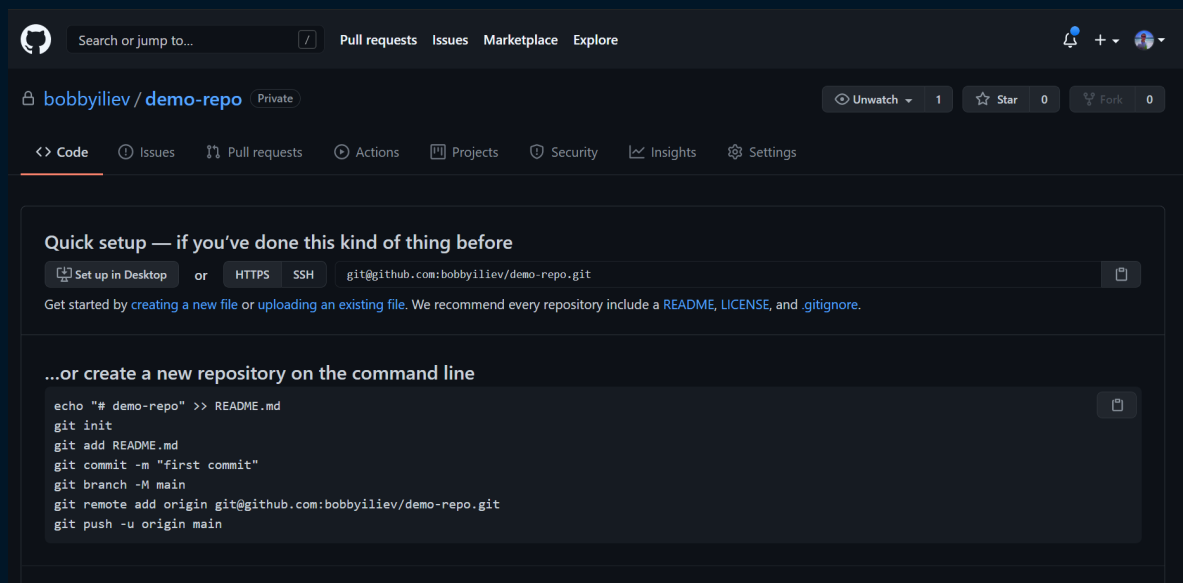


After that, you would get to a page where you can specify the information for your new repository like:

- The name of the project: Here, make sure to use something descriptive
- Some general description about the project and what it is about
- Choose whether you want the repository to be Public or Private

A screenshot of the 'Create a new repository' page on GitHub. The page has a dark theme. At the top, there is a navigation bar with the GitHub logo, a search bar, and links for 'Pull requests', 'Issues', 'Marketplace', and 'Explore'. The main heading is 'Create a new repository'. Below it, there is a subheading 'Repository template' and a button 'No template'. The 'Owner' field is set to 'bobbyiliev'. The 'Repository name' field is empty. Below the name field, there is a hint: 'Great repository names are short and memorable. Need inspiration? How about miniature-funicular?'. The 'Description (optional)' field is empty. At the bottom, there are two radio buttons: 'Public' (selected) and 'Private'. The 'Public' option has a description: 'Anyone on the internet can see this repository. You choose who can commit.' The 'Private' option has a description: 'You choose who can see and commit to this repository.'

Once you've added the necessary information and hit the create button, you will get to a page with some instructions on how to push your local project to GitHub:



We will go over those steps more in-depth in the next few chapters.

Public vs. Private repositories

Depending on the project and whether or not it is open source, you could set your repository to be **public** or **private**.

The main difference is that with a public repository, anyone on the internet can see this repository. But even though that everyone would be able to see the repository and read the code, you would be the maintainer of the project, and you will choose who can commit.

With a private repository, it would only be available for your and the people that you've invited.

Public repositories are used for open source projects.

The README.md file

The `README.md` file is an essential part of each project. The `.md` extension stands for Markdown.

You can think of the `README.md` file as the introduction to your repository. It's beneficial that while looking at someone's repo, you can just scroll down to their README file and have a look at what their project is all about.

And it is crucial that your project is properly introduced. Because if the project itself isn't introduced properly, no one will spend their time helping to improve it and try to develop it further.

That's why having a good README file shouldn't be overlooked, and you should spend a considerable amount of your time on it.

In this post, I am going to share some tips with you about how you can improve your README file, and hopefully, it can help you with your repositories.

For more information, make sure to check out this post on [how to write a good README.md file](#).

Initializing a Git project

If you are starting a new project or if you have an existing project which you would like to add to Git and then push to GitHub, you need to initialize a new Git project with the `git init` command.

To keep things simple, let's say that we want to start building a fresh new project. The first thing that I would usually do is to create a new folder where I would store my project files at. To do that, I can use the `mkdir` command followed by the name of the folder, which will create a new empty directory/folder:

```
mkdir new-project
```

The above command will create a folder called `new-project`. Then as we learned in chapter 4, we can use the `cd` command to access the directory:

```
cd new-project
```

After that, by using the `ls` command, we will be able to verify that the directory is completely empty:

```
ls -lah
```

Then with that, we are ready to initialize a new Git project:

```
git init
```

You will get the following output:

```
Initialized empty Git repository in /home/devdojo/new-project/.git/
```

As you can see, what the `git init` command does is to create a new `.git` folder which we already discussed in chapter 5.

With that, you've successfully created a new empty Git project! Let's move to the next chapter, where you will learn how to use the `git status` command to check the current status of your repository.

Git Status

Whenever you make changes to your Git project, you would want to verify what has changed before making a commit or before pushing your changes to GitHub, for example.

To check the current status of your project, you can use the `git status` command. If you run the `git status` command in the same directory where you initialized your Git project from the last chapter, you will see the following output:

```
On branch main  
  
No commits yet  
  
nothing to commit (create/copy files and use "git add" to  
track)
```

As this is a fresh new repository, there are no commits and no changes yet. So let's go ahead and create a `README.md` file with some generic content. We can run the following command to do so:

```
echo "# Demo Project" >> README.md
```

What this would do is to output the `# Demo Project` and store it in the `README.md` file.

If you run `git status` again, you will then see the following output:

```
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)
```

As you can see, Git is detecting that there is 1 new file that is not tracked at the moment called `README.md`, which we just created. And already, Git is prompting us to use the `git add` command to start tracking the file. We will learn more about the `git add` command in the next chapter!

We are going to be using the `git status` command throughout the next few chapters a lot! This is particularly helpful, especially when you've modified a lot of files and you want to check the current status and see all of the modified, updated, or deleted files.

Git Add

By default, when you create a new file inside your Git project, it is not being tracked by Git. So to tell git that it should start tracking the file, you need to use the `git add` command.

The syntax is the following:

```
git add NAME_OF_FILE
```

In our case, we have only 1 file inside our project called `README.md`, so to add this file to Git, we can use the following command:

```
git add README.md
```

If you then run `git status` again, you will see a different output:

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

Here you would see that there are now some changes staged and ready to be committed. Also, Git tells us that the `README.md` is a new file that was just staged and has not been tracked before.

In case that you have a couple of files, you could list them all divided by space after the `git add` command to stage them all rather than running `git add` multiple times for each individual file:

```
git add file1.html file2.html file3.html
```

With the above, we will add the 3 files by running `git add` just once, however in some cases, you might have a lot of new files, and adding them one by one could be very time-consuming.

So there is a way to stage absolutely all files in your current project, and this is by specifying a dot after the `git add` command as follows:

```
git add .
```

Note: You need to be careful with this as in some cases, there might be some files that you don't want to add to Git.

With that, we are ready to move on and learn about the `git commit` command.

Git Commit

Once you have added/staged your files, the next step is actually to commit the changes. So if you run `git status` again, you will be able to see that Git tells us that there are changes to be committed:

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

In this case, it is only the `README.md` file that will be committed. So in order to do so, we can run the following command:

```
git commit -m "Your Commit Message Here"
```

Rundown of the command:

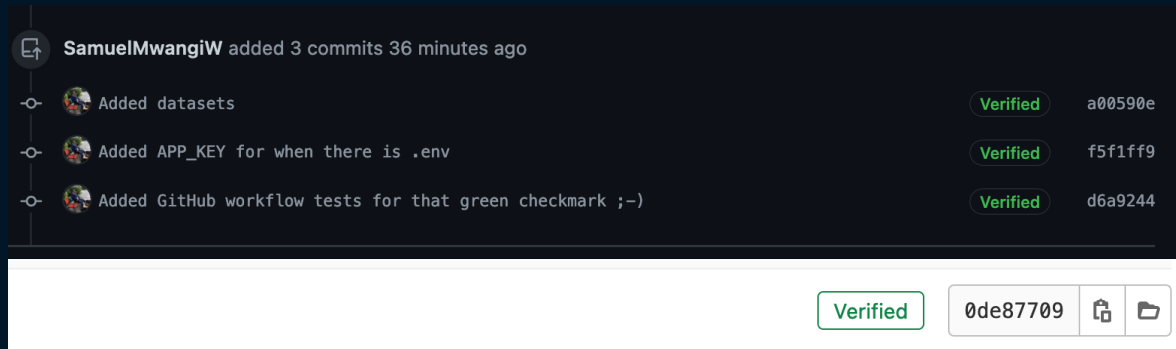
- `git commit`: here, we are telling git that we want to commit the changes that we've staged with the `git add` command
- `-m`: this flag indicates that we will specify our commit message directly after that
- Finally, in the quotes we've got our commit message, it is important to write short and descriptive commit messages

In our case we could set our commit message to something like `"Initial commit"` or `"Add README.md"` file, for example.

If you don't specify the `-m` flag, Git will open the default text editor that we've configured in chapter 5 where you will be able to type the commit message directly.

Signing Commits

Git allows you to sign your commits. Commits signed with a verified signature in GitHub and GitLab display a verified label as shown below.



To sign commits, first you need to:

- make sure that you have GNU GPG installed on your host.
- Generate a GPG signing key pair if you don't already have

```
gpg --full-generate-key
```

- Use the `gpg --list-secret-keys --keyid-format=long` command to list the long form of the GPG keys

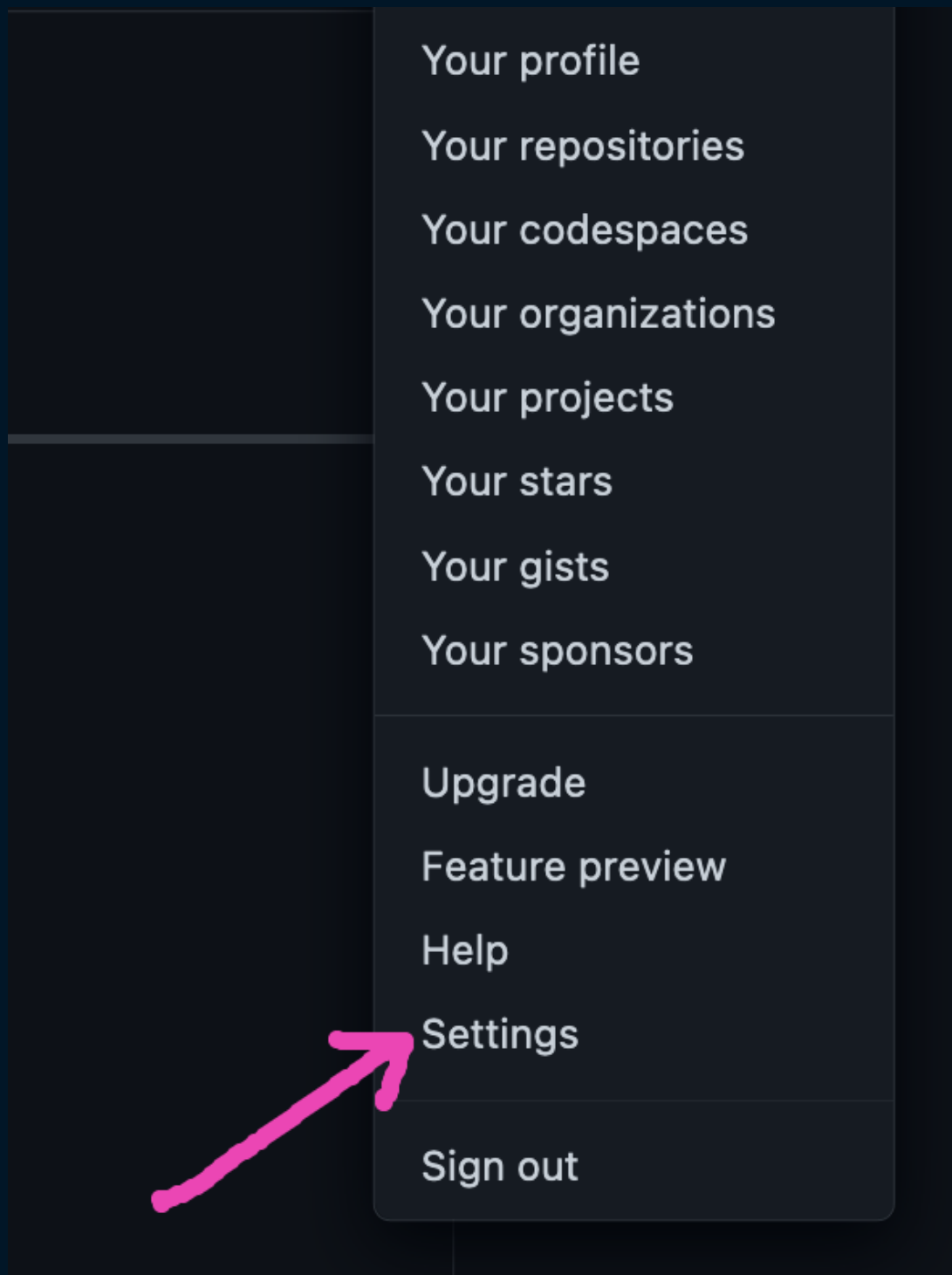
```
gpg --list-secret-keys --keyid-format=long
/Users/bobby/.gnupg/pubring.kbx
-----
sec   rsa4096/E630A0A00CAA7AAA 2021-10-01 [SC] [expires:
2026-10-01]
      5F1F417F8A043C888888888888E630F6D35CFA7ECD
uid           [ultimate] Bobby Illiev (For signing git
commits) <bobby@bobbyiliev.com>
ssb   rsa4096/46EE4AA180001AA6 2021-10-01 [E] [expires:
2026-10-01]
```

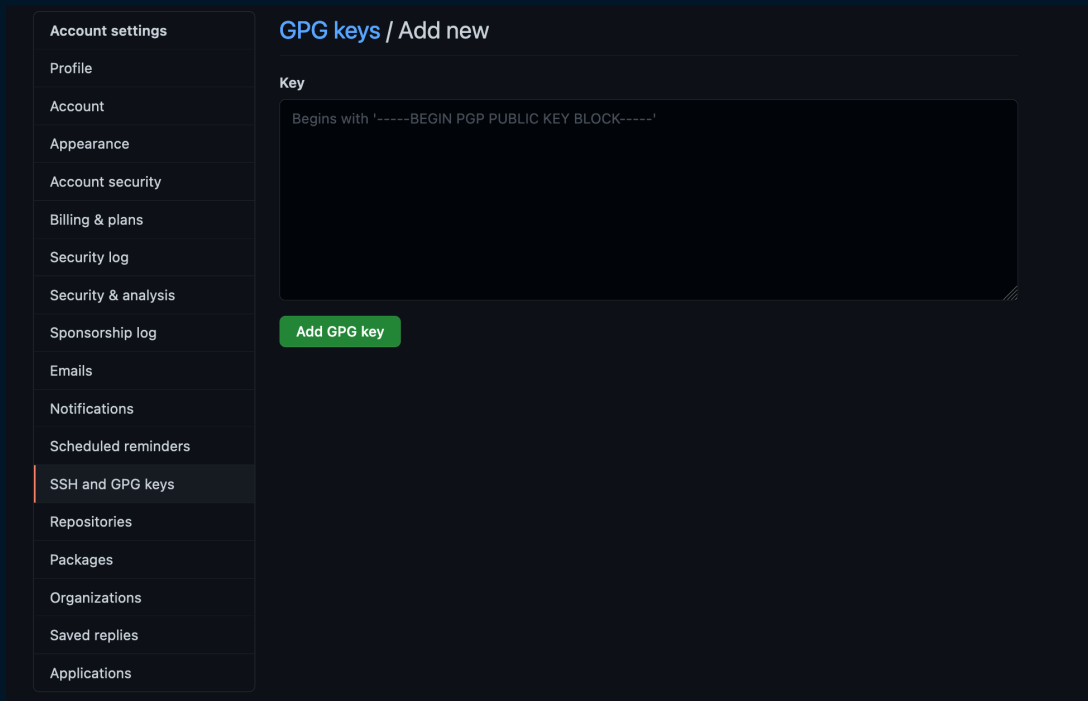
- Copy the long form of the GPG key ID you'd like to use. In this sample, the GPG key ID is `E630A0A00CAA7AAA`.

- Export the public key:

```
gpg --armor --export E630A0A00CAA7AAA
```

- Copy your GPG key, beginning with -----BEGIN PGP PUBLIC KEY BLOCK----- and ending with -----END PGP PUBLIC KEY BLOCK-----.
- Login to GitHub or GitLab and add a new GPG key under settings:





- Set your GPG signing key in Git: (If you intend to add the signing key per repository, the omit the `--global` flag)

```
git config --global user.signingkey E630A0A00CAA7AAA
```

- Enable automatic signing for all commits:

```
git config --global commit.gpgsign true
```

- Or Sign per commit by passing `-S` option to `git commit`:

```
git commit -S -m "your commit message"
```

After running the `git commit` command, we can use the `git status` command again to check the current status:

```
git status
```

Output:

```
On branch main
nothing to commit, working tree clean
```

As you can see, Git is telling us that there are no changes to be committed as we've already committed them.

Let's go ahead and make another change to the `README.md` file. You can open the file with your favorite text editor and make the change directly, or you can run the following command:

```
echo "Git is awesome!" >> README.md
```

The above would add a new line at the bottom of the `README.md` file. So if we were to run `git status` again, we will see the following output:

```
On branch main
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")
```

As you can see, Git has detected that the `README.md` file has been modified and is also prompting us to use the command that we've learned to first stage/add the file!

In case that you wanted to change your last commit message, you can run the `git commit --amend` command. This will open the default editor where you can change your commit message. Also, this allows you to change the commit changes.

The `git status` command gives us a great overview of the files that have changed, but it does not show us what the changes actually are. In the next chapter, we are going to learn how to check the differences between the last commit and the current changes.

Git Diff

As mentioned in the last chapter, the `git status` command gives us a great overview of the files that have changed, but it does not show us what the changes actually are.

You can check the actual changes that were made with the `git diff` command. If we were to run the command in our repository, we would see the following output:

```
diff --git a/README.md b/README.md
index 9366068..2b14655 100644
--- a/README.md
+++ b/README.md
@@ -1,2 @@
  # Demo Project
+Git is awesome
```

As we only changed the `README.md` file, Git is showing us the following:

- `diff --git a/README.md b/README.md`: here git indicates that it shows the changes made to the `README.md` file since the last commit compared to the current version of the file.
- `@@ -1,2 @@`: here git indicates that 1 new line was added
- `+Git is awesome`: here, the important part is the `+`, which indicates that this is a new line that was added. In case that we remove a line, you would see a `-` sign instead.

In our case, as we only added 1 new line to the file, Git indicates that only 1 file was changed and that only 1 new line was added.

Next, let's go ahead and stage that change and commit it with the

comments that we've learned from the previous chapters!

- Stage the changed file:

```
git add README.md
```

- Then again run `git status` to check the current status:

```
git status
```

The output would look like this, indicating that there is 1 modified file:

```
On branch main
Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        modified:   README.md
```

- Commit the changes:

```
git commit -m "Update README.md"
```

Finally, if you run `git status` again you will see that there are no changes to be committed.

I always run `git status` and `git diff` before making any commits, just so that I'm sure what has changed.

In some cases, you would like to see a list of the previous commits. We will learn how to do that in the next chapter.

Git Log

In order to list all of the previous commits, you can use the following command:

```
git log
```

This will provide you with your commit history, the output would look like this:

```
commit da46ce39a3fd663ff802d013f834431d4b4159a5 (HEAD -> main)
Author: Bobby Iliev <bobby@bobbyiliev.com>
Date:   Fri Mar 12 17:14:02 2021 +0000

    Update README.md

commit fa583473b4be2807b45f35b755aa84ac78922259
Author: Bobby Iliev <bobby@bobbyiliev.com>
Date:   Fri Mar 12 17:01:17 2021 +0000

    Initial commit
```

Rundown of the output:

- **commit da46ce39a3fd663ff802d013f834431d4b4159a5**: Here you can see the specific commit ID
- **Author: Bobby Iliev...** : Then you can see who created the changes
- **Date: Fri Mar 12...**: After that, you've got the exact time and date when the commit was created
- Finally, you have the commit message. This is one of the reasons why it is important to write short and descriptive commit messages

so that later on, you could tell what changes were introduced by the particular commit.

If you want to check the differences between the current state of your repository and a particular commit, what you could do is use the `git diff` command followed by the commit ID:

```
git diff fa583473b4be2807b45f35b755aa84ac78922259
```

In my case the output will be the following:

```
diff --git a/README.md b/README.md
index 9366068..2b14655 100644
--- a/README.md
+++ b/README.md
@@ -1,2 @@
-# Demo Project
+Git is awesome
```

So the difference between that specific commit and the current state of the repository is the change in the `README.md` file.

In case that you wanted to see only the commit IDs and commit messages on one line, you could add the `--oneline` argument:

```
git log --oneline
```

Output:

```
* da46ce3 (HEAD -> main) Update README.md
* fa58347 Initial commit
```

With that, you now know how to check your commit history! Next, let's

go ahead and learn how to exclude specific files from Git!

Gitignore

In some cases, you might not want to commit some of your files to Git due to security reasons.

For example, if you have a config file where you have all of your database credentials and other sensitive secrets, you should never add it to Git and push it to GitHub as other people will be able to get hold of that sensitive information.

To do so, you need to have a `gitignore` file which includes a list of all of the files and directories that should be excluded from your Git repository. In this chapter, you will learn how to do that!

Ignoring a specific file

Let's have a look at the following example if you had a `PHP` project and a file called `config.php`, which stores your database connection string details like username, password, host, etc.

In order to exclude that file from your git project, you could create a file called `.gitignore` inside your project's directory:

```
touch .gitignore
```

Then inside that file, all that you need to add is the name of the file that you want to ignore, so the content of the `.gitignore` file would look like this:

```
config.php
```

That way, the next time you run `git add .` and then run `git commit` and `git push`, the `config.php` file will be ignored and will not be added nor pushed to your Github repository.

That way, you would keep your database credentials safe!

Ignoring a whole directory

In some cases, you might want to ignore a whole folder. For example, if you have a huge `node_modules` folder, there is no need to add it and commit it to your Git project, as that directory is generated automatically whenever you run `npm install`.

The same would go for the `vendor` folder in Laravel. You should not really add the `vendor` folder to your Git project, as all of the content of that folder is generated automatically whenever you run `composer install`.

So in order to ignore the `vendors` and `node_modules` folders, you could just add them to your `.gitignore` file:

```
# Ignored folders
/vendor/
node_modules/
```

Getting a gitignore file for Laravel

In order to get a `gitignore` file for Laravel, you could get the file from [the official Laravel Github repository] here(<https://github.com/laravel/laravel/>).

The file would look something like this:

```
/node_modules
/public/hot
/public/storage
/storage/*.key
/vendor
.env
.env.backup
.phpunit.result.cache
Homestead.json
Homestead.yaml
npm-debug.log
yarn-error.log
```

It essentially includes all of the files and folders that are not needed to get the application up and running.

Using gitignore.io

As the number of frameworks and application grows day by day, it might be hard to keep your `.gitignore` files up to date or it could be intimidating if you had to search for the correct `.gitignore` file for every specific framework that you use.

I recently discovered an open-source project called gitignore.io. It is a site and a CLI tool with a huge list of predefined `gitignore` files for different frameworks.

All that you need to do is visit the site and search for the specific framework that you are using.

For example, let's search for a `.gitignore` file for Node.js:



Then just hit the **Create button** and you would instantly get a well

documented [.gitignore](#) file for your Node.js project, which will look like this:

```
# Created by
https://www.toptal.com/developers/gitignore/api/node
# Edit at
https://www.toptal.com/developers/gitignore?templates=node

### Node ###
# Logs
logs
*.log
npm-debug.log*
yarn-debug.log*
yarn-error.log*
lerna-debug.log*

# Diagnostic reports (https://nodejs.org/api/report.html)
report.[0-9]*.[0-9]*.[0-9]*.[0-9]*.json

# Runtime data
pids
*.pid
*.seed
*.pid.lock

# Directory for instrumented libs generated by
# jscoverage/JSCover
lib-cov

# Coverage directory used by tools like Istanbul
coverage
*.lcov

# nyc test coverage
.nyc_output

# Grunt intermediate storage
# (https://gruntjs.com/creating-plugins#storing-task-files)
.grunt

# Bower dependency directory (https://bower.io/)
bower_components

# node-waf configuration
```

```
.lock-wscript

# Compiled binary addons (https://nodejs.org/api/addons.html)
build/Release

# Dependency directories
node_modules/
jspm_packages/

# TypeScript v1 declaration files
typings/

# TypeScript cache
*.tsbuildinfo

# Optional npm cache directory
.npm

# Optional eslint cache
.eslintcache

# Microbundle cache
.rpt2_cache/
.rts2_cache_cjs/
.rts2_cache_es/
.rts2_cache_umd/

# Optional REPL history
.node_repl_history

# Output of 'npm pack'
*.tgz

# Yarn Integrity file
.yarn-integrity

# dotenv environment variables file
.env
.env.test

# parcel-bundler cache (https://parceljs.org/)
.cache

# Next.js build output
.next
```

```
# Nuxt.js build / generate output
.nuxt
dist

# Gatsby files
.cache/
# Comment in the public line in if your project uses Gatsby
and not Next.js
# https://nextjs.org/blog/next-9-1#public-directory-support
# public

# vuepress build output
.vuepress/dist

# Serverless directories
.serverless/

# FuseBox cache
.fusebox/

# DynamoDB Local files
.dynamodb/

# TernJS port file
.tern-port

# Stores VSCode versions used for testing VSCode extensions
.vscode-test

# End of https://www.toptal.com/developers/gitignore/api/node
```

Using gitignore.io CLI

If you are a fan of the command-line, the gitignore.io project offers a CLI version as well.

To get it installed on Linux, just run the following command:

```
git config --global alias.ignore \  
'!gi() { curl -sL  
https://www.toptal.com/developers/gitignore/api/$@ ;}; gi'
```

If you are using a different OS, I would recommend checking out the documentation [here](#) on how to get it installed for your specific Shell or OS.

Once you have the **gi** command installed, you could list all of the available **.gitignore** files from gitignore.io by running the following command:

```
gi list
```

For example, if you quickly needed a **.gitignore** file for Laravel, you could just run:

```
gi laravel
```

And you would get a response back with a well-documented Laravel **.gitignore** file:

```
# Created by
https://www.toptal.com/developers/gitignore/api/laravel
# Edit at
https://www.toptal.com/developers/gitignore?templates=laravel

### Laravel ###
/vendor/
node_modules/
npm-debug.log
yarn-error.log

# Laravel 4 specific
bootstrap/compiled.php
app/storage/

# Laravel 5 & Lumen specific
public/storage
public/hot

# Laravel 5 & Lumen specific with changed public path
public_html/storage
public_html/hot

storage/*.key
.env
Homestead.yaml
Homestead.json
/.vagrant
.phpunit.result.cache

# Laravel IDE helper
*.meta.*
_ide_*

# End of
https://www.toptal.com/developers/gitignore/api/laravel
```

Conclusion

Having a **gitignore** file is essential, it is great that you could use a tool like the [gitignore.io](https://www.gitignore.io) to generate your **gitignore** file automatically,

depending on your project!

If you like the gitignore.io project, make sure to check out and contribute to the project [here](#).


SSH Keys

There are a few ways to authenticate with GitHub. Essentially you would need this so that you could push your local changes from your laptop to your GitHub repository.

You could use one of the following methods:

- HTTPS: Essentially, this would require your GitHub username and password each time you try to push your changes
- SSH: With SSH, you could generate an SSH Key pair and add your public key to GitHub. That way, you would not be asked for your username and password every time you push your changes to GitHub.

Quick setup — if you've done this kind of thing before

 Set up in Desktop

or

HTTPS

SSH

`git@github.com:bobbyiliev/demo-repo.git`

One thing that you need to keep in mind is that the GitHub repository URL is different depending on whether you are using SSH or HTTPS:

- HTTPS: `https://github.com/bobbyiliev/demo-repo.git`
- SSH: `git@github.com:bobbyiliev/demo-repo.git`

Note that when you choose SSH, the `https://` part is changed with `git@`, and you have `:` after `github.com` rather than `/`. This is important as this defines how you would like to authenticate each time.

Generating SSH Keys

In order to generate a new SSH key pair in case that you don't have

one, you can run the following command:

```
ssh-keygen
```

For security reasons you can specify a passphrase, which essentially is the password for your private SSH key.

The above would generate 2 files:

- 1 **private** SSH key and 1 public SSH key. The private key should always be stored safely on your laptop, and you should not share it with anyone.
- 1 **public** SSH key, which you need to upload to GitHub.

The two files will be automatically generated at the following folder:

```
~/.ssh
```

You can use the `cd` command to access the folder:

```
cd ~/.ssh
```

Then with `ls` you can check the content:

```
ls
```

Output:

```
id_rsa id_rsa.pub
```

The `id_rsa` is your private key, and again you should not share it with

anyone.

The `id_rsa.pub` is the public key that would need to be uploaded to GitHub.

Adding the public SSH key to GitHub

Once you've created your SSH keys, you need to upload the **public** SSH key to your GitHub account. To do so, you first need to get the content of the file.

To get the content of the file, you can use the `cat` command:

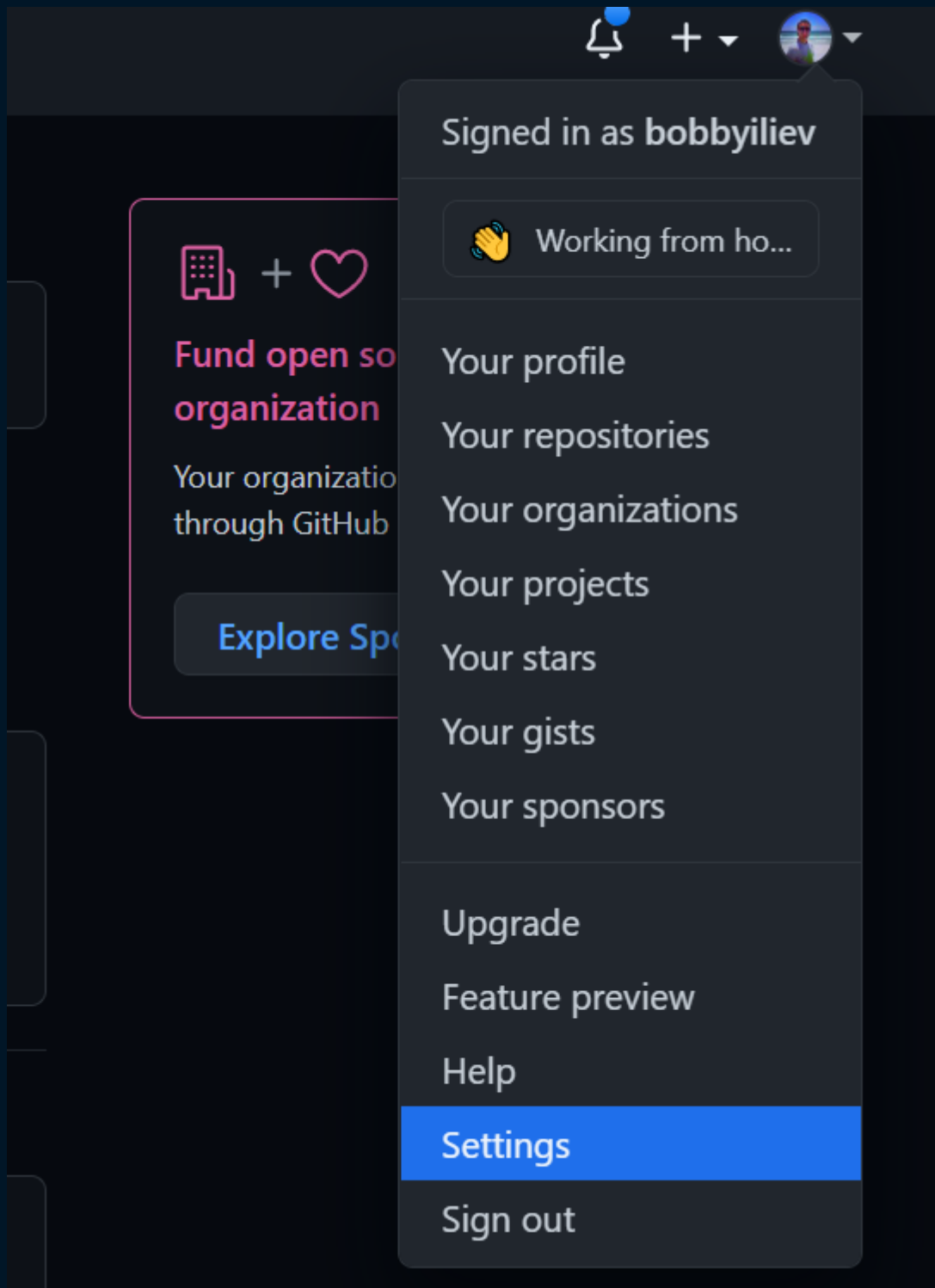
```
cat ~/.ssh/id_rsa.pub
```

The output will look like this:

```
ssh-rsa AAB3NzaC1yc2EAAAADAQAB..... your_user@your_host
```

Copy the whole thing and then visit [GitHub](#) and follow these steps:

- Click on your profile picture on the right top
- Then click on settings



- On the left, click on **SSH and GPG Keys**:

Account settings
Profile
Account
Appearance New
Account security
Billing & plans
Security log
Security & analysis
Emails
Notifications
Scheduled reminders
SSH and GPG keys
Repositories
Packages

Public profile

Name

Your name may appear around GitHub where you contribute or are mentioned. You can remove it at any time.

Public email
Remove

You can manage verified email addresses in your [email settings](#).

Bio

You can @mention other users and organizations to link to them.

URL

Twitter username

- After that, click on the **New SSH Key** button
- Then specify a title of the SSH key, it should be something descriptive, for example: **Work Laptop SSH Key**. And in the **Key** area, paste your public SSH key:

Bobby Iliev
Your personal account
Switch to another account

Go to your personal profile

Account settings
Profile
Account
Appearance New
Account security
Billing & plans
Security log
Security & analysis

SSH keys / Add new

Title

Key

```
ssh-rsa
AB3NzaVVZWR1FsRIZTWHBVM5Cb1VYcEdOVmw2U2taUIZVWkNVVIZTUWxWVJrTJUWVpDVVd0R1VsSkdiFHla2FJ
VVZWR1FsRIZTWHBVM5Cb1VYcEdOVmw2U2taUIZVWkNVVIZTUWxWVJrTJUWVpDVVd0R1VsSkdiVVZWR1FsRIZT
WHBVM5Cb1VYcEdOVmw2U2taUIZVWkNVVIZTUWxWVJrTJUWVpDVVd0R1VsSkdi bobby@bobby.sh
```

- Finally click the **Add SSH Key** button at the bottom of the page

Conclusion

With that, you now have your SSH Keys generated and added to GitHub. That way, you will be able to push your changes without having to type your GitHub password and user each time.

For more information about SSH keys, make sure to check this tutorial [here](#).

Git Push

Then finally, once you've made all of your changes, you've staged them with the `git add .` command, and then you committed the changes with the `git commit` command. You have to push those changes to your remote GitHub repository.

Before you can push to your remote GitHub repository, you would need to first create your remote repository via GitHub as per Chapter 6.

Once you have your remote GitHub repository ready, you can add it to your local project with the following command:

```
git remote add origin  
git@github.com:your_username/your_repo_name.git
```

Note: Make sure to change the `your_username` and `your_repo_name` details accordingly.

This is how you would link your local Git project with your remote GitHub repository.

If you've read the previous chapter, you will most likely notice we are using SSH as the authentication method.

If you did not follow the steps from the previous chapter, you could use HTTPS rather than SSH:


```
git remote add origin  
https://github.com/your_username/your_repo_name.git
```

In order to verify your remote repository, you could run the following command:

```
git remote -v
```

To do so, just use the `git push` command:

```
git push origin main
```

If you are using SSH with your SSH key uploaded to GitHub, the push command will not ask you for a password, but it would push your changes to GitHub straight away.

In case that you did not run the `git remote add` command, you will get the following error:

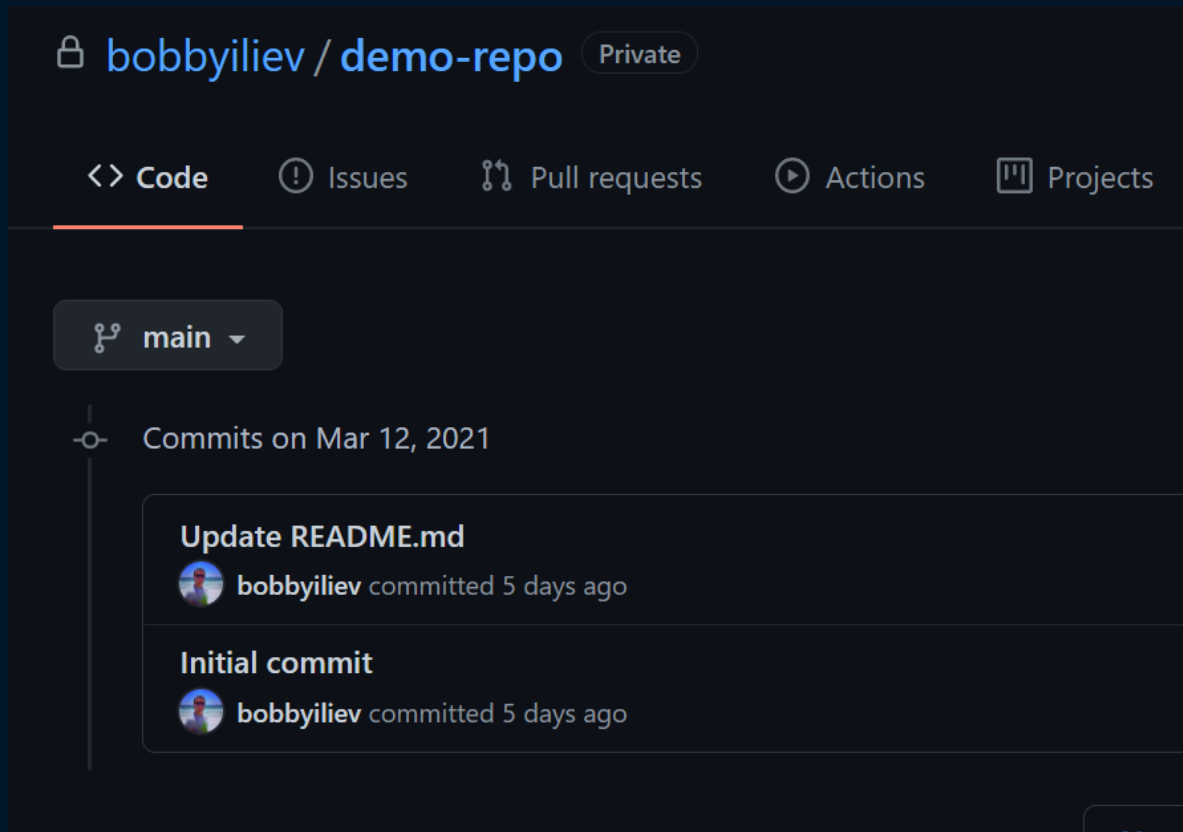
```
fatal: 'origin' does not appear to be a git repository  
fatal: Could not read from remote repository.  
  
Please make sure you have the correct access rights  
and the repository exists.
```

This would mean that you've not added your GitHub repository as the remote repository. This is why we run the `git remote add` command in order to create that connection between your local repository and the remote GitHub repository.

Note that the connection would be in place if you used the `git clone` command to clone an existing repository from GitHub to your local machine. We will go through the `git pull` command in the next few

chapters as well.

After running the `git push` command, you can head over to your GitHub project, and you will be able to see the commits that you've made locally, present on GitHub. If you were to click on the `commits` link, you would be able to see all commits just as if you were to run the `git log` command:



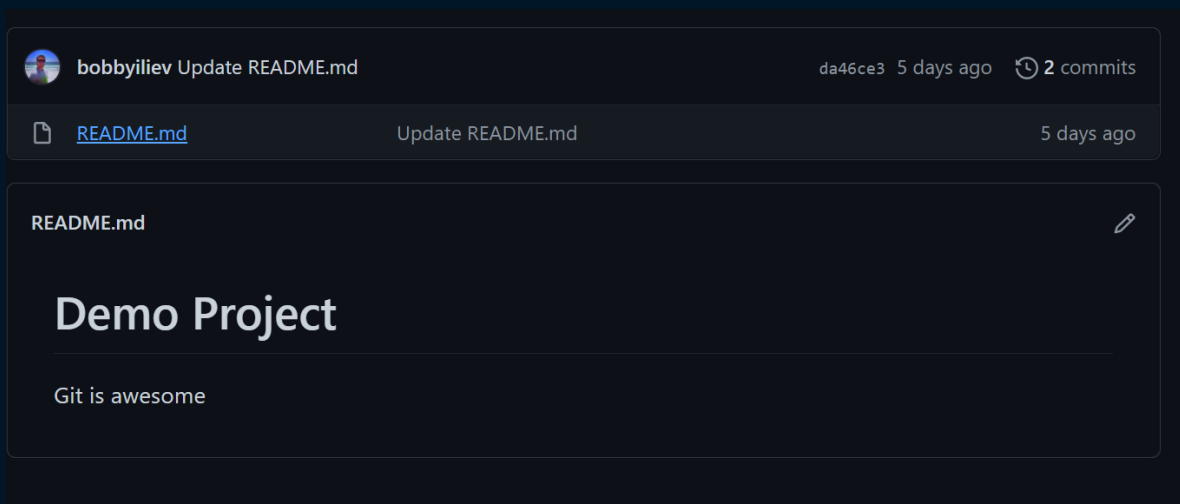
Now that you know how to push your latest changes from your local Git project to your GitHub repository, it's time to learn how to pull the latest changes from GitHub to your local project.

Git Pull

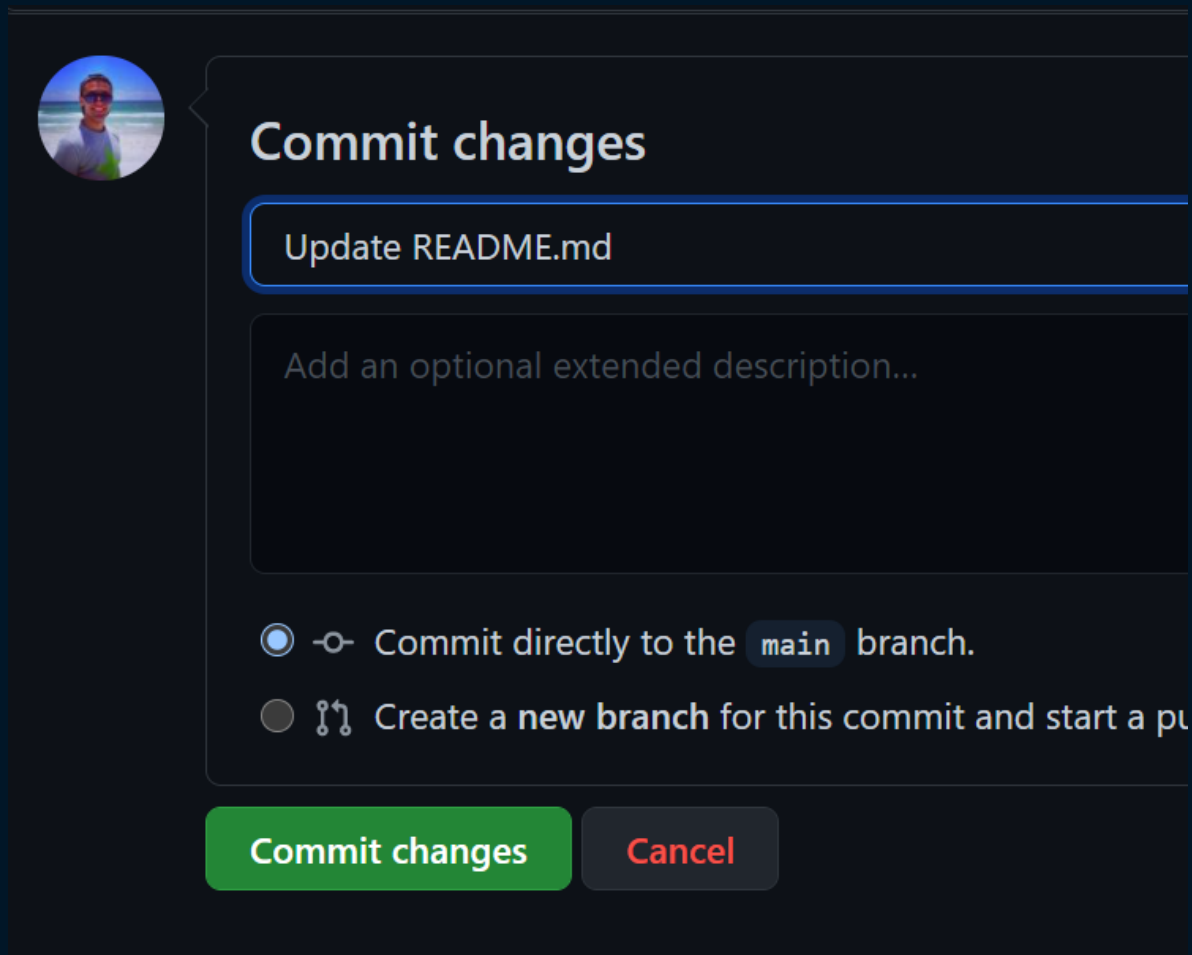
If you are working on a project with multiple people, the chances are that the codebase will change very often. So you would need to have a way to get the latest changes from the GitHub repository to your local machine.

You already know that you can use the `git push` command to push your latest commits, so in order to do the opposite and pull the latest commits from GitHub to your local project, you need to use the `git pull` command.

To test this, let's go ahead and make a change directly on GitHub directly. Once you are there, click on the `README.md` file and then click on the pencil icon to edit the file:



Make a minor change to the file, add a descriptive commit message and click on the `Commit Changes` button:

A screenshot of the GitHub 'Commit changes' dialog. On the left is a circular profile picture of a person with glasses and a blue shirt. The main area has a title 'Commit changes' in bold. Below it is a text input field containing 'Update README.md'. Underneath is a larger text area with the placeholder 'Add an optional extended description...'. At the bottom, there are two radio button options: the first is selected and says 'Commit directly to the main branch.' with 'main' in a dark box; the second is unselected and says 'Create a new branch for this commit and start a pull request'. At the very bottom are two buttons: a green 'Commit changes' button and a grey 'Cancel' button.

Commit changes

Update README.md

Add an optional extended description...

☒ Commit directly to the **main** branch.

☐ Create a new branch for this commit and start a pull request

Commit changes Cancel

With that, you've now made a commit directly on GitHub, so your local repository will be behind the remote GitHub repository.

If you were to try and push a change now to that same branch, it would fail with the following error:

```
! [rejected]          main -> main (fetch first)
error: failed to push some refs to
'git@github.com:bobbyiliev/demo-repo.git'
hint: Updates were rejected because the remote contains work
that you do
hint: not have locally. This is usually caused by another
repository pushing
hint: to the same ref. You may want to first integrate the
remote changes
hint: (e.g., 'git pull ...') before pushing again.
hint: See the 'Note about fast-forwards' in 'git push --help'
for details.
```

As stated in the output, the remote repository is ahead of your local one, so you need to run the `git pull` command to get the latest changes:

```
git pull origin main
```

The output that you will get will look like this:

```
remote: Enumerating objects: 5, done.
remote: Counting objects: 100% (5/5), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (3/3), 646 bytes | 646.00 KiB/s, done.
From github.com:bobbyiliev/demo-repo
* branch                main          -> FETCH_HEAD
   da46ce3..442afa5      main          -> origin/main

 README.md | 3 ++-
 1 file changed, 2 insertions(+), 1 deletion(-)
```

We can see that the `README.md` file was changed and that there were 2 new lines added and 1 line deleted.

Now, if you were to run `git log`, you will see the commit that you've made on GitHub available locally.

Of course, this is a simplified scenario. In the real world, you would not make any changes directly to GitHub, but you would most likely work with other people on the same project, and you would have to pull their latest changes on a regular basis.

You need to make sure that you pull the latest changes every time before you try to push your changes.

Now that you know the basic Git commands let's go ahead and learn what Git Branches are.

Git Branches

So far, we have been working only on our Main branch, which is created by default when creating a new GitHub repository. In this chapter, you will learn more about Git Branches. Why you need them and how to work with them.

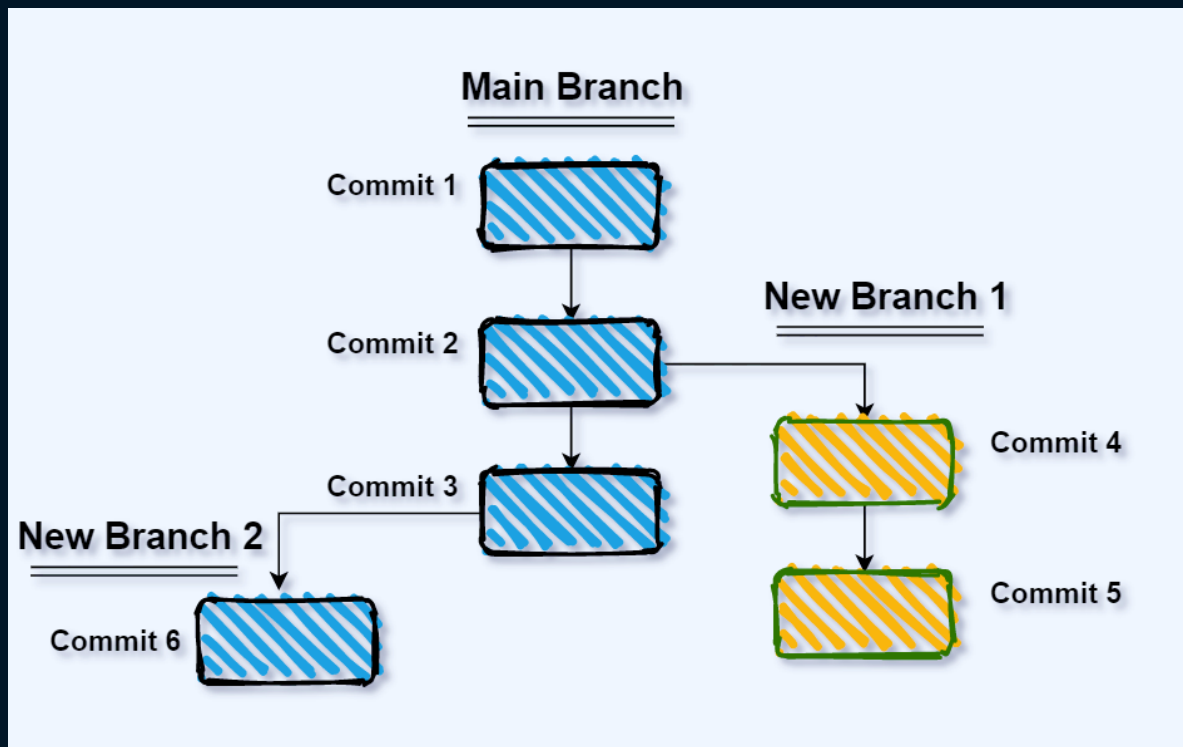
The official definition of a Git branch from the git-scm.com website is the following:

A branch in Git is simply a lightweight movable pointer to one of these commits.

This might be a bit confusing in case that you are just getting started. So you could think of branches as a way to work on your project by adding a new feature or bug fixes without affecting the Main branch.

That way, each new feature or bug fix that you are developing could live on a separate branch, and later on, once you are ready and have fully tested the changes, you can merge the new branch to your main branch. You will learn more about merging in the next chapter!

If we look into the following illustration where we have a few branches, you can see that it looks like a tree, hence the term branching:



Thanks to the multiple branches, you can have multiple people working on different features or fixes at the same time each one working on their own branch.

The image shows 3 branches:

- The main branch
- New Branch 1
- New Branch 2

The main branch is the default branch that you are already familiar with. We can consider the other two branches as two new features that are being developed. One developer could be working on a new contact form for your web application on branch #1, and another developer could be working on a user registration form feature on branch #2.

Thanks to the separate branches, both developers could be working on the same project without getting into each others way.

Next, let's go ahead and learn how to create new branches and see this in action!

Creating a new branch

Let's start by creating a new branch called `newFeature`. In order to create the branch, you could use the following command:

```
git branch newFeature
```

Now, in order to switch to that new branch, you would need to run the following command:

```
git checkout newFeature
```

Note: You can use the `git checkout` command to switch between different branches.

The above two commands could be combined into 1, so that you don't have to create the branch first and then switch to the new branch. You could use this command instead, which would do both:

```
git checkout -b newFeature
```

Once you run this command, you will see the following output:

```
Switched to a new branch 'newFeature'
```

In order to check what branch you are currently on, you can use the following command:

```
git branch
```

Output:

```
main
* newFeature
```

We can tell that we have 2 branches: the `main` one and the `newFeature` one that we just created. The star before the `newFeature` branch name indicates that we are currently on the `newFeature` branch.

If you were to use the `git checkout` command to switch to the `main` branch:

```
git checkout main
```

And then run `git branch` again. You will see the following output indicating that you are now on the `main` branch:

```
* main
newFeature
```

Making changes to the new branch

Now let's go ahead and make a change on the new feature branch. First switch to the branch with the `git checkout` command:

```
git checkout newFeature
```

Note: we only need to add the `-b` argument when creating new branches

Check that you've actually switched to the correct branch:

```
git branch
```

Output:

```
main  
* newFeature
```

Now let's create a new file with some demo content. You can do that with the following command:

```
echo "<h1>My First Feature Branch</h1>" > feature1.html
```

The above will echo out the `<h1>My First Feature Branch</h1>` string and store it in a new file called `feature1.html`.

After that, stage the file and commit the change:

```
git add feature1.html  
git commit -m "Add feature1.html"
```

The new `feature1.html` file will only be present on the `newFeature` branch. If you were to switch to the `main` branch and run the `ls` command or check the `git log`, you will be able to see that the file is not there.

You can check that by using the `git log` command:

```
git log
```

With that, we've used quite a bit of the commands that we've covered in the previous chapters!

Renaming a branch

In case that you've created a branch with a wrong name or if you think that the name could be improved as it is not descriptive enough, you can rename a branch by running the following command:

```
git branch -m wrong-branch-name correct-branch-name
```

If you want to rename your **current branch**, you could just run the following:

```
git branch -m my-branch-name
```

After that, if you run `git branch` again you will be able to see the correct branch name.

Deleting a branch

If you wanted to completely delete a specific branch you could run the following command:

```
git branch -d name_of_the_branch
```

This would only delete the branch from your local repository, in case that you've already pushed the branch to GitHub, you can use the following command to delete the remote branch:

```
git push origin --delete name_of_the_branch
```

If you wanted to synchronize your local branches with the remote

branches you could run the following command:

```
git fetch
```

Conclusion

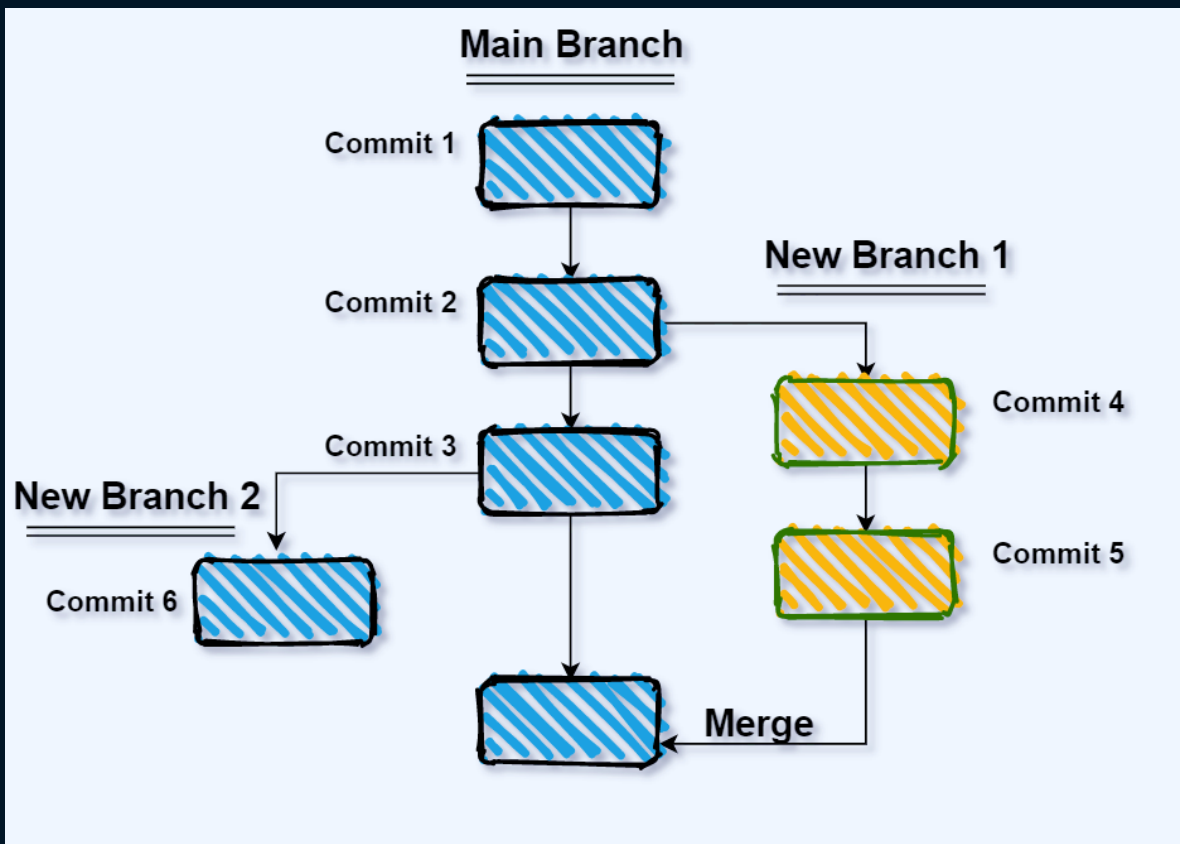
With that, our `newFeature` branch is now ahead of the main branch with 1 commit. So in order to get that new changes over to the main branch, we need to merge the `newFeature` branch into our `main` branch.

In the next chapter, you will learn how to merge your changes from one branch to another!

One thing that you might want to keep in mind is that in the past when creating a new GitHub repository the default branch name was called `master`, however new repositories created on GitHub use `main` instead of `master` as the default branch name. This is part of GitHub's effort to remove unnecessary references to slavery and replace them with more inclusive terms.

Git Merge

Once the developers are ready with their changes, they can merge their feature branches into the main branch and make those features live on the website.



If you followed the steps from the previous chapter, then your **newFeature** branch is now ahead of the main branch with 1 commit. So in order to get that new changes over to the main branch, we need to merge the **newFeature** branch into our **main** branch.

Merging a branch

You can do that by following these steps:

- First switch to your `main` branch:

```
git checkout main
```

- After that, in order to merge your `newFeature` branch and the changes that we created in the last chapter, run the following `git merge` command:

```
git merge newFeature
```

Output:

```
Updating ab1007b..a281d25
Fast-forward
 feature1.html | 1 +
 1 file changed, 1 insertion(+)
 create mode 100644 feature1.html
```

As you were on the `main` branch when you ran the `git merge` command, Git will take all of the commits from that branch and merge them into the `main` branch.

Now, if you run the `ls` command, you will be able to see the new `feature1.html` file, and if you check the commit history with the `git log` command, you will see the commit from the `newFeature` branch present on your `main` branch.

Before doing the merge, you could again use the `git diff` command to check the differences between your current branch and the branch that you want to merge. For example, if you are currently on the `main` branch, you could use the following:

```
git diff newFeature
```

In this case, the merge went through smoothly as there were no merge conflicts. However, if you are working on a real project with multiple people making changes, there might be some merge conflicts. Essentially this happens when changes are made to the same line of a file, or when one developer edits a file on one branch and another developer deletes the same file.

Resolving conflicts

Let's simulate a conflict. To do so, create a new branch:

```
git checkout -b conflictDemo
```

Then edit the `feature1.html` file:

```
echo "<p>Conflict Demo</p>" >> feature1.html
```

The command above will echo out the `<p>Conflict Demo</p>` string, and thanks to the double grater sign `>>`, the string will be added to the bottom of the `feature1.html` file. You can check the content of the file with the `cat` command:

```
cat feature1.html
```

Output:


```
<h1>My First Feature Branch</h1>
<p>Conflict Demo</p>
```

You can again run `git status` and `git diff` to check what exactly has been modified before committing.

After that, go ahead and commit the change:

```
git commit -am "Conflict Demo 1"
```

Note that we did not run the `git add` command, but instead, we used the `-a` flag, which stands for `add`. You can do that for files that have been added to git and have just been modified. If you've added a new file, then you would have to stage it first with the `git add` command.

Now go switch back to your `main` branch:

```
git checkout main
```

And now, if you check the `feature1.html` file, it will only have the `<h1>My First Feature Branch</h1>` line as the change that we made is still only present on the `conflictDemo` branch.

Now let's go ahead and make a change to the same file:

```
echo "<p>Conflict: change on main branch</p>" >> feature1.html
```

Now we are adding again a line to the bottom of the `feature1.html` file with different content.

Go ahead and stage this and commit the change:

```
git commit -am "Conflict on main"
```

Now your `main` branch and the `conflictDemo` branch have changes to the same file, on the same line. So let's run the `git merge` command and see what happens:

```
git merge conflictDemo
```

Output:

```
Auto-merging feature1.html
CONFLICT (content): Merge conflict in feature1.html
Automatic merge failed; fix conflicts and then commit the
result.
```

As we can see from the output, the merge is failing as there were changes to the same file on the same line, so Git is unsure which is the correct change.

As always, there are multiple ways to fix conflicts. Here we will go through one.

Now if you were to check the content of the `feature1.html` file you will see the following output:

```
<h1>My First Feature Branch</h1>
<<<<<< HEAD
<p>Conflict: change on main branch</p>
=====
<p>Conflict Demo</p>
>>>>>> conflictDemo
```

Initially, it could be a little bit overwhelming, but let's quickly review it:

- <<<<<< HEAD: this part here indicates the start of the changes on your current branch. In our case, the <p>Conflict: change on main branch</p> line is present on the main branch, which is also the branch that we've currently switched to.
- =====: this line indicates where the changes from the current branch end and where the changes from the new branch are coming from. In our case, the change from the new branch is the <p>Conflict Demo</p> line.
- >>>>>> conflictDemo: this indicates the name of the branch that the changes are coming from.

You can resolve the conflict by manually removing the lines that are not needed, so at the end, the file will look like this:

```
<h1>My First Feature Branch</h1>
<p>Conflict: change on main branch</p>
```

In case that you are using an IDE like VS Code, for example, it will allow you to choose which changes to keep with a click of a button.

After resolving the conflict, you will need to make another commit as the conflict is now resolved:

```
git commit -am "Reslove merge conflict"
```

Conclusion

Git branches and merges allow you to work on a project together with other people. One important thing to keep in mind is to make sure that you pull the changes to your local main branch on a regular basis so that it does not get behind from the remote one.

A few more commands which you might find useful once you feel

comfortable with what we've covered so far are the `git rebase` command and the `git cherry-pick` command, which lets you pick which commits from a specific branch you would like to carry over to your current branch.

Reverting changes

As with everything, there are multiple ways to do a specific thing. But what I would usually do in this case I want to undo my latest commit and then commit my new changes is the following.

- Let's say that you made some changes and you committed the changes:

```
git commit -m "Committing the wrong changes"
```

- After that if you run `git log`, you will see the history of everything that has been committed to a repository.
- To undo the last commit, just run the following:

```
git reset --soft HEAD~1
```

The above command will reset back with 1 point.

Note: the above would undo your commit, but it would keep your code changes if you would like to get rid of the changes as well, you need to do a hard reset: `git reset --hard HEAD~1`

- After that, make your new changes

- Once you are done with the changes, run `git add` to add any of the files that you would like to be included in the next commit:

```
git add .
```

- Then use `git commit` as normal to commit your new changes:

```
git commit -m "Your new commit message"
```

- After that, you could again check your history by running:

```
git log
```

Here's a screenshot of the process:

```

root@do-dev:~/demo# git init .
Initialized empty Git repository in /root/demo/.git/
root@do-dev:~/demo# touch demo.txt
root@do-dev:~/demo# git add .
root@do-dev:~/demo# git commit -m "First commit"
[master (root-commit) 45f651d] First commit
 1 file changed, 0 insertions(+), 0 deletions(-)
 create mode 100644 demo.txt
root@do-dev:~/demo# echo "Wrong changes..." > demo.txt
root@do-dev:~/demo# git add .
root@do-dev:~/demo# git commit -m "Wrong commit..."
[master 9688e23] Wrong commit...
 1 file changed, 1 insertion(+)
root@do-dev:~/demo# git log
commit 9688e23761a6ccbbfaa4362a391b50a63d4ba39a (HEAD -> master)
Author: Bobby Iliev <bobby@bobbyiliev.com>
Date:   Wed Jan 8 08:49:49 2020 +0000

    Wrong commit...

commit 45f651dd4e83205fe1a72ac16bf0d7a3ecfba904
Author: Bobby Iliev <bobby@bobbyiliev.com>
Date:   Wed Jan 8 08:49:27 2020 +0000

    First commit
root@do-dev:~/demo# git reset --soft HEAD~1
root@do-dev:~/demo# git log
commit 45f651dd4e83205fe1a72ac16bf0d7a3ecfba904 (HEAD -> master)
Author: Bobby Iliev <bobby@bobbyiliev.com>
Date:   Wed Jan 8 08:49:27 2020 +0000

    First commit
root@do-dev:~/demo# echo "Fixed changes..." > demo.txt
root@do-dev:~/demo# git add .
root@do-dev:~/demo# git commit -m "Fixed commit..."
[master 081f0fb] Fixed commit...
 1 file changed, 1 insertion(+)
root@do-dev:~/demo# git log
commit 081f0fbf3d32ad7e7946e1ec4cc5b432fc699fef (HEAD -> master)
Author: Bobby Iliev <bobby@bobbyiliev.com>
Date:   Wed Jan 8 08:50:28 2020 +0000

    Fixed commit...

commit 45f651dd4e83205fe1a72ac16bf0d7a3ecfba904
Author: Bobby Iliev <bobby@bobbyiliev.com>
Date:   Wed Jan 8 08:49:27 2020 +0000

    First commit
root@do-dev:~/demo#

```

Another approach would be to use `git revert COMMIT_ID` instead.

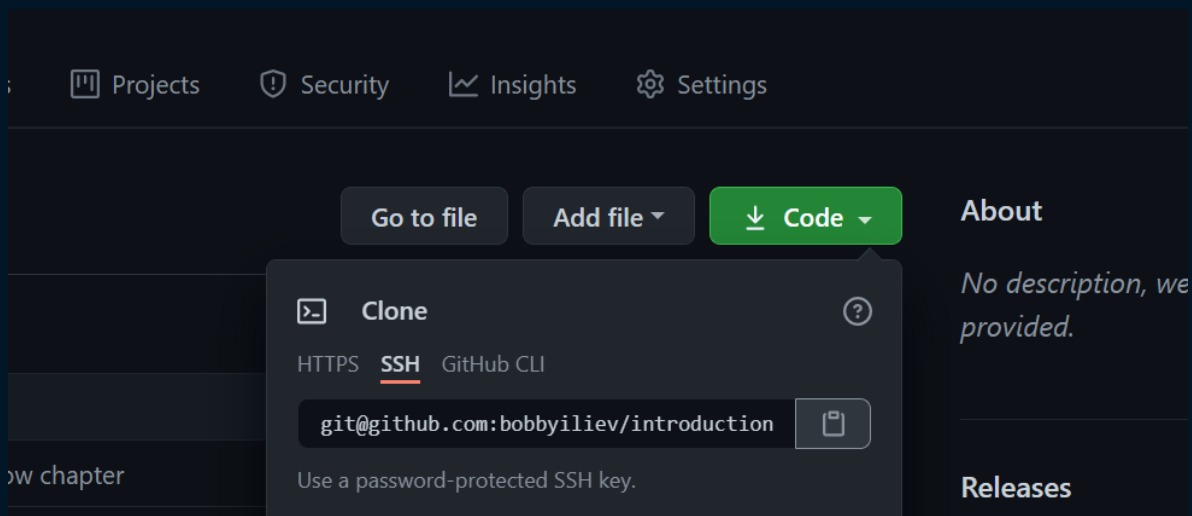
Here is a quick video demo on how to do the above:

[Reverting changes](#)

Git Clone

More often than not, rather than starting a new project from scratch, you would either join a company and start working on an existing project, or you would contribute to an already established open source project. So in this case, in order to get the repository from GitHub to your local machine, you would need to use the `git clone` command.

The most straight forward way to clone your GitHub repository is to first visit the repository in your browser, and then click on the green **Code** button and choose the method that you want to use to clone the repository:



In my case, I would go for the SSH method as I already have my SSH keys configured as per chapter 14.

As I am cloning this repository [here](#), the URL would look like this:

```
git@github.com:bobbyiliev/introduction-to-bash-scripting.git
```

Once you have this in my clipboard, head back to your terminal, go to a directory where you would like to clone the repository to and then run the following command:

```
git clone git@github.com:bobbyiliev/introduction-to-bash-scripting.git
```

The output that you would get will look like this:

```
Cloning into 'introduction-to-bash-scripting'...
remote: Enumerating objects: 21, done.
remote: Counting objects: 100% (21/21), done.
remote: Compressing objects: 100% (16/16), done.
remote: Total 215 (delta 7), reused 14 (delta 4), pack-reused
194
Receiving objects: 100% (215/215), 3.08 MiB | 5.38 MiB/s,
done.
Resolving deltas: 100% (114/114), done.
```

Essentially what the `git clone` command does is to more or less download the repository from GitHub to your local folder.

Now you can start making the changes to the project by creating a new branch, writing some code, and finally committing and pushing your changes!

One important thing to keep in mind is that in case that you are not the maintainer of the repository and do not have the rights to push to the repository, you would need to first fork the original repository and then clone the forked repository from your account. In the next chapter, we will go through the full process of forking a repository!

Forking in Git

When contributing to an open-source project, you will not be able to make the changes directly to the project. Only the repository maintainers have that privilege.

What you need to do instead is to fork the specific repository, make the changes to the forked project and then submit a pull request to the original project. You will learn more about pull requests in the next chapters.

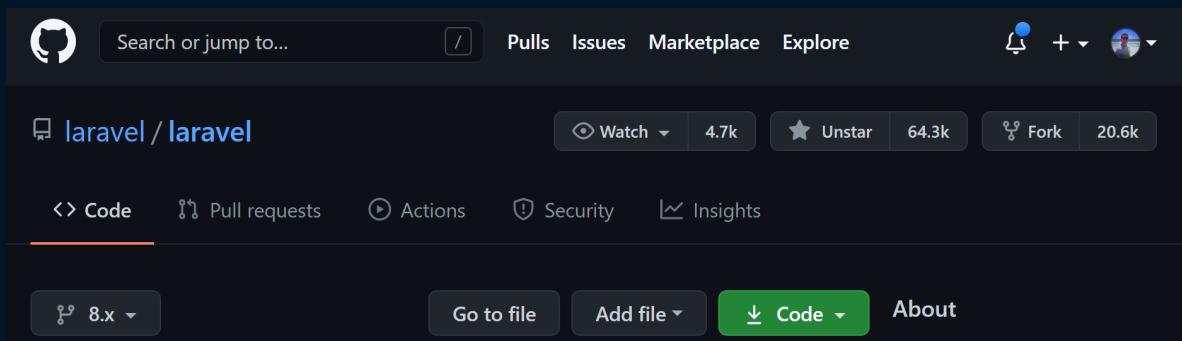
If you clone a repository that you don't have the access to and then try to push the changes directly to that repository, you would get the following error:

```
ERROR: Permission to laravel/laravel.git denied to bobbyiliev.  
Fatal: Could not read from remote repository.
```

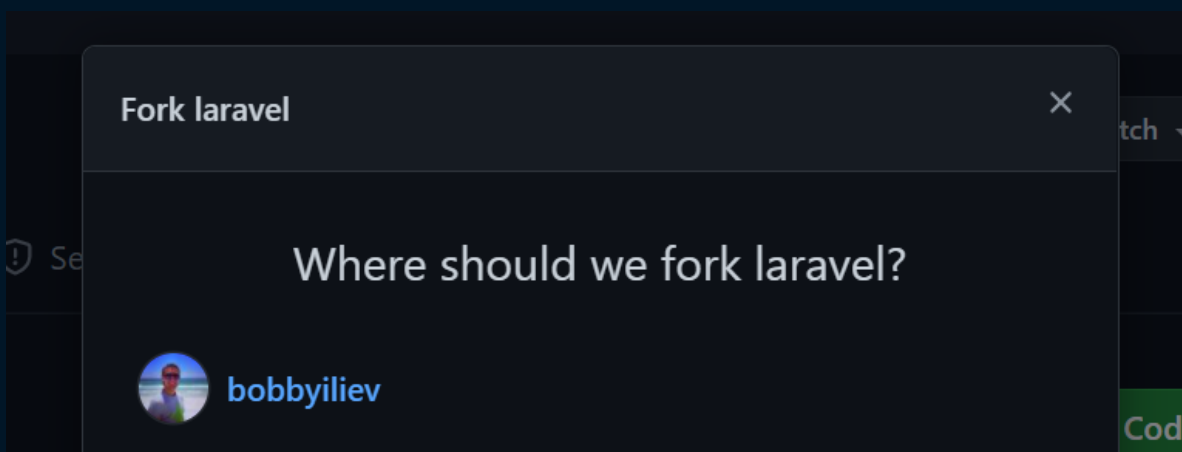
```
Please make sure you have the correct access rights  
and the repository exists.
```

This is where Forks come into play!

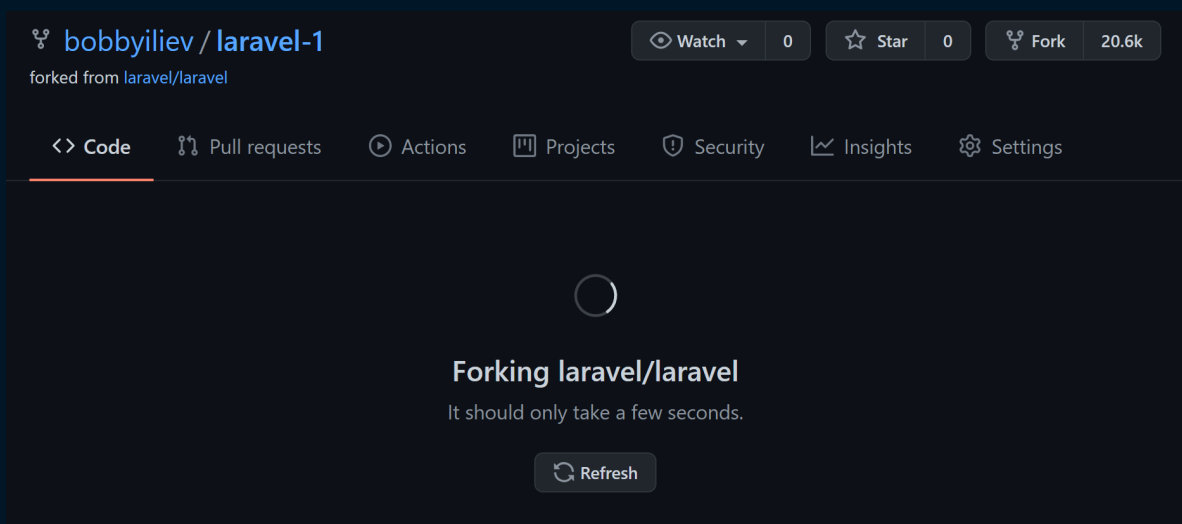
In order to fork a repository, you need to visit the repository via your browser and click on the Fork button on the top right:



Then choose the account that you want to fork the repository to:



Then it might take a few seconds for the repository to be forked under your account:



With that, you would have an exact copy of the repository in question under your account.

The benefit here is that you can now clone the forked repository under your account, make the changes to that repository as normal, and then once you are ready, you can submit a pull request to the original repository contributing your changes.

As we've now mentioned submitting pull requests a few times already, let's go ahead and learn more about pull requests in the next chapter!

Git Workflow

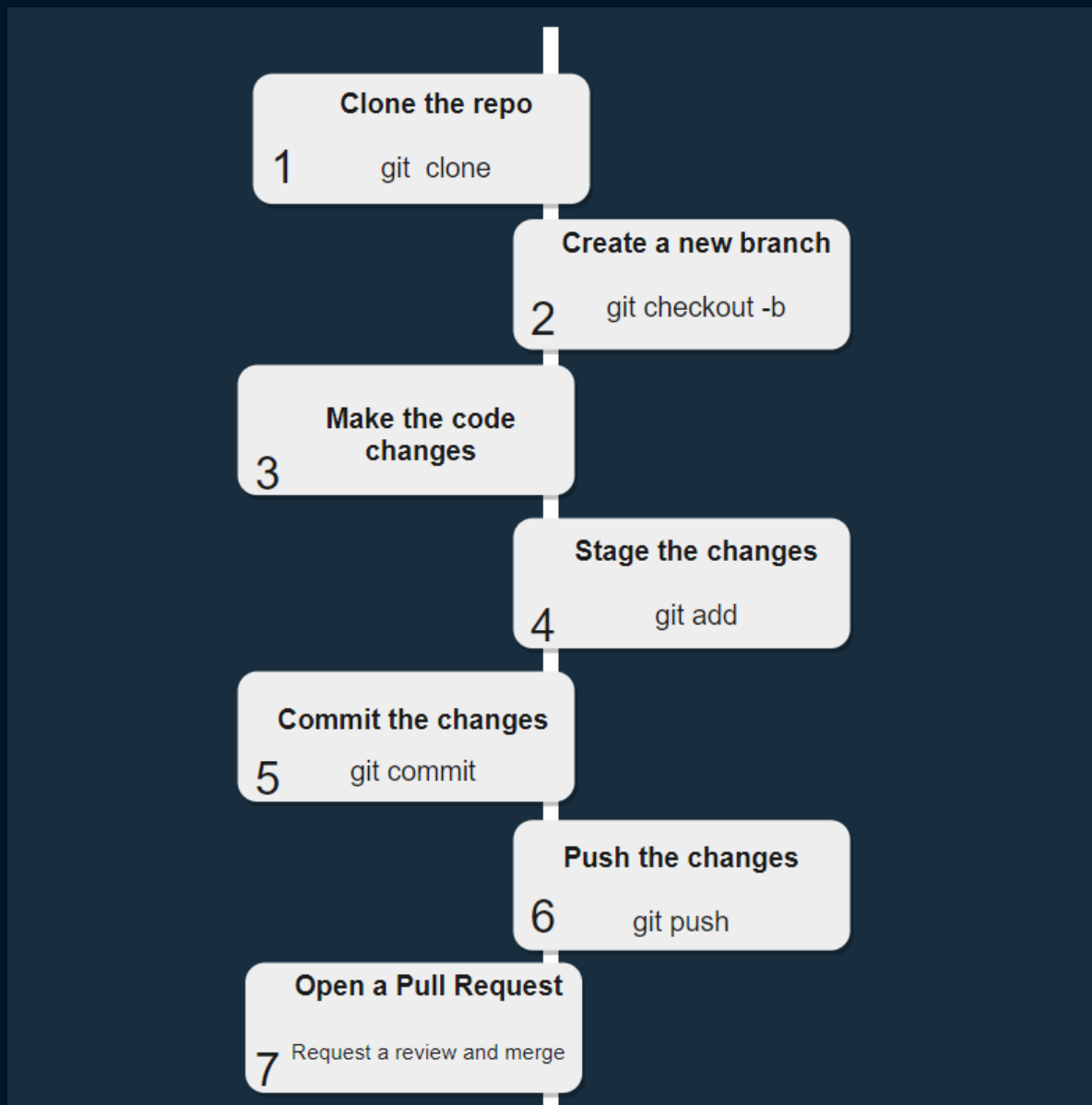
Now that you know the basic commands, let's put it all together and go through a basic Git workflow.

Usually, the workflow looks something like this:

- First, you clone an existing project with the `git clone` command, or if you are starting a new project, you initialize it with the `git init` command.
- After that, before starting with your code changes, it's best to create a new Git branch where you would work on. You can do that with the `git checkout -b YOUR_BRANCH_NAME` command.
- Once you have your branch ready, you would start making the changes to your code.
- Then, once you are ready with the changes, you need to stage them with the `git add` command.
- Then, to commit/save the changes to your local Git repository, you need to run the `git commit` command and provide a descriptive commit message.
- To push your local changes to your remote GitHub project, you would use the `git push origin YOUR_BRANCH_NAME` command

- Finally, once you've pushed your changes, you would need to submit a pull request (PR) from your branch to the main branch of the repository.
- It is considered good practice to add a couple of people as reviewers and ask them to review the changes.
- Finally, once the changes have been approved, the PR would get merged into the main branch taking all of your changes from your branch into the main branch.

The overall process will look like this:



My advice is to create a new repository and go over this process a few times until you feel completely comfortable with all of the commands.

Pull Requests

You already know how to merge changes from one branch to another on your local Git repository.

To do the same thing on GitHub, you would need to open a Pull Request (or a Merge Request if you are using GitLab) or a PR for short and request a merge from your feature branch to the `main` branch.

The steps that you would need to take to open a Pull Request are:

- If you are working on an open-source project that you are not the maintainer of, first fork the repository as per chapter 21. Skip this step if you are the maintainer of the repository.
- Then clone the repository locally with the `git clone` command:

```
git clone git@github.com:your_user/your_repo
```

- Create a new branch with the `git checkout` command:

```
git checkout -b branch_name
```

- Make your code changes
- Stage the changes with `git add`

```
git add .
```

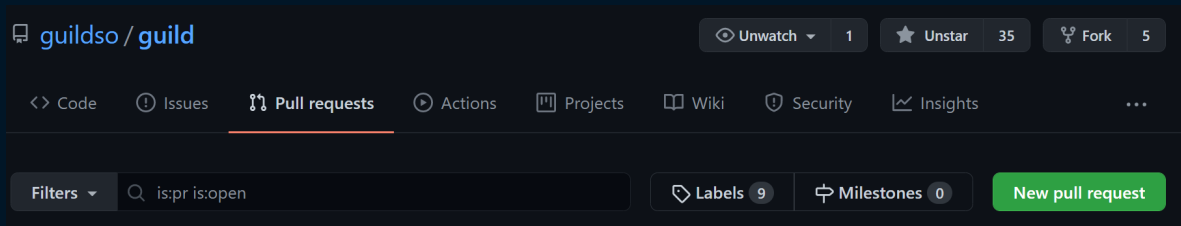
- And then commit them with `git commit`:

```
git commit -m "Commit Message"
```

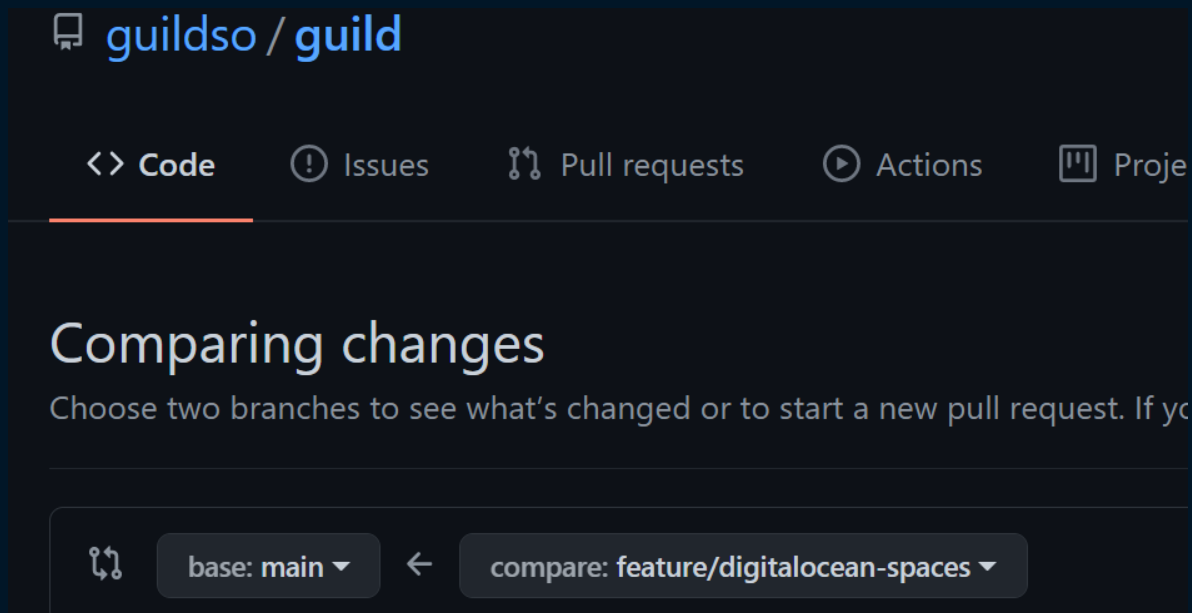
- Then push your new branch to GitHub with `git push`:

```
git push origin branch_name
```

- After that, visit the repository on GitHub and click on the **Pull Requests** button and then click on the green **New pull request** button:



- In there, choose the branch that you want to merge to and the branch that you want to merge from:



- Then review the changes and add a title and description and hit the create button
- If you are working on a project with multiple contributors, make sure to select a few reviewers. Essentially reviewers are people who you would like to review your code before it gets merged to the `main` branch.

For a visual representation of the whole process, make sure to check out this step by step tutorial as well:

- [How to Submit Your First Pull Request on GitHub](#)

Git And VS Code

As much as I love to use the terminal in order to do my daily tasks in the end, I would rather do multiple tasks within one window (GUI) or perform everything from the terminal itself.

In the past, I was using the text editors (vim, nano and etc.) in my terminal to edit the code in my repositories and then go along with the git client to commit my changes. Still, then I switched to Visual Studio Code to manage and develop my code.

I will recommend you to check this article on why you should use Visual Studio. It is an article from Visual Studio's website itself.

[Why you should use Visual Studio](#)

Visual Studio Code has integrated source control management (SCM) and includes Git support in-the-box. Many other source control providers are available through extensions on the VS Code Marketplace. It also has support for handling multiple Source Control providers simultaneously so you can open all of your projects at the same time and make changes whenever this is needed. I personally find this really handy.

Installing VS Code

You need to install Visual Studio Code. It runs on the macOS, Linux, and Windows operating systems.

Follow the platform-specific guides below:

- [macOS](#)
- [Linux](#)
- [Windows](#)

You need to install Git first before you get these features. Make sure you install at least version 2.0.0. If you do not have git installed on your machine, feel free to check this really useful article on [How to get started with Git](#)

You need to set your username and email in the Git configuration, or git will fail back to using information from your local machine when you commit. We need to provide this information because Git embeds this information into each commit we do.

In order to set this, you can execute the following commands:

```
git config --global user.name "John Doe"
git config --global user.email "johnde@domain.com"
```

The information will be saved in your `~/.gitconfig` file.

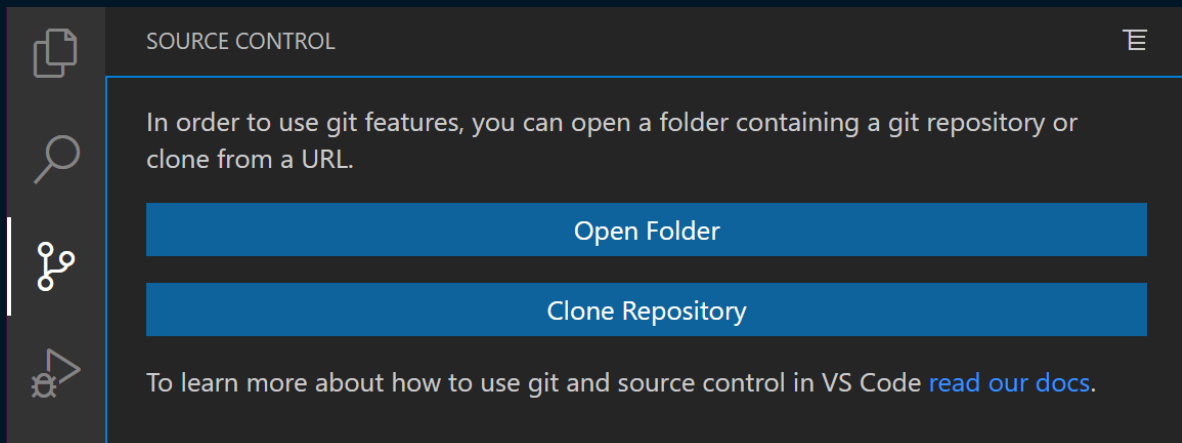
```
[user]
  name = John Doe
  email = johndoe@domain.com
```

With Git installed and set up on your local machine, you are now ready

to use Git for version control with Visual Studio or using the terminal.

Cloning a repository in VS Code

The good thing is that Visual Studio will auto-detect if you've opened a folder that is actually a repository. If you've already opened a repository, it will be visible in the Source Control View.



If you haven't opened a folder yet, the Source Control view will give you the option to Open Folder from your local machine or Clone Repository.

If you select Clone Repository, you will be asked for the URL of the remote repository (for example, on GitHub) and the parent directory under which to put the local repository.

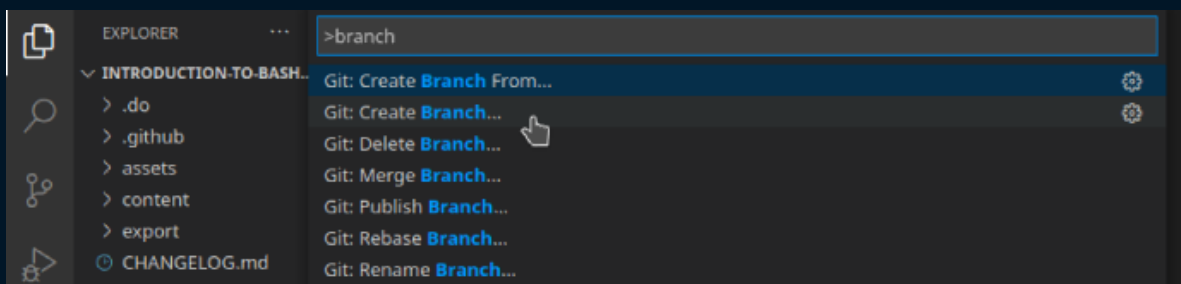
For a GitHub repository, you would find the URL from the GitHub Code dialog.

Create a branch

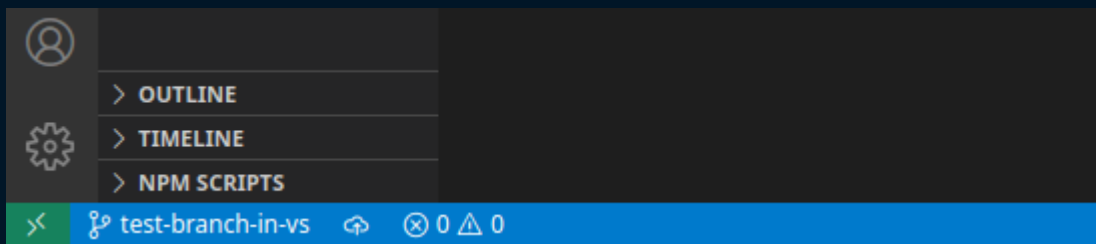
In order to create a branch open the command pallet:

- Windows: Ctrl + Shift + P
- Linux: Ctrl + Shift _ P
- MacOS: Shift + CMD + P

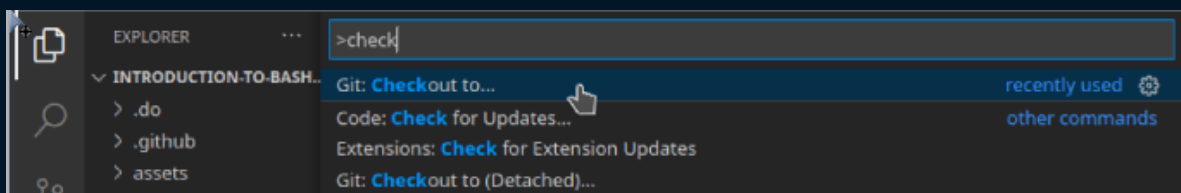
And select **Git Create Branch...**



Then you just need to enter a name for the branch. Keep in mind that in the bottom left corner, you can see in which branch you are. The default one will be the main, and if you successfully create the branch, you should see the name of the newly created branch.



If you want to switch branches, you can open the command pallet and search for **Git checkout to** and then select the main branch or switch to a different branch.



Setup a commit message template

If you want to speed up the process and have a predefined template for your commit messages, you can create a simple file that will contain this information.

In order to do that, open your terminal if you're on Linux or macOS and create the following file: `.gitmessage` in your home directory. In order to create the file, you can open it in your favorite text editor and then simply put the default content you would like and then just save and exit the file. Example content is:

```
cat ~/.gitmessage
```

```
#Title
```

```
#Summary of the commit
```

```
#Include Co-authored-by for all contributors.
```

To tell Git to use it as the default message that appears in your editor when you run `git commit` and set the `commit.template` configuration value:

```
$ git config --global commit.template ~/.gitmessage
$ git commit
```

Conclusion

If you prefer to code in Visual Studio Code and you also use version control, I will definitely recommend you to give it a go and interact with the repositories in VS code. I believe that everyone has their own style, and they might do things differently depending on their mood as well. As long as you can add/modify your code and then commit your changes to the repository, there is no exactly correct/wrong way to achieve this. For example, you can edit your code in vim and push the changes using the git client in your terminal or do the coding in Visual Studio and then commit the changes using the terminal as well. You're free to do it the way you want it and the way you find it more convenient as well. I believe that using git within VS code can make your workflow more efficient and robust.

Additional sources:

- [Version Control](#) - Read more about integrated Git support.
- [Setup Overview](#) - Set up and start using VS Code.
- [GitHub with Visual Studio](#) - Read more about the GitHub support in VS code
- You can also check this mini video tutorial on how to use the basics of Git version control in Visual Studio Code

Source:

- Contribured by: [Alex Georgiev](#).
- Initially posted [here](#).

GitHub CLI

The GitHub CLI or `gh` is basically GitHub on command-line.

You can interact with your GitHub account directly through your command line and manage things like pull requests, issues, and other GitHub actions.

In this tutorial, I will give a quick overview of how to install `gh` and how to use it!

GitHub CLI Installation

As I will be using Ubuntu, to install **gh** you need to run the following commands:

```
sudo apt-key adv --keyserver keyserver.ubuntu.com --recv-key  
C99B11DEB97541F0  
sudo apt-add-repository https://cli.github.com/packages  
sudo apt update  
sudo apt install gh
```

If you are on a Mac, you can install **gh** using Homebrew:

```
brew install gh
```

For any other operating systems, I recommend following the steps from the official documentation [here](#).

Once you have **gh** installed, you can verify that it works with the following command:

```
gh --version
```

This would output the **gh** version:

```
gh version 1.0.0 (2020-09-16)  
https://github.com/cli/cli/releases/tag/v1.0.0
```

In my case, I'm running the latest **gh** v1.0.0, which got released just a couple of days ago.

Authentication

Once you have `gh` installed, you need to login to your GitHub account.

To do so, you need to run the following command:

```
gh auth login
```

You will see the following output:

```
? What account do you want to log into? [Use arrows to move,
type to filter]
> GitHub.com
  GitHub Enterprise Server
```

You have an option to choose between GitHub.com or GitHub Enterprise. Click enter and then follow the authentication process.

Another useful command is the `gh help` command. This will give you a list with the available `gh` commands that you could use:

USAGE

gh <command> <subcommand> [flags]

CORE COMMANDS

gist: Create gists
issue: Manage issues
pr: Manage pull requests
release: Manage GitHub releases
repo: Create, clone, fork, and view repositories

ADDITIONAL COMMANDS

alias: Create command shortcuts
api: Make an authenticated GitHub API request
auth: Login, logout, and refresh your authentication
completion: Generate shell completion scripts
config: Manage configuration for gh
help: Help about any command

FLAGS

--help Show help for command
--version Show gh version

EXAMPLES

```
$ gh issue create  
$ gh repo clone cli/cli  
$ gh pr checkout 321
```

ENVIRONMENT VARIABLES

See 'gh help environment' for the list of supported environment variables.

LEARN MORE

Use 'gh <command> <subcommand> --help' for more information about a command.

Read the manual at <https://cli.github.com/manual>

FEEDBACK

Open an issue using 'gh issue create -R cli/cli'

Then let's clone an existing project which we will use to play with. As an example, we can use the [LaraSail](#) repository. Rather than cloning the repository using the standard `git clone` command, we will use `gh` to do so:

```
gh repo clone thedevdojo/larasail
```

You will see the following output:

```
Cloning into 'larasail'...
```

After that `cd` into that folder:

```
cd larasail
```

We are now ready to move to some of the more useful `gh` commands!

Useful GitHub CLI commands

Using `gh`, you can pretty much get all of the information for your repository on GitHub without having even to leave your terminal.

Here's a list of some useful commands:

Working with GitHub issues

To list all open issues, run:

```
gh issue list
```

The output that you will see is:

```
Showing 4 of 4 open issues in thedevdojo/larasail

#25 Add option to automatically create database
    (enhancement) about 3 months ago
#22 Remove PHP mcrypt as it is no longer needed
    about 3 months ago
#11 Add redis support
    about 8 months ago
#10 Wondering about the security of storing root mysql
    password in /etc/.larasail/tmp/mysqlpass          about
    3 months ago
```

You can even create a new issue with the following command:

```
gh issue create --label bug
```

Or if you wanted to view an existing issue, you could just run:

```
gh issue view '#25'
```

This would return all of the information for that specific issue number:

```
Add option to automatically create database
Open • bobbyiliev opened about 3 months ago • 0 comments

Labels: enhancement

Add an option to automatically create a new database, a
database user and
possibly update the database details in the .env file for a
specific project

View this issue on GitHub:
https://github.com/thedevdojo/larasail/issues/25
```

Working with your GitHub repository

You can use the `gh repo` command to create, clone or view an existing repository:

```
gh repo create
gh repo clone cli/cli
gh repo view --web
```

For example, if we ran the `gh repo view`, we would see the same README information for our repository directly in our terminal.

Working with Pull requests

You can use the `gh pr` command with a set of arguments to fully

manage your pull requests.

Some of the available options are:

```
checkout:  Check out a pull request in git
checks:    Show CI status for a single pull request
close:     Close a pull request
create:    Create a pull request
diff:      View changes in a pull request
list:      List and filter pull requests in this repository
merge:     Merge a pull request
ready:     Mark a pull request as ready for review
reopen:    Reopen a pull request
review:    Add a review to a pull request
status:    Show status of relevant pull requests
view:      View a pull request
```

With the above commands, you are ready to execute some of the main GitHub actions you would typically take directly in your terminal!

Conclusion

Now you know what the GitHub CLI tool is and how to use it! For more information, I would recommend checking out the official documentation here:

<https://cli.github.com/manual/>

I'm a big fan of all command-line tools! They can make your life easier and automate a lot of the daily repetitive tasks!

Initially posted here: [What is GitHub CLI and how to get started](#)

Git Cheat Sheet

Here is a list of the Git commands mentioned throughout the eBook

- Git Configuration

Before you initialize a new git repository or start making commits, you should set up your git identity.

In order to change the name that is associated with your commits, you can use the `git config` command:

```
git config --global user.name "Your Name"
```

The same would go for changing your email address associated with your commits as well:

```
git config --global user.email "yourmail@example.com"
```

That way, once you have the above configured when you make a commit and then check the git log, you will be able to see that the commit is associated with the details that you've configured above.

```
git log
```

In my case the output looks like this:

```
commit 45f96b8c2ef143011f11b5f6cc7a3ae20db5349d (HEAD -> main,  
origin/master, origin/HEAD)  
Author: Bobby Iliev <bobby@bobbyiliev.com>  
Date:   Fri Jun 19 17:03:53 2020 +0300
```

```
    Nginx server name for www version (#26)
```

Initializing a project

To initialize a new local git project, open your git or bash terminal, `cd` to the directory that you would like your project to be stored at, and then run:

```
git init .
```

If you already have an existing project in GitHub, for example, you can clone it by using the git clone command:

```
git clone your_project_url
```

Current status

In order to check the current status of your local git repository, you need to use the following command:

```
git status
```

This is probably one of the most used commands as you would need to check the status of your local repository quite often in order to be able to tell what files have been changed, staged, or deleted.

Add a file to the staging area

Let's say that you have a static HTML project, and you have already initialized your git repository.

After that, at a later stage, you decide to add a new HTML file called `about-me.html`, then you've added some HTML code in there already. In order to add your new file so that it is also tracked in git, you first need to use the `git add` command:

```
git add file_name
```

This will stage your new file, which essentially means that the next time you make a commit, the change will be part of the commit.

To check that, you can again run the `git status` command:

```
git status
```

You will see the following output:

```
On branch main
Your branch is up to date with 'origin/main'.

Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

       new file:   about-me.html
```

Removing files

In order to remove a file from your git project, use the following command:

```
git rm some_file.txt
```

Then after that, if you run `git status` again, you will see that the `some_file.txt` file has been deleted:

```
On branch main
Your branch is up to date with 'origin/main'.

Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

        deleted:    some_file.txt
```

Discard changes for a file

In case that you've made a mistake and you want to discard the changes for a specific file and reset the content of that file as it was in the latest commit, you need to use the command below:

```
git checkout -- file_name
```

This is a convenient command as you can really quickly revert a file back to its original content.

Commit to local

Once you've made your changes and you've staged them with the `git add` command, you need to commit your changes.

To do so, you have to use the `git commit` command:

```
git commit
```

This will open a text editor where you could type your commit message.

Instead, you could use the `-m` flag to specify the commit message directly in your command:

```
git commit -m "Nice commit message here"
```

List branches

In order to list all of the available local branches, just run the following command:

```
git branch -a
```

You would get a list of both local and remote branches, the output would look like this:

```
bugfix/nginx-www-server-name
develop
* main
remotes/origin/HEAD -> origin/master
remotes/origin/bugfix/nginx-www-server-name
remotes/origin/develop
remotes/origin/main
```

The `remotes` keyword indicates that those branches are remote branches.

Fetch changes from remote and merge the current branch with upstream

If you are working together with a team of developers working on the same project, more often than not, you would need to fetch the changes that your colleagues have made in order to have them locally on your PC.

To do that, all you need to do is to use the `git pull` command:

```
git pull origin branch_name
```

Note that this will also merge the new changes to the current branch that you are checked into.

Create a new branch

To create a new branch, all you need to do is use the `git branch` command:

```
git branch branch_name
```

Instead of the above, I prefer using the following command as it creates a new branch and also switches you to the newly created branch:

```
git checkout -b branch_name
```

If the `branch_name` already exists, you would get a warning that the branch name exists and you would not be checked out to it,

Push local changes to remote

Then finally, once you've made all of your changes, you've staged them with the `git add .` command, and then you committed the changes with the `git commit` command, you have to push those changes to the remote git repository.

To do so, just use the `git push` command:

```
git push origin branch_name
```

Delete a branch

```
git branch -d branch_name
```

Switch to a new branch

```
git checkout branch_name
```

As mentioned above, if you add the `-b` flag, it would create the branch if it does not exist.

Conclusion

Knowing the above commands will let you manage your project like a pro!

If you are interested in improving your command line skills in general, I strongly recommend this [Linux Command-line basics course here!](#)

Conclusion

Congratulations! You have just completed the Git basics guide!

If you found this useful, be sure to star the project on [GitHub](#)!

If you have any suggestions for improvements, make sure to contribute pull requests or open issues.

In this introduction to Git and GitHub eBook, we just covered the basics, but you still have enough under your belt to start using Git and start contributing to some awesome open source projects!

As a next step, try to create a GitHub project, clone it locally and push a project that you've been working on to GitHub! I could also recommend the following [GitHub training here](#).

In case that this eBook inspired you to contribute to some amazing open-source project, make sure to tweet about it and tag [@bobbyiliev](#) so that we could check it out!

Congrats again on completing this eBook!