Module five

Local Repository

1 - **Initializing a Local Repository**

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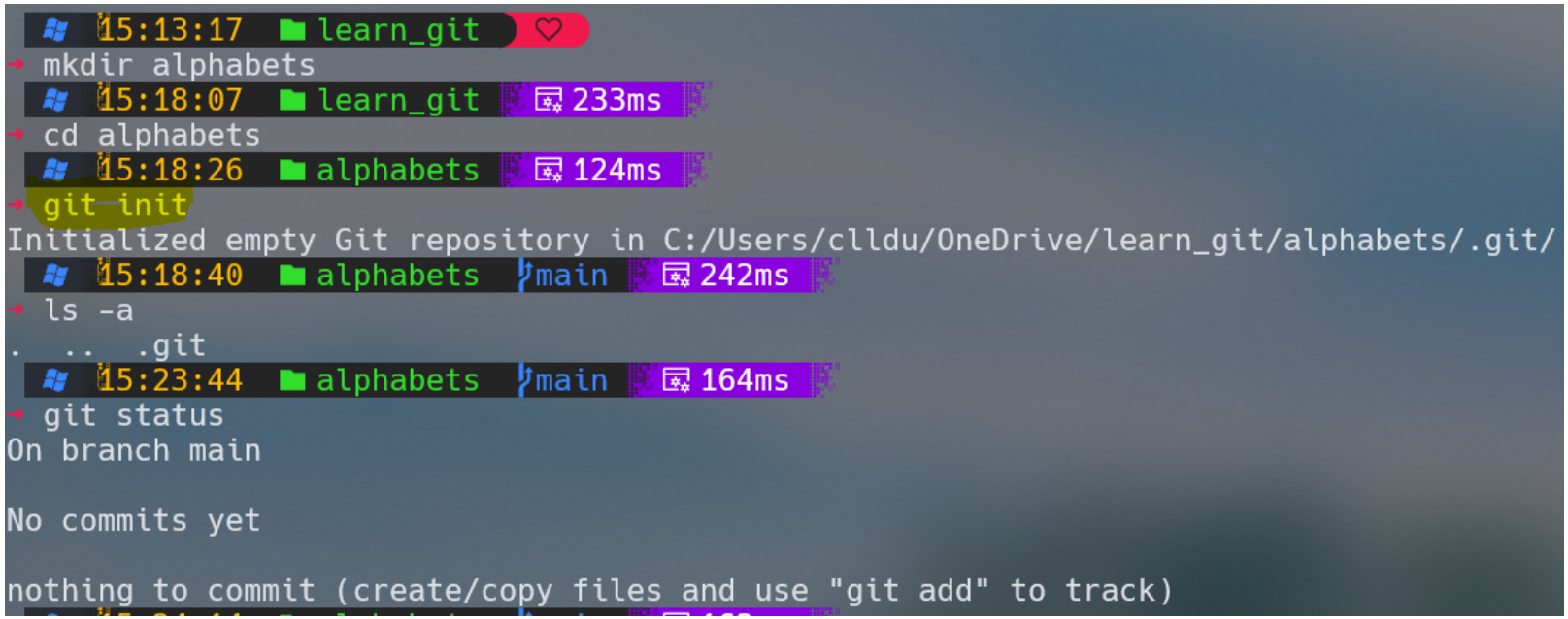
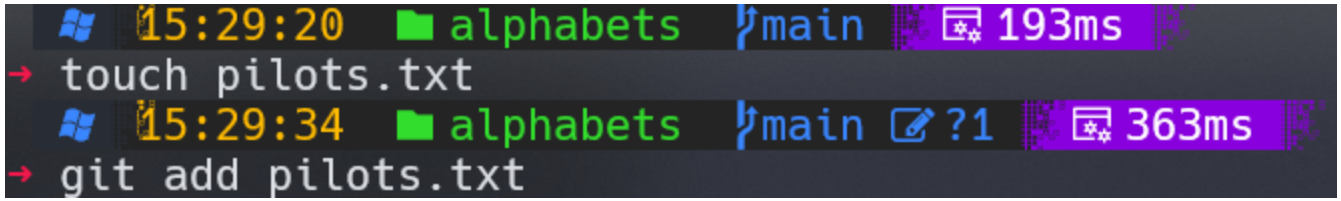
4 - **Saving changes**

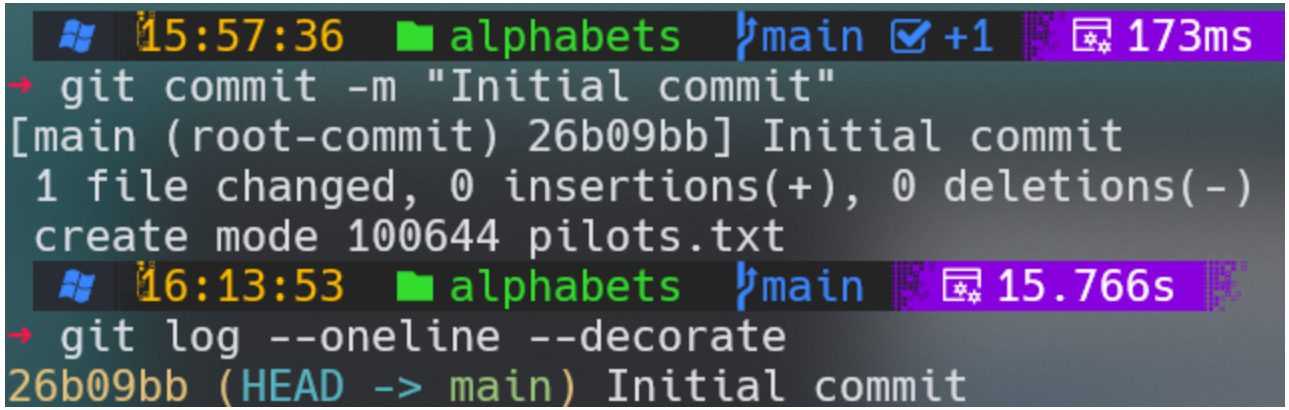
Up to now we have cloned remote repositories created on GitHub to kick start a project. It is also possible to create a brand new Git repository locally on your machine using the git init command.

Initializing a Local Repository

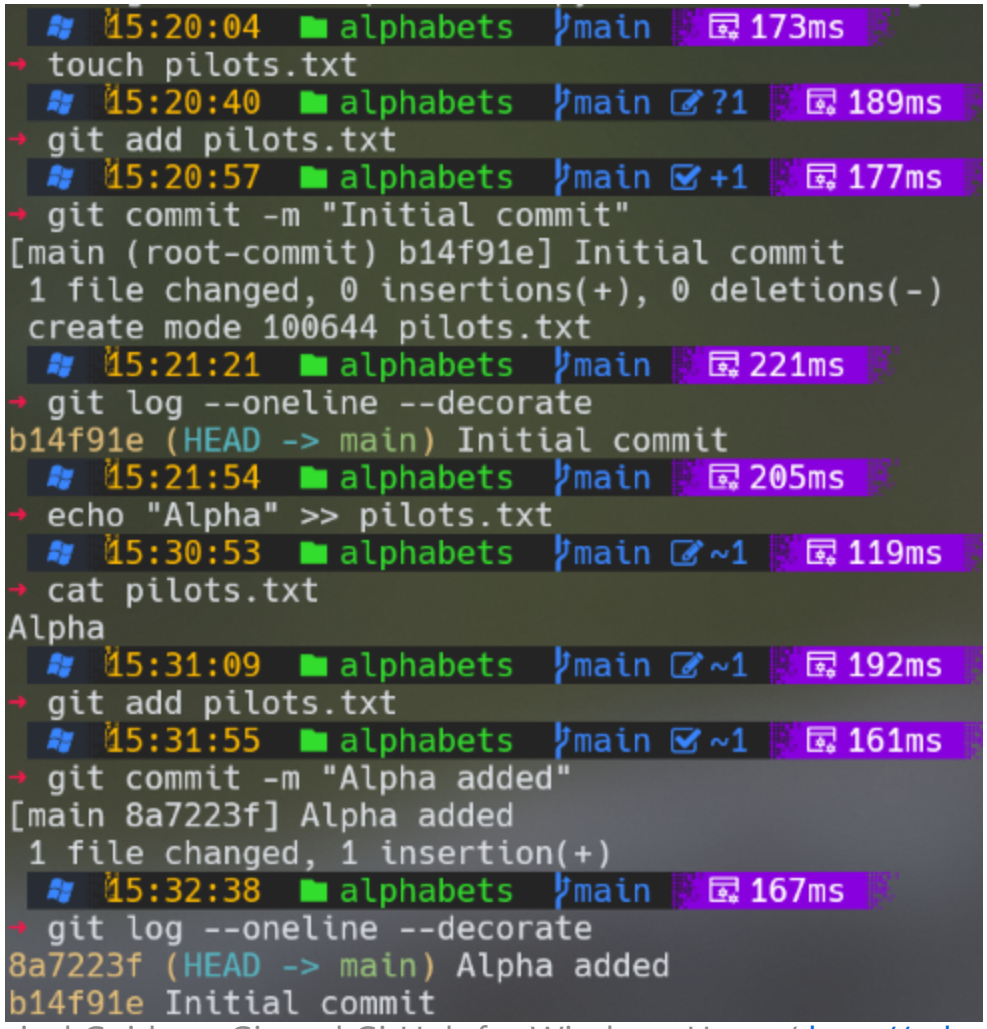


Your new local Git repository is ready to use. You can now start adding files to it.

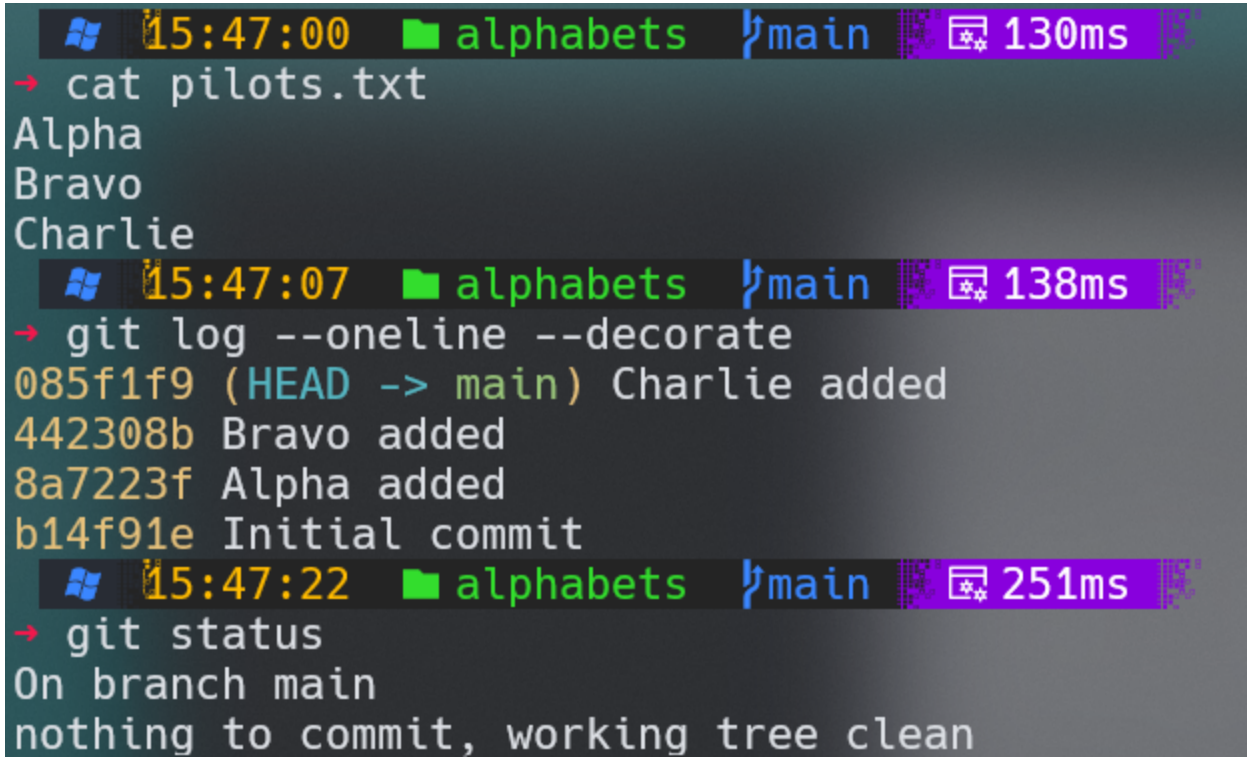




Let's now build some commit history. Make a change to pilots.txt by inserting the word "Alpha" on the first line.



Bravo and Charlie added to pilots



A remote repository is not required to follow the exercises in this slides, however for your reference a local Git repository created with git init can easily be uploaded to GitHub from the command line. All you have to do is create a new empty repository on GitHub, add it as a new remote and push the contents of the local repo.

After creating a local Git repository with git init, you can push it to GitHub by following these steps:

Go to GitHub.
Log in to your GitHub account or create one if you don't have an account.
Click the "+" icon in the top right corner and select "New Repository" to create a new repository on GitHub.
Fill in the repository name, description, and other settings as needed.
Link Local Repository to GitHub Repository:

In your local terminal or command prompt, navigate to the root directory of your local Git repository. Use the following command to set the remote repository URL for your local repository, replacing username with your GitHub username and repository-name with the name of the GitHub repository you created in step 1: git remote add origin https://github.com/username/repository-name.git

Commit Your Changes:

Before you can push your code to GitHub, you need to commit your changes. Use the following commands to stage and commit your changes:

```
git add .
git commit -m "Initial commit" # You can use a different commit message
```

Push to GitHub:

Finally, push your local repository to GitHub using the following command:

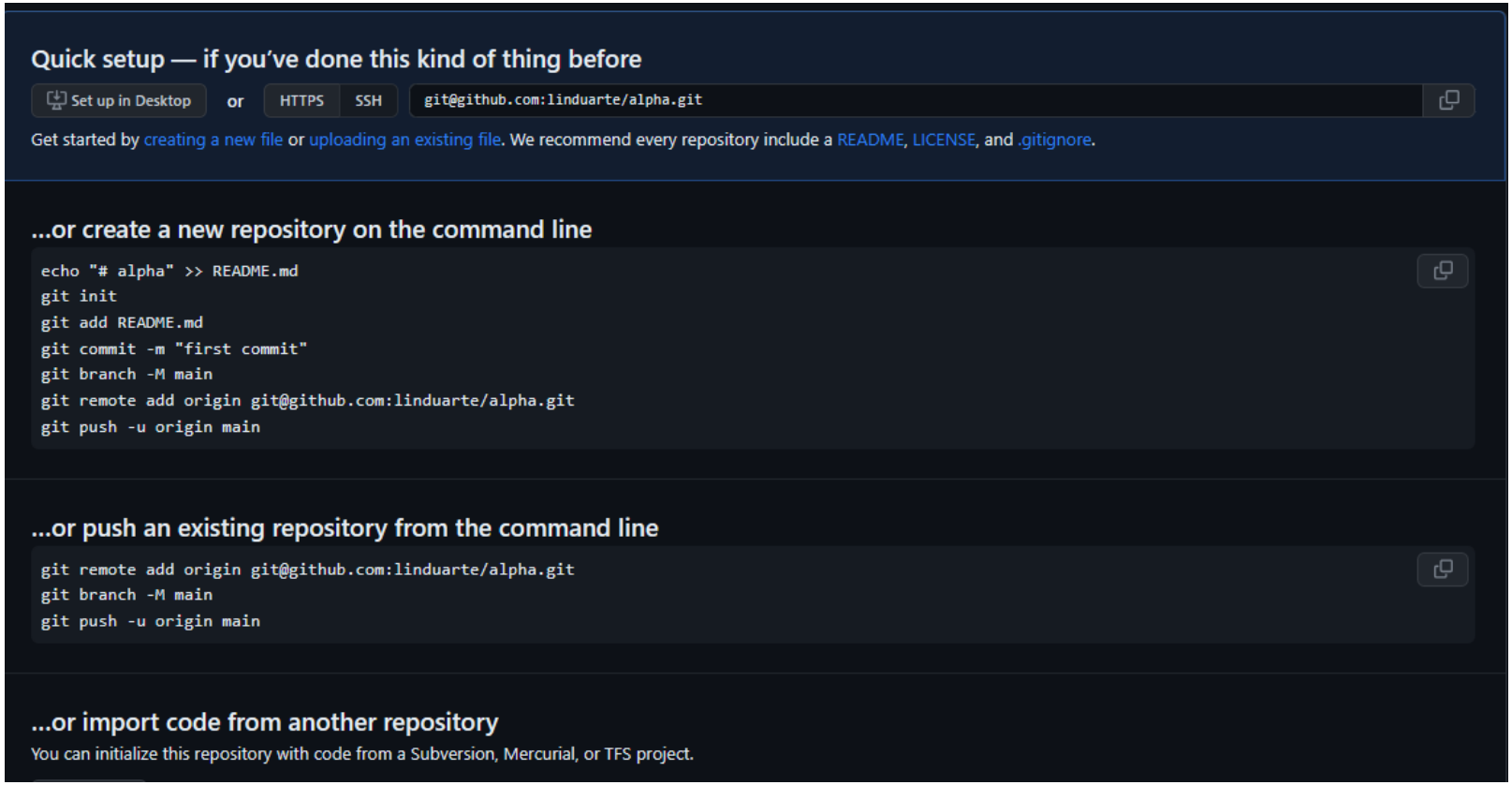
```
git push -u origin main
```

This command pushes your code to the main branch (or whatever branch you are currently on) of your GitHub repository. The -u flag sets up a tracking relationship between your local branch and the remote branch on GitHub, so you can simply use git push in the future to push changes to the same branch.

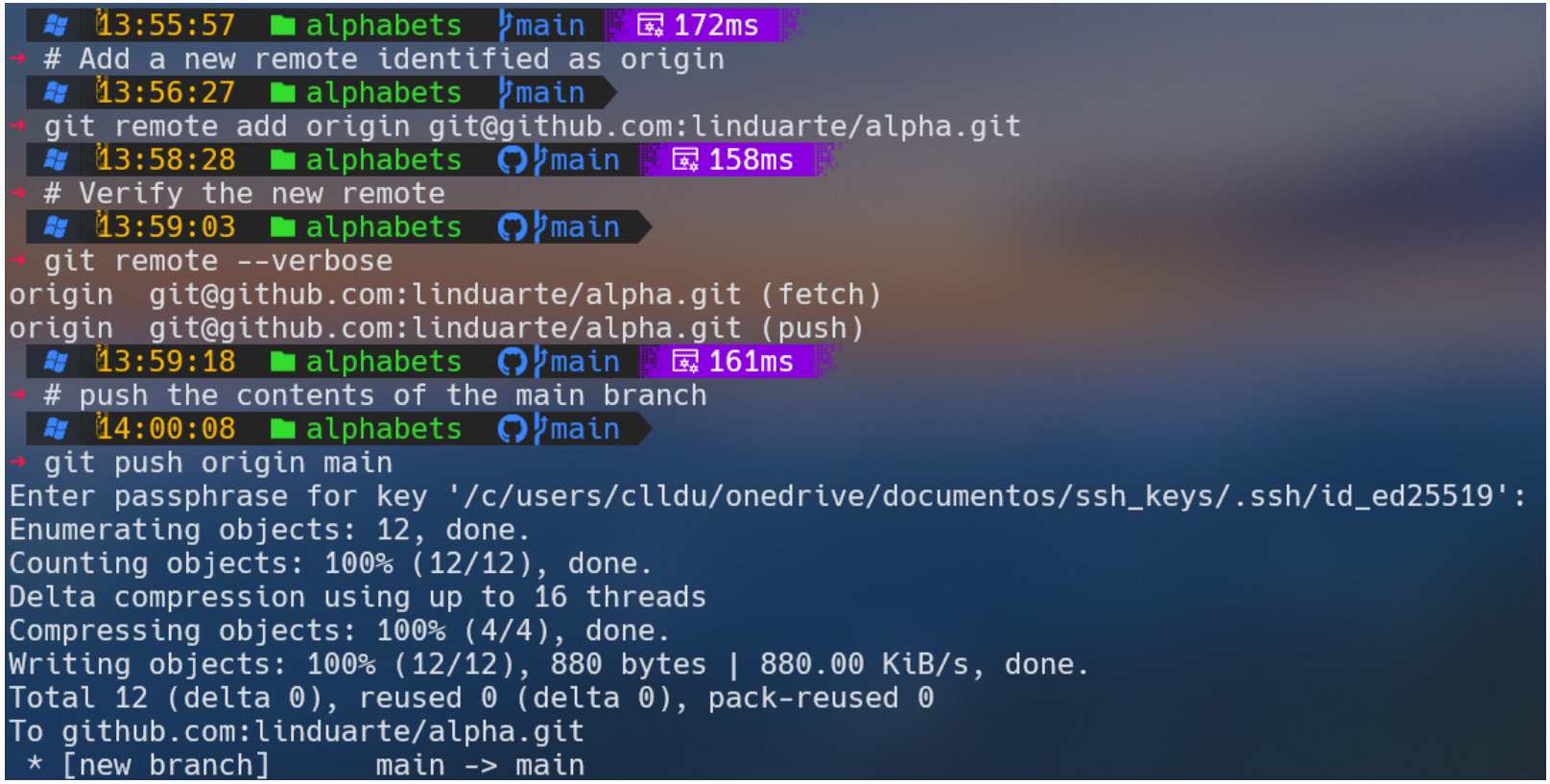
Authenticate with GitHub:

If you haven't already authenticated with your GitHub account on your local system, Git will prompt you to enter your GitHub username and password or personal access token.
After completing these steps, your local repository will be pushed to your GitHub repository, and you can access it on GitHub's website. Make sure to keep your personal access tokens or credentials secure and use HTTPS or SSH for secure connections, depending on your GitHub settings and preferences.

Create a repository in GitHub



Push to origin

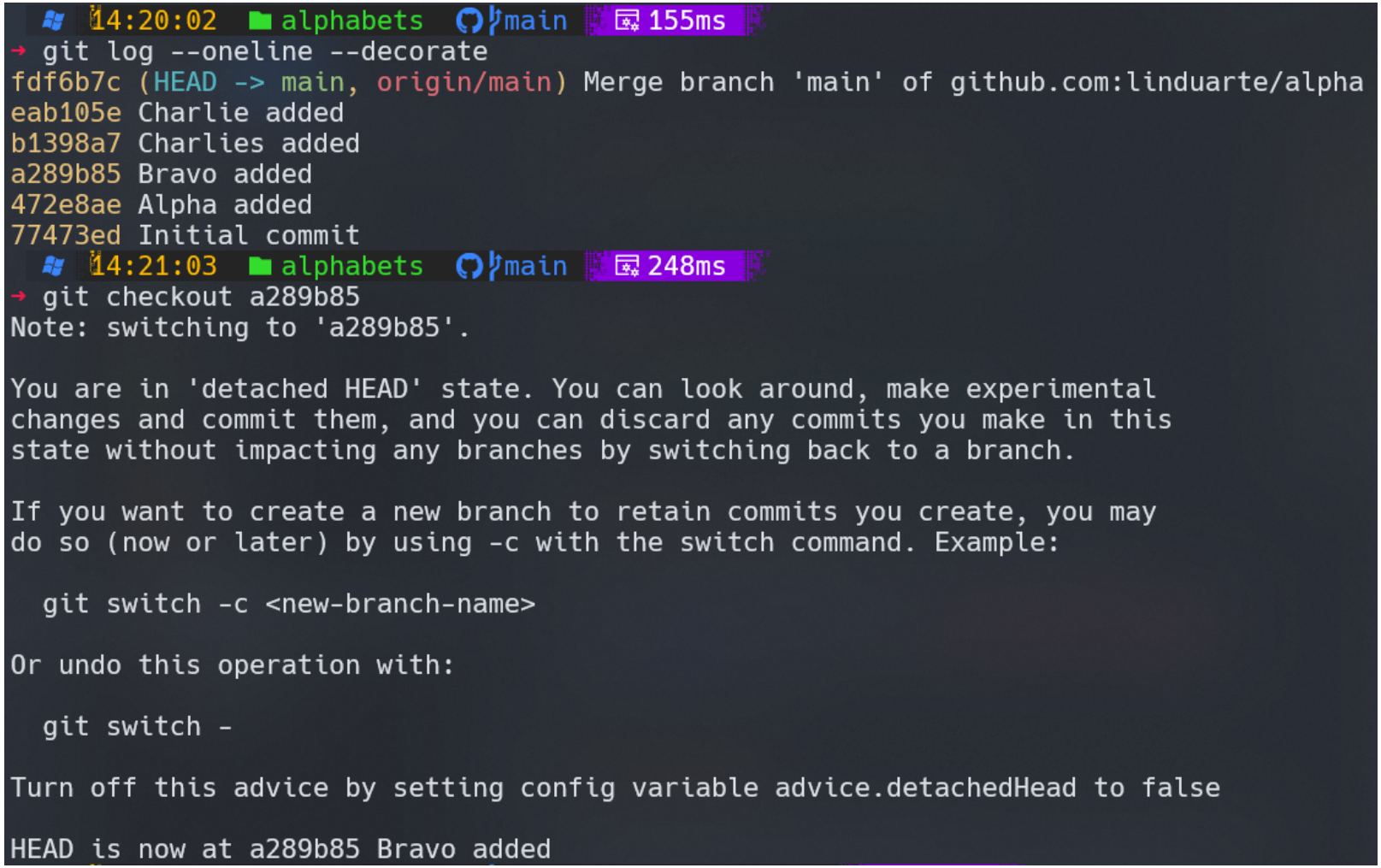


Going back in history

The git checkout command to switch branches and to undo unstaged changes in a file. It can also be used to go back in history in the form git checkout (commit) where is the hash (or identifier) of a commit in the revision history.

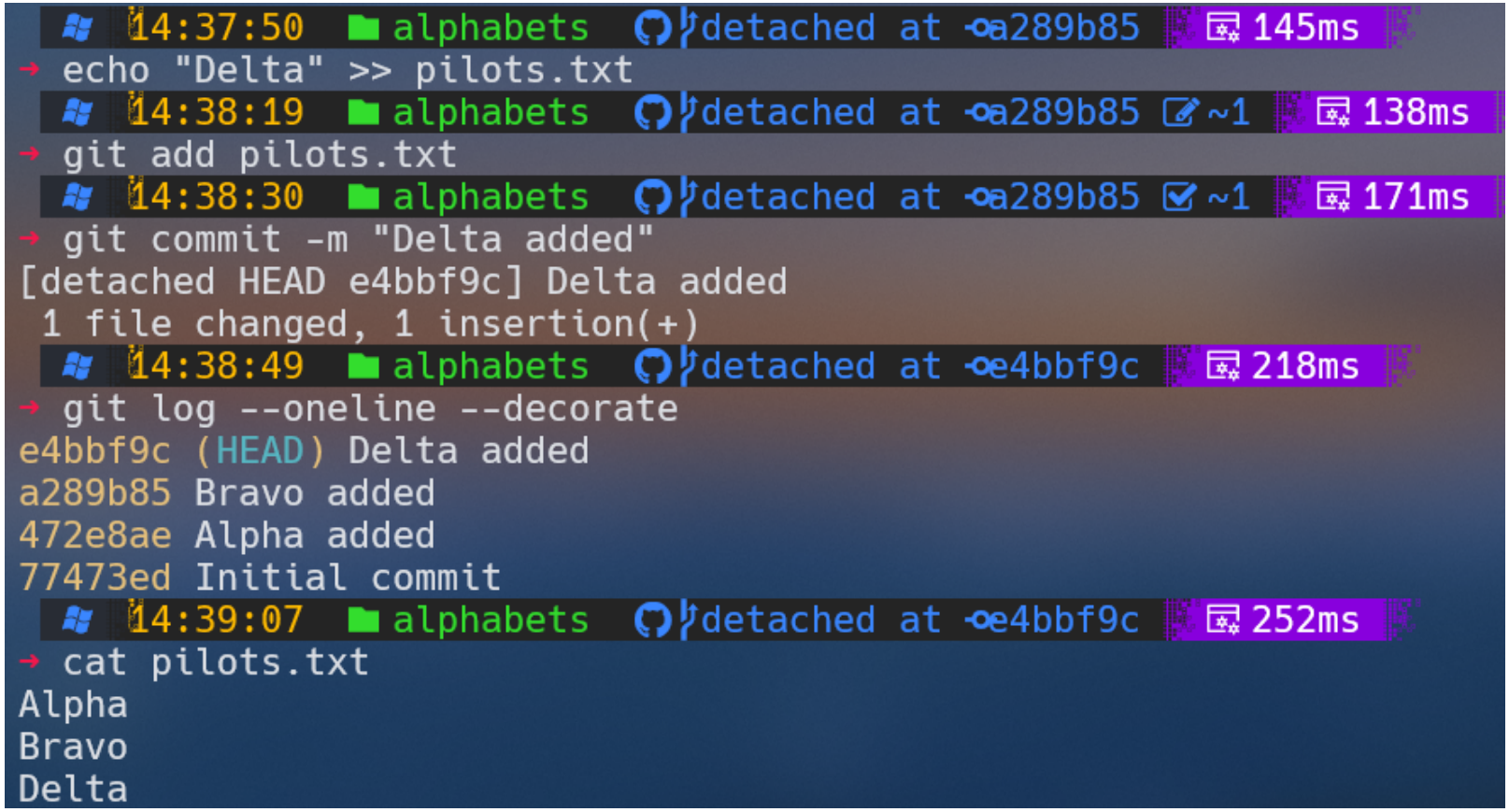
Detached HEAD

This use of the checkout command will cause the files in the working directory to go back to the state they were when the specified commit took place. Once in this state, called detached HEAD state, any commit as you perform another checkout operation. To preserve any changes you make in a detached HEAD state you need to create a branch.

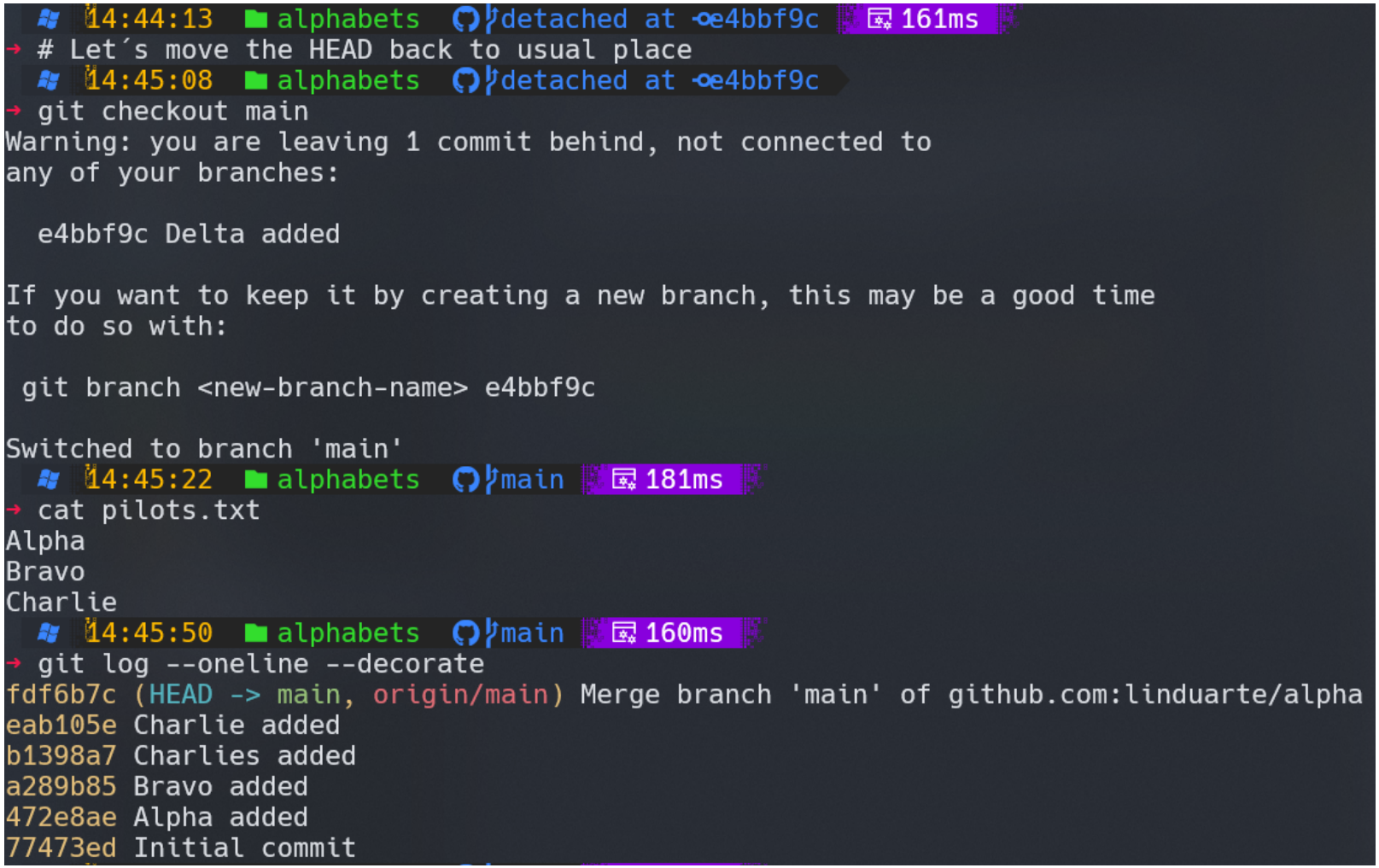

14:20:02 alphabets main 155ms
git log --oneline --decorate
fdf6b7c (HEAD -> main, origin/main) Merge branch 'main' of github.com:linduarte/alpha
eab105e Charlie added
b1398a7 Charlies added
a289b85 Bravo added
472e8ae Alpha added
77473ed Initial commit
14:21:03 alphabets main 248ms
git checkout a289b85
Note: switching to 'a289b85'.
You are in 'detached HEAD' state. You can look around, make experimental
changes and commit them, and you can discard any commits you make in this
state without impacting any branches by switching back to a branch.
If you want to create a new branch to retain commits you create, you may
do so (now or later) by using -c with the switch command. Example:
git switch -c <new-branch-name>
Or undo this operation with:
git switch -
Turn off this advice by setting config variable advice.detachedHead to false
HEAD is now at a289b85 Bravo added

The git checkout output warns of the detached HEAD state. Any new commits made whilst in this state will be lost as soon as you perform another checkout operation. We will demonstrate this with an experiment.

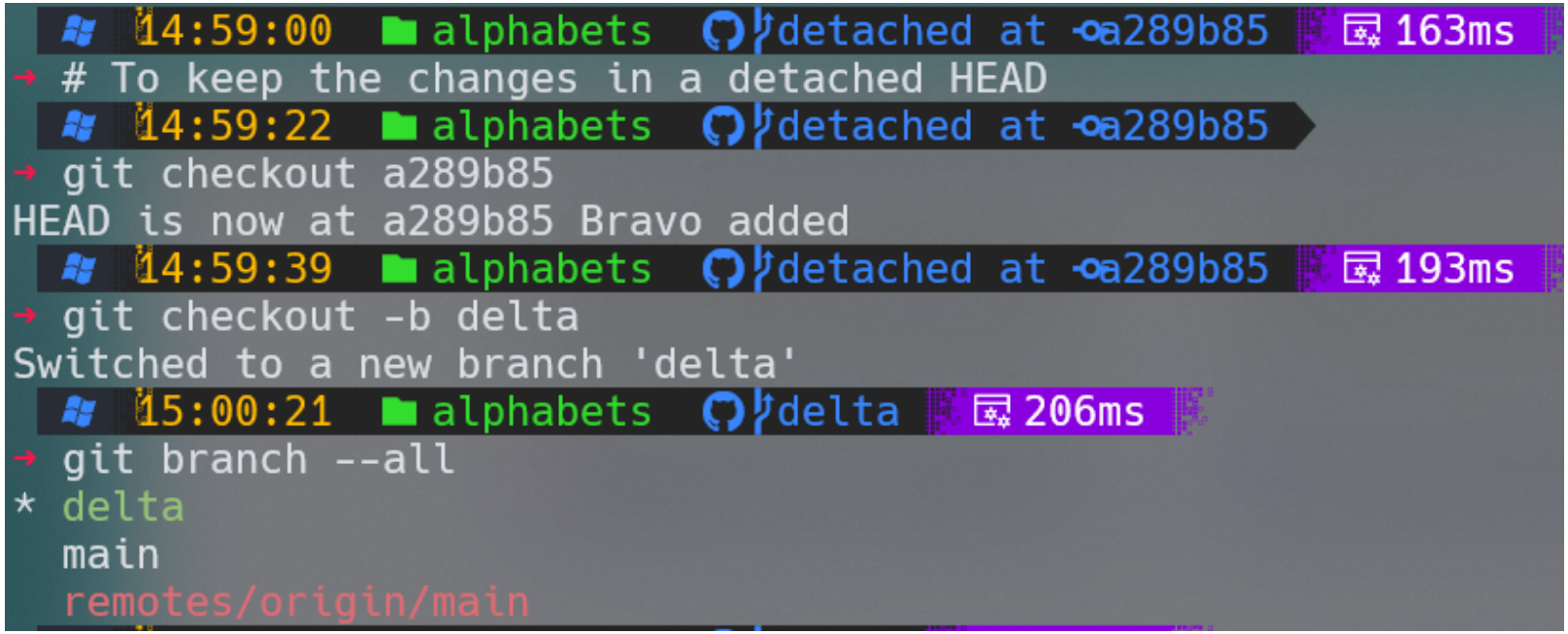
Let's add a new word to pilots.txt and commit:



HEAD usual place

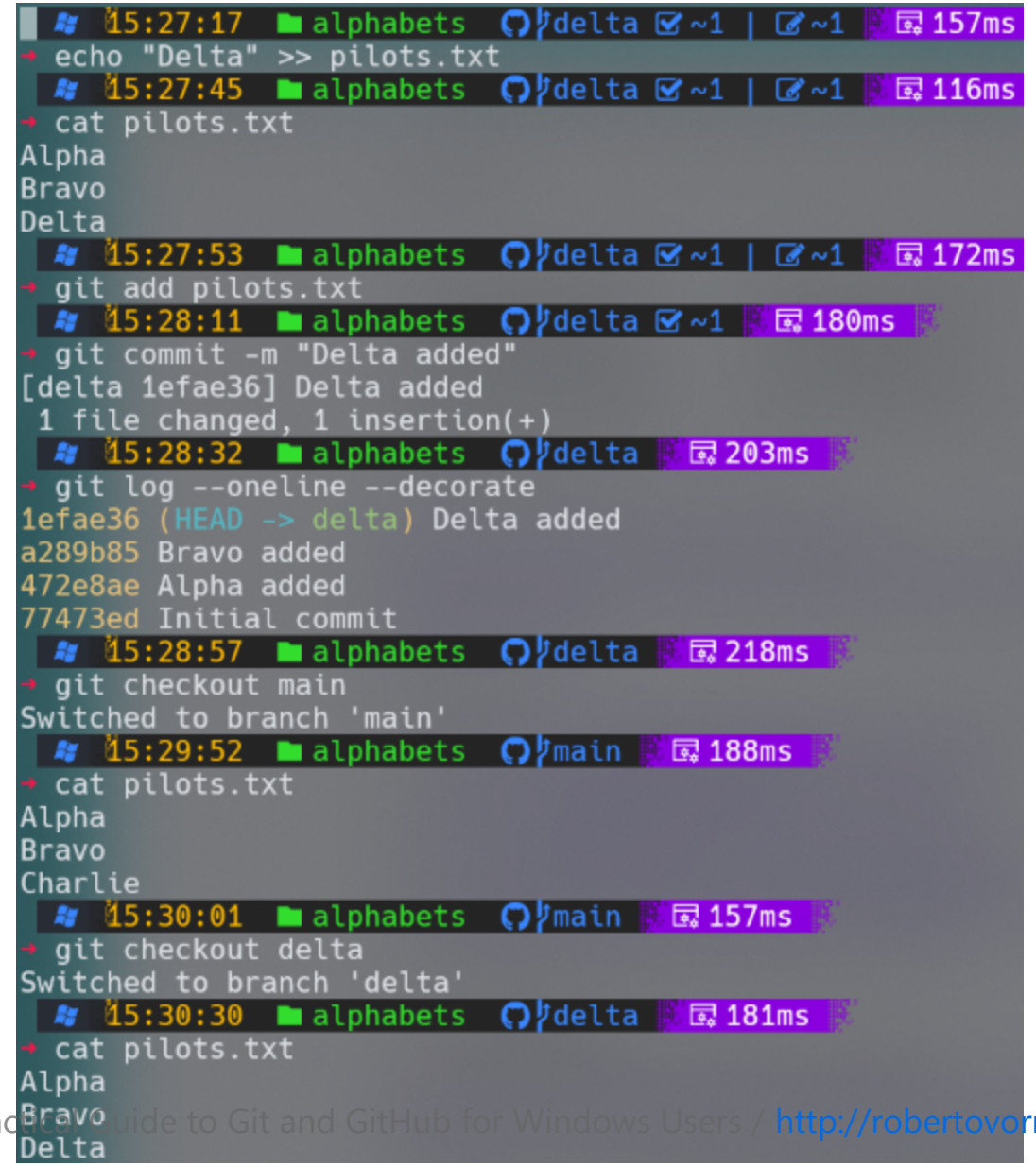


In order to keep the changes you make whilst in a detached HEAD state you need to create a branch.



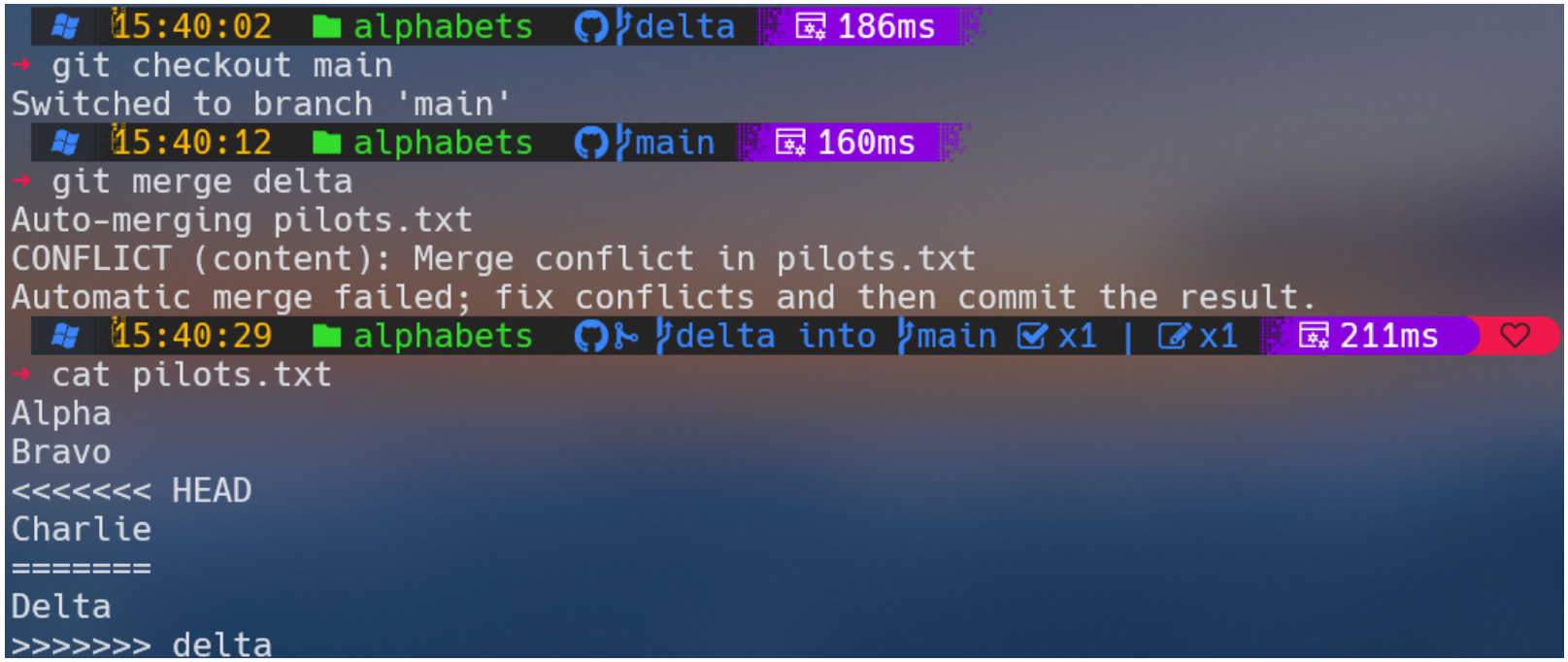
Note the git checkout -b delta command. The -b option creates a new branch (named delta) and immediately switches to it. The current branch is now delta as you can see from the output of the git branch --all command.

Let's make the same change we did earlier to add the word "Delta" to pilots.txt and commit:

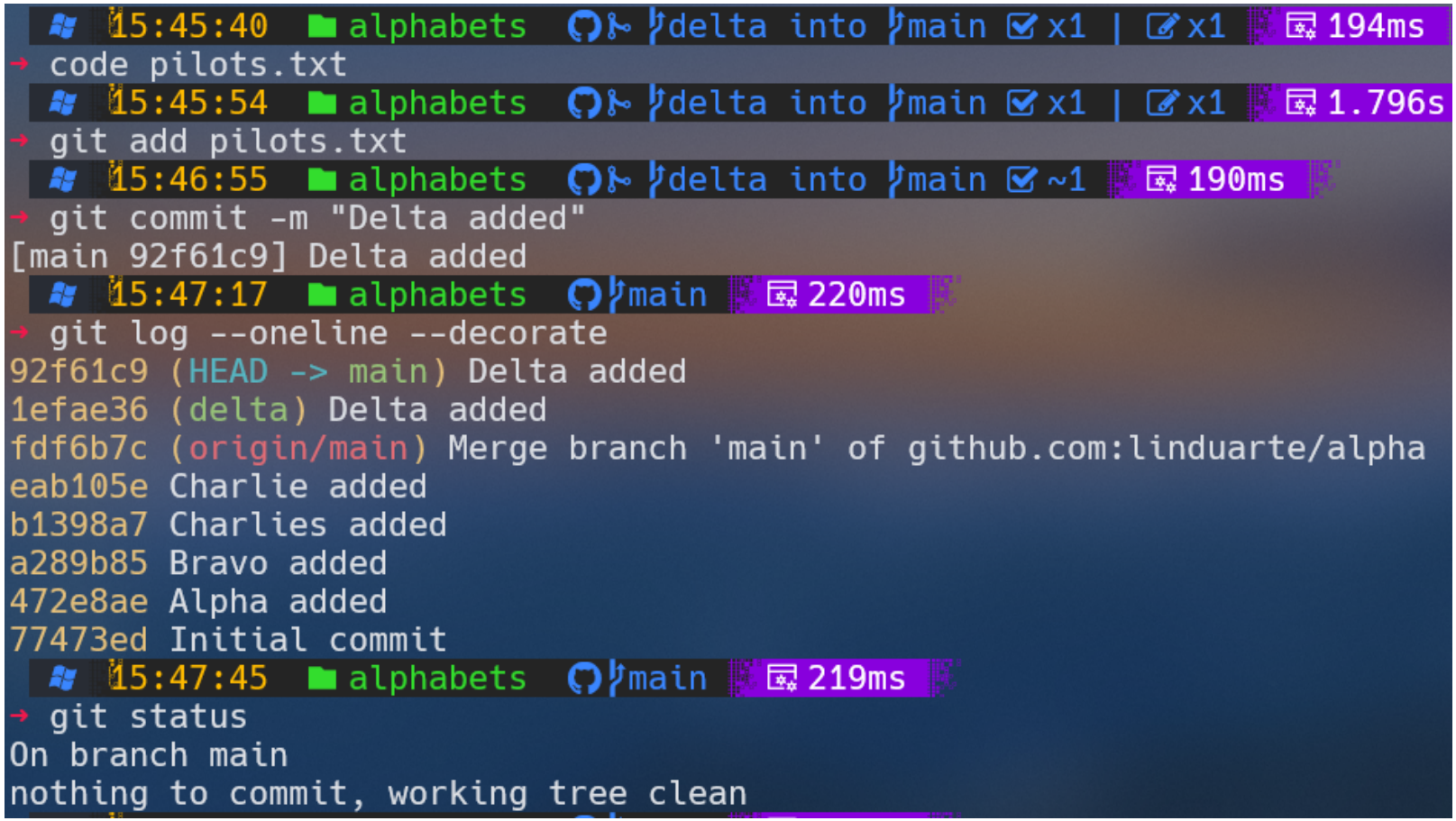


To bring the changes into the main branch you just have to merge. In this case Git will flag a conflict in the third line of pilots.txt as the content differs between the two branches (we have "Charlie" in main and "Delta" in delta).

Let's switch to main and merge:



We need to resolve the conflict manually. Open pilots.txt with VSC and delete the markings added by Git leaving both words ("Charlie" and "Delta") and then commit:



Let´s understanding what happened

The commit 1efae36 (delta) Delta added is the merge from the delta branch.

The commit 92f61c9 (HEAD -> main) Delta added is the commit following conflict resolution.

This experiment has demonstrated the power of the git checkout command. It allows you to go back to any point in time in the commit history of your source code, make experimental changes in a separate branch and, if required, merge the results back to the main code base.

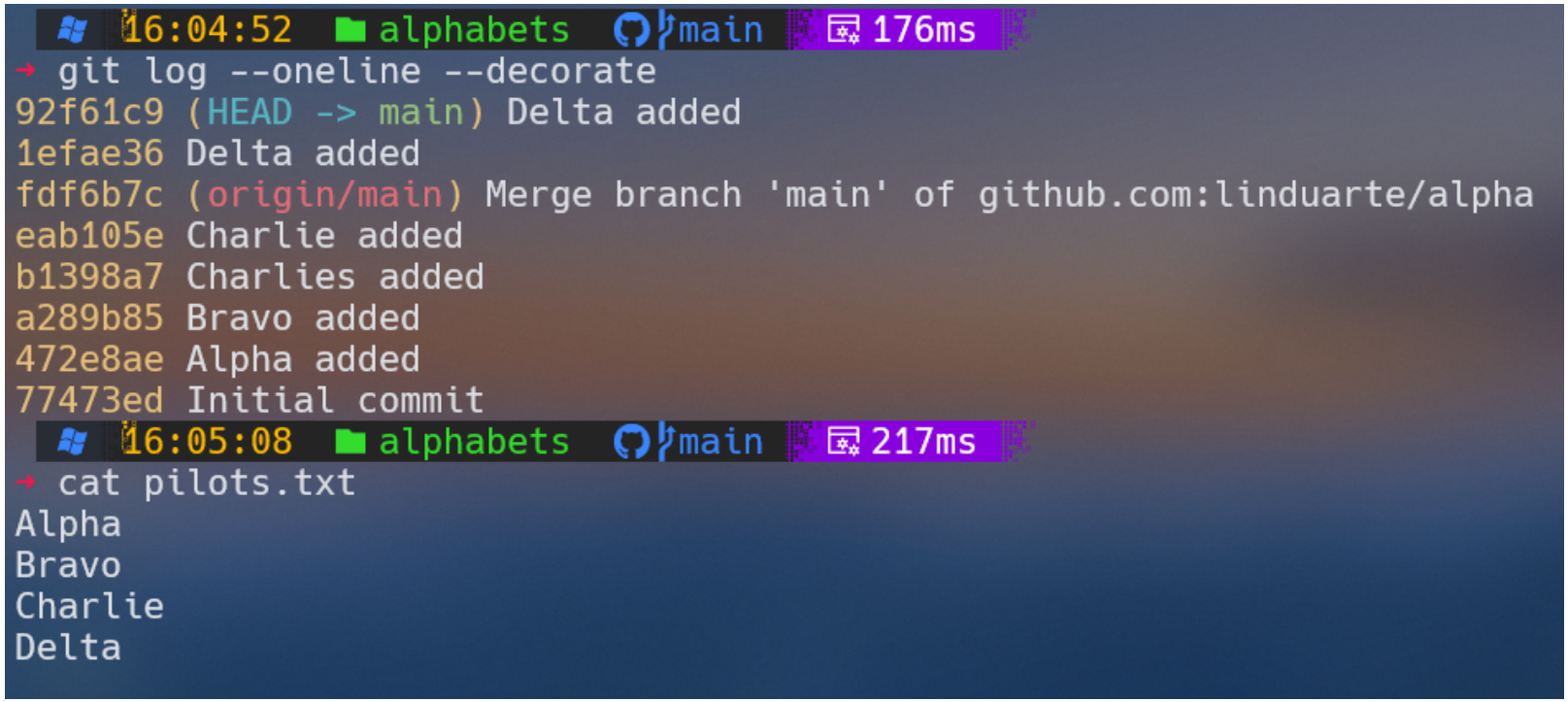
You can use the git branch -D command to remove a development branch you no longer need:

Changing history

There are two Git commands capable of re-writing the commit history of a branch: git reset and git rebase.

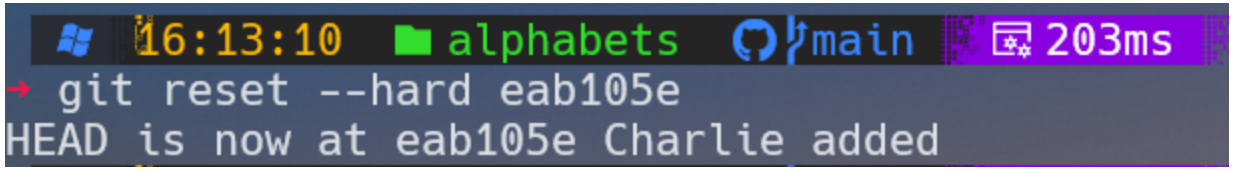
Reset
We will demonstrate what git reset does with an experiment. Open Git Bash and change to the local "alphabets" repository created earlier.

Dump the log history of the main branch:

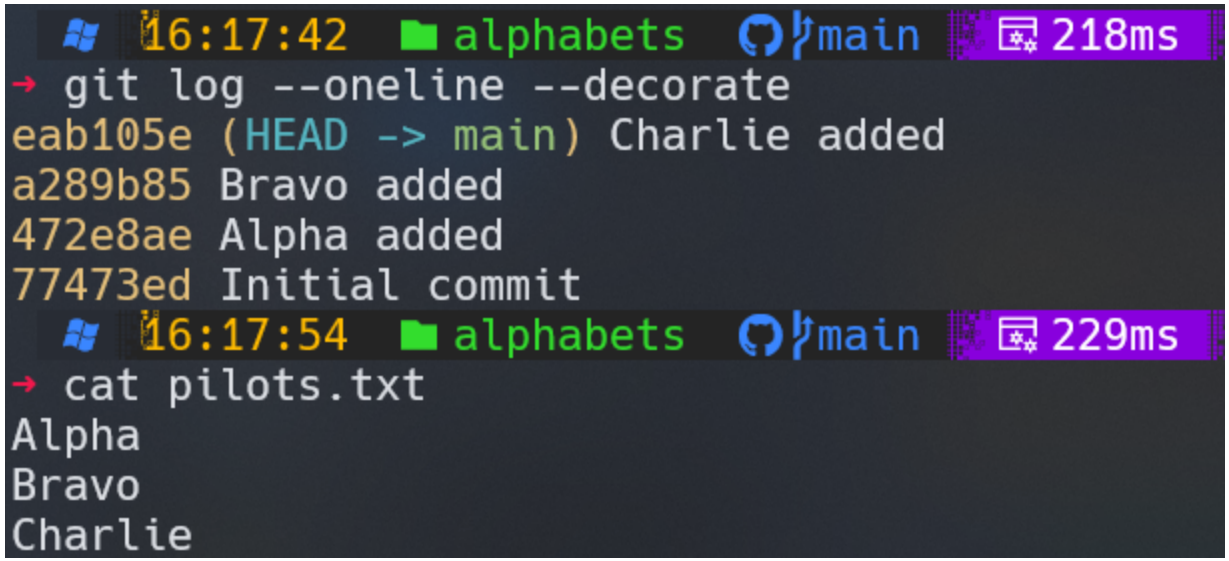


Suppose you want to reset the history of commits to the point where you added the word "Charlie" (hash eab105e in my history log, it will be something else in your repo).

All you have to do is typing the following command replacing the hash value with the one in your history log:



Now check again the history log and you will find that the last two commits have been removed. The pilots.txt file contents have gone back to the point prior to the merging operation we performed in the previous slide:



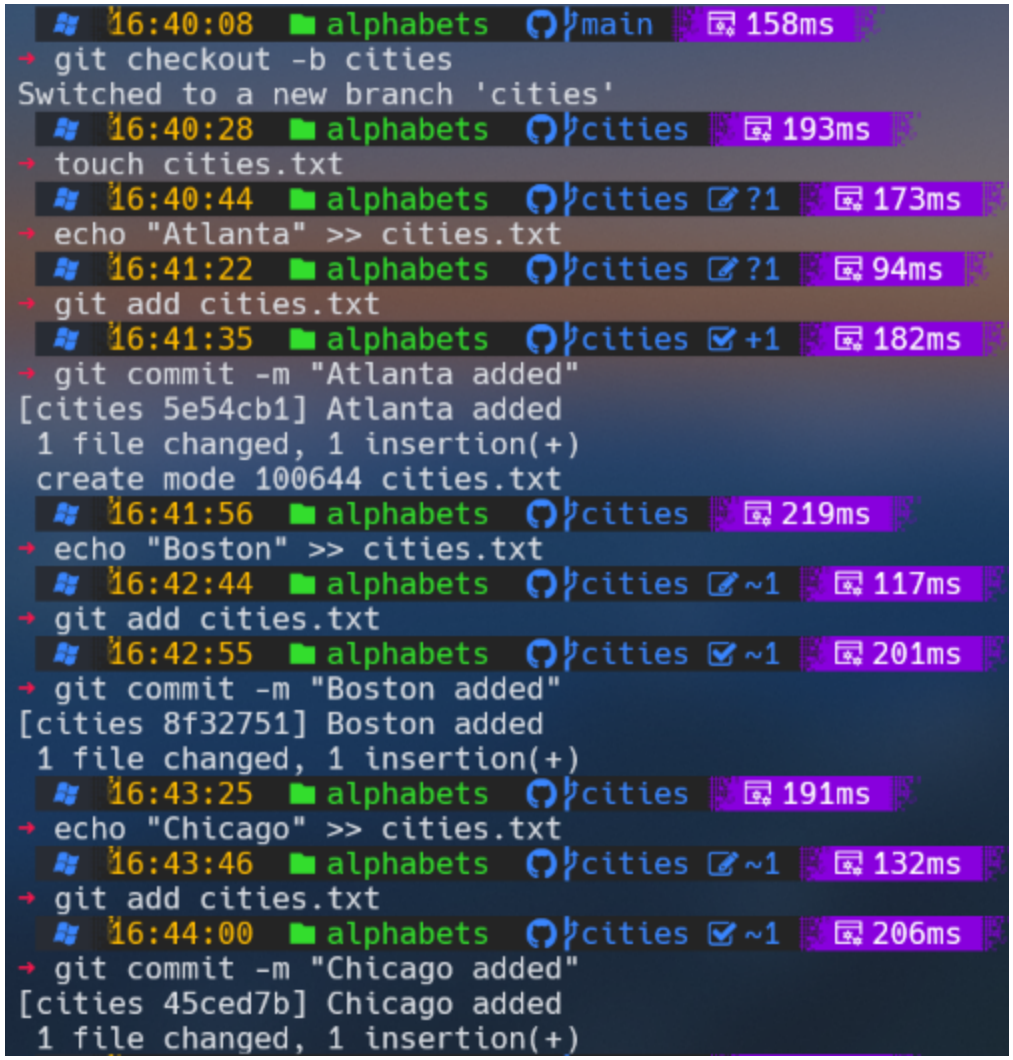
Attention

Although removing unwanted commits can be useful in some situations, it must be done with extreme caution. Warning: *Never change the commit history of shared branches* when collaborating with other users as it will cause them a lot of problems when you push the changes back to a shared public repository. Only use this form of reset if you want to remove unwanted commits from a local private branch.

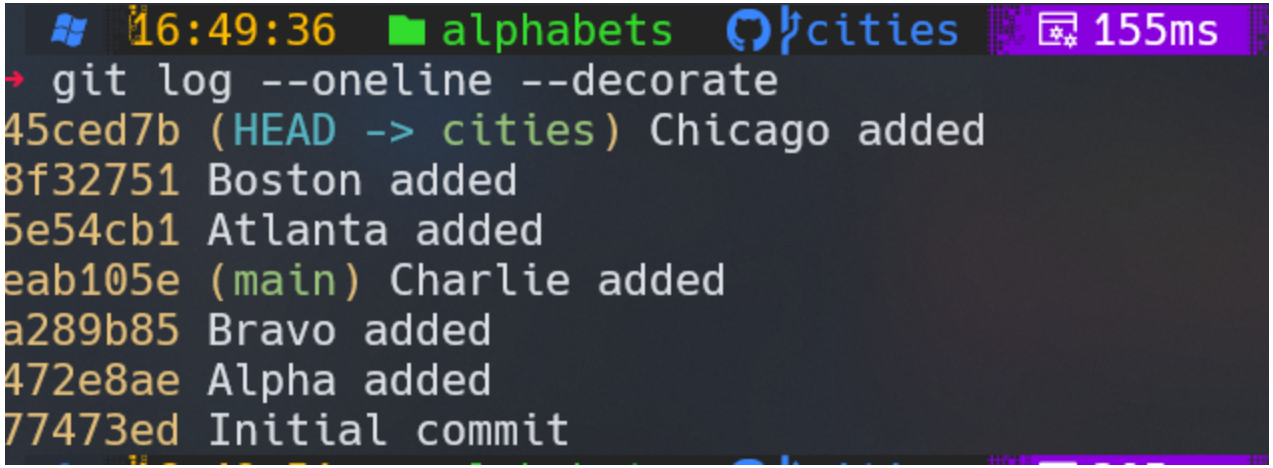
Rebase

The command git rebase can be used in place of git merge to integrate the work you have done in separate branches. Whereas the merge operation preserves history, the rebase operation can modify the target branch history by inserting intermediary commits.

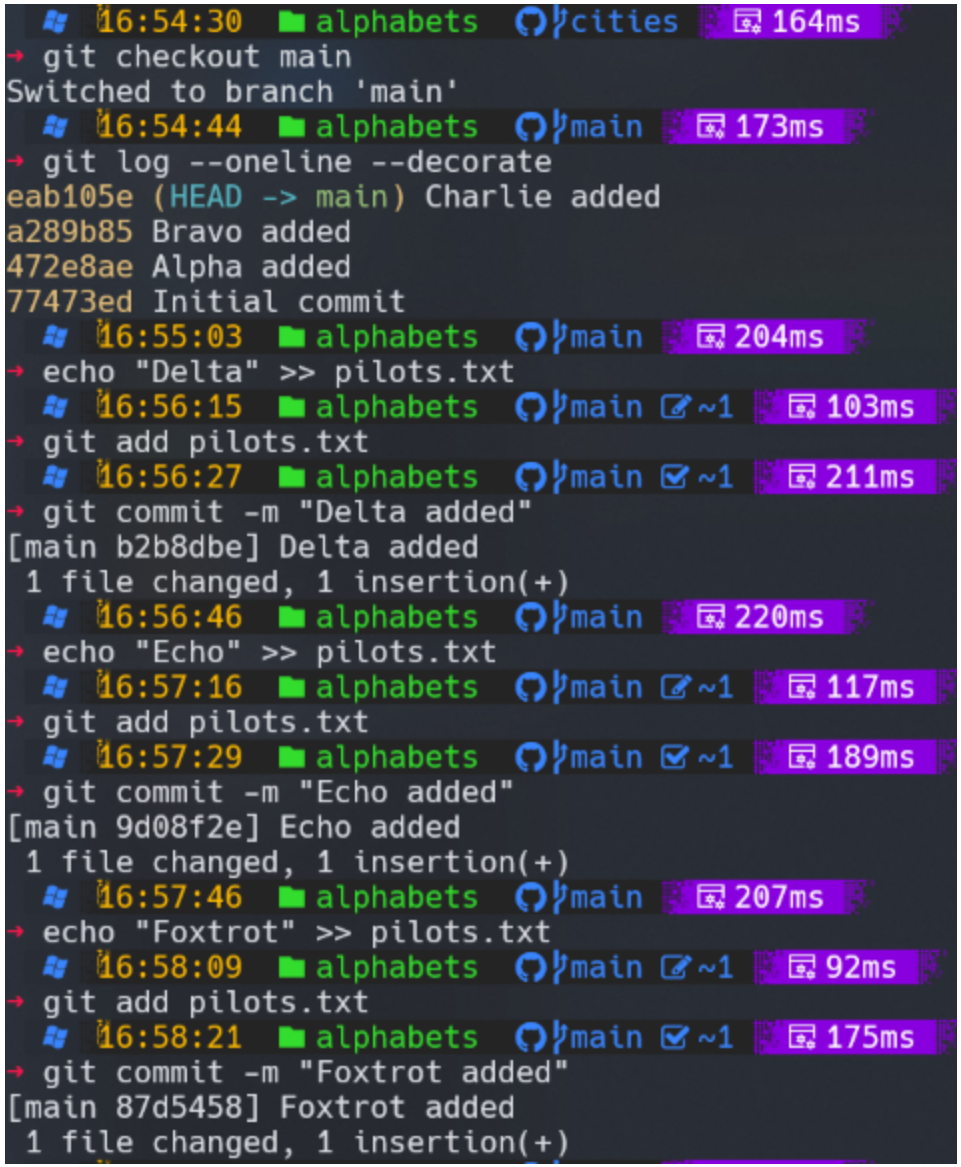
Let´s explore the difference between git merge and git rebase.



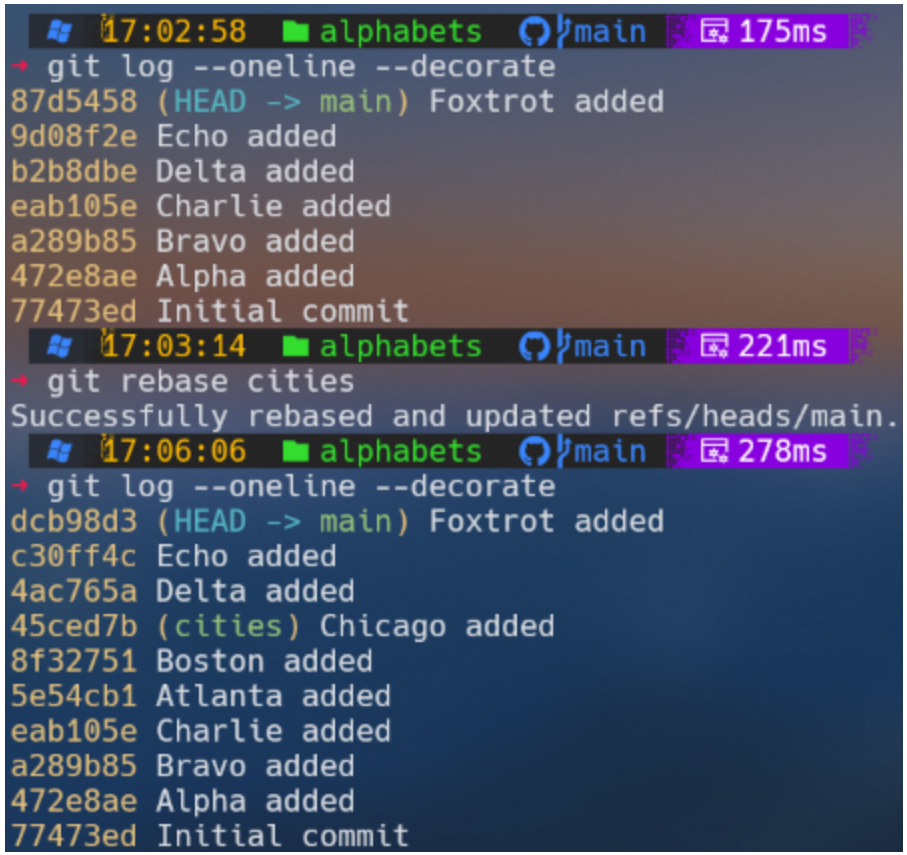
After the previous process we get:



Now we added Delta, Echo and Foxtrot to main branch



Suppose we want to integrate the work we have done on the cities branch on to the main branch. This time, instead of git merge, we will use git rebase. Let's see what happens:



With git merge the commits would have been added to the history of the main branch at the point of merge, leaving the previous history intact. The rebase operation instead has replayed the commits we did on the cities branch on top of the main branch effectively modifying its history as if we had done all the work sequentially on the master branch.

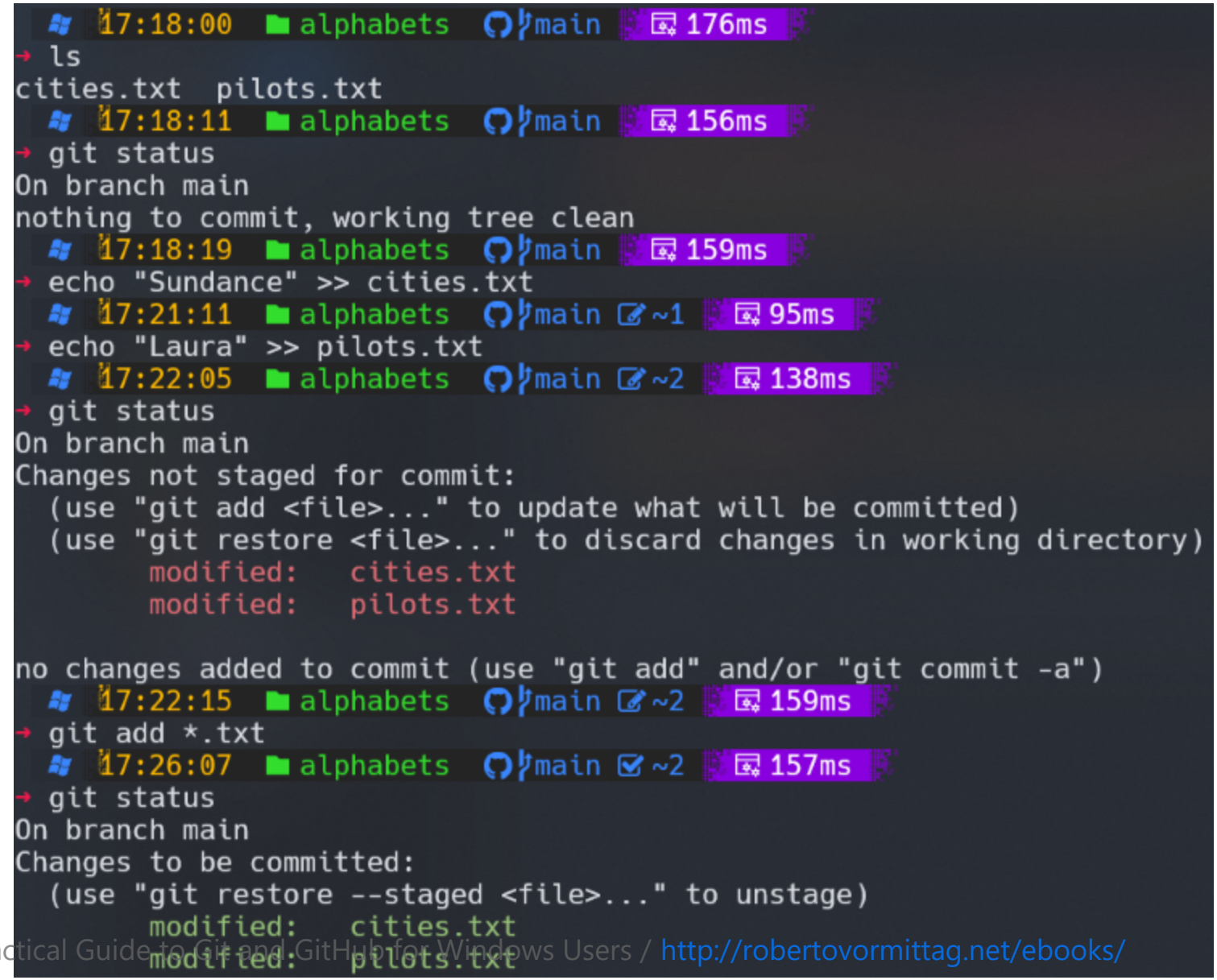
Warning

As we have already stated, changing the commit history of a public shared branch will confuse and potentially cause errors when with other users. Only use rebase instead of merge in short-lived local private branches where you want to see the commit history of the feature branch replayed onto the target branch. Never use rebase on public shared branches that are pushed to remote repositories

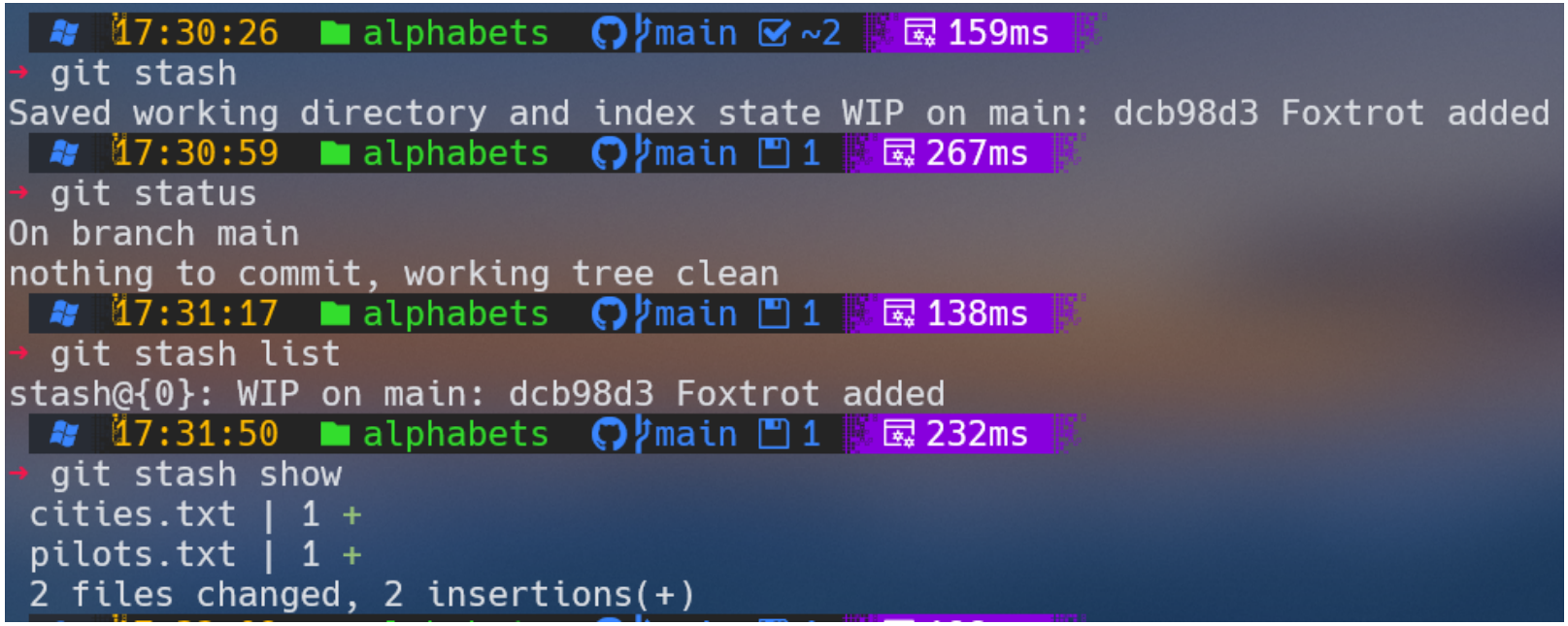
Saving changes

The git stash command can be used to "stash away" half-baked changes are not prepared to commit yet but want to keep for later.

Let´s practice on main branch adding some words and keep them staged:



Suppose now you decide to start some other work from a clean working directory but without loosing the changes you have made so far. You can simply stash the changes away by typing:



The working directory and index are now clean;

But your changes have not been lost. You can view any modifications stashed away with the following commands:git stash list and git stash show.

When you decide to restore the work you have stashed away you can do so by entering the command git stash apply: