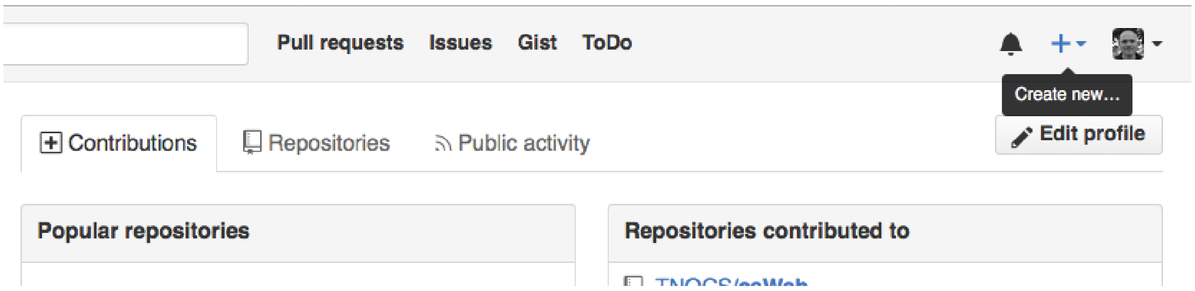
Remotes in GitHub

Version control really comes into its own when we begin to collaborate with other people. We already have most of the machinery we need to do this; the only thing missing is to copy changes from one repository to another.

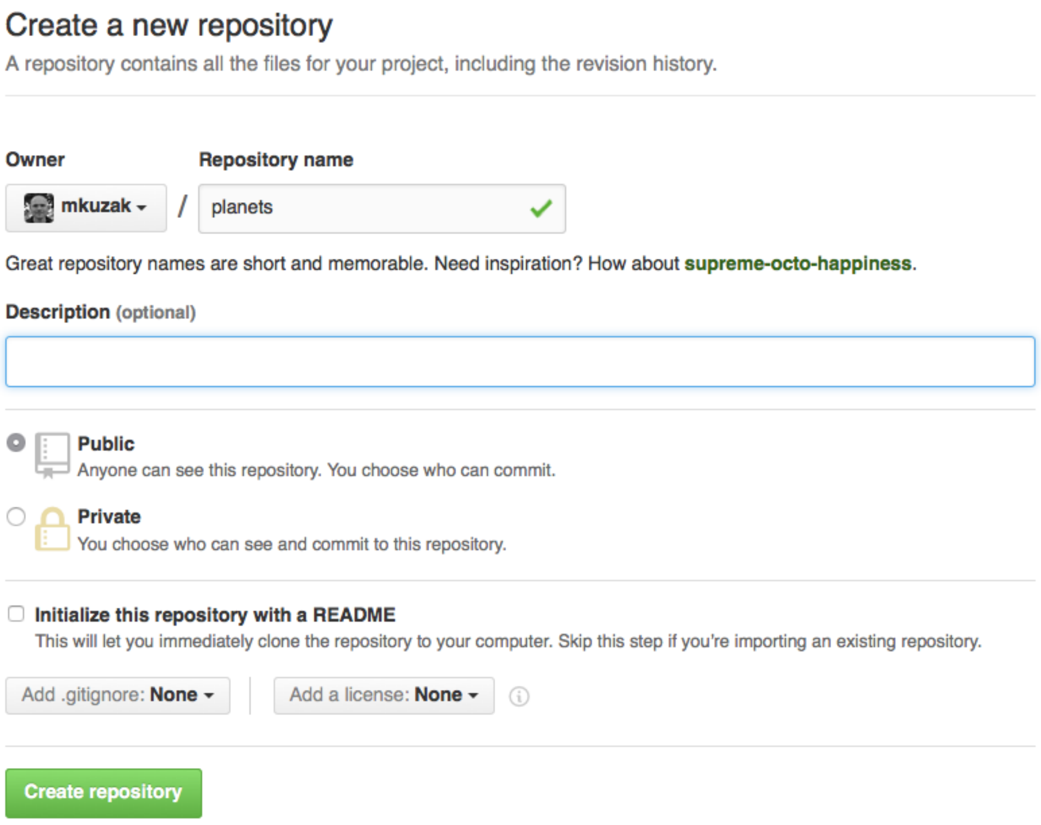
Systems like Git allow us to move work between any two repositories. In practice, though, it's easiest to use one copy as a central hub, and to keep it on the web rather than on someone's laptop. Most programmers use hosting services like GitHub, Bitbucket or GitLab to hold those master copies; we'll explore the pros and cons of this in the final section of this lesson.

Let's start by sharing the changes we've made to our current project with the world. Log in to GitHub, then click on the icon in the top right corner to create a new repository called `planets`:



Name your repository "planets" and then click "Create Repository".

Note: Since this repository will be connected to a local repository, it needs to be empty. Leave "Initialize this repository with a README" unchecked, and keep "None" as options for both "Add .gitignore" and "Add a license." See the "GitHub License and README files" exercise below for a full explanation of why the repository needs to be empty.



Create a new repository

A repository contains all the files for your project, including the revision history.

Owner: mkuzak / Repository name: planets

Great repository names are short and memorable. Need inspiration? How about **supreme-octo-happiness**.

Description (optional)

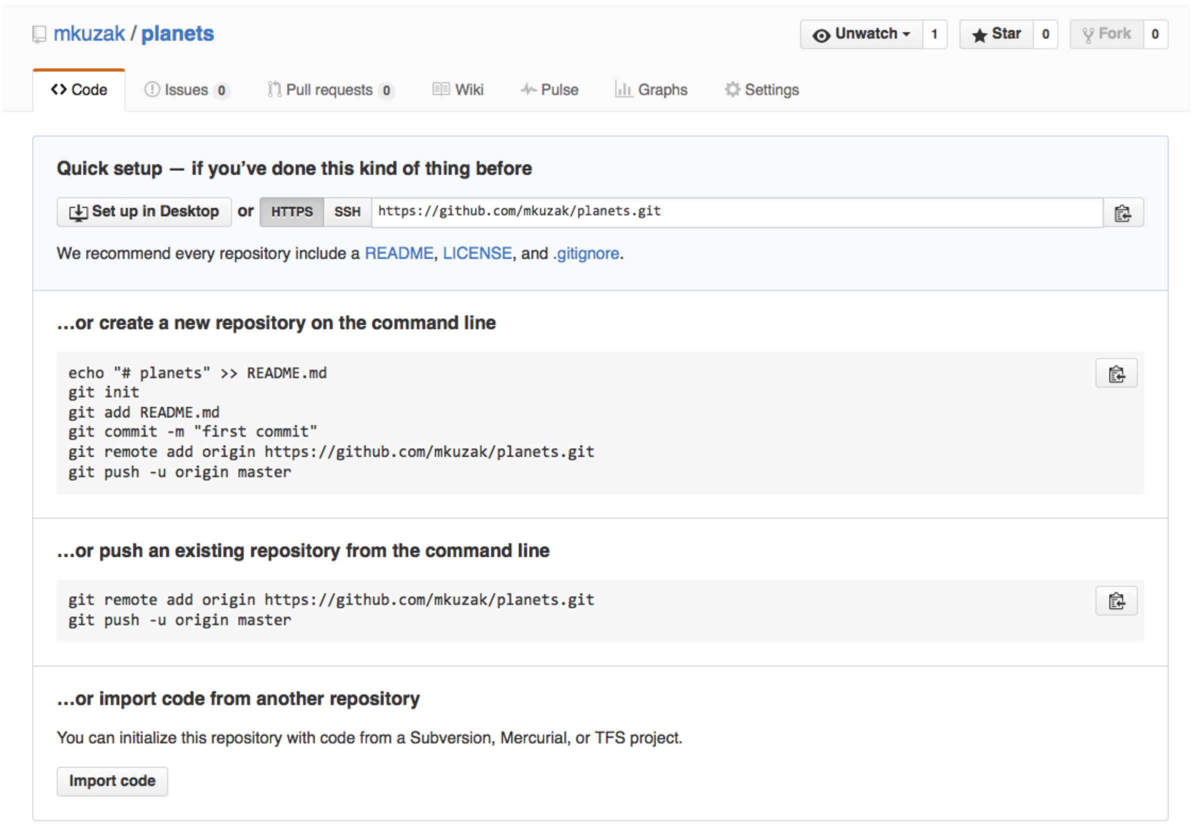
[✓ Public] Anyone can see this repository. You choose who can commit.

Private — You choose who can see and commit to this repository.

☐ Initialize this repository with a README
This will let you immediately clone the repository to your computer. Skip this step if you're importing an existing repository.

Add .gitignore: **None**   Add a license: **None**

As soon as the repository is created, GitHub displays a page with a URL and some information on how to configure your local repository:



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

Set up in Desktop or HTTPS SSH https://github.com/mkuzak/planets.git

We recommend every repository include a README, LICENSE, and .gitignore.

...or create a new repository on the command line

```
echo "# planets" >> README.md
git init
git add README.md
git commit -m "first commit"
git remote add origin https://github.com/mkuzak/planets.git
git push -u origin master
```

...or push an existing repository from the command line

```
git remote add origin https://github.com/mkuzak/planets.git
git push -u origin master
```

...or import code from another repository

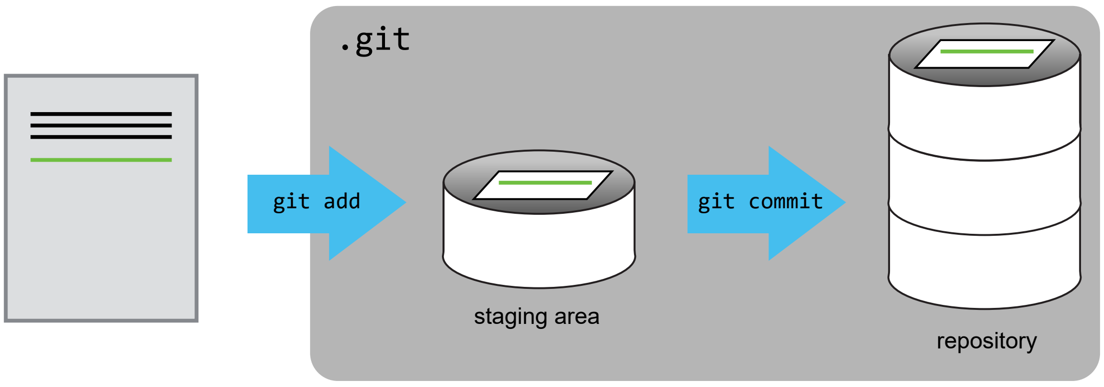
You can initialize this repository with code from a Subversion, Mercurial, or TFS project.

Import code

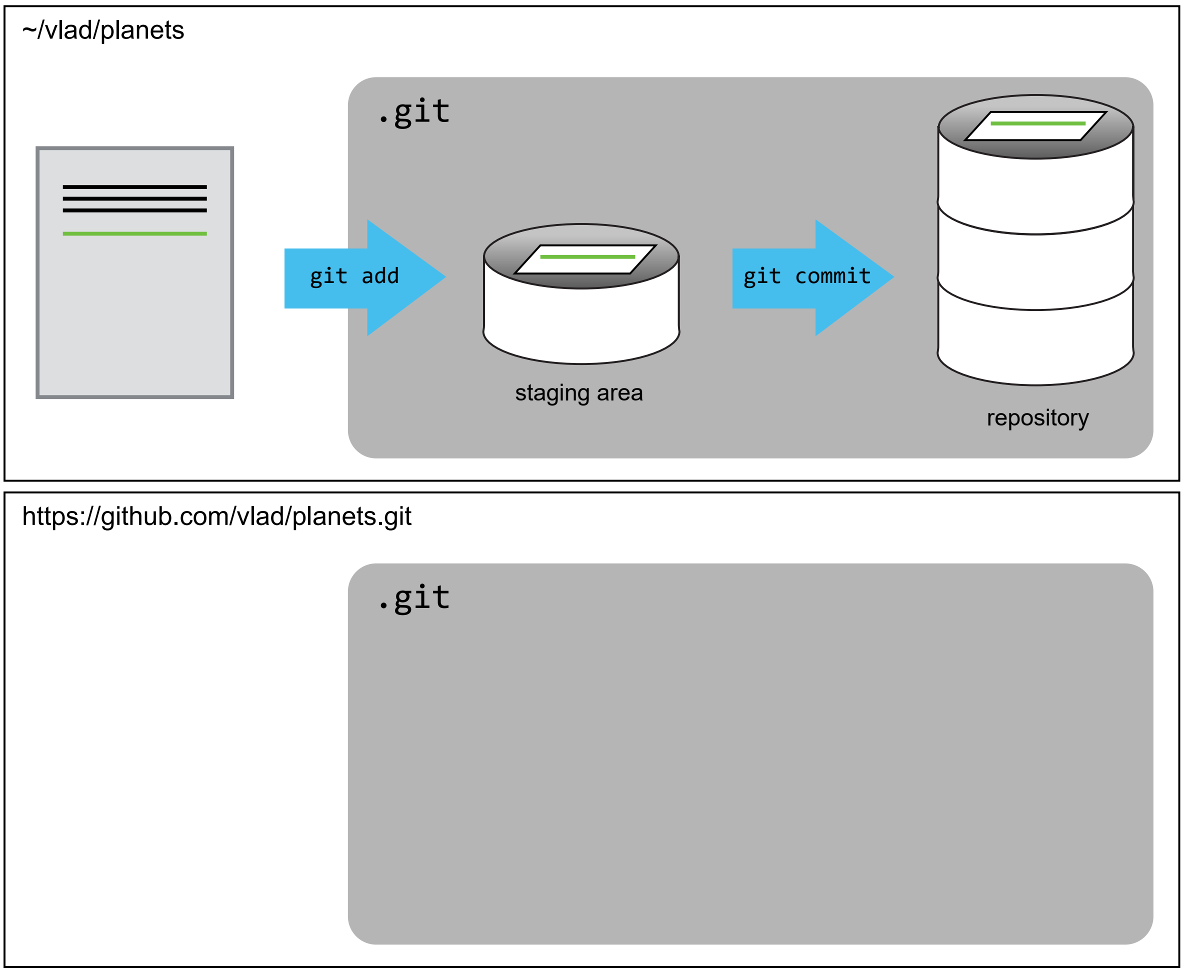
This effectively does the following on GitHub's servers:

```
$ mkdir planets
$ cd planets
$ git init
```

If you remember back to the earlier lesson where we added and committed our earlier work on `mars.txt`, we had a diagram of the local repository which looked like this:

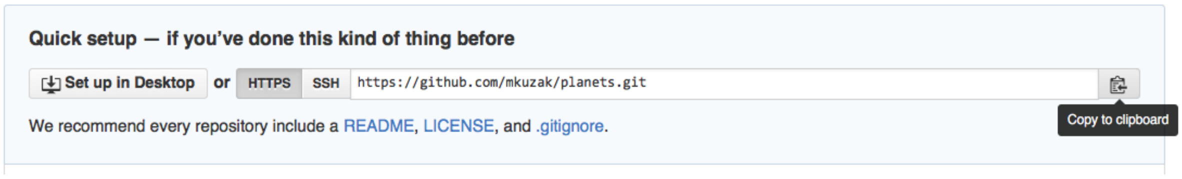


Now that we have two repositories, we need a diagram like this:



Note that our local repository still contains our earlier work on `mars.txt`, but the remote repository on GitHub appears empty as it doesn't contain any files yet.

The next step is to connect the two repositories. We do this by making the GitHub repository a remote for the local repository. The home page of the repository on GitHub includes the string we need to identify it:



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

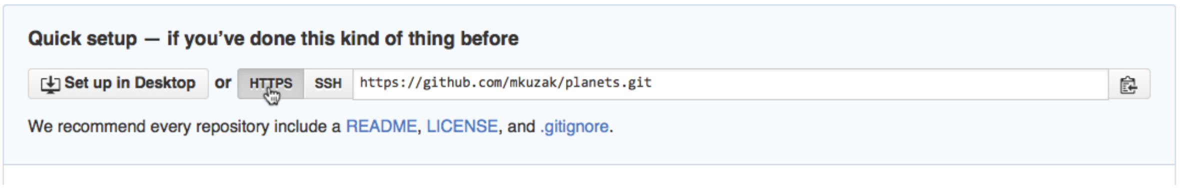
Set up in Desktop or HTTPS SSH https://github.com/mkuzak/planets.git

We recommend every repository include a README, LICENSE, and .gitignore.

Click on the 'HTTPS' link to change the protocol from SSH to HTTPS.

HTTPS vs. SSH

We use HTTPS here because it does not require additional configuration. After the workshop you may want to set up SSH access, which is a bit more secure, by following one of the great tutorials from GitHub, Atlassian/Bitbucket and GitLab (this one has a screencast).



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

Set up in Desktop or HTTPS SSH https://github.com/mkuzak/planets.git

We recommend every repository include a README, LICENSE, and .gitignore.

Copy that URL from the browser, go into the local `planets` repository, and run this command:

```
$ git remote add origin https://github.com/vlad/planets.git
```

Make sure to use the URL for your repository rather than Vlad's: the only difference should be your username instead of `vlad`.

`origin` is a local name used to refer to the remote repository. It could be called anything, but `origin` is a convention that is often used by default in git and GitHub, so it's helpful to stick with this unless there's a reason not to.

We can check that the command has worked by running `git remote -v`:

```
$ git remote -v
```

Output:

```
origin   https://github.com/vlad/planets.git (push)
origin   https://github.com/vlad/planets.git (fetch)
```

We'll discuss remotes in more detail in the next episode, while talking about how they might be used for collaboration.

Once the remote is set up, this command will push the changes from our local repository to the repository on GitHub:

```
$ git push origin master
```

Output:

```
Enumerating objects: 16, done.
Counting objects: 100% (16/16), done.
Delta compression using up to 8 threads.
Compressing objects: 100% (11/11), done.
Writing objects: 100% (16/16), 1.45 KiB | 372.00 KiB/s, done.
Total 16 (delta 2), reused 0 (delta 0)
remote: Resolving deltas: 100% (2/2), done.
To https://github.com/vlad/planets.git
 * [new branch]      master -> master
```

Proxy

If the network you are connected to uses a proxy, there is a chance that your last command failed with "Could not resolve hostname" as the error message. To solve this issue, you need to tell Git about the proxy:

```
$ git config --global http.proxy http://user:password@proxy.url
$ git config --global https.proxy http://user:password@proxy.url
```

When you connect to another network that doesn't use a proxy, you will need to tell Git to disable the proxy using:

```
$ git config --global --unset http.proxy
$ git config --global --unset https.proxy
```

Password Managers

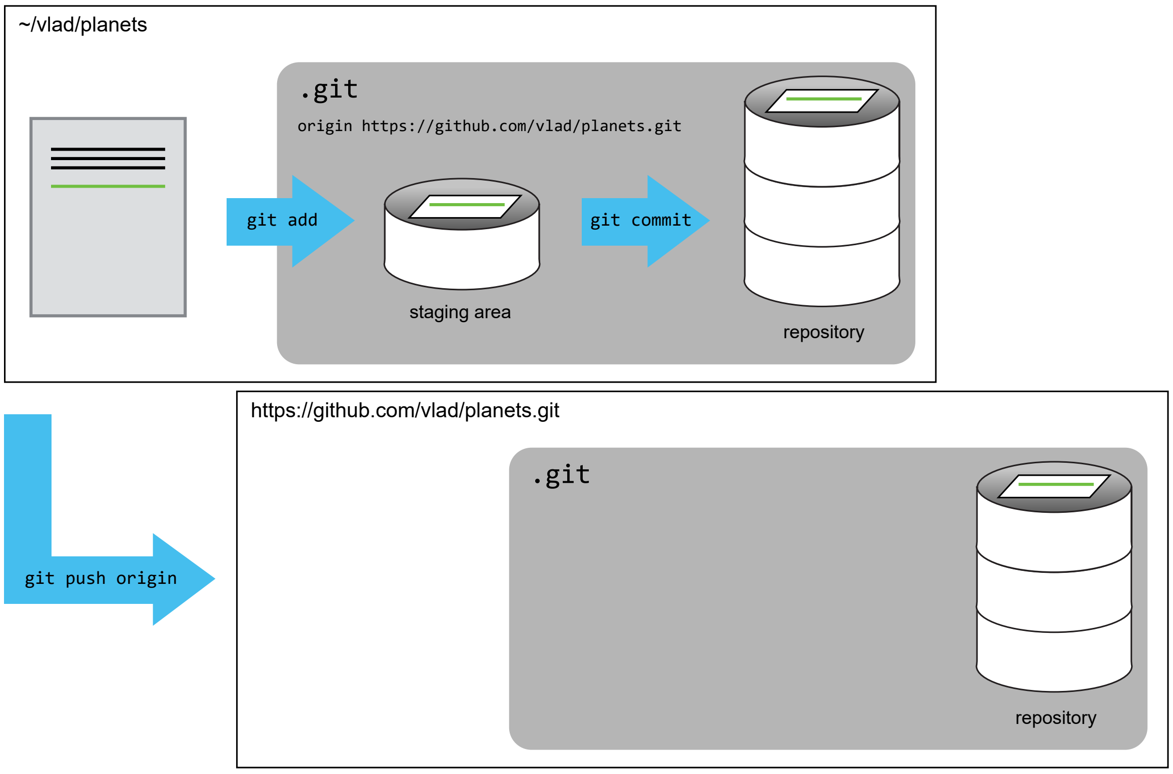
If your operating system has a password manager configured, `git push` will try to use it when it needs your username and password. For example, this is the default behavior for Git Bash on Windows. If you want to type your username and password at the terminal instead of using a password manager, type:

```
$ unset SSH_ASKPASS
```

in the terminal, before you run `git push`. Despite the name, [Git uses `SSH_ASKPASS` for all credential entry](), so you may want to unset `SSH_ASKPASS` whether you are using Git via SSH or https.

You may also want to add `unset SSH_ASKPASS` at the end of your `~/.bashrc` to make Git default to using the terminal for usernames and passwords.

Our local and remote repositories are now in this state:



The '-u' Flag

You may see a `-u` option used with `git push` in some documentation. This option is synonymous with the `--set-upstream-to` option for the `git branch` command, and is used to associate the current branch with a remote branch so that the `git pull` command can be used without any arguments. To do this, simply use `git push -u origin master` once the remote has been set up.

We can pull changes from the remote repository to the local one as well:

```
$ git pull origin master
```

Output:

```
From https://github.com/vlad/planets
 * branch            master     -> FETCH_HEAD
Already up-to-date.
```

Pulling has no effect in this case because the two repositories are already synchronized. If someone else had pushed some changes to the repository on GitHub, though, this command would download them to our local repository.

GitHub GUI

Browse to your `planets` repository on GitHub. Under the Code tab, find and click on the text that says “XX commits” (where “XX” is some number). Hover over, and click on, the three buttons to the right of each commit. What information can you gather/explore from these buttons? How would you get that same information in the shell?

Solution

The left-most button (with the picture of a clipboard) copies the full identifier of the commit to the clipboard. In the shell, `git log` will show you the full commit identifier for each commit.

When you click on the middle button, you’ll see all of the changes that were made in that particular commit. Green shaded lines indicate additions and red ones removals. In the shell we can do the same thing with `git diff`. In particular, `git diff ID1..ID2` where ID1 and ID2 are commit identifiers (e.g. `git diff a3bf1e5..041e637`) will show the differences between those two commits.

The right-most button lets you view all of the files in the repository at the time of that commit. To do this in the shell, we’d need to checkout the repository at that particular time. We can do this with `git checkout ID` where ID is the identifier of the commit we want to look at. If we do this, we need to remember to put the repository back to the right state afterwards!

Uploading files directly in GitHub browser

Github also allows you to skip the command line and upload files directly to your repository without having to leave the browser. There are two options. First you can click the “Upload files” button in the toolbar at the top of the file tree. Or, you can drag and drop files from your desktop onto the file tree. You can read more about this on this GitHub page

GitHub Timestamp

Create a remote repository on GitHub. Push the contents of your local repository to the remote. Make changes to your local repository and push these changes. Go to the repo you just created on GitHub and check the timestamps of the files. How does GitHub record times, and why?

Solution

GitHub displays timestamps in a human readable relative format (i.e. “22 hours ago” or “three weeks ago”). However, if you hover over the timestamp, you can see the exact time at which the last change to the file occurred.

Push vs. Commit

In this lesson, we introduced the “git push” command. How is “git push” different from “git commit”?

Solution

When we push changes, we’re interacting with a remote repository to update it with the changes we’ve made locally (often this corresponds to sharing the changes we’ve made with others). Commit only updates your local repository.

GitHub License and README files

In this section we learned about creating a remote repository on GitHub, but when you initialized your GitHub repo, you didn’t add a README.md or a license file. If you had, what do you think would have happened when you tried to link your local and remote repositories?

Solution

In this case, we’d see a merge conflict due to unrelated histories. When GitHub creates a README.md file, it performs a commit in the remote repository. When you try to pull the remote repository to your local repository, Git detects that they have histories that do not share a common origin and refuses to merge.

```
$ git pull origin master
```

Output:

```
warning: no common commits
remote: Enumerating objects: 3, done.
remote: Counting objects: 100% (3/3), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (3/3), done.
From https://github.com/vlad/planets
 * branch            master     -> FETCH_HEAD
 * [new branch]      master     -> origin/master
fatal: refusing to merge unrelated histories
```

> > You can force git to merge the two repositories with the option `--allow-unrelated-histories`. Be careful when you use this option and carefully examine the contents of local and remote repositories before merging.
> >
> > ```
> > $ git pull --allow-unrelated-histories origin master
> > ```
> >
> > Output:
> >
> > ```
> > From https://github.com/vlad/planets
> >  * branch            master     -> FETCH_HEAD
> > Merge made by the 'recursive' strategy.
> > README.md | 1 +
> > 1 file changed, 1 insertion(+)
> > create mode 100644 README.md
> > ```

> ## Key Points
>
> - A local Git repository can be connected to one or more remote repositories.
> - Use the HTTPS protocol to connect to remote repositories until you have learned how to set up SSH.
> - `git push` copies changes from a local repository to a remote repository.
> - `git pull` copies changes from a remote repository to a local repository.

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