git

Collaborative development

with

Git and GitHub

by Gábor Szabó

Collaborative Development using Git and GitHub

Adding Test and Continuous Integration with Travis-CI and AppVeyor

Gábor Szabó

This book is for sale at http://leanpub.com/collab-dev-git

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[1] https://leanpub.com/u/szabgab
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Preface

There are several reasons you might want to learn how to use Git and GitHub to contribute to a project even if you are not a programmer.

Your company might be using these technologies and they told you that you can update the documentation via GitHub. They might store configuration files in GitHub and they would like to make you, a non-programmer, to be able to tweak the system. Without the need to ask one of the developers to do it for you. (See for example the article of Dan Palmer on how and why the teach non-engineers to use GitHub at Thread[3]).

If your company might use Git and GitHub to develop the software, then you definitely need to know this.

Even if not, there are several reasons why you might want to know this to be able to contribute to an Open Source project.

This book and the accompanying exercises will show you how to use Git and GitHub to cooperate with other developers. Git and GitHub are the de-facto standard in Open Source development and many companies also embrace them. The 2017 survey of Stack Overflow[4] indicated that 70% of the developers use Git.
Even this book was written using these two tools.

Git Logo by Jason Long[5] is licensed under the Creative Commons Attribution 3.0 Unported License[6]. Downloaded from git-scm.com[7].

[3] https://thread.engineering/teaching-non-engineers-how-to-contribute-code-2e85411ab464
[4] https://insights.stackoverflow.com/survey/2017
[5] https://twitter.com/jasonlong
[6] https://creativecommons.org/licenses/by/3.0/
[7] https://git-scm.com/downloads/logos

Outline

What is Version Control

In this chapter we are going to explain what is a Version Control System and why is it good for you to use one. We will look at how some people still use manual Version Control Systems. Even among the respondents of the Stack Overflow Survey 2017[8] there were 4.8% who did not use any VCS and 3.7% used manual VCS.

Setup the environment

These are the basics. Intsalling Git on your computer. Creating an accoung on GitHub etc.

First Pull Request

You learn how to make a simple chage to a file in a GitHub repository without even copying the whole thing to your computer. We will also see how Travis-CI, the Continuous Integration system can protect us from mistakes.

This way of working is really only good for small things, like fixing a typo or adding a few lines in the docmentation, but it is probably easier to go step-by-step when we are learning several technologies.

Second Pull Request

Here we are going to go a step further and we'll use our local computer and our text editor to make changes to a file. It is not strictly necessary for this task, but this way we can get a step closer to contributing to real projects.

Update the project

While you work on your changes other people have also contributed and the project moved forward. How do you catch-up with the progress?
How can you bring the latest and greates of the code-base and how can you integrate your changes that might not be finished yet?

How can you reduce the workload of the maintainers of the project by making your change as close to the current state of the project even if you have started to work on it a few weeks ago?

[8] https://insights.stackoverflow.com/survey/2017

Conflict management

When more than one people work on the same project they might introduce conflicting changes. We'll see two types of conflicts and we'll learn about the way these conflicts can be resolved. We'll also see how we might be able to avod the conflicts so they won't happen.

Continuous Integration - CI

You'll read what is Continuous Integration. Why is it good for yur health. What CI systems are available.
Then we'll delve into two (or maybe more?) cloud-based CI systems. Travis-CI and Appveyor. We'll learn how to set them up
for a simple Python project.

Python

We will learn a few things about Python development. Specifically we'll learn about Virtualenv and writing simple tests to be used with the CI systems.

Perl 5

You will learn how to write tests for a module written in Perl 5 and how to run the tests. You will also learn how to set up the CI systems for this Perl 5 project. In addition we'll see how to generate a test-coverage report for your Perl project and use that as the driving force for writing more tests or eliminating unused code.

Perl 6

The same for Rakudo Perl 6.

Changes

v0.32 2019.04.16

- Minor fixes

v0.31 2018.08.02

- Errors while pushing a branch (Martha Ryan).
- Add a section about conflicts and merges.
- Start adding an outline.
- Start writing an intro to Git itself.
- Git stash.

v0.25 2017.10.22

- Add Perl 5 project including Travis-CI, Appveyor setup and test coverage reporting.
- Information on setting up Appveyor for Python projects.
- Details on setting up Travis-CI for Python projects.
- Add information on how to provide feedback.
- Switched to the experimental Maruka markup.

v0.15 2017.09.18

- git config fixes thanks to Yishai Zaltzberg.
- Rename the First Pull-requet to be Second.
- Add a new First PR that is done online. Without the need of any installations.
- Write more about CI.
- Add examples using Perl 5.

v0.10 2017.09.10

- Editor recommendations
- Details registering on GitHub
- Add more text for the Introduction.
- Add section dealing with Travis-CI to the first PR chapter.
- Add back the Delete repository section. (Leora Betesh)
- Improve “Push out the changes to GitHub”.

v0.05 2017.08.27

- First publishing

Feedback and Questions

This book is about Git and GitHub so I think the most appropriate way to get feedback for the book is via GitHub.

I've created a repository called feedback[9]. If you have any questions regarding the content of this book feel free to open an issue[10].

Before you ask a question, please check if there is a similar issue already. Either open or closed. You might find your answer there saving time both for you and for me.

In addition, before you ask a question, please verify that you are reading the most recent version of the book. You can compare the date and version number of the Changes section in the book to the one that appears in the Free Sample[11]. If this is not the most recent edition, then upgrade and check if the issue still exists or if it might have been addressed in the meantime.

If the issue is something you feel is embarrassing either for you or for me to make it public, or for some other reason you'd prefer to contact me privately, (e.g. you'd like to offer me a large sum of money) then send your comment via email to me: szabgab@gmail.com.

[9] https://github.com/collab-dev/feedback/
[10] https://github.com/collab-dev/feedback/issues
[11] https://leanpub.com/collab-dev-git

Contributors

I would like to thank all the participants of our Collaborative Development meetings for asking questions and driving this book ahead and especially *Leora Betesh*, *Yishai Zaltzberg*, *William Schwab* who contributed to the content of the book. In addition I'd like to than the following people for their input: *Martha Ryan*, *Yves Muya Benda*.

Introduction

In the hi-tech world in general and in the Open Source world in particulare, programming or coding seems like the only important thing. Nothing could be further from the truth. There are plenty of other activities one can do. Some of them might be even more valuable than the programming part.

For example you could contribute to an Open Source project by helping other users. You could report bugs or help design features. You could help triage bugs, closing duplicates, verifying the validity of reported bugs etc. You could work on the web site or the UI of the project. There is always a huge need for better documentation and better tutorials. There are probably many other tasks I have missed.

Similar tasks exist in corporations as well, though there might be some artificial separation dividing the various tasks. In Open Source projects the borders among various tasks is much less defined and people often handle multiple tasks.

In any case, one of the main requirements from anyone in the hi-tech world is good communication skills and the ability to cooperate. Even if this is not explicitly emphasized by many organizations.

For most of the tasks mentioned above, especially in Open Source projects we use some kind of a Version Control System (VCS).

So if you'd like to contribute to an Open Source project the first thing you need to learn, if you don't already know it, is using Git and GitHub for version control.

There are plenty of Version Control Systems out there, but the most popular, especially in the Open Source world is Git. It is a stand-alone VCS that you can use on your own computer alone, you can use it internally in your company, or you can use it with one of the cloud-based solution that provides hosting for your Git repository. GitHub is the most popular among those Cloud services. So to be clear: You can use Git on its own and you can use Git together with GitHub.

Version Control Systems in general have a couple of contributions to out life:

- They allow us to experiment with the files we have without the fear of "how do I get back to the previous state".
- They allow us to look at the history of our development to see older versions of our project.
- They allow us to locate the change that introduced a bug even if that was several weeks, months, or even years before we noticed the bug.
- They make it easy to collaborate on the same project.

Let me dwell on the fear-part a bit.

In my experience many people, especially in the corporate environment actually fear the Version Control System itself. That's very unfortunate as VCS are there to help us reduce feat. I found three major contributing factor to the fear.

One of them is lack of training. People who are not familiar with the capabilities of the VCS they are using will be afraid to make mistakes. Some VCS provide a lot less power and thus are easier to learn, some, such as Git, provide a lot more flexibility, but with that comes a longer and probably steeper learning curve.

The second major source of fear is the process a company builds around the tool. In many case the selected VCS is itself has a built-in process, but companies add additional requirements that make the use of the VCS unpleasant. For example the blind insistence of an open and approved "issue" for every change in the VCS will usually make people a lot less interested in refactoring code.

The third source of the fear is the lack of good project management. Using a flexible VCS such as Git might even make this problem worse. The problem arises when several people have to work on the same file. Even worse if they have to work in the same area of the file. When this happens this is usually a problem with project management and/or with the code itself. This should happen rarely. In older and usually proprietary VCS-es people have to lock the files they are working on. Thus if a second person wants to work on the same file she will be blocked. This is not really good as it wastes a lot of time, but people at companies got used to it. In modern VCSes, and especially in Distributed VCS-es such as Git, you never lock a file. You allow multiple people to work on the same files and then expect the second one to finish her were to merge the changes. In well managed and well designed environments where people communicate with each other, this merge is usually very smooth. The problem is if two people work in the same area of the code, then their changes will create a conflict that will have to be resolved manually. This is the part that people fear and I can totally understand them.

The good solution for this is improved communication among the developers (really, you need to talk to each other...), a better compartmentalization of the source code, and better management of tasks.

Tasks

In this book you'll get a number of tasks to do with ample explanation to accomplish them. You will also get a number of pointers where you can learn a lot more about the specific subjects.

Start by Installing and configuring Git on your local machine. Then you need to learn Git. You can first play with it locally following one of the recommended tutorials, or you can jump ahead and try the first task to Send your first Pull-request to a GitHub project.

Some people will probably do both at the same time jumping back and forth between the tutorials and the tasks.

A few resources to learn Git and GitHub are:

- Git SCM[12]
- Version Control with Git[13]
- GitHub and Collaboration[14]
- How to Use Git and GitHub[15]
- Using GitHub[16]
- Git-It by Jessica Lord[17]

Once you have sent your first pull-request to our own project, you could go on and start contributing to other Open Source projects. However in order to better collaborate with other developers it is best to learn how to update a GitHub project after the central repo (usually referred to as 'upstream') made some progress.

Once you are confident in these basic Git and GitHub skills you can move to the next task. This one still does not require any programming skills. You will have to collect some information on the Internet, organize it in a JSON file and send a Pull-request for CodeAndTalk project.

This is already a live project. Your contribution, once accepted, will show up on the Code And Talk[18] web site.

You can make several contribution to this project without any programming. This is strongly recommended as a way for you to practice using Git and GitHub. It's also fun to see our work have almost immediate impact on the world. Even if the impact is small.

[12] https://git-scm.com/
[13] https://www.udacity.com/course/version-control-with-git--ud123
[14] https://www.udacity.com/course/github-collaboration--ud456
[15] https://classroom.udacity.com/courses/ud775
[16] https://guides.github.com/activities/hello-world/
[17] https://github.com/jlord/git-it-electron
[18] https://codeandtalk.com/

When you are ready to do some programming the following tasks are suggested. Learn about Continuous Integration in general and Travis-CI in particular.

In the first exercise you'll set up Travis-CI for an existing project that already has tests.

In the second exercise you'll add a test in Python and set up Travis-CI.

The next step is to visit PyDigger[19] that lists the most recently released Python modules that use GitHub but does not use Travis-CI. Pick one you feel is not too hard to test. Add a unit-test. Hook it up to Travis-CI. Send a PR.

Later we might add exercises using other languages as well.

[19] https://pydigger.com/

Privacy

Before you get on this journey let me tell you a bit about online privacy.

When you participate in online discussion, when you ask questions on forums you usually have to use some nickname or give your full name. If you participate on mailing lists both your e-mail address and your name becomes public. In Git every change is recorded with a name and an e-mail address.

Personally I don't mind these information to be public. Partially because it became public so long ago that I would not be able to hide it any more and partially because my online presence helps my work career. People in the field know my name and my nickname and they can associate my contribution in various places with each other and with me.

Some people, however want to make sure the "Internet" does not know who they are off-line. Others might want to hide their private and corporate e-mail address. I can totally relate to that too.

If you feel you fall in this category then I'd recommend you create an online persona with a made-up name and a new e-mail address. Then make sure in the following, wherever I write "your name" you will replace it with that made-up nickname and "your e-mail" is replaced by the e-mail address of that online persona.

Even if you don't want people and programs to easily connect your online and offline identity it is usually a good idea to have a single online identity used consistently in the various places. Creating and using such an online persona will help you gain trust by others who only see this online identity of you. By using the same persona consistently you will build up the identity with time.

This still won't provide 100% privacy. After all there are tons of online services where you might have already registered with your real name and e-mail address (e.g. the various services of Google, Amazon, E-bay, Apple, Microsoft etc.) and they cross-reference your presence on a lot of web sites, but discussing that is way beyond the scope of this book.

In any case I would not use the name and e-mail address of my employer in any online communication. My employer will change and then this information will be obsolete. Besides that, no one needs to associate my technical questions with my employer. No one needs to know what kind of problems we are trying to solve and what kind of technologies we use.

What is Version Control, Git, and GitHub?

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Manual VCS

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Version Control Systems

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Setup your environment

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Create an account on GitHub.

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Terminal

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Linux: Open the Terminal

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OSX: Terminal and iTerm2

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Windows: Open the Command Prompt

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Install Git on your desktop machine (Windows, Linux, OSX)

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Make sure git works

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Configure Git client

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Configure your name and e-mail on your local computer

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Git Aliases

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Git configuration file

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Set Notepad++ as the default editor

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Install Editor or IDE

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MS Windows

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Git locally

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Git

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Getting Help for Git

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Creating a local Git repository

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Initialize git in the current directory

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Other articles

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git stash - temporary saving changes

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The stash is a stack

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Listing the content of the stash

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Showing the content of a stash

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Removing an entry from the stash

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Cleaning up the stash

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Stashing new, untracked files

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Merging conflict in stash

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Your first Pull Request

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CSV - Comma Separated Values

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CSV file on GitHub

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Edit CSV file on GitHub

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Send a Pull-Request

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Your second Pull Request

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Fork a repository

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Clone a repository

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Create a branch

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Make some changes

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Record the changes

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Push out the changes to GitHub

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Troubleshooting

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Send a Pull-Request

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Observe Travis-CI running and reporting

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Update your local Git repository from the central repository of the project.

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What to do if I mess up?

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Conflict management

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The 4 cases we are going to cover

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No local changes yet

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Integrated branch

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Changes that were not pushed out

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Rebase your local branch and update a PR

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Delete a branch

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Merge and Conflict

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Version Conflict

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File Name collision

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Type 1 conflict

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Type 2 conflict

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Type 2 conflict - another case

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Solution to the Type 2 conflict

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Prevention of Type 2 conflicts

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Conflict resolution

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Type 3 conflict

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Pull Request for Code And Talk

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The full process

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Setup working directory

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A cycle of changes:

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Update from the central repository

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Continuous Integration - CI

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Various CI systems

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Travis CI

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Set up Travis-CI

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Troubleshooting unittest

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Configure Travis-CI

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Create the Travis configuration file

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Fix the tests

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Send a Pull Request

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Conclusion

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Virtualenv for Python

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Add Python test

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Python test coverage

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Add test to a Python project

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Perl 5

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Add test to Perl 5 project

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Test Coverage

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Generate Test Coverage report

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Perl 6

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Tasks

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