Undoing Changes

In the last module, we learned how to record versions of a project into a Git repository. The whole point of maintaining these "safe" copies is peace of mind: should our project suddenly break, we'll know that we have easy access to a functional version, and we'll be able to pinpoint precisely where the problem was introduced.

To this end, storing "safe" versions isn't much help without the ability to restore them. Our next task is to learn how to view the previous states of a project, revert back to them, and reset uncommitted changes.

 Download the repository for this module

If you've been following along from the previous module, you already have everything you need. Otherwise, download the zipped Git repository from the above link, uncompress it, and you're good to go.

Display Commit Checksums

As a quick review, let's display our repository's history. Navigate a command prompt (or Git Bash) to the `my-git-repo` folder and run the following.

```
git log --oneline
```

The output for this should look similar to the following, but contain different commit checksums.

```
1c310d2 Add navigation links
54650a3 Create blue and orange pages
b650e4b Create index page
```

Git only outputs the first 7 characters of the checksum (remember that you can see the full version with the default formatting of `git log`). These first few characters effectively serve as a unique ID for each commit.

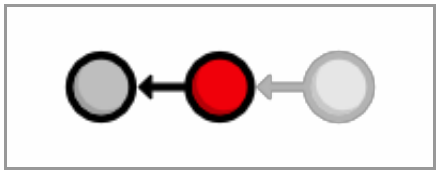
View an Old Revision

Using the new `git checkout` command, we can view the contents of a previous snapshot. Make sure to change 54650a3 in the following command to the ID of your *second* commit.

```
git checkout 54650a3
```

This will output a lot of information about a `detached HEAD` state. You can ignore it for now. All you need to know is that the above command turns your `my-git-repo` directory into an exact replica of the second snapshot we committed in The Basics.

Open the HTML files in a text editor or web browser to verify that the navigation links we added in the third commit have disappeared. Running `git log` will also tell us that the third commit is no longer part of the project. After checking out the second commit, our repository history looks like the following (the red circle represents the current commit).



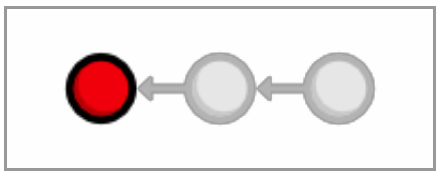
Checking out the 2nd commit

View an Older Revision

Let's go even farther back in our history. Be sure to change b650e4b to the ID of your *first* commit.

```
git checkout b650e4b
```

Now, the `blue.html` and `orange.html` files are gone, as is the rest of the `git log` history.



Checking out the 1st commit

In the last module, we said that Git was designed to never lose a committed snapshot. So, where did our second and third snapshots go? A simple `git status` will answer that question for us. It should return the following message:

```
# Not currently on any branch.
nothing to commit (working directory clean)
```

Compare this with the status output from the previous module:

```
# On branch master
nothing to commit (working directory clean)
```

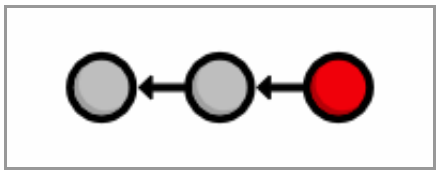
All of our actions in *The Basics* took place on the `master` branch, which is where our second and third commits still reside. To retrieve our complete history, we just have to check out this branch. This is a very brief introduction to branches, but it's all we need to know to navigate between commits. The next module will discuss branches in full detail.

Return to Current Version

We can use the same `git checkout` command to return to the `master` branch.

```
git checkout master
```

This makes Git update our working directory to reflect the state of the `master` branch's snapshot. It re-creates the `blue.html` and `orange.html` files for us, and the content of `index.html` is updated as well. We're now back to the current state of the project, and our history looks like:



Current project history

Tag a Release

Let's call this a stable version of the example website. We can make it official by **tagging** the most recent commit with a version number.

```
git tag -a v1.0 -m "Stable version of the website"
```

Tags are convenient references to official releases and other significant milestones in a software project. It lets developers easily browse and check out important revisions. For example, we can now use the `v1.0` tag to refer to the third commit instead of its random ID. To view a list of existing tags, execute `git tag` without any arguments.

In the above snippet, the `-a` flag tells Git to create an **annotated tag**, which lets us record our name, the date, and a descriptive message (specified via the `-m` flag). We'll use this tag to find the stable version after we try some crazy experiments.

Try a Crazy Experiment

We're now free to add experimental changes to the example site without affecting any committed content. Create a new file called `crazy.html` and add the following HTML.

```
<!DOCTYPE html>
<html lang="en">
<head>
```

```
  <title>A Crazy Experiment</title>
  <meta charset="utf-8" />
</head>
<body>
  <h1>A Crazy Experiment</h1>
  <p>We're trying out a <span style="color: #F0F">crazy</span>
  <span style="color: #06C">experiment</span>!

  <p><a href="index.html">Return to home page</a></p>
</body>
</html>
```

Stage and Commit the Snapshot

Stage and commit the new file as usual.

```
git add crazy.html
git status
git commit -m "Add a crazzzy experiment"
git log
```

It's a good practice to run `git status` to see exactly what you're committing before running `git commit -m`. This will keep you from unintentionally committing a file that doesn't belong in the current snapshot.

As expected, the new snapshot shows up in the repository's history. If your log history takes up more than one screen, you can scroll down by pressing Space and return to the command line by pressing the letter q.

View the Stable Commit

Let's go back and take a look at our stable revision. Remember that the `v1.0` tag now serves as a user-friendly shortcut to the third commit's ID.

```
git checkout v1.0
```

After seeing the stable version of the site, we decide to scrap the crazy experiment. But, before we undo the changes, we need to return to the `master` branch. If we didn't, all of our updates would be on some non-existent branch. As we'll discover next module, you should never make changes directly to a previous revision.

```
git checkout master
git log --oneline
```

At this point, our history should look like the following:

```
514fbe7 Add a crazzzy experiment
1c310d2 Add navigation links
54650a3 Create blue and orange pages
b650e4b Create index page
```

Undo Committed Changes

We're ready to restore our stable tag by removing the most recent commit. Make sure to change `514fbe7` to the ID of the *crazy experiment's commit* before running the next command.

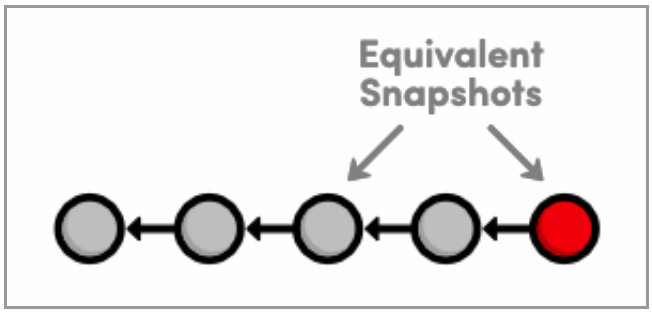
```
git revert 514fbe7
```

This will prompt you for a commit message with a default of `Revert "Add a crazzzy experiment"...`. You can leave the default message and close the file. After verifying that `crazy.html` is gone, take a look at your history with `git log --oneline`.

```
506bb9b Revert "Add a crazzzy experiment"
514fbe7 Add a crazzzy experiment
1c310d2 Add navigation links
54650a3 Create blue and orange pages
b650e4b Create index page
```

Notice that instead of deleting the "crazzzy experiment" commit, Git figures out how to undo the changes it contains, then tacks on another commit with the resulting

content. So, our fifth commit and our third commit represent the exact same snapshot, as shown below. Again, Git is designed to *never* lose history: the fourth snapshot is still accessible, just in case we want to continue developing it.



Current project history

When using `git revert`, remember to specify the commit that you want to undo—not the stable commit that you want to return to. It helps to think of this command as saying "undo this commit" rather than "restore this version."

Start a Smaller Experiment

Let's try a smaller experiment this time. Create `dummy.html` and leave it as a blank file. Then, add a link in the "Navigation" section of `index.html` so that it resembles the following.

```
<h2>Navigation</h2>
<ul>
  <li style="color: #F90">
    <a href="orange.html">The Orange Page</a>
  </li>
  <li style="color: #00F">
    <a href="blue.html">The Blue Page</a>
  </li>
  <li>
    <a href="dummy.html">The Dummy Page</a>
  </li>
</ul>
```

In the next section, we're going to abandon this uncommitted experiment. But since the `git revert` command requires a commit ID to undo, we can't use the method

discussed above.

Undo Uncommitted Changes

Before we start undoing things, let's take a look at the status of our repository.

```
git status
```

We have a tracked file and an untracked file that need to be changed. First, we'll take care of `index.html`:

```
git reset --hard
```

This changes all *tracked* files to match the most recent commit. You can also pass a filename to this command to reset only that file (e.g., `git reset --hard index.html`). The `--hard` flag is what actually updates the file. Running `git reset index.html` without any flags will simply unstage the file, leaving its contents as is. In either case, `git reset` only operates on the working directory and the staging area, so our `git log` history remains unchanged.

Next, let's remove the `dummy.html` file. Of course, we could manually delete it, but using Git to reset changes eliminates human errors when working with several files in large teams. Run the following command.

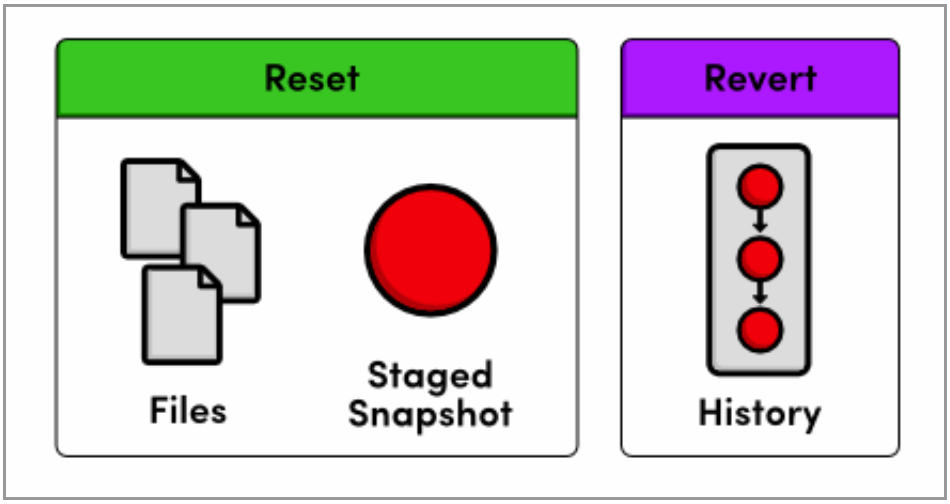
```
git clean -f
```

This will remove all *untracked* files. With `dummy.html` gone, `git status` should now tell us that we have a "clean" working directory, meaning our project matches the most recent commit.

Be careful with `git reset` and `git clean`. Both operate on the working directory, not on the committed snapshots. Unlike `git revert`, they *permanently* undo changes, so make sure you really want to trash what you're working on before you use them.

Conclusion

As noted in the previous module, most Git commands operate on one of the three main components of a Git repository: the working directory, the staged snapshot, or the committed snapshots. The `git reset` command undoes changes to the working directory and the staged snapshot, while `git revert` undoes changes contained in committed snapshots. Not surprisingly, `git status` and `git log` directly parallel this behavior.



Resetting vs. Reverting

I mentioned that instead of completely removing a commit, `git revert` saves the commit in case you want to come back to it later. This is only one reason for preserving committed snapshots. When we start working with remote repositories, we'll see that altering the history by removing a commit has dramatic consequences for collaborating with other developers.

This module also introduces the concept of switching between various commits and branches with `git checkout`. Branches round out our discussion of the core Git components, and they offer an elegant option for optimizing your development workflow. In the next module, we'll cover the basic Git branch commands.

Quick Reference

```
git checkout <commit-id>
```
View a previous commit.

```
git tag -a <tag-name> -m "<description>"
```
Create an annotated tag pointing to the most recent commit.

```
git revert <commit-id>
```

Undo the specified commit by applying a new commit.

`git reset --hard`

Reset *tracked* files to match the most recent commit.

`git clean -f`

Remove *untracked* files.

`git reset --hard` / `git clean -f`

Permanently undo uncommitted changes.

Continue to *Branches, Part I* ›