

Web Programming with Python and JavaScript

Git

HTML, CSS

Flask

SQL

APIs

JavaScript

Front Ends

Django

Testing, CI/CD

Scalability

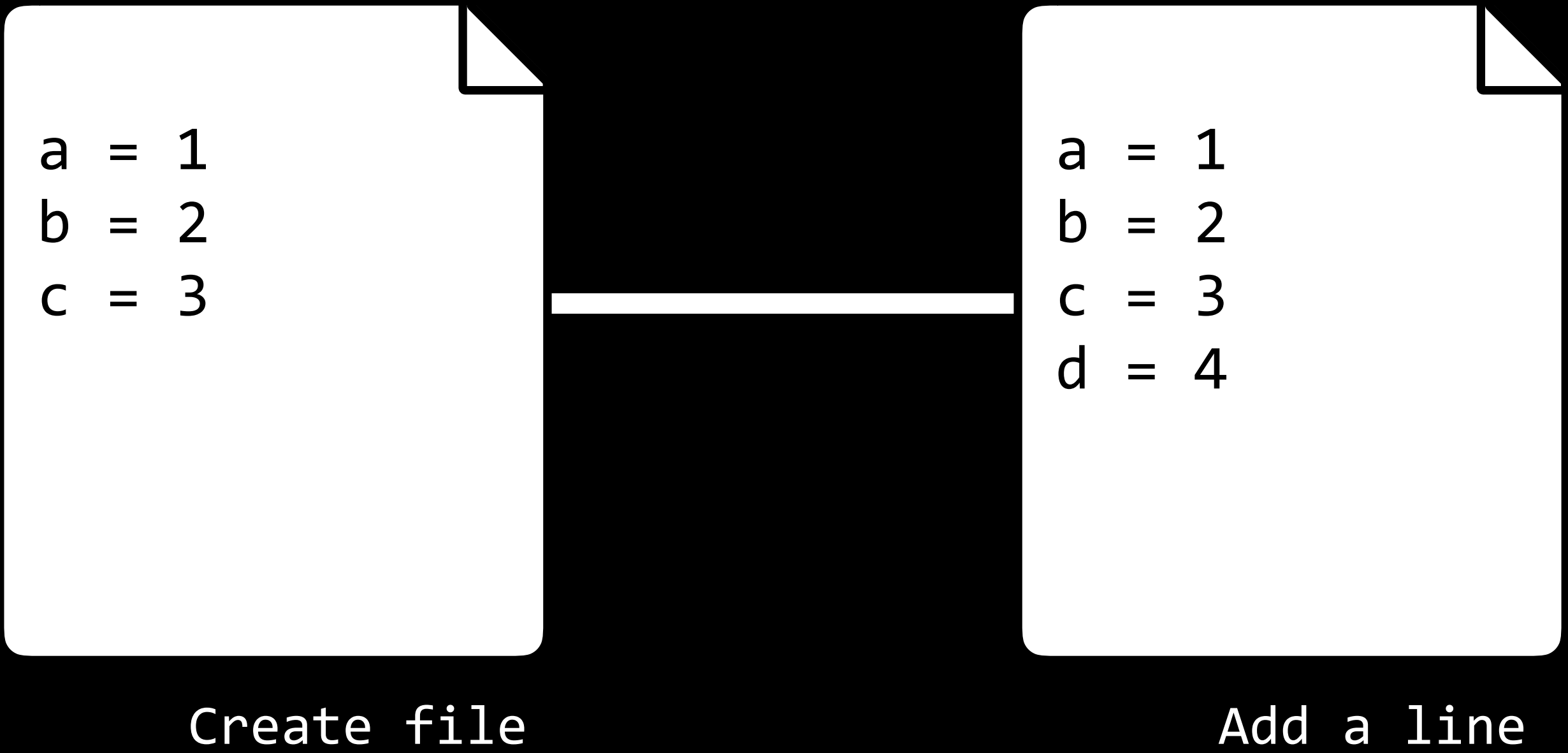
Security

- Project 0
- Project 1
- Project 2
- Project 3
- Final Project

Version Control

git

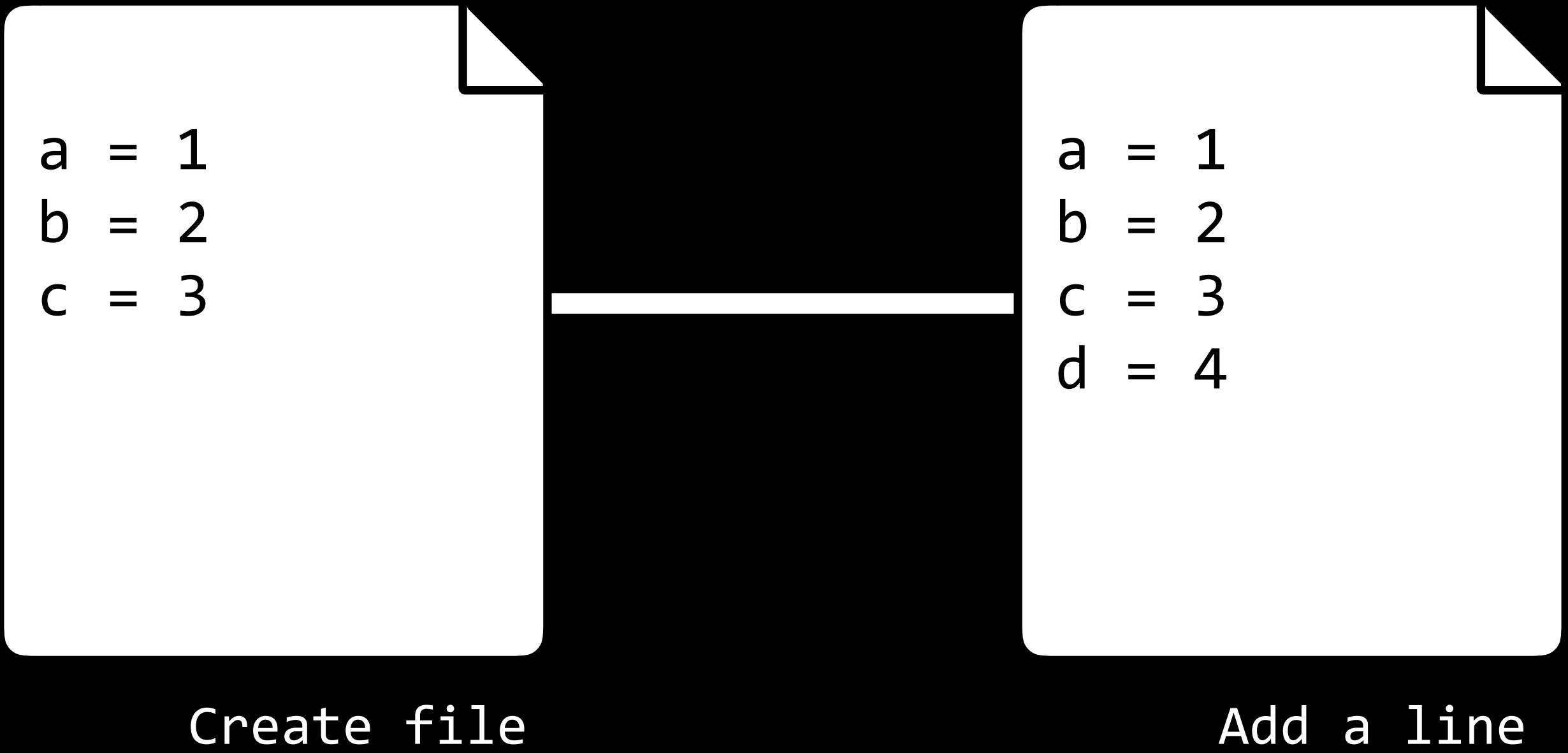
Keep track of changes to code.



```
a = 1  
b = 2  
c = 3
```

Create file

Keep track of changes to code.



```
a = 1  
b = 2  
c = 3
```

Create file

```
a = 1  
b = 2  
c = 3  
d = 4
```

Add a line

Keep track of changes to code.

The diagram illustrates a sequence of three code files connected by horizontal lines. Each file is represented as a white document icon with a folded top-right corner. The first file contains three lines of code: 'a = 1', 'b = 2', and 'c = 3'. The second file contains four lines: 'a = 1', 'b = 2', 'c = 3', and 'd = 4'. The third file contains three lines: 'a = 1', 'c = 3', and 'd = 4'. The label 'Remove a line' is positioned below the third file, indicating that the line 'b = 2' from the second file has been removed.

```
a = 1  
b = 2  
c = 3
```

Create file

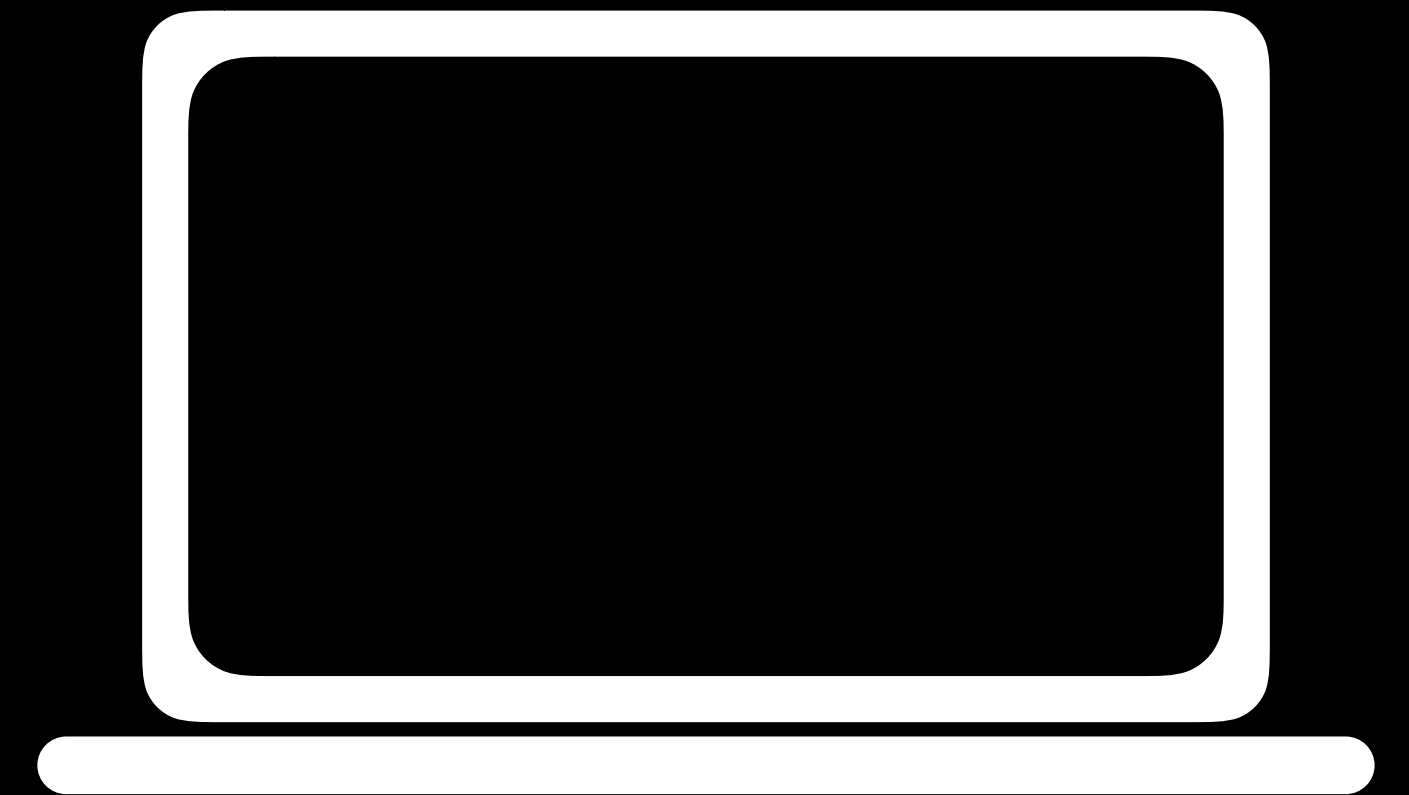
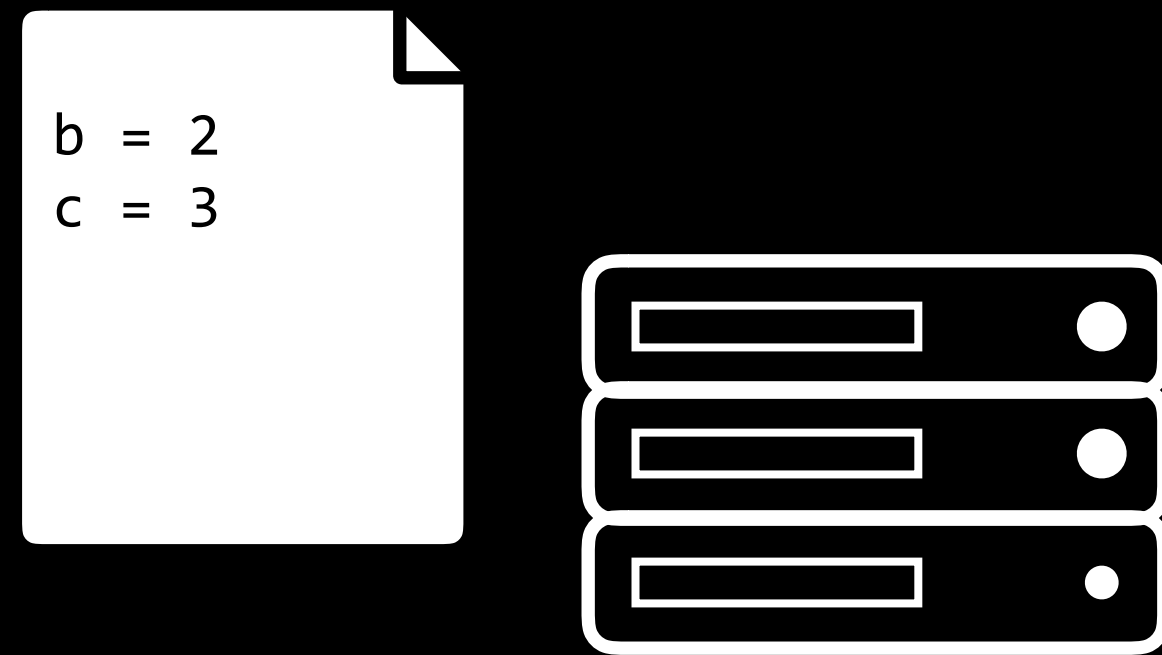
```
a = 1  
b = 2  
c = 3  
d = 4
```

Add a line

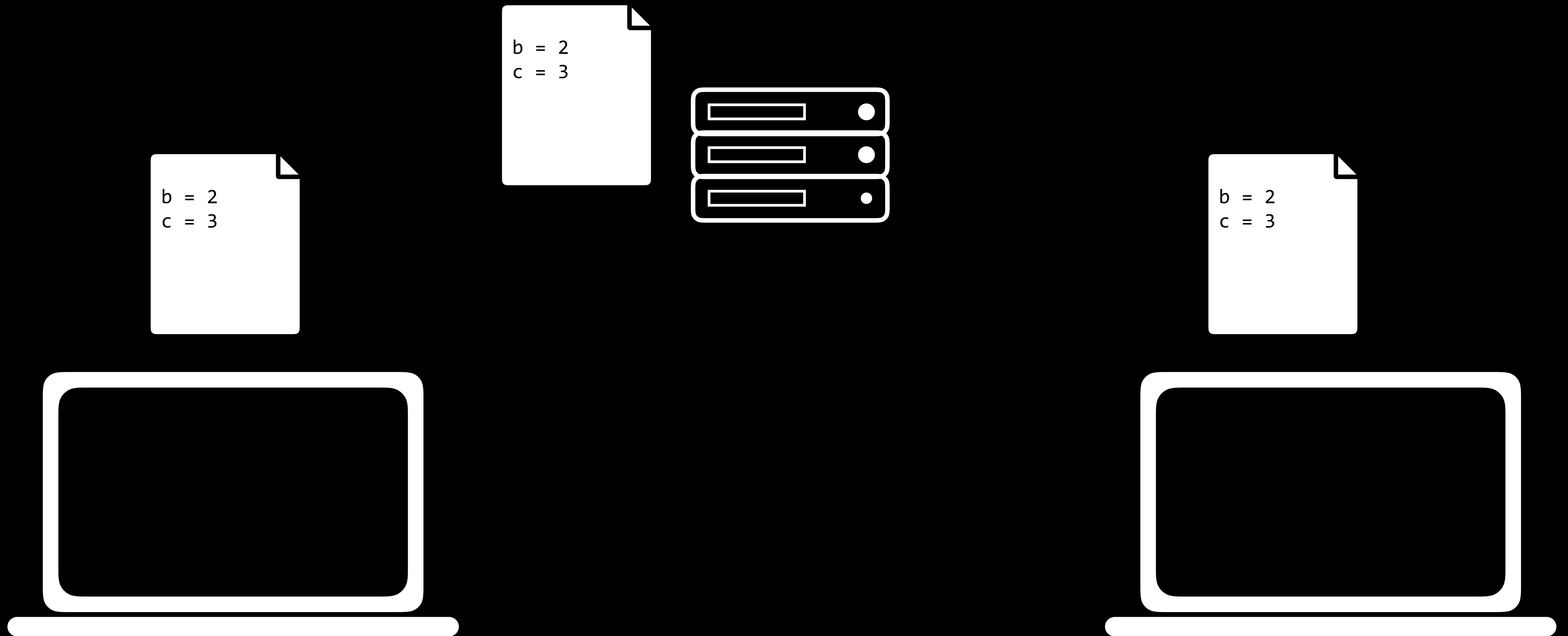
```
a = 1  
c = 3  
d = 4
```

Remove a line

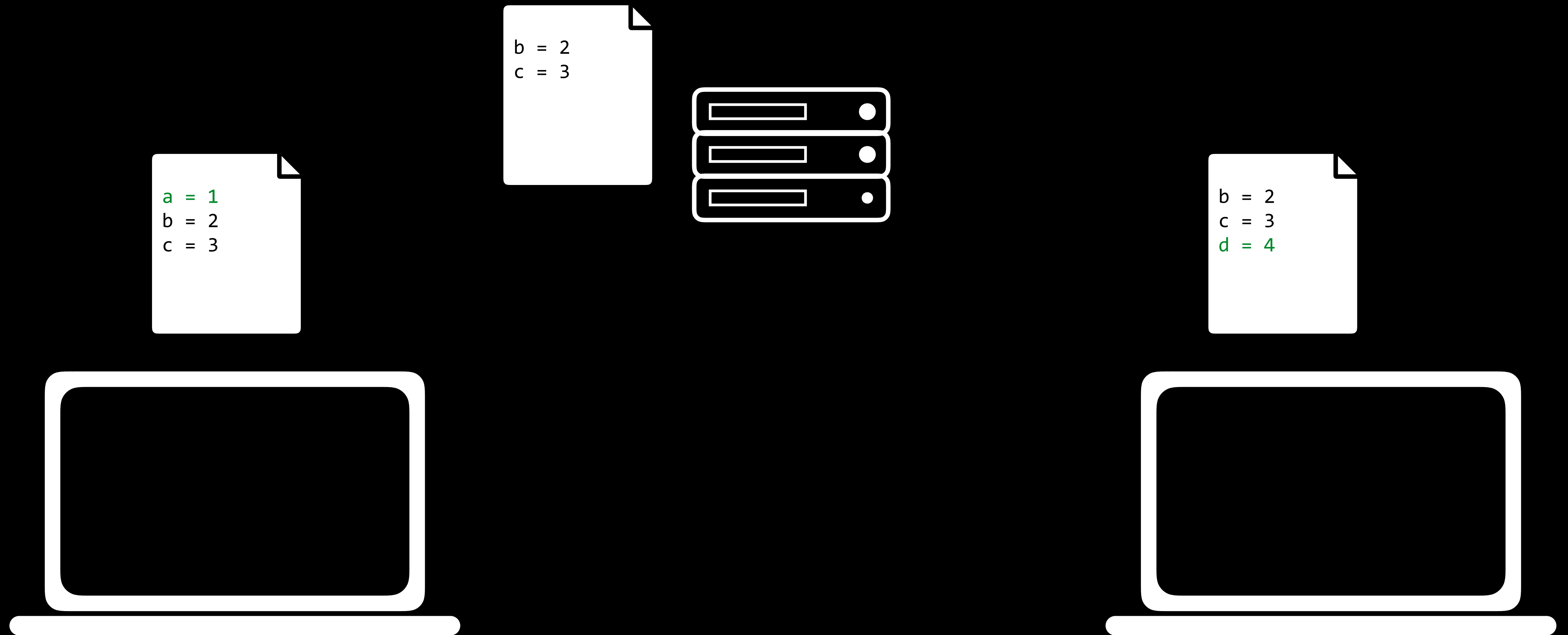
Synchronizes code between different people.



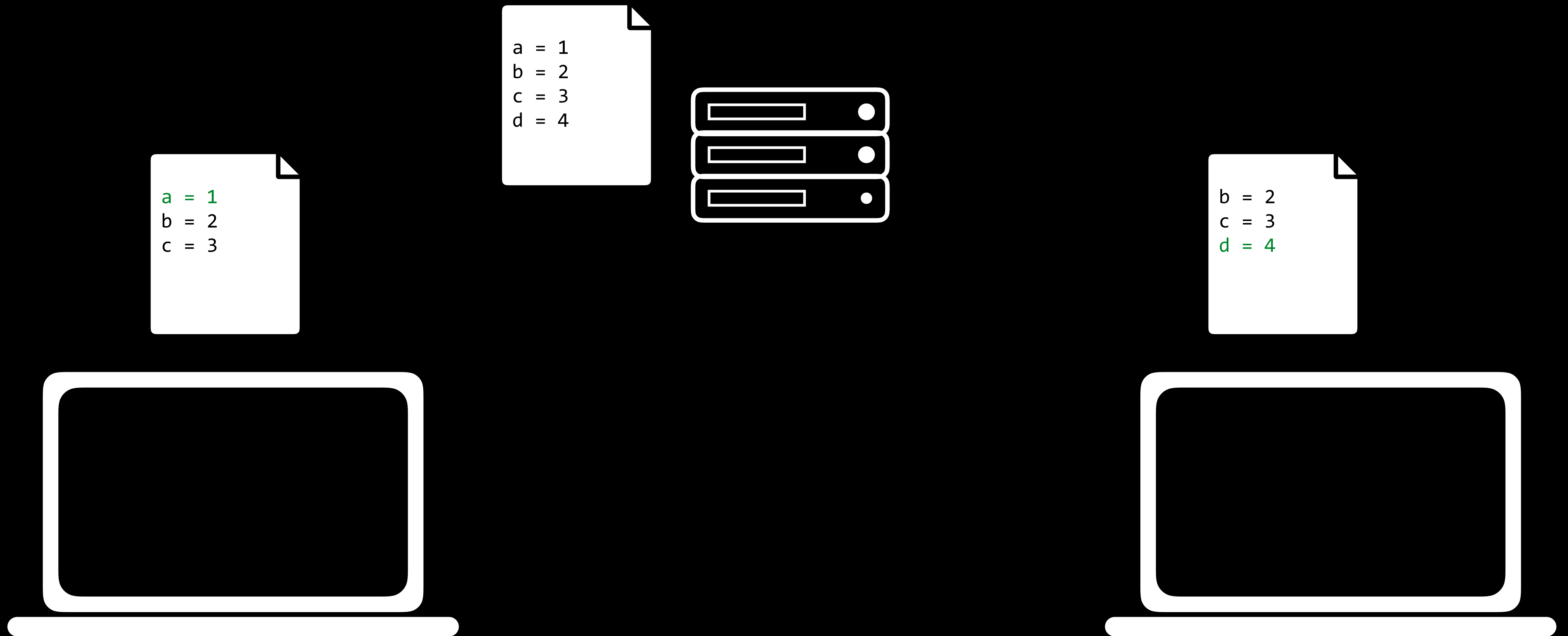
Synchronizes code between different people.



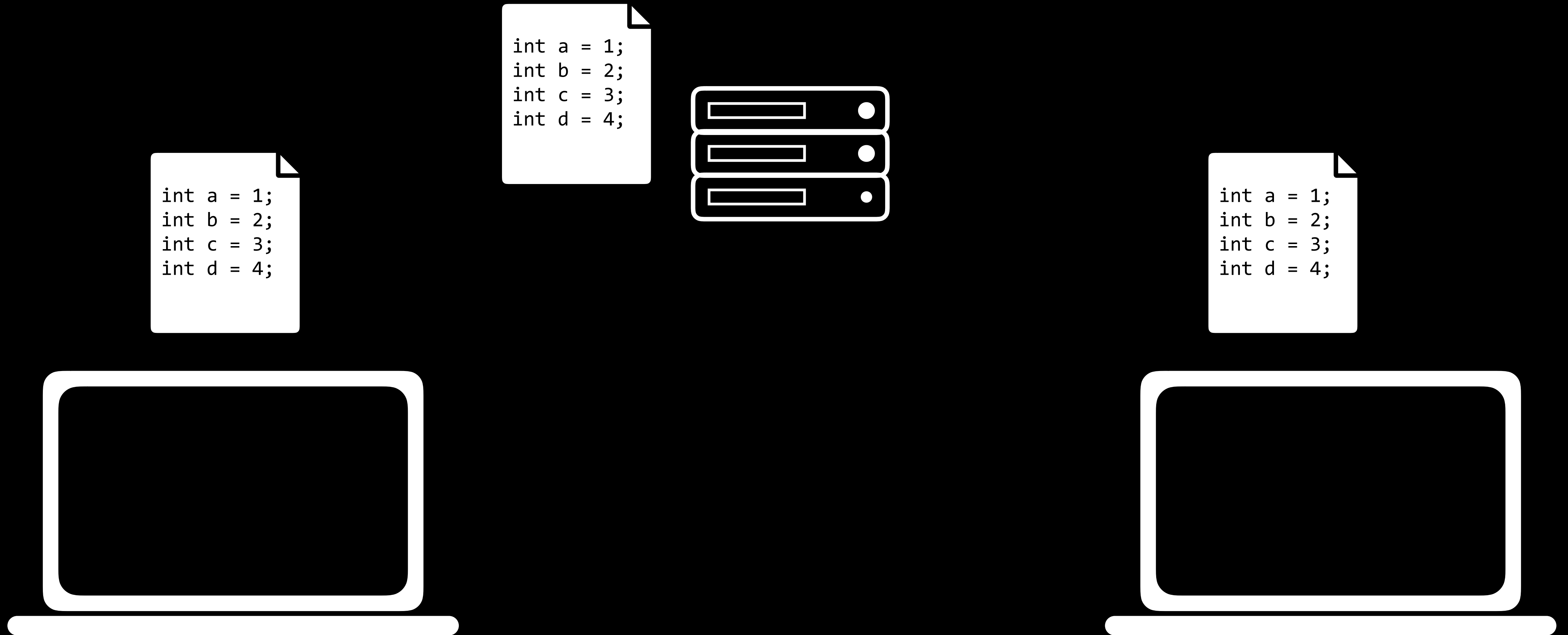
Synchronizes code between different people.



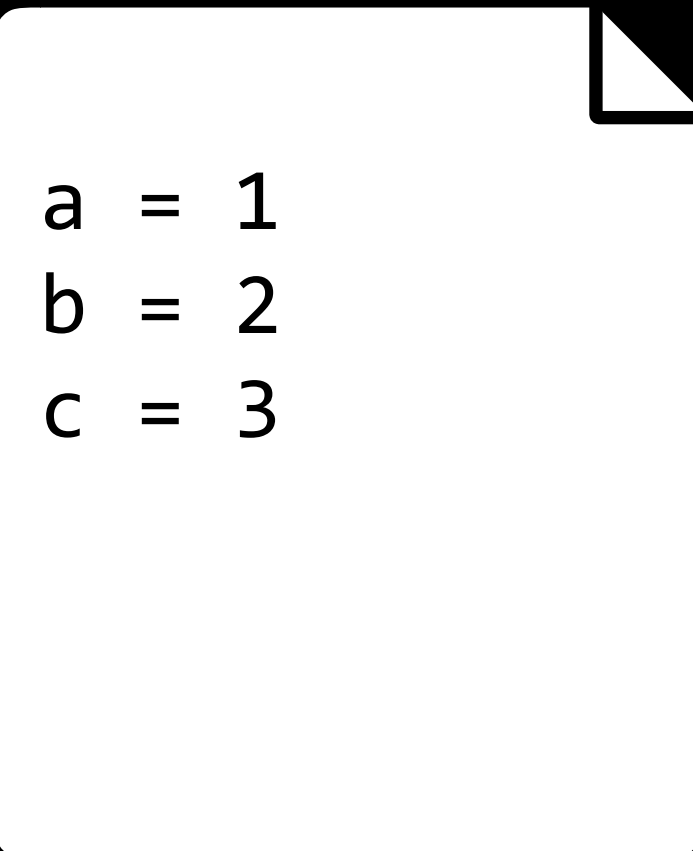
Synchronizes code between different people.



Synchronizes code between different people.

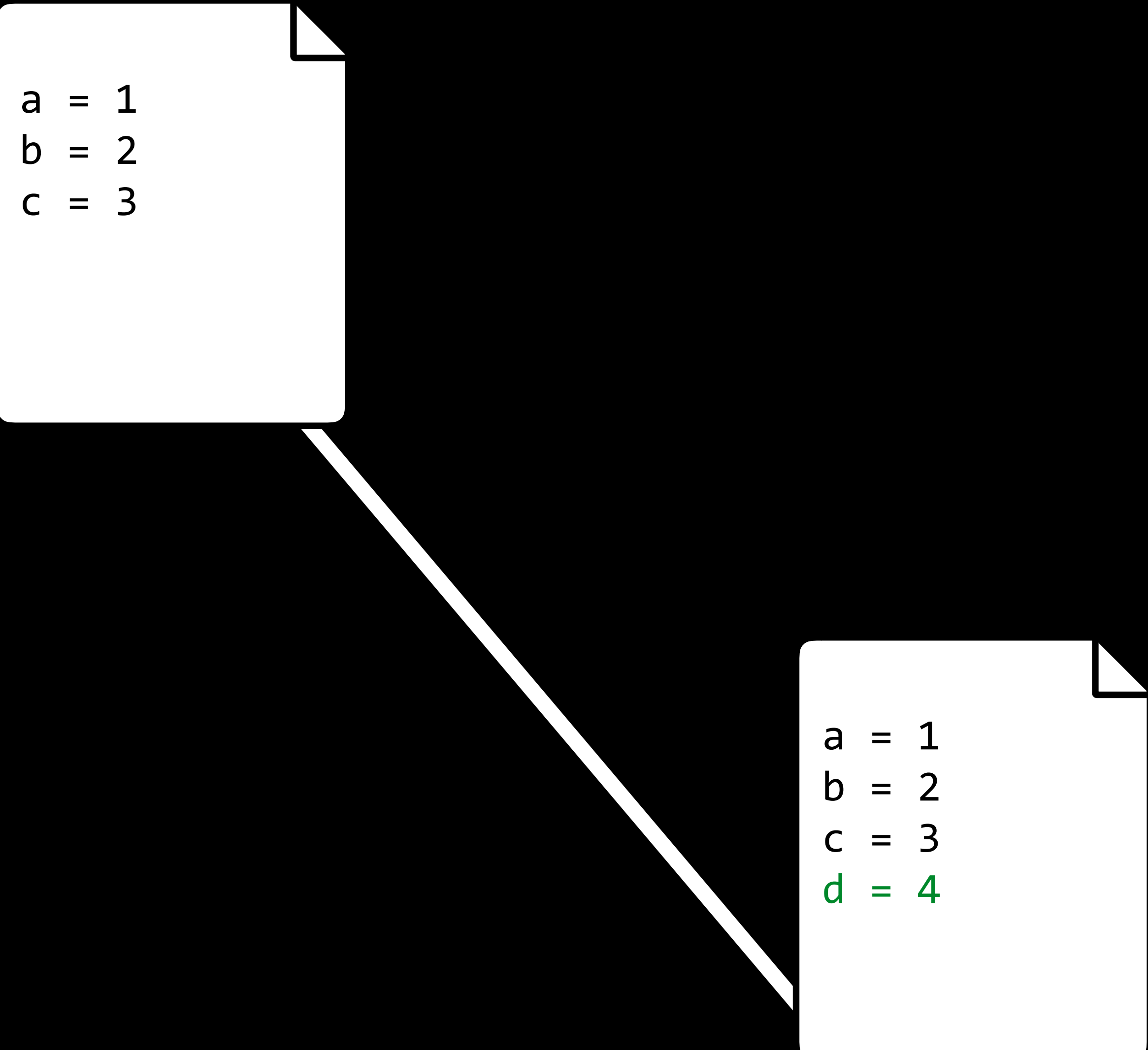


Test changes to code without losing the original.



```
a = 1  
b = 2  
c = 3
```


Test changes to code without losing the original.



```
a = 1  
b = 2  
c = 3
```

The diagram illustrates a branching process. A white rectangular box with a folded top-right corner, representing a code file, contains the text 'a = 1', 'b = 2', and 'c = 3'. A horizontal white line extends from the left side of this box. A diagonal white line extends from the bottom-right corner of the box to a second, similar white rectangular box located below and to the right. This second box contains the text 'a = 1', 'b = 2', 'c = 3', and 'd = 4', where the last line is highlighted in green.

```
a = 1  
b = 2  
c = 3  
d = 4
```

Test changes to code without losing the original.

```
a = 1  
b = 2  
c = 3
```

```
a = 1  
b = 2  
c = 3  
d = 4
```

```
a = 1  
b = 2  
c = 3  
d = 4
```

Revert back to old versions of code.

```
a = 1  
b = 2  
c = 3
```

Create file

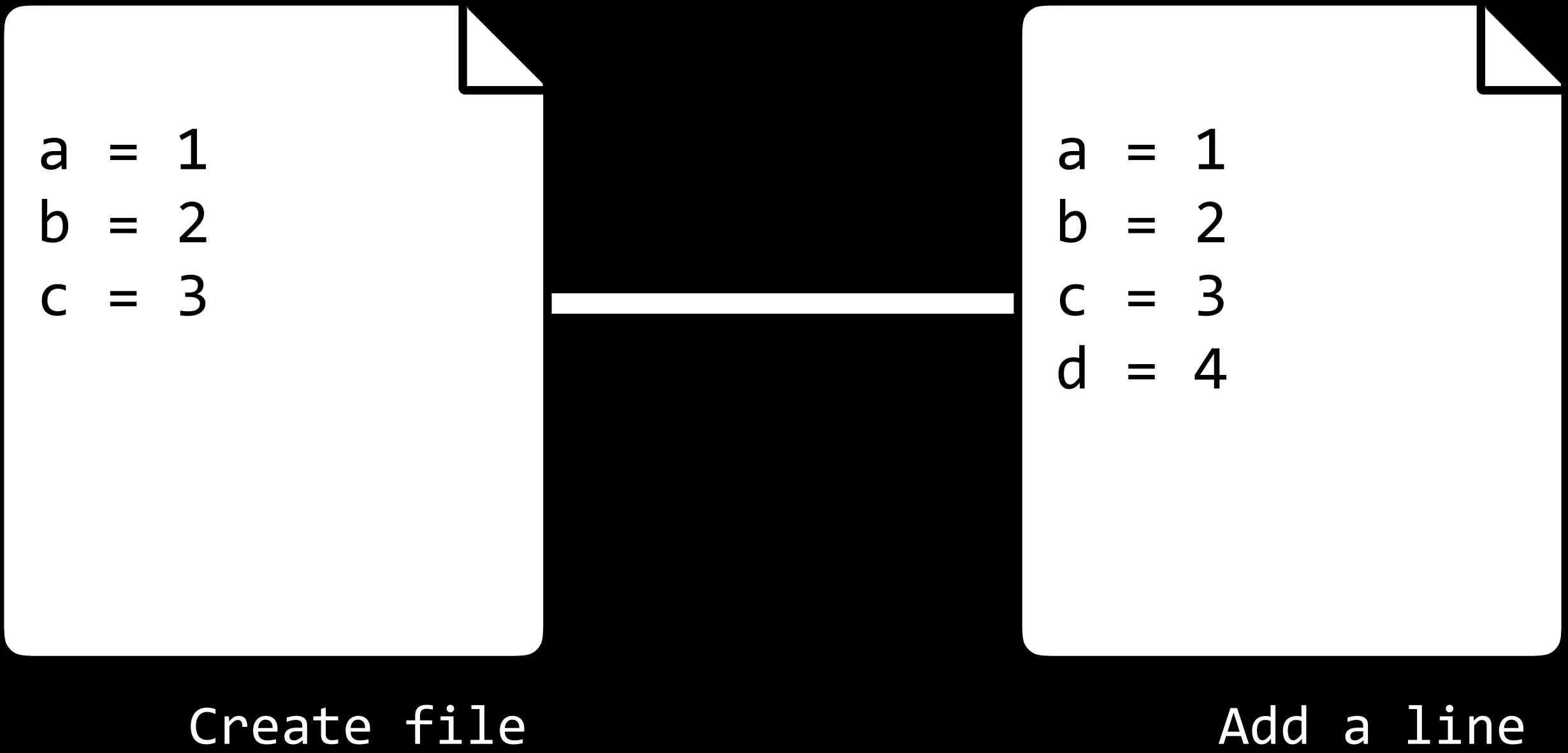
```
a = 1  
b = 2  
c = 3  
d = 4
```

Add a line

```
a = 1  
c = 3  
d = 4
```

Remove a line

Revert back to old versions of code.



```
a = 1  
b = 2  
c = 3
```

Create file

```
a = 1  
b = 2  
c = 3  
d = 4
```

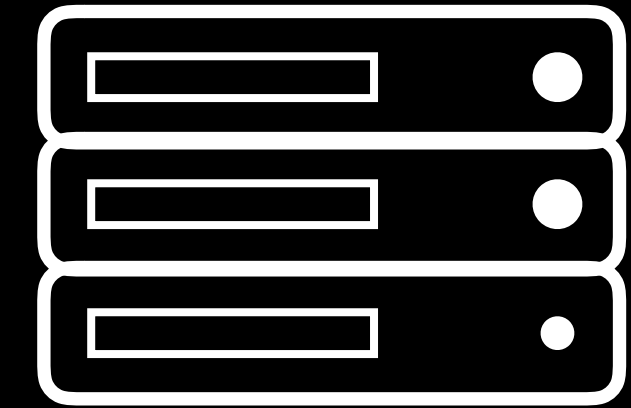
Add a line

GitHub

```
git clone
```

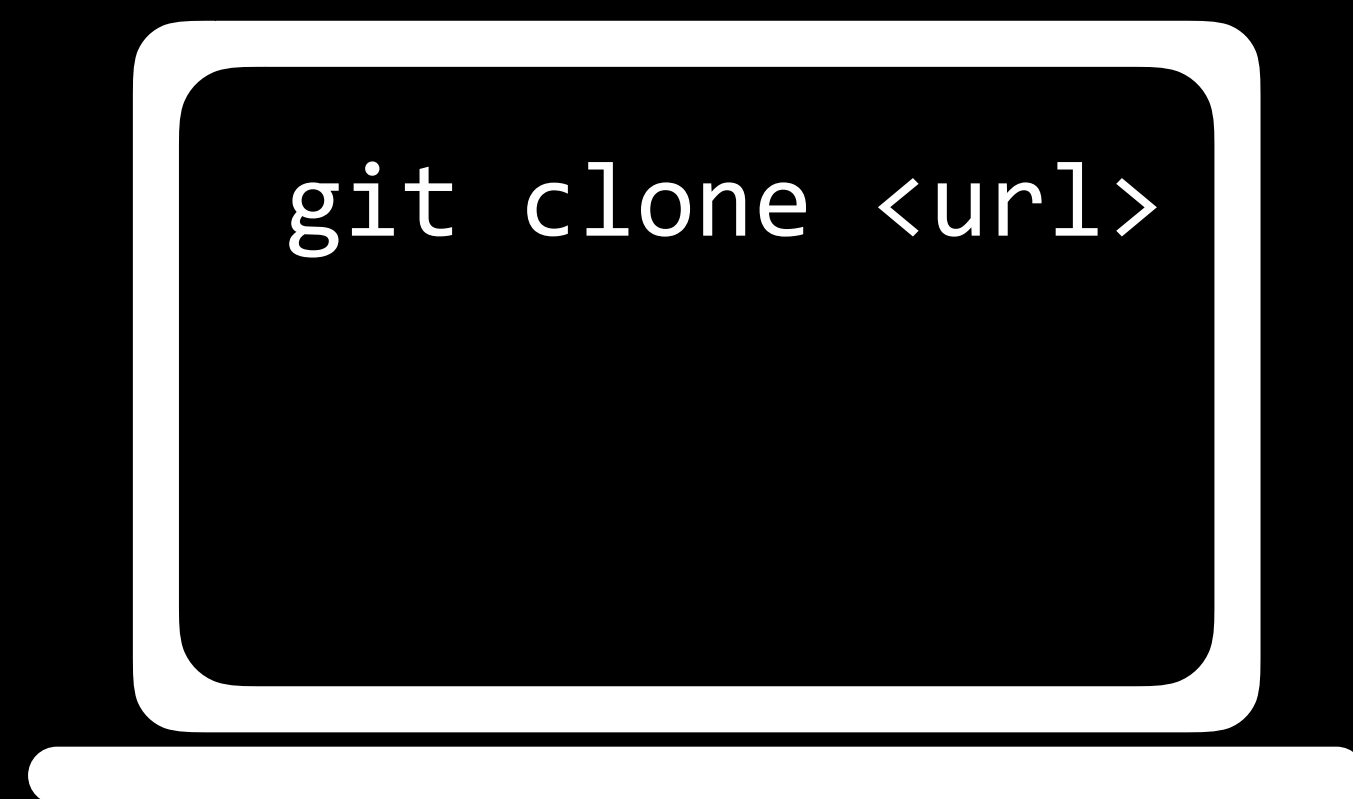
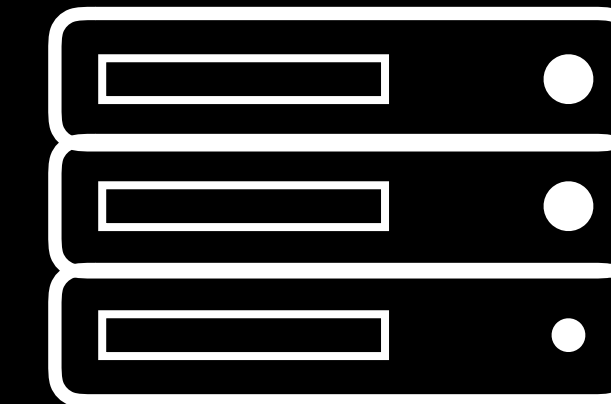
```
git clone <url>
```

```
a = 1  
b = 2  
c = 3  
d = 4
```



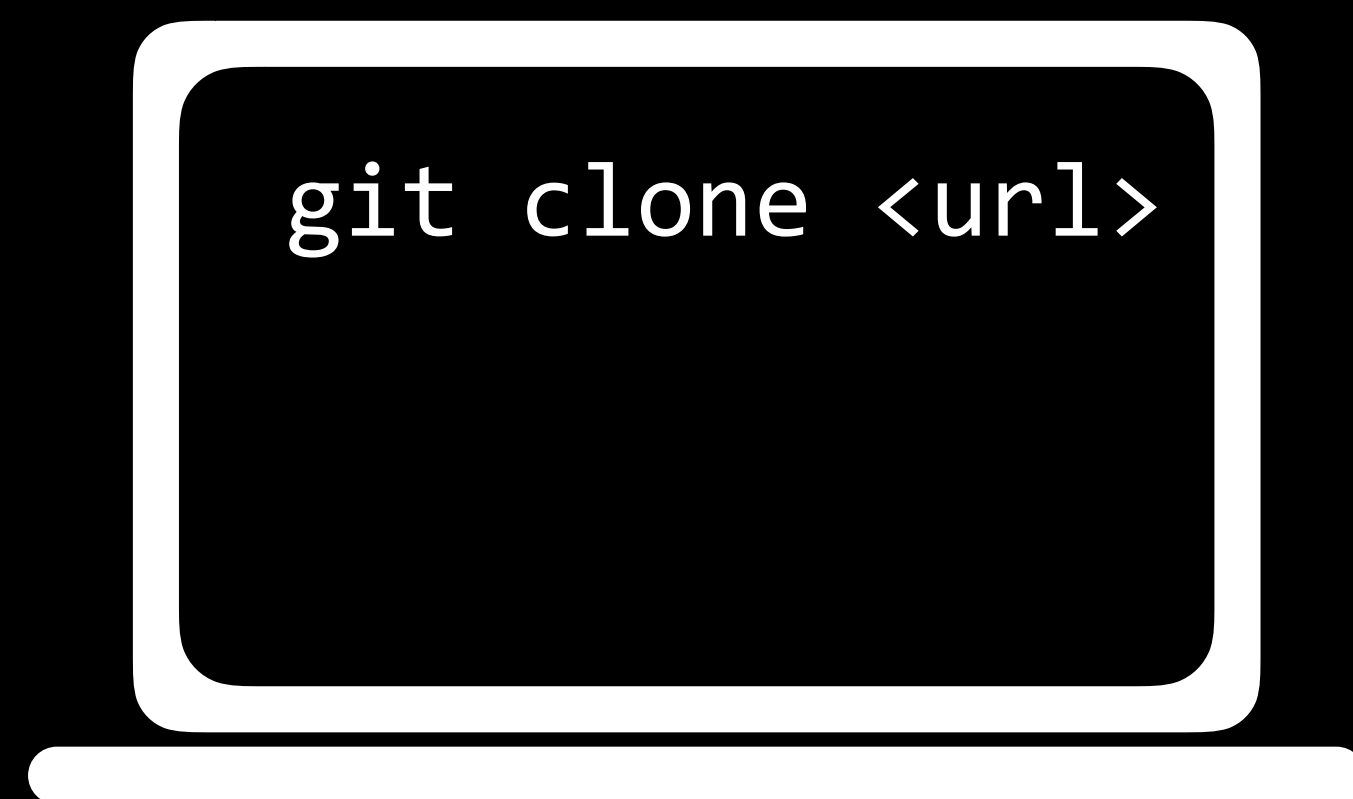
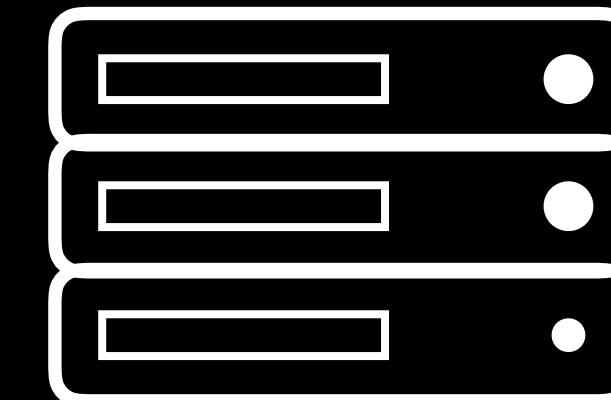
```
git clone <url>
```

```
a = 1  
b = 2  
c = 3  
d = 4
```




```
git clone <url>
```

```
a = 1  
b = 2  
c = 3  
d = 4
```

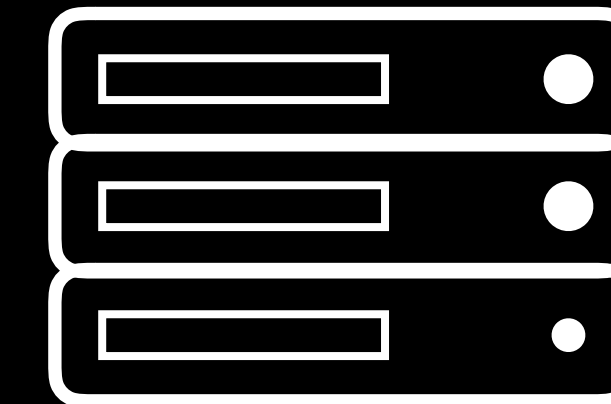


```
a = 1  
b = 2  
c = 3  
d = 4
```

```
git add
```

```
git add <filename>
```

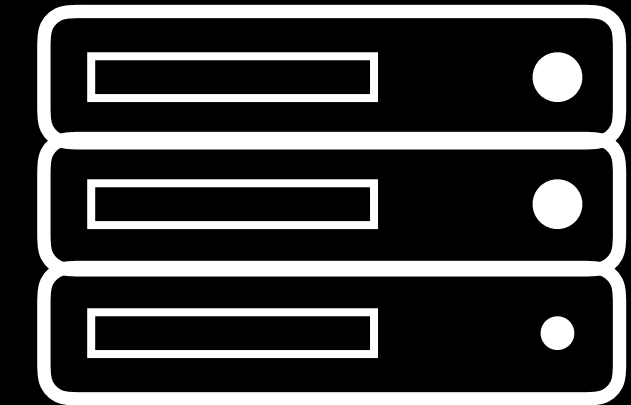
```
a = 1  
b = 2  
c = 3  
d = 4
```



```
a = 1  
b = 2  
c = 3  
d = 4
```

```
git add <filename>
```

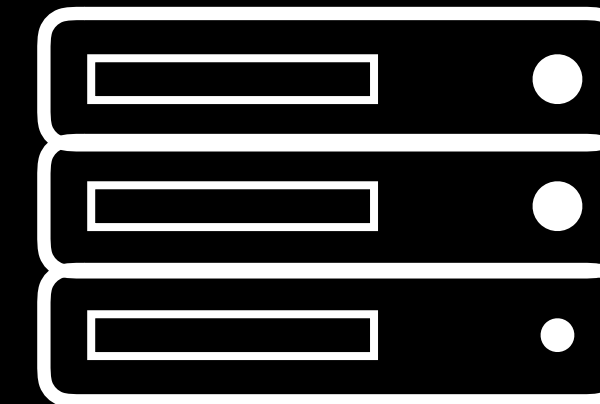
```
a = 1  
b = 2  
c = 3  
d = 4
```



```
a = 1  
b = 2  
c = 3  
d = 4  
e = 5
```

```
git add <filename>
```

```
a = 1  
b = 2  
c = 3  
d = 4
```

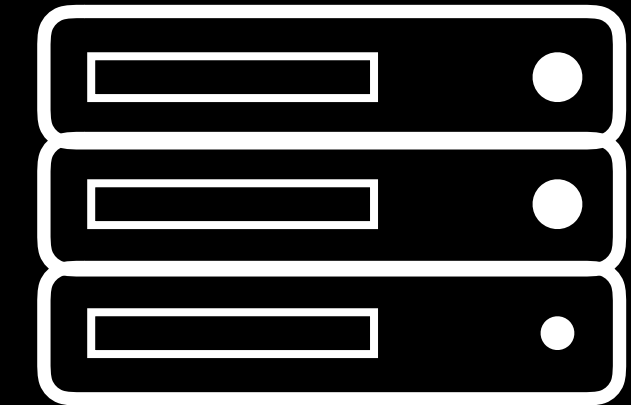


```
git add foo.py
```

```
a = 1  
b = 2  
c = 3  
d = 4  
e = 5
```

```
git add <filename>
```

```
a = 1  
b = 2  
c = 3  
d = 4
```



```
git add foo.py
```

```
a = 1  
b = 2  
c = 3  
d = 4  
e = 5
```

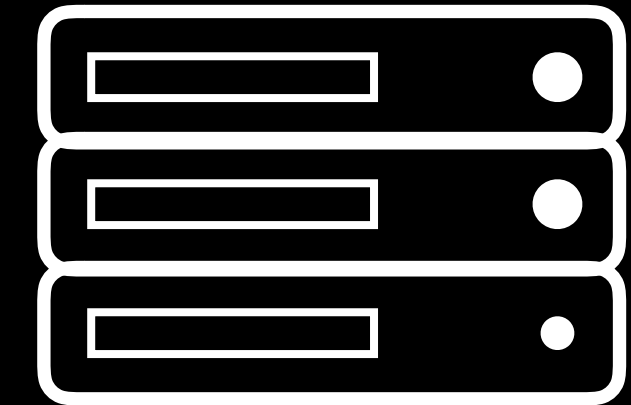
Changes to be committed:

```
modified: foo.py
```

```
git commit
```

```
git commit -m "message"
```

```
a = 1  
b = 2  
c = 3  
d = 4
```

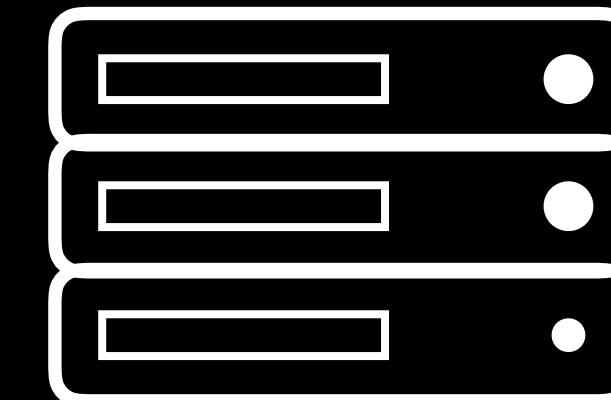


```
a = 1  
b = 2  
c = 3  
d = 4  
e = 5
```



```
git commit -m "message"
```

```
a = 1  
b = 2  
c = 3  
d = 4
```

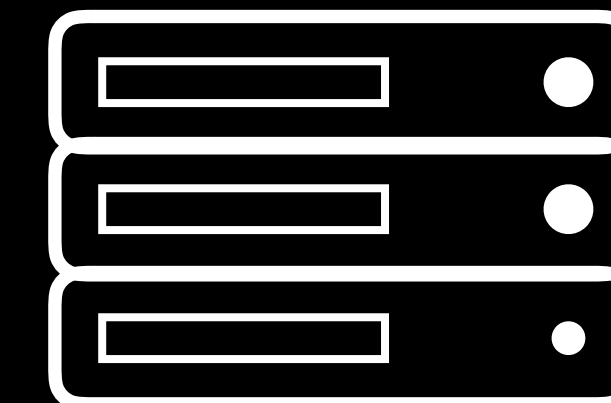


```
git commit -m  
"Add line"
```

```
a = 1  
b = 2  
c = 3  
d = 4  
e = 5
```

```
git commit -m "message"
```

```
a = 1  
b = 2  
c = 3  
d = 4
```



```
a = 1  
b = 2  
c = 3  
d = 4
```



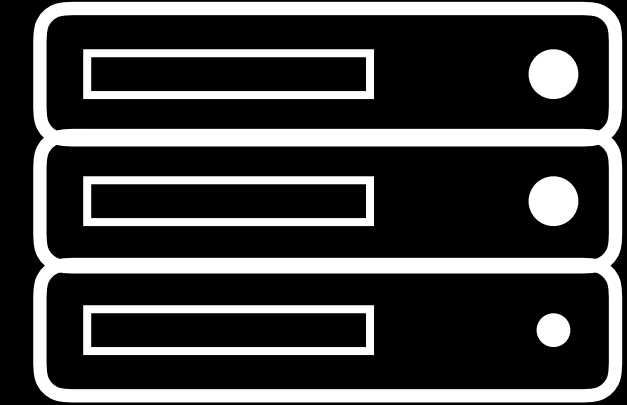
```
a = 1  
b = 2  
c = 3  
d = 4  
e = 5
```

Add line

```
git status
```

git status

```
a = 1  
b = 2  
c = 3  
d = 4
```



```
a = 1  
b = 2  
c = 3  
d = 4
```



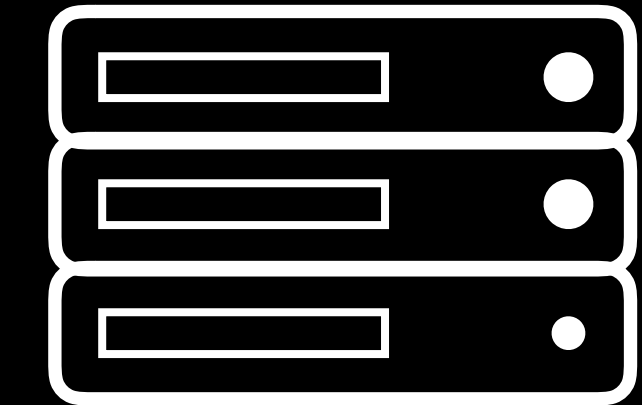
```
a = 1  
b = 2  
c = 3  
d = 4  
e = 5
```

Add line



git status

```
a = 1  
b = 2  
c = 3  
d = 4
```



```
a = 1  
b = 2  
c = 3  
d = 4
```

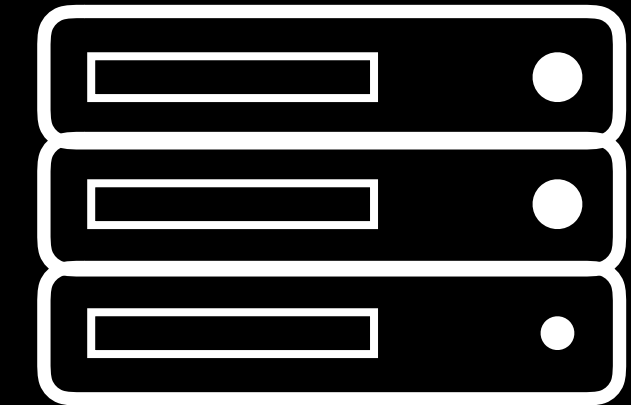
```
a = 1  
b = 2  
c = 3  
d = 4  
e = 5
```

Add line



git status

```
a = 1  
b = 2  
c = 3  
d = 4
```



```
a = 1  
b = 2  
c = 3  
d = 4
```

```
a = 1  
b = 2  
c = 3  
d = 4  
e = 5
```

Add line

git status

On branch master

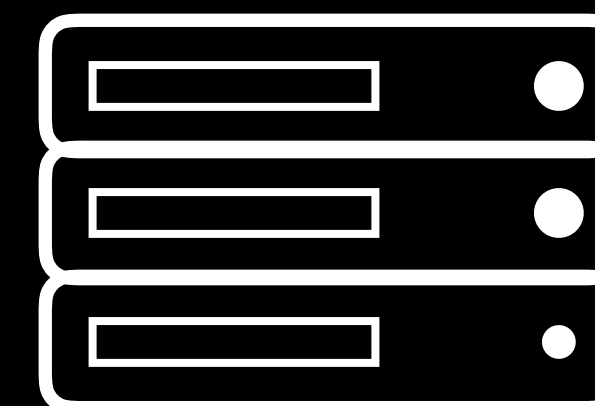
Your branch is ahead of 'origin/master' by 1 commit.

(use "git push" to publish your local commits)

```
git push
```

git push

```
a = 1  
b = 2  
c = 3  
d = 4
```



```
a = 1  
b = 2  
c = 3  
d = 4
```

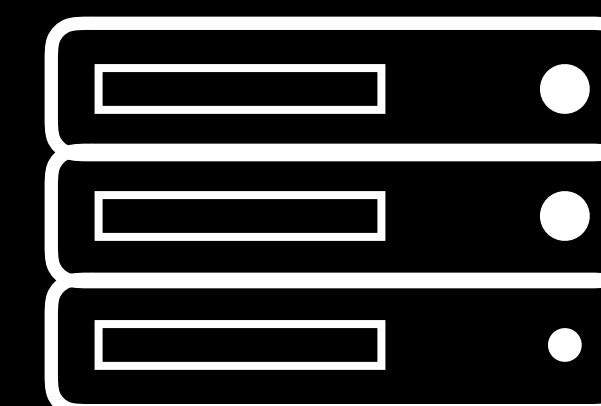


```
a = 1  
b = 2  
c = 3  
d = 4  
e = 5
```

Add line

git push

```
a = 1  
b = 2  
c = 3  
d = 4
```



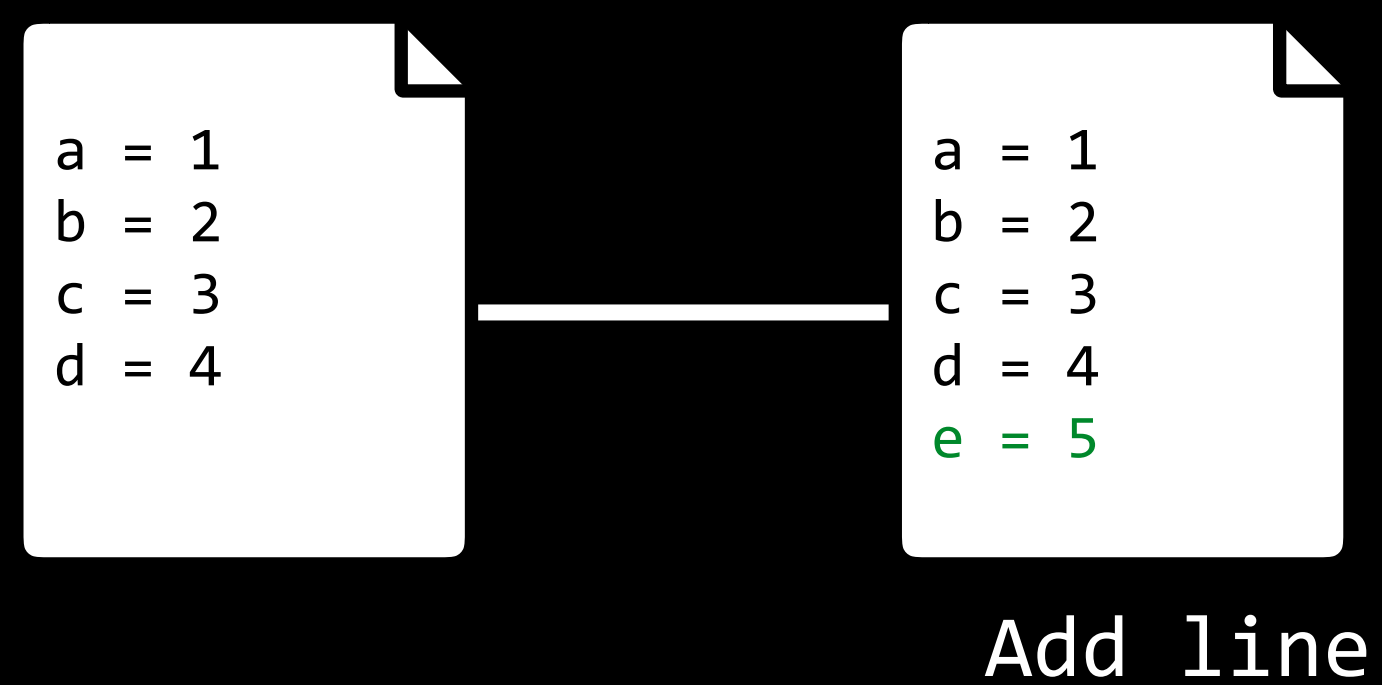
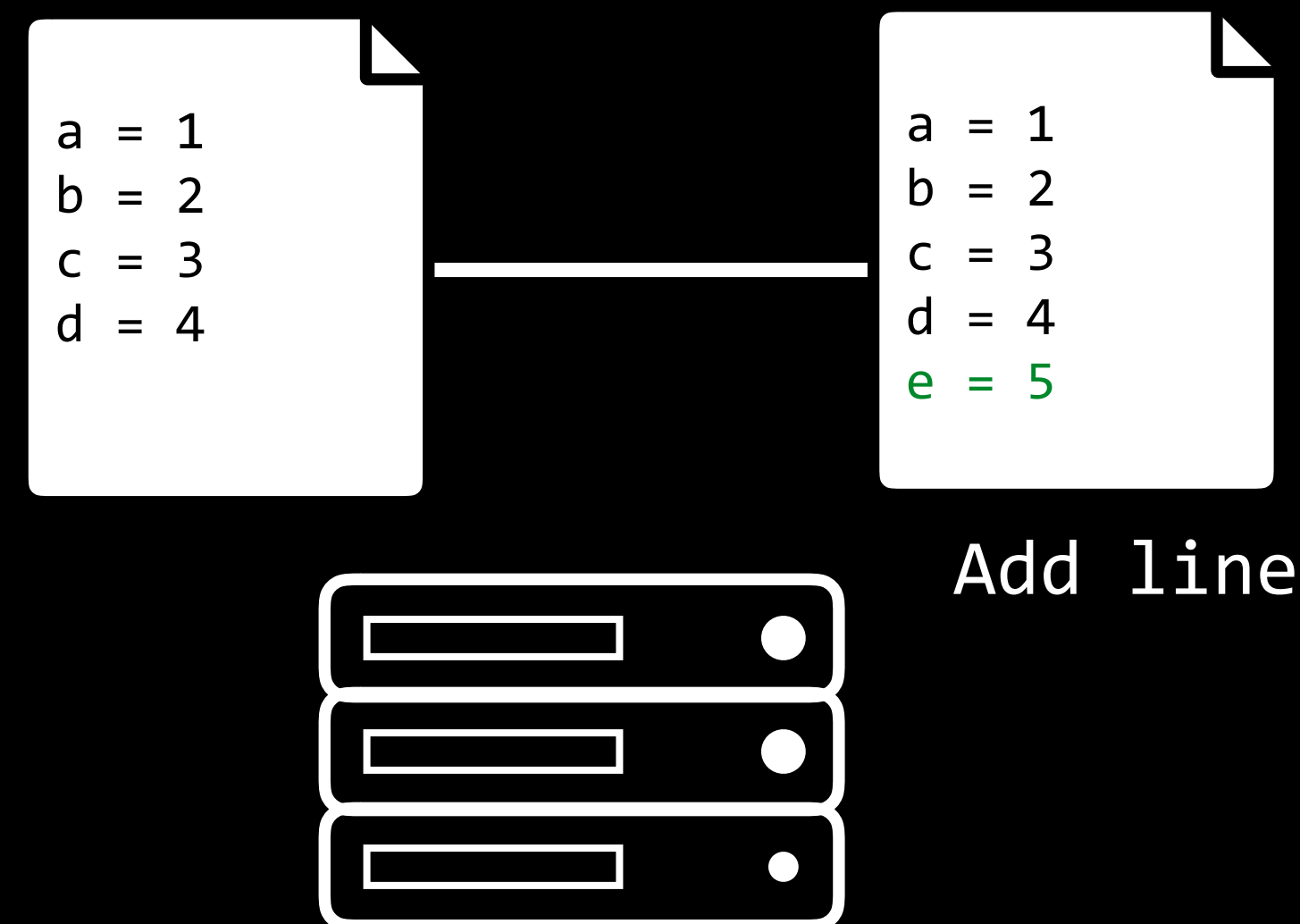
```
a = 1  
b = 2  
c = 3  
d = 4
```



```
a = 1  
b = 2  
c = 3  
d = 4  
e = 5
```

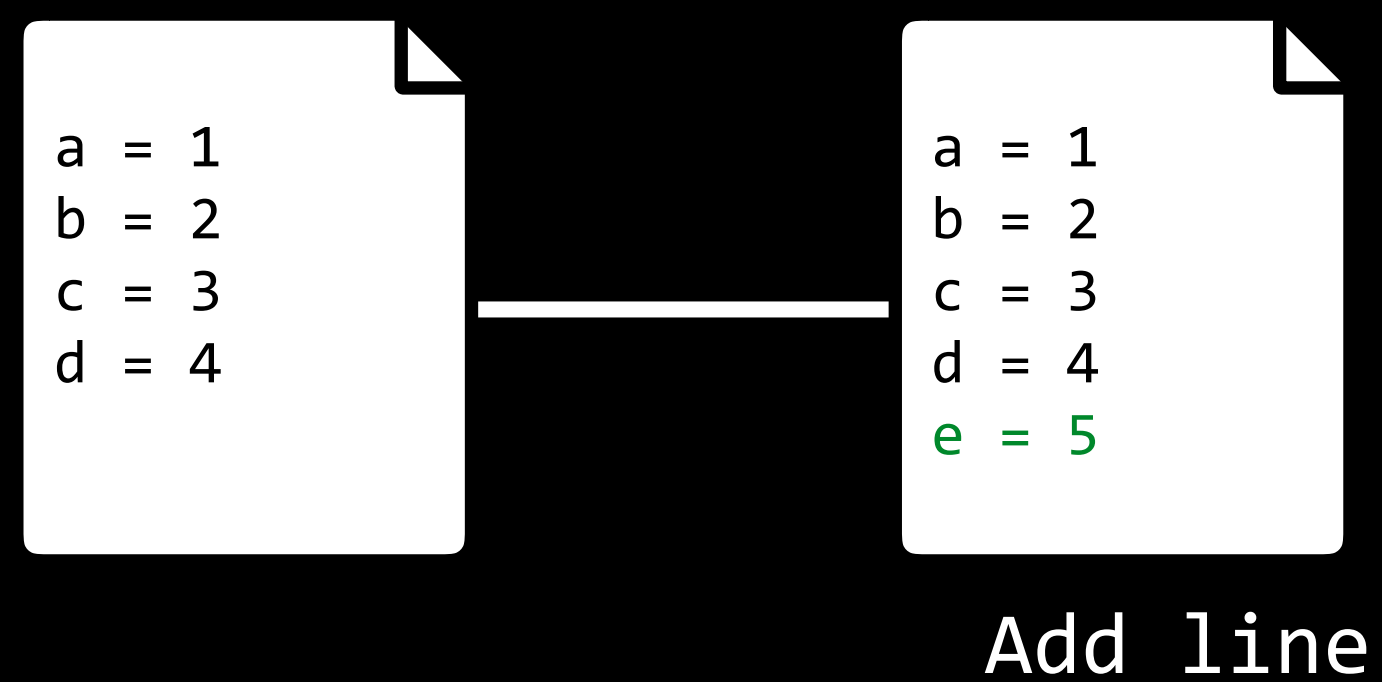
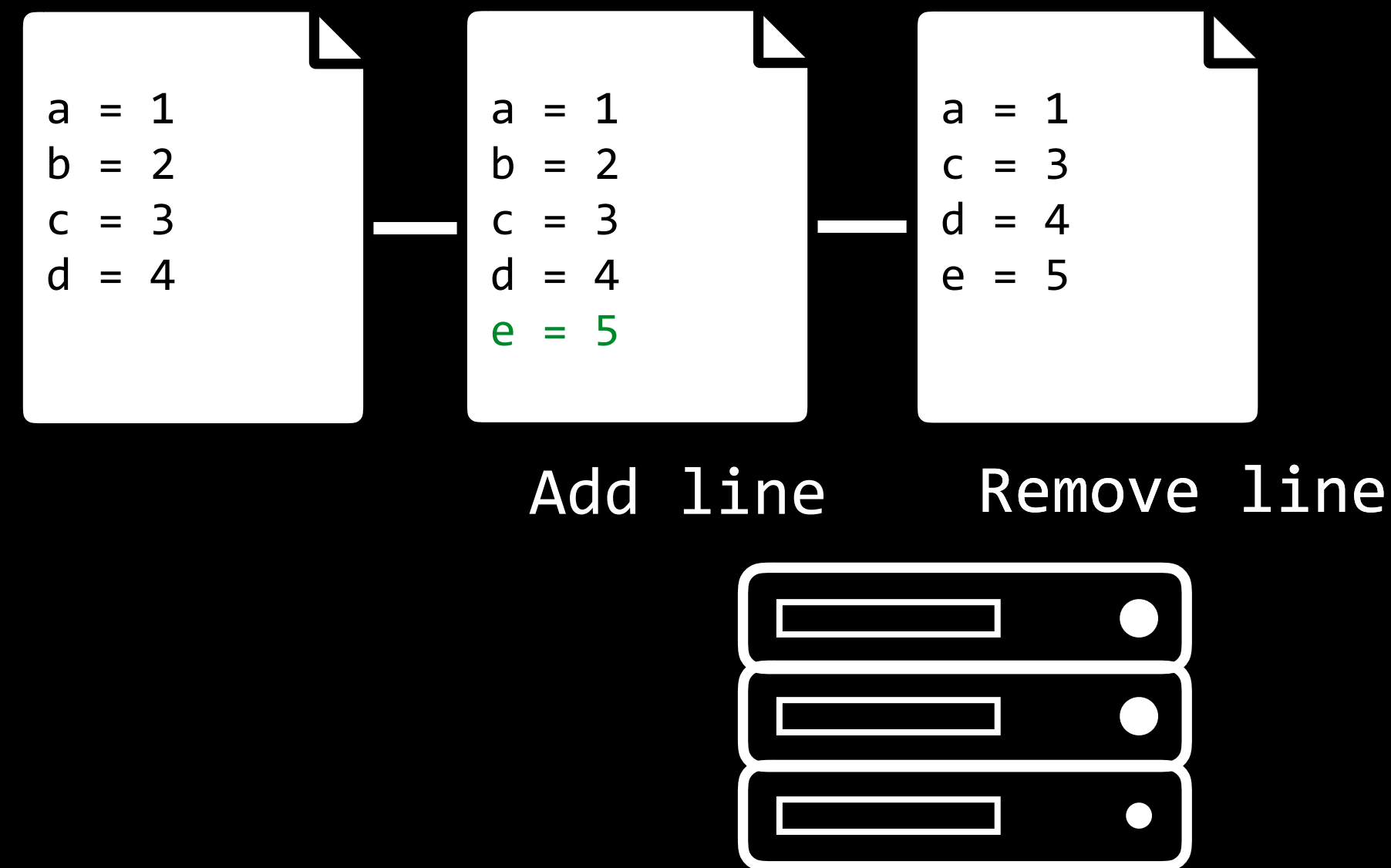
Add line

git push

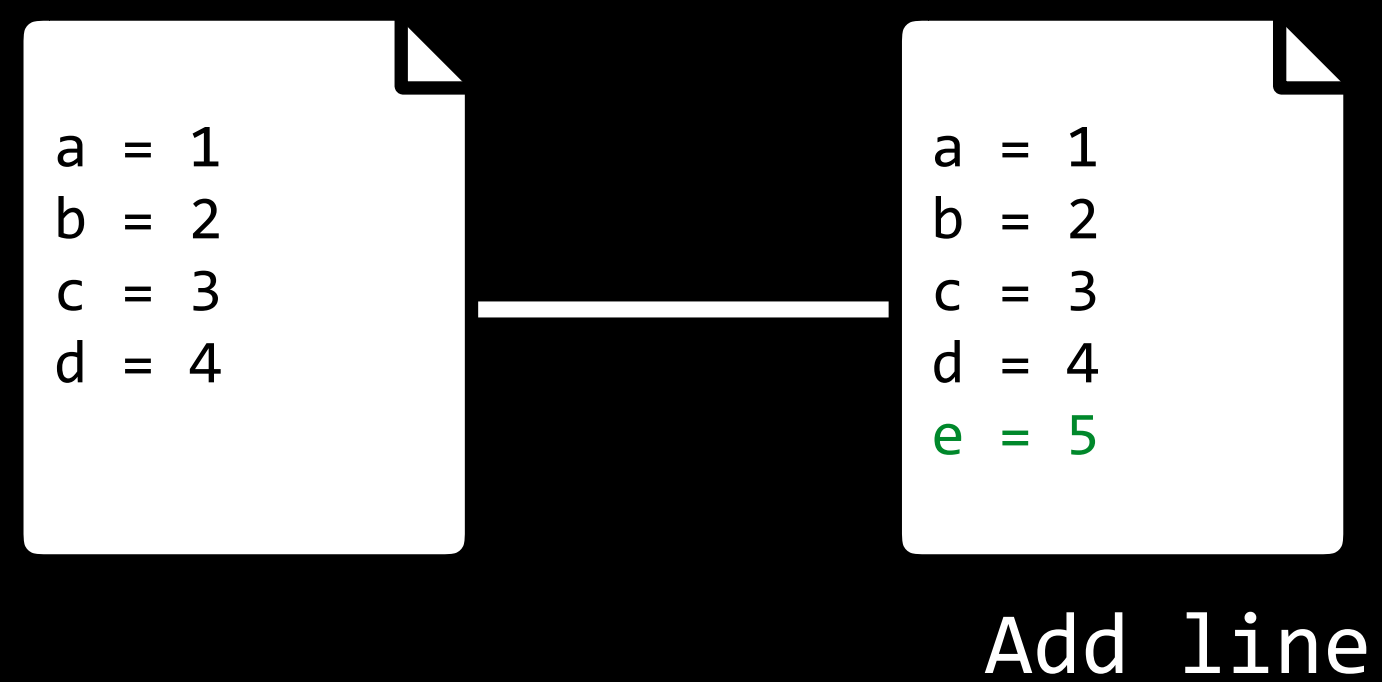
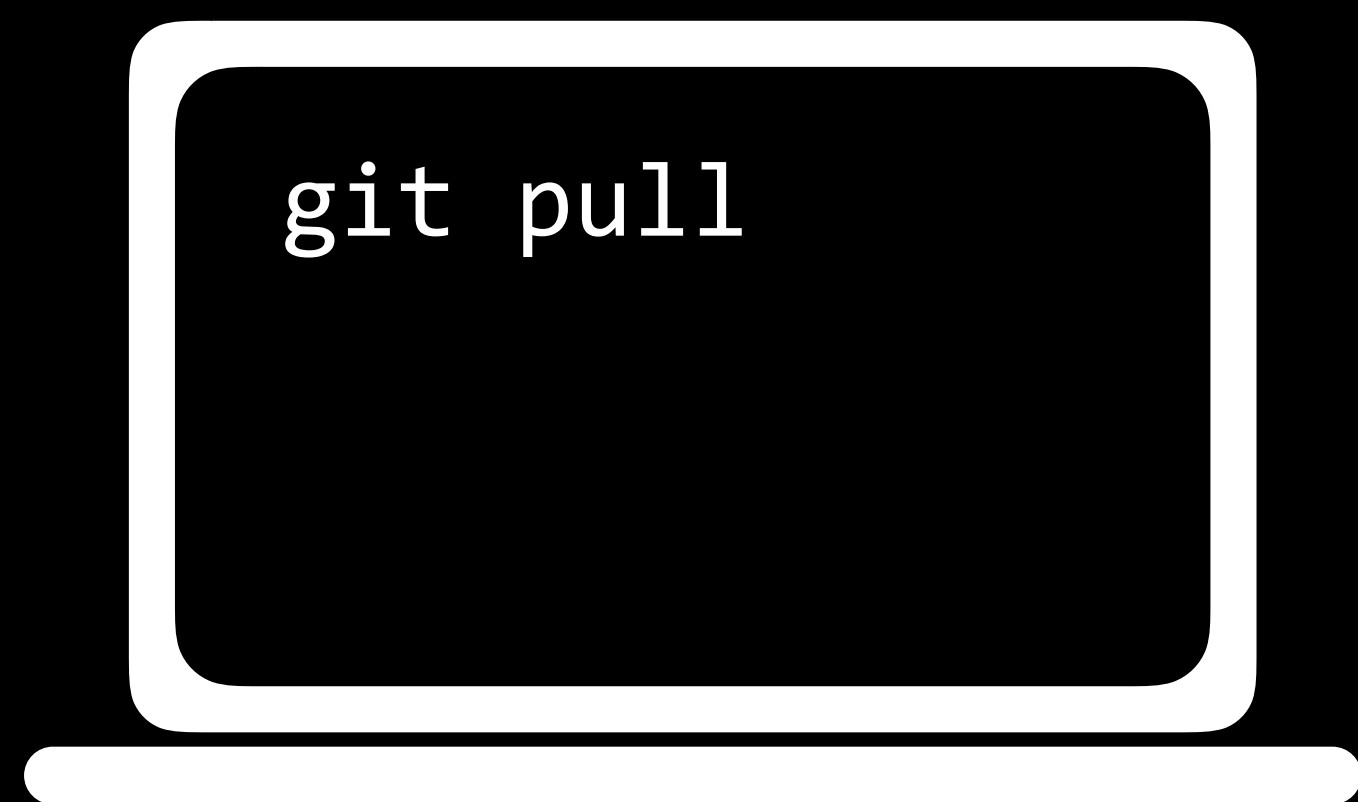
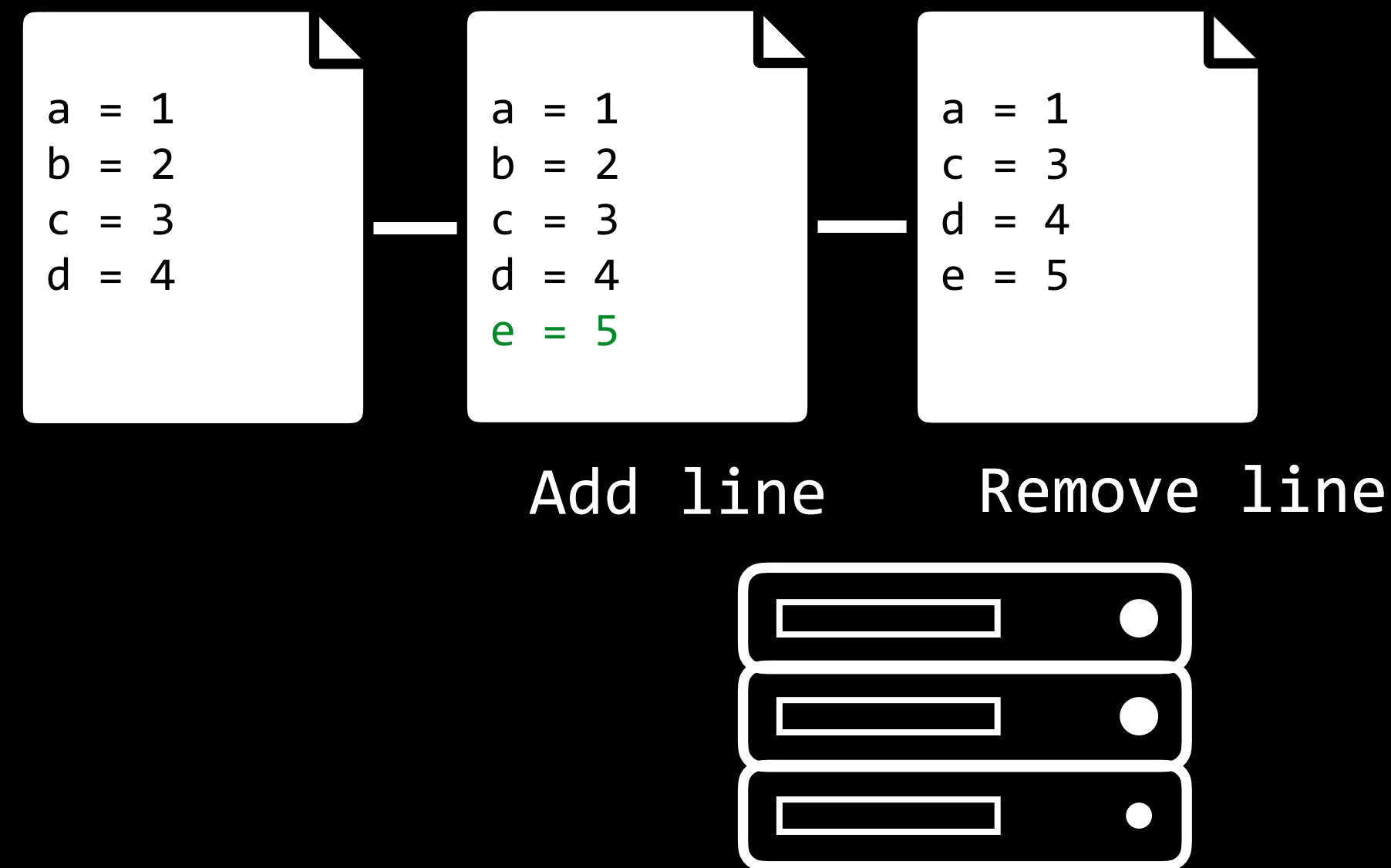


```
git pull
```

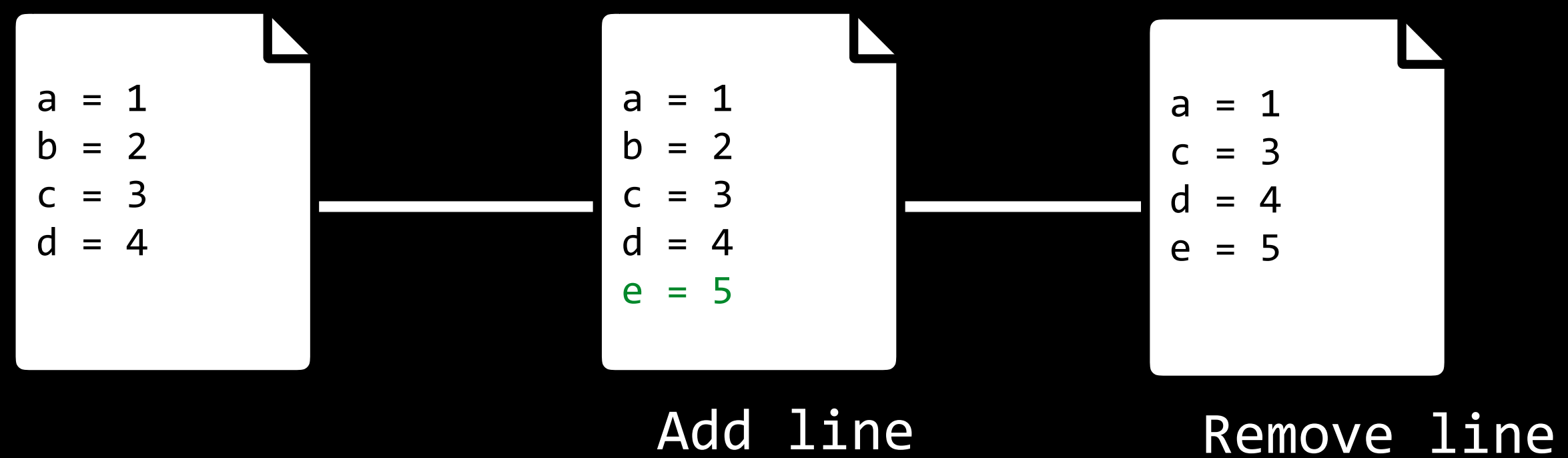
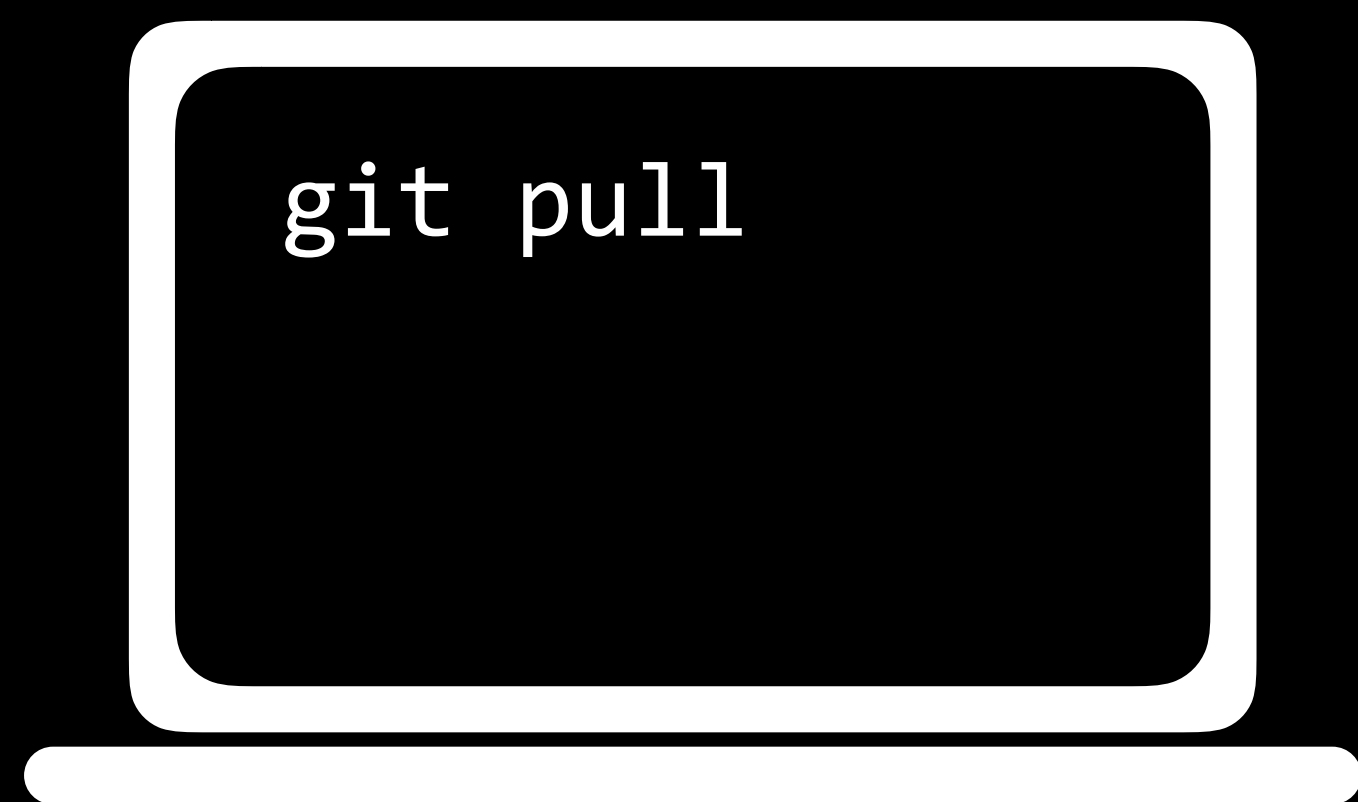
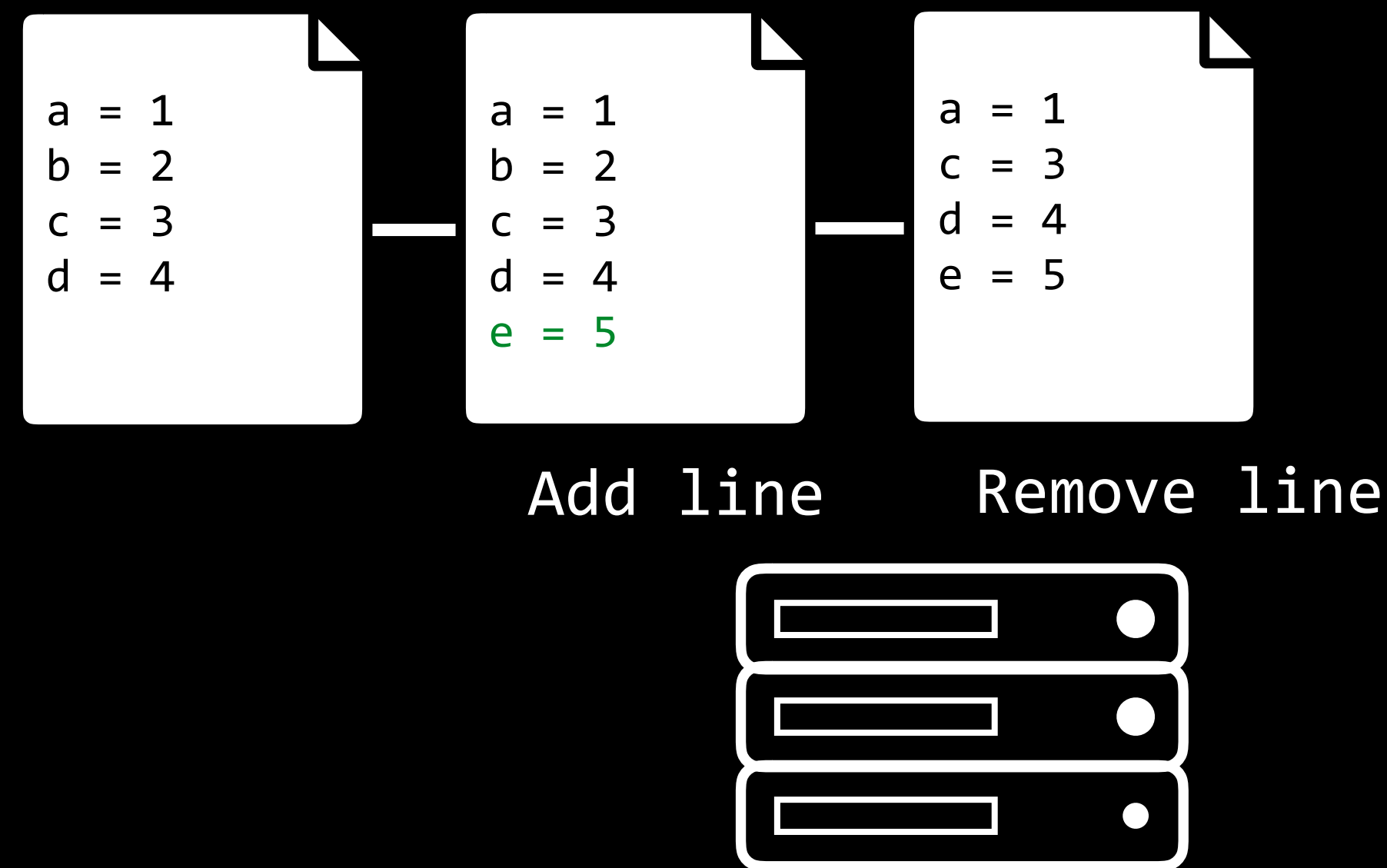
git pull



git pull



git pull



Merge Conflicts

Merge Conflicts



Merge Conflicts

A white outline of a terminal window with a rounded rectangle for the screen and a horizontal bar for the base. The text "git pull" is centered inside the screen.

```
git pull
```

Merge Conflicts



```
git pull
```

```
CONFLICT (content): Merge conflict in foo.py  
Automatic merge failed; fix conflicts and then  
commit the result.
```

Merge Conflicts

```
git pull
```

```
a = 1
```

```
<<<<< HEAD
```

```
b = 2
```

```
=====
```

```
b = 0
```

```
>>>>> 57656c636f6d6520746f20576562
```

```
c = 3
```

```
d = 4
```

```
e = 5
```

Merge Conflicts




```
git pull
```

your
changes

remote
changes

```
a = 1
<<<<< HEAD
{ b = 2
  =====
  { b = 0
    >>>>> 57656c636f6d6520746f20576562
c = 3
d = 4
e = 5
```

conflicting commit



Merge Conflicts

```
git pull
```

```
a = 1
```

```
<<<<< HEAD
```

```
b = 2
```

```
=====
```

```
b = 0
```

```
>>>>> 57656c636f6d6520746f20576562
```

```
c = 3
```

```
d = 4
```

```
e = 5
```

Merge Conflicts

```
git pull
```

```
a = 1
```

```
b = 2
```

```
c = 3
```

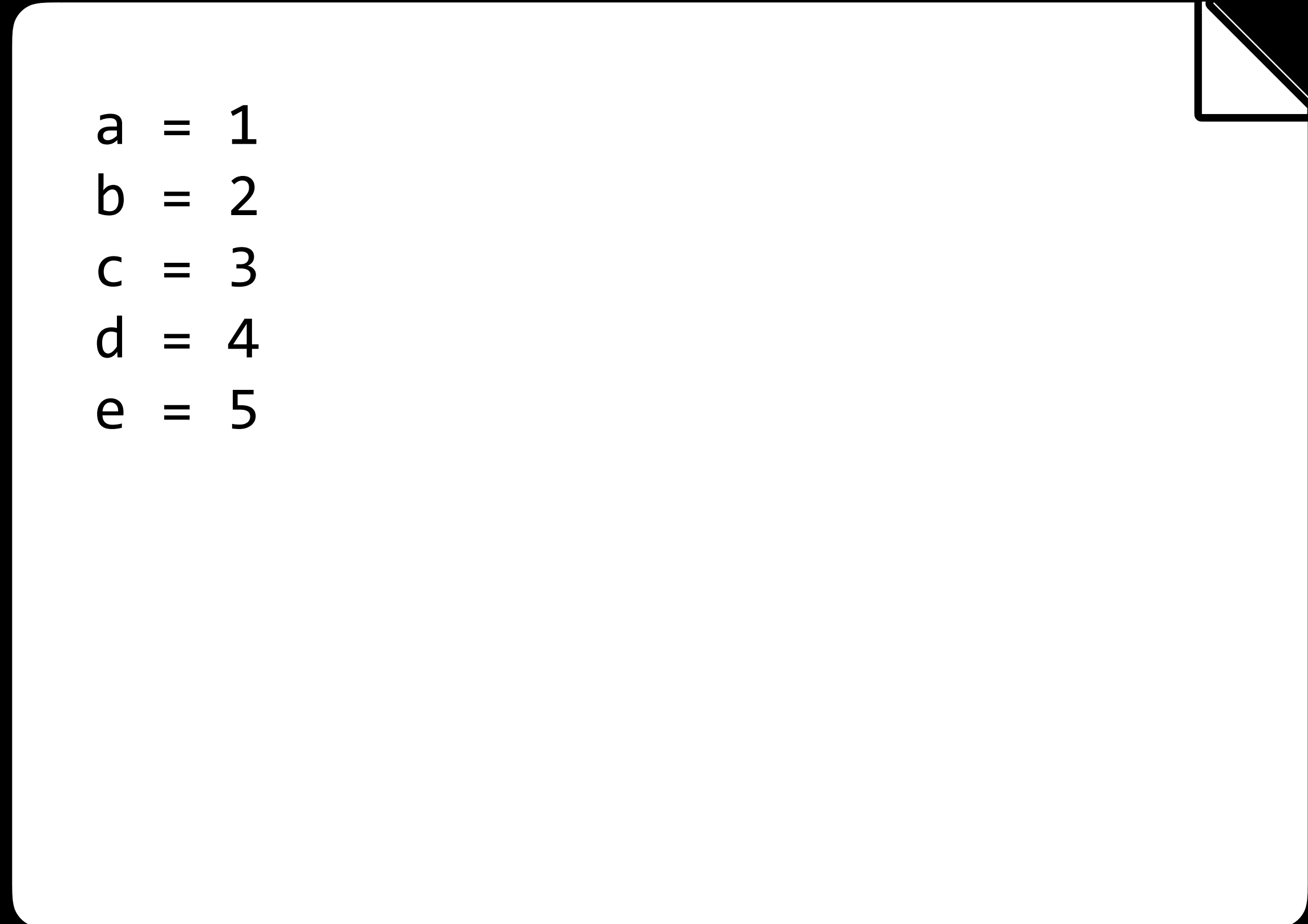
```
d = 4
```

```
e = 5
```

Merge Conflicts



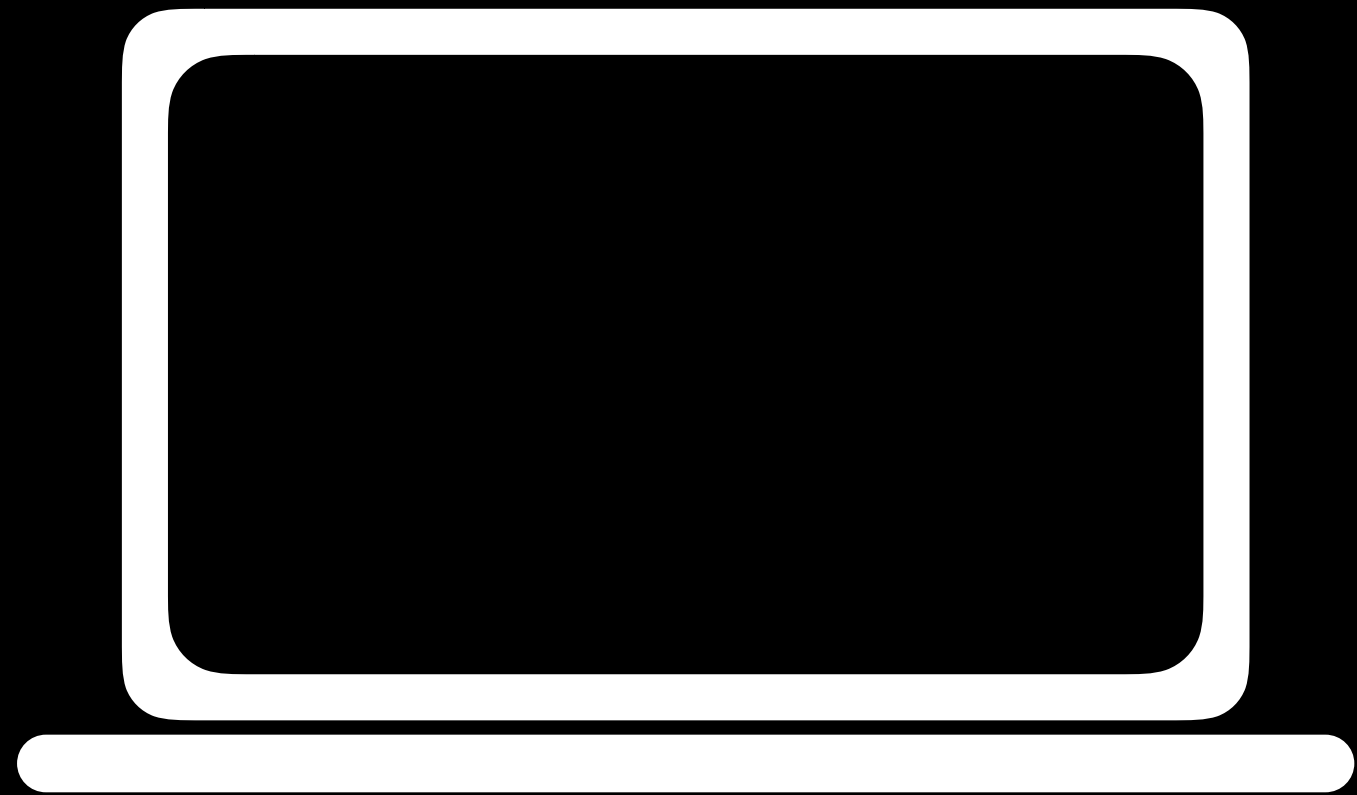
```
git pull
```



```
a = 1  
b = 2  
c = 3  
d = 4  
e = 5
```

```
git log
```


git log



```
git log
```



git log

```
commit 436f6d6d6974204d73672048657265
Author: Brian Yu <brian@cs.harvard.edu>
Date:   Mon Jan 22 14:06:28 2018 -0400
```

Remove a line

```
commit 57656c636f6d6520746f20576562
Author: Brian Yu <brian@cs.harvard.edu>
Date:   Mon Jan 22 14:05:28 2018 -0400
```

Add a line



```
git reset
```

git reset

- `git reset --hard <commit>`
- `git reset --hard origin/master`



```
int a = 1;
int b = 2;
int c = 3;
int d = 4;
```

```
int a = 1;
int b = 2;
int c = 3;
int d = 4;
int e = 5;
```

Add line
57656c6

```
int a = 1;
int c = 3;
int d = 4;
int e = 5;
```

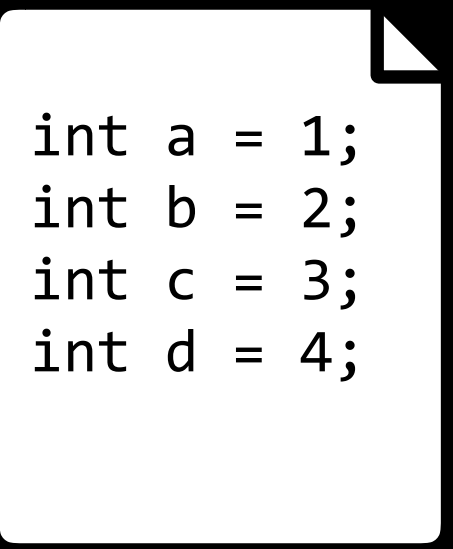
Remove line
436f6d6

git reset

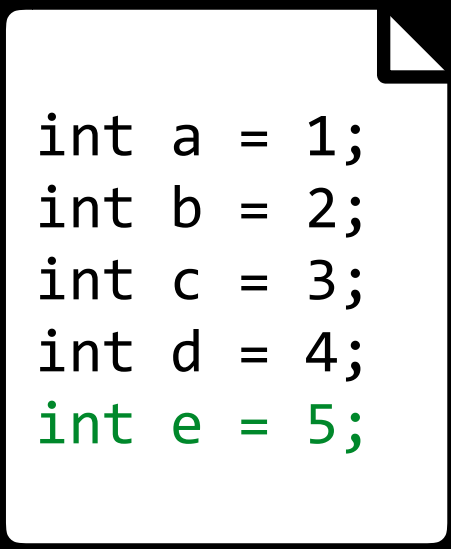
- `git reset --hard <commit>`
- `git reset --hard origin/master`



```
git reset --hard  
57656c6
```

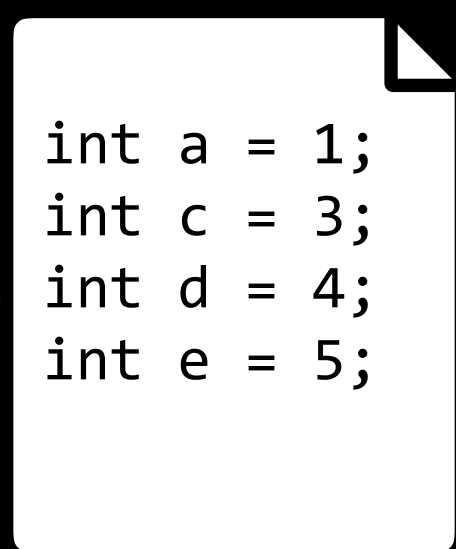


```
int a = 1;  
int b = 2;  
int c = 3;  
int d = 4;
```



```
int a = 1;  
int b = 2;  
int c = 3;  
int d = 4;  
int e = 5;
```

Add line
57656c6



```
int a = 1;  
int c = 3;  
int d = 4;  
int e = 5;
```

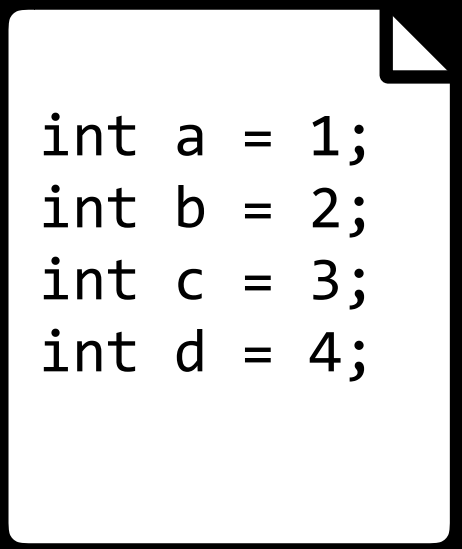
Remove line
436f6d6

git reset

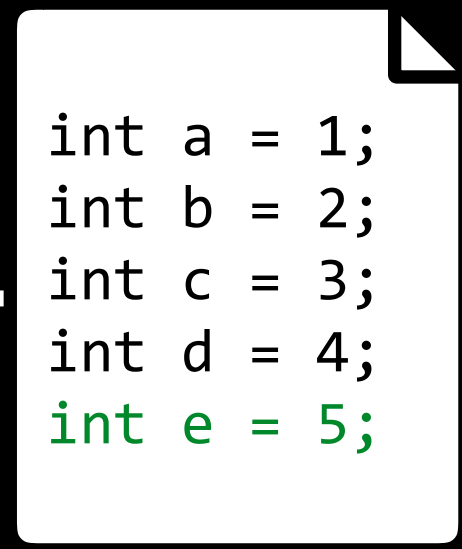
- `git reset --hard <commit>`
- `git reset --hard origin/master`



```
git reset --hard  
57656c6
```



```
int a = 1;  
int b = 2;  
int c = 3;  
int d = 4;
```



```
int a = 1;  
int b = 2;  
int c = 3;  
int d = 4;  
int e = 5;
```

Add line
57656c6

HTML

A First Webpage

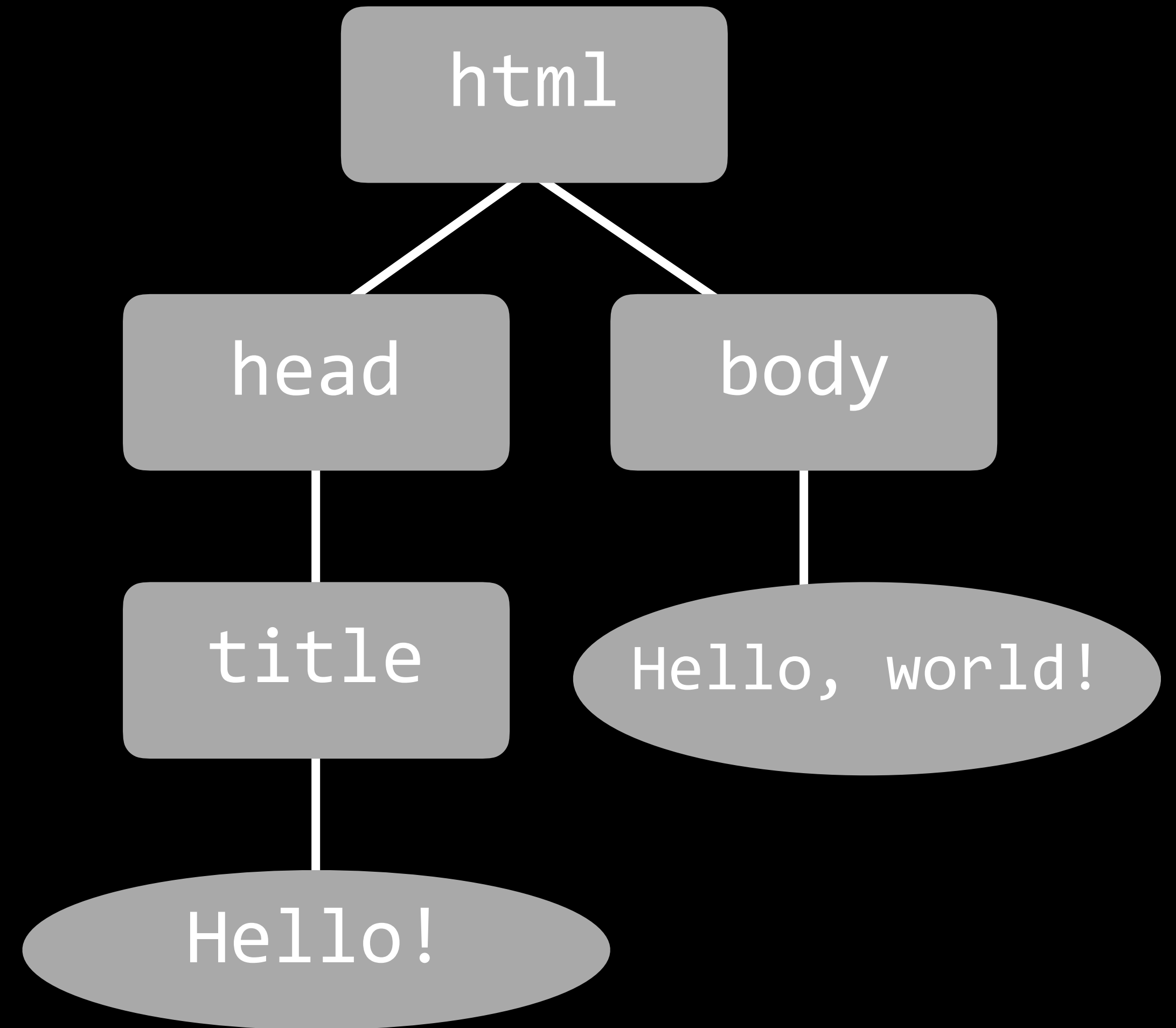
```
<!DOCTYPE html>
<html>
  <head>
    <title>Hello!</title>
  </head>
  <body>
    Hello, world!
  </body>
</html>
```

Common HTML Tags

- `<h1>`, `<h2>`, ..., `<h6>`
- ``, ``
- ``
- `<a>`
- `<table>`
- `<form>`

Document Object Model

```
<!DOCTYPE html>  
<html>  
  <head>  
    <title>Hello!</title>  
  </head>  
  <body>  
    Hello, world!  
  </body>  
</html>
```



CSS

Common CSS Properties

- `color`
- `text-align`
- `width`, `height`
- `margin`, `padding`
- `font-family`, `font-size`, `font-weight`
- `border`

Non-Semantic Elements and Attributes

- `div`
- `span`
- `id`
- `class`

GitHub Pages