

CSE306

SOFTWARE QUALITY IN PRACTICE

Dr. Carl Alphonse

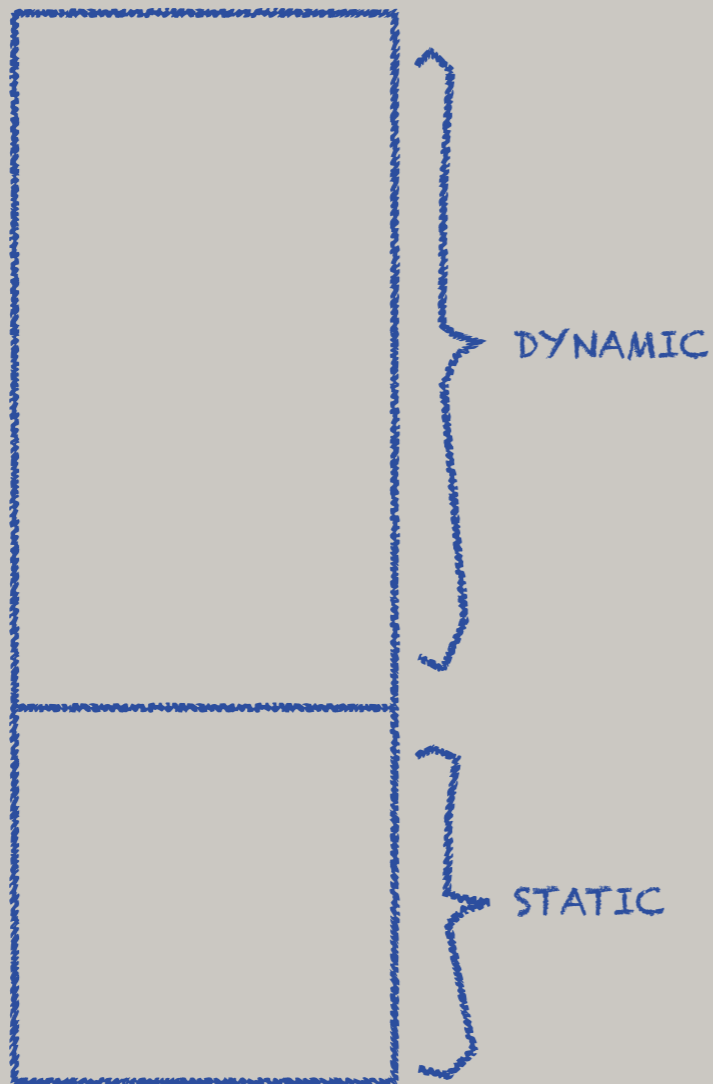
alphonse@buffalo.edu

343 Davis Hall

www.cse.buffalo.edu/faculty/alphonse/SP24/CSE306

MEMORY ORGANIZATION

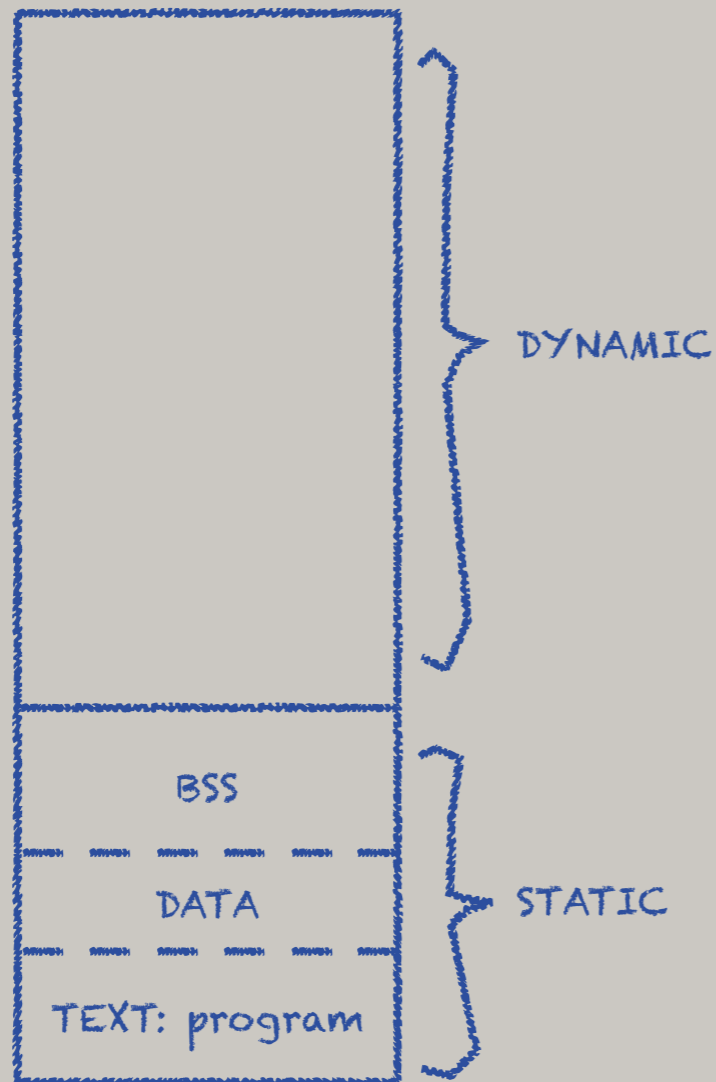
MEMORY ORGANIZATION



Each process (a running program) has a chunk of memory at its disposal.

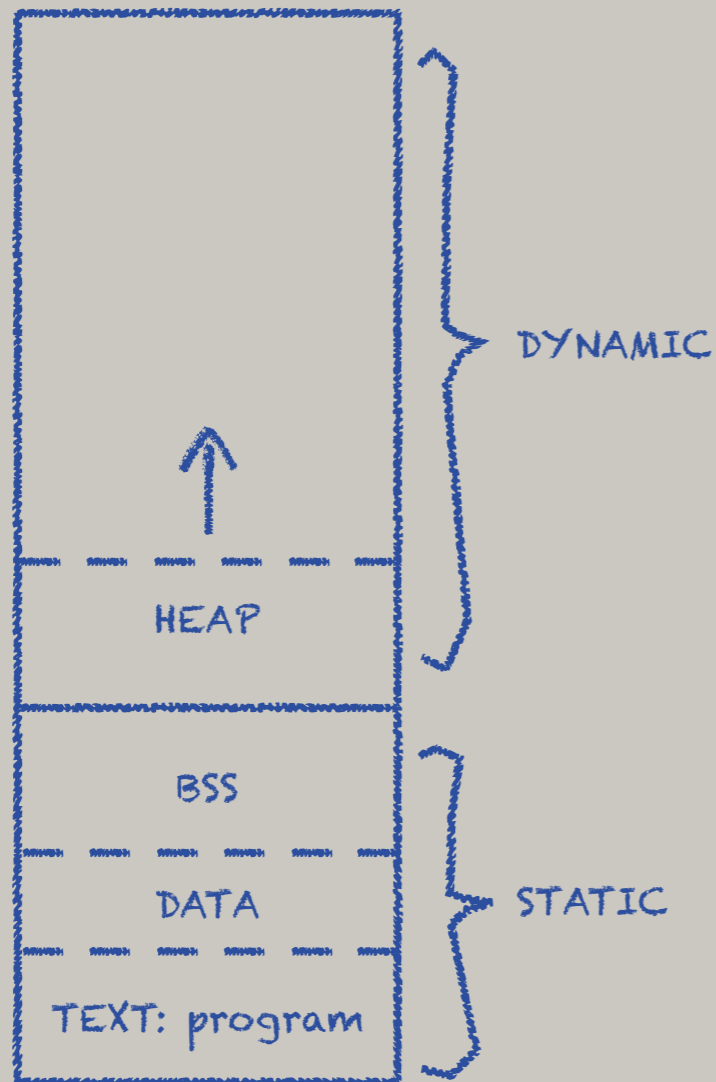
This memory is divided into "static" memory (allocated/structured before execution begins) and "dynamic" memory (allocated while the program executes).

MEMORY ORGANIZATION



The static segment is divided into a TEXT segment (holding the machine language instructions of the program), a DATA segment (for initialized variables), and a BSS segment (for uninitialized but implicitly zero-assigned values).

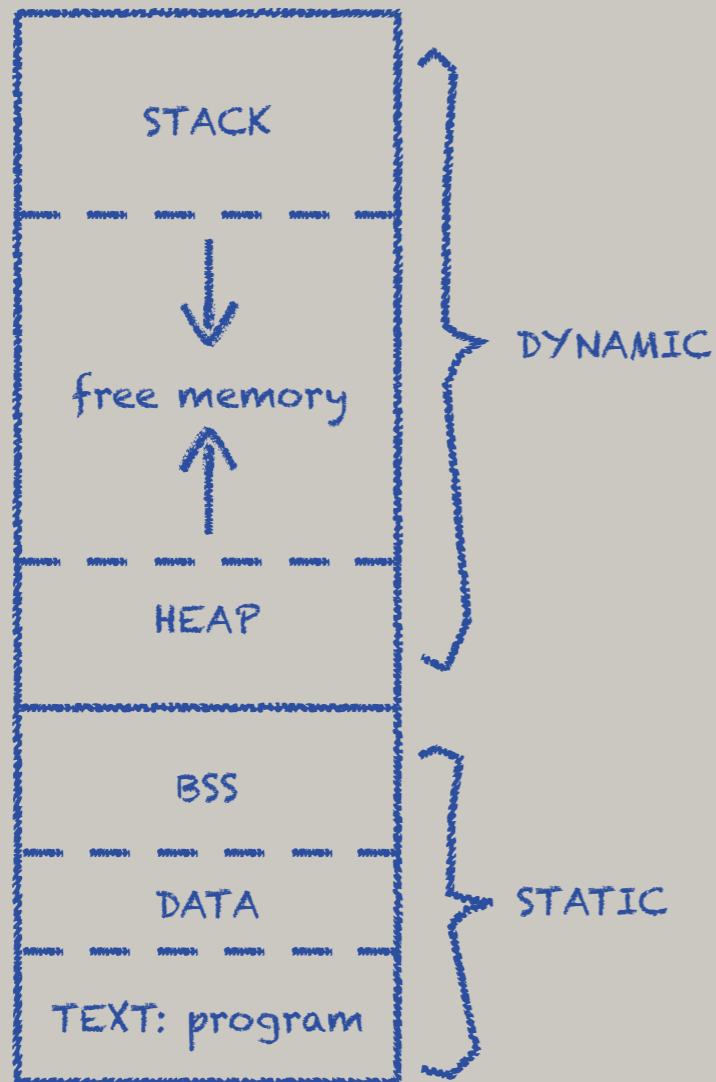
MEMORY ORGANIZATION



The dynamic segment is divided into STACK and a HEAP areas.

The HEAP is generally located adjacent to the STATIC segment, and grows "up" (to higher memory addresses).

MEMORY ORGANIZATION



The STACK holds invocation records (also called stack frames).

An invocation record is created whenever a function is called. It has space for the function's parameters, local variables, any return value, as well as bookkeeping information related to the call itself (e.g. where to return to).

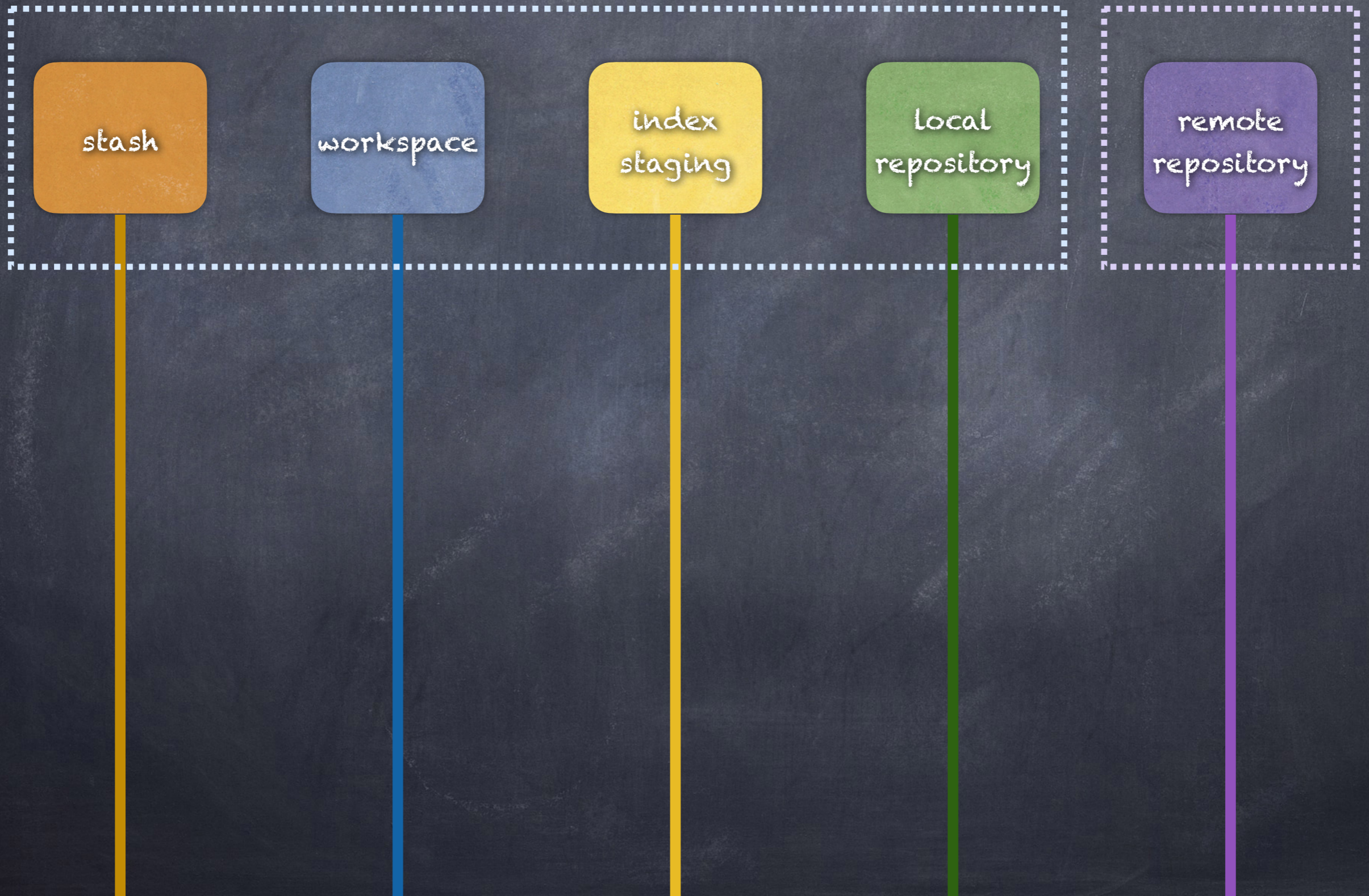
TOPHAT QUESTION

git

- distributed version control system

Local Machine
(e.g. your laptop, or
cerf if you've ssh'ed in)

Remote
(e.g. bitbucket,
github,
CSE servers)



What you see
when working

stash

workspace

index
staging

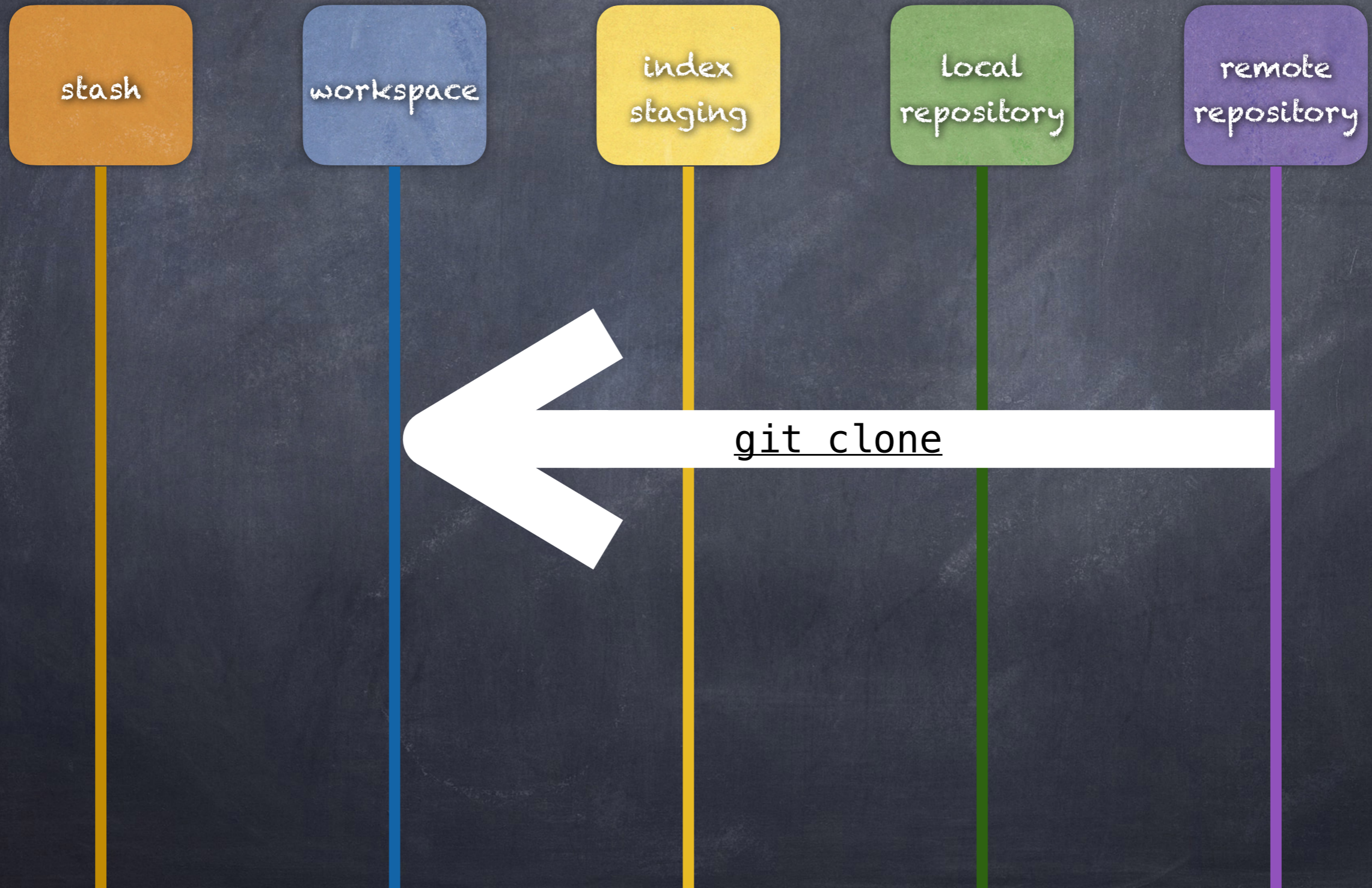
local
repository

remote
repository

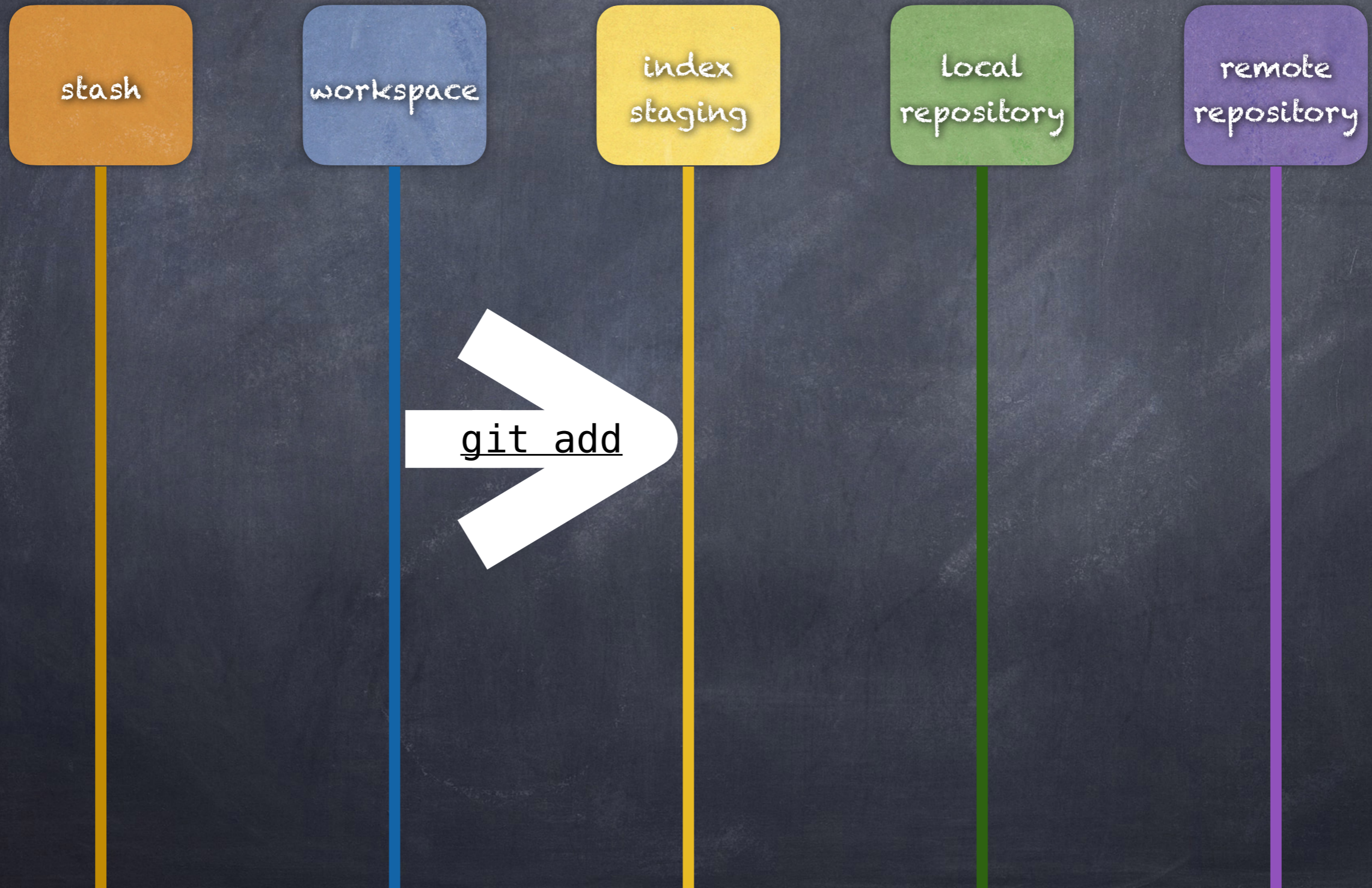


Cloning a remote

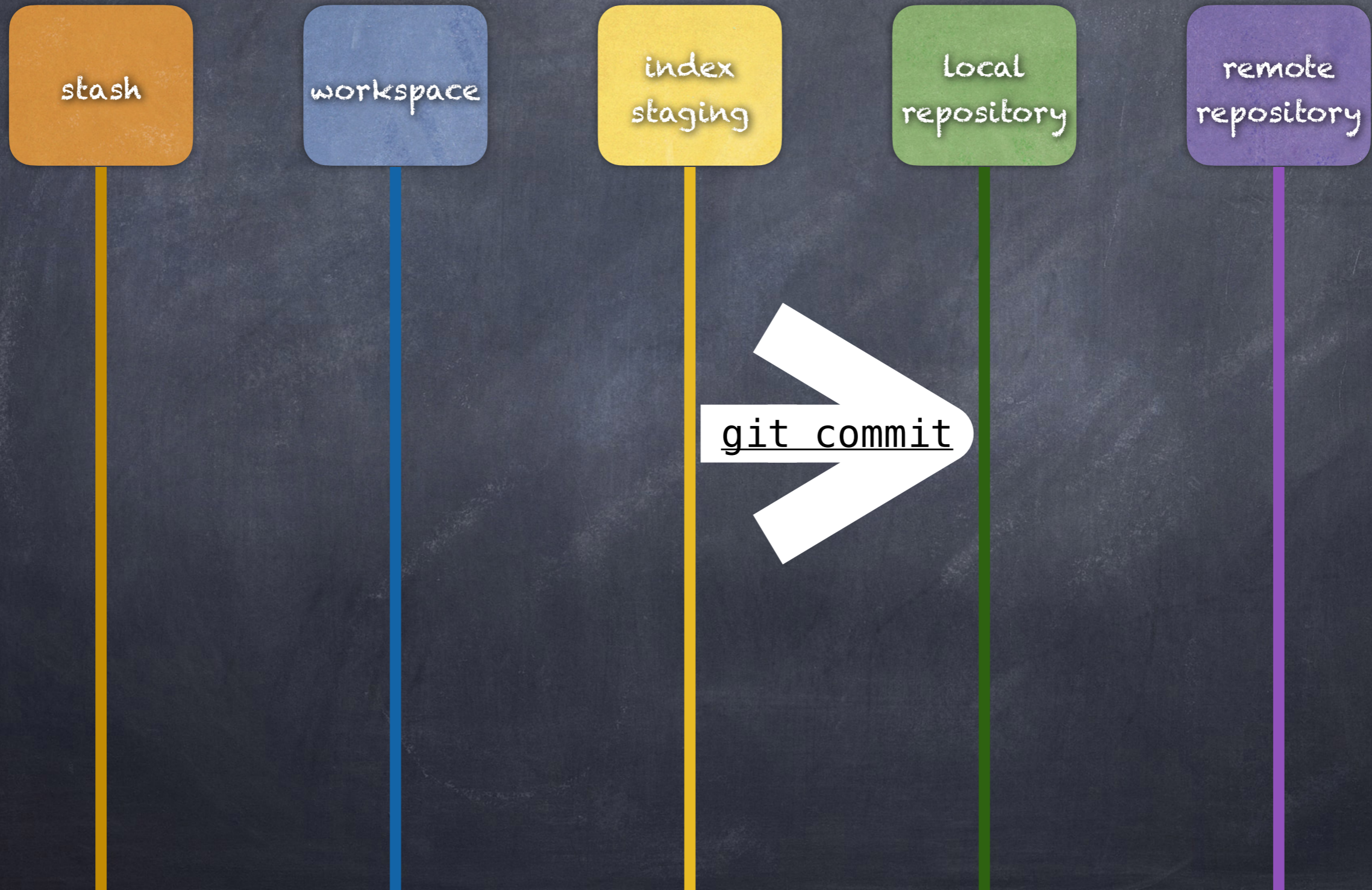
Makes a copy of remote repo in local repo
and checks out branch into workspace



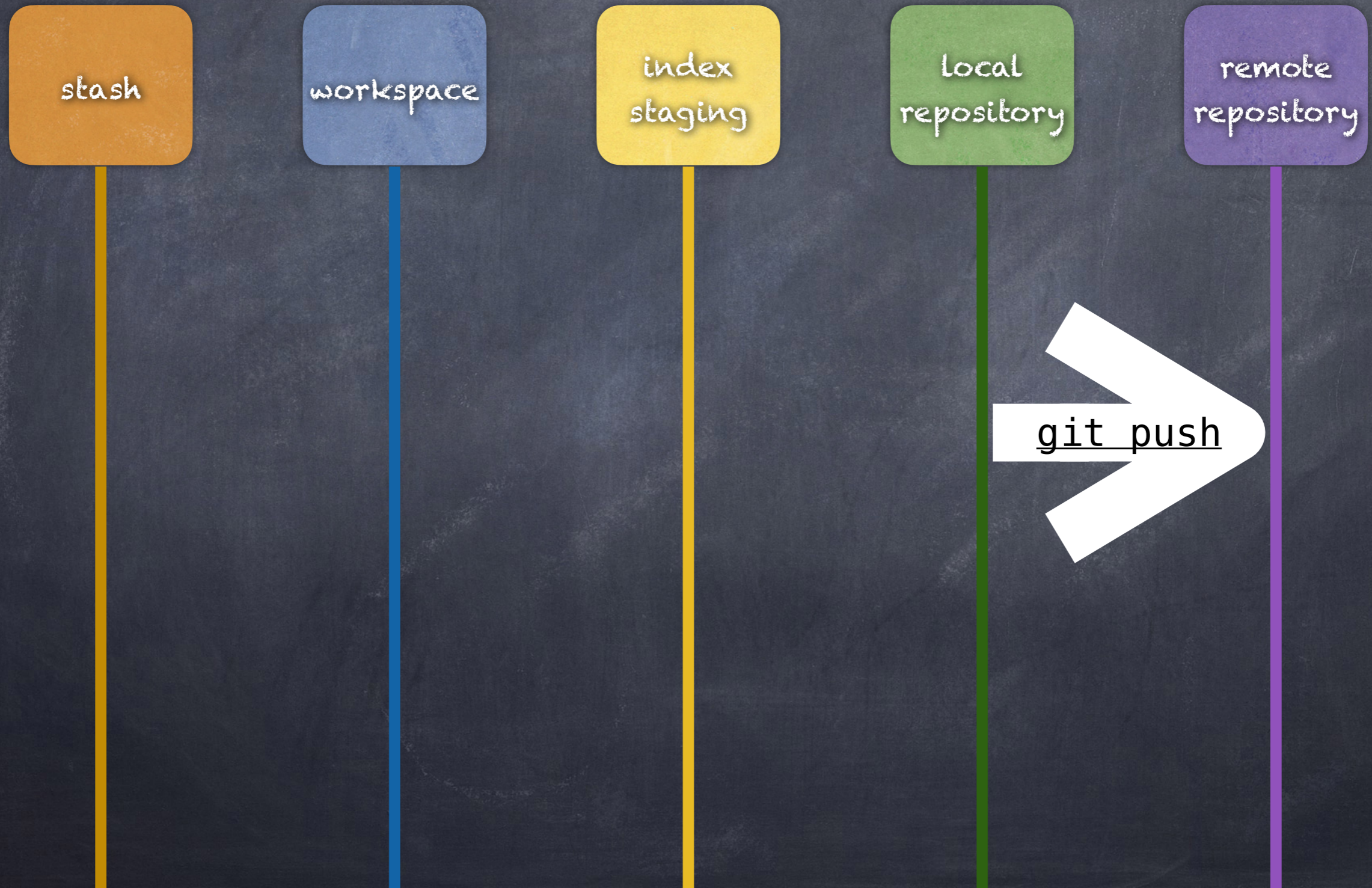
Add a file to the staging area
(add it to the index)



Create a new commit object with the staged items from the index

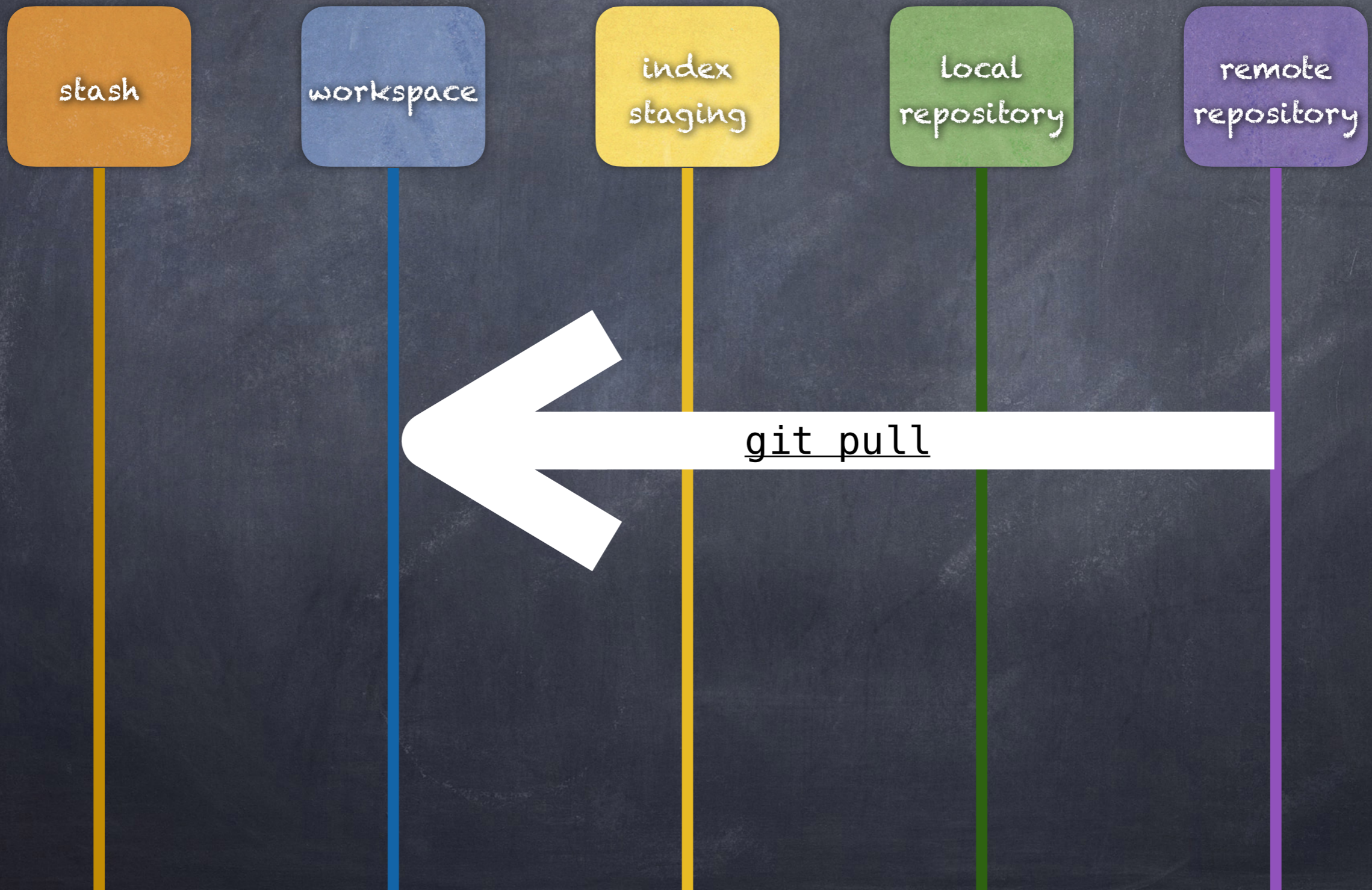


Push files from local repo to remote repo

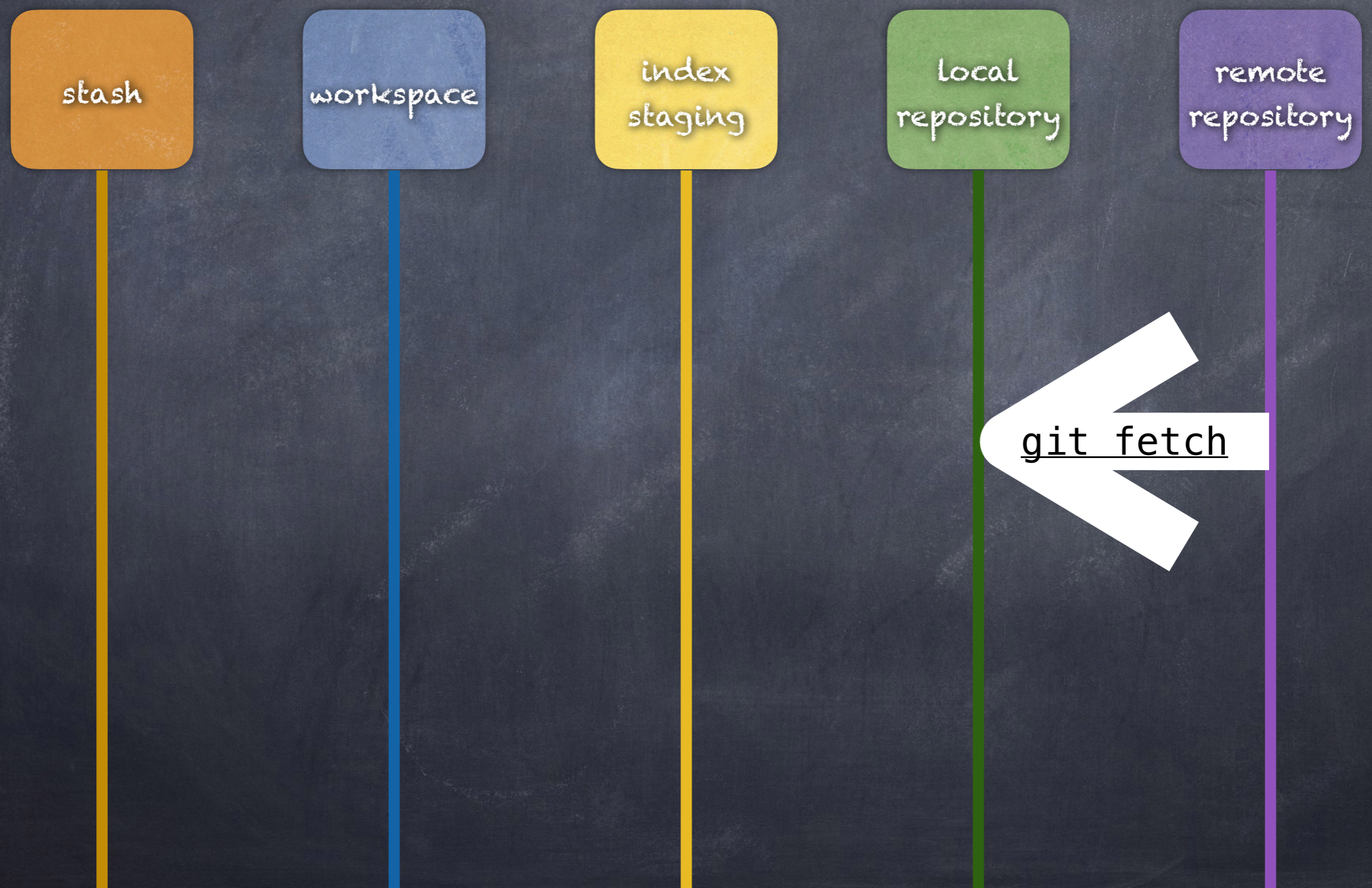


Pulling files

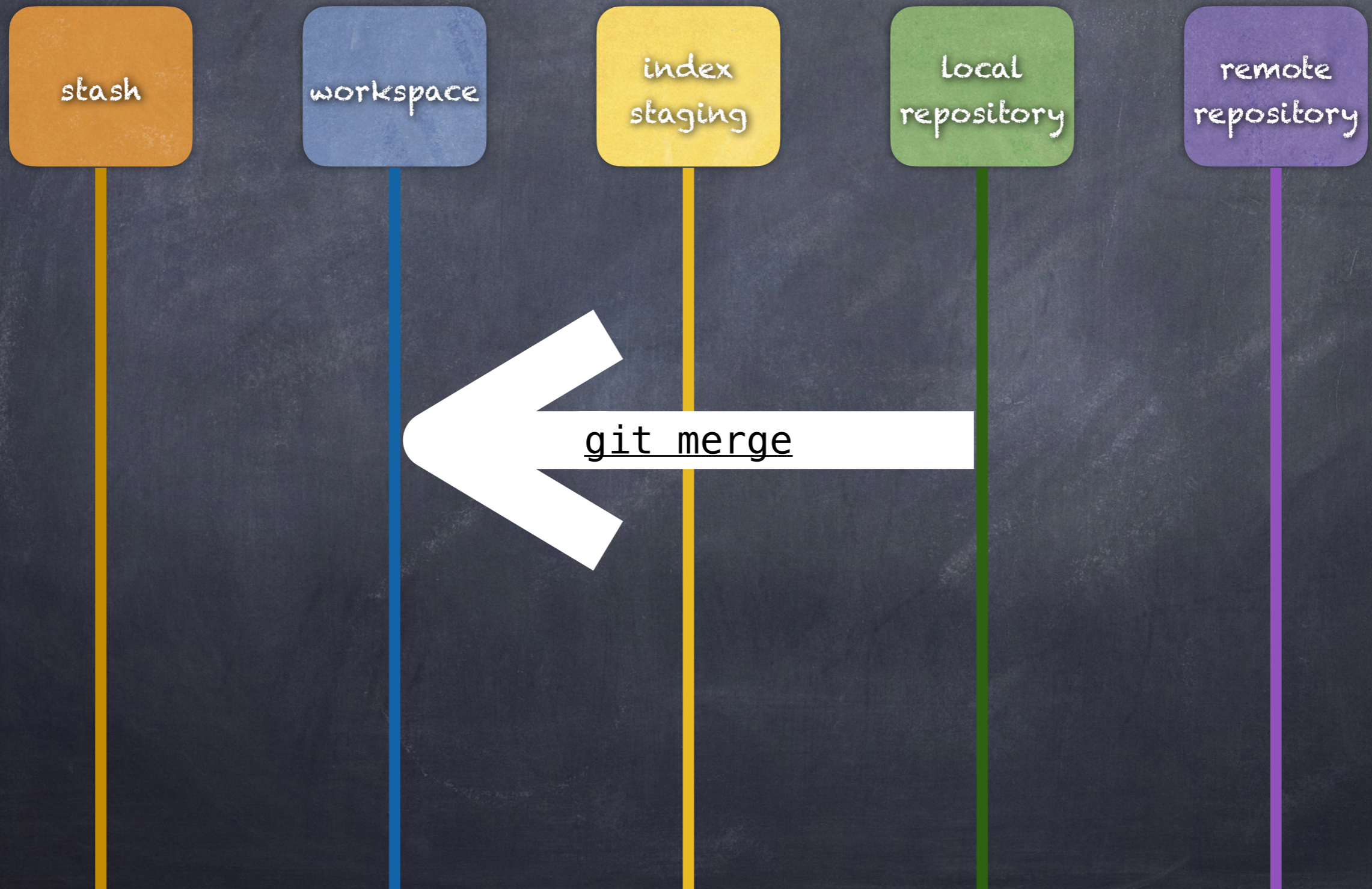
"git pull is shorthand for git fetch followed by git merge FETCH_HEAD"
[<https://git-scm.com/docs/git-pull>]



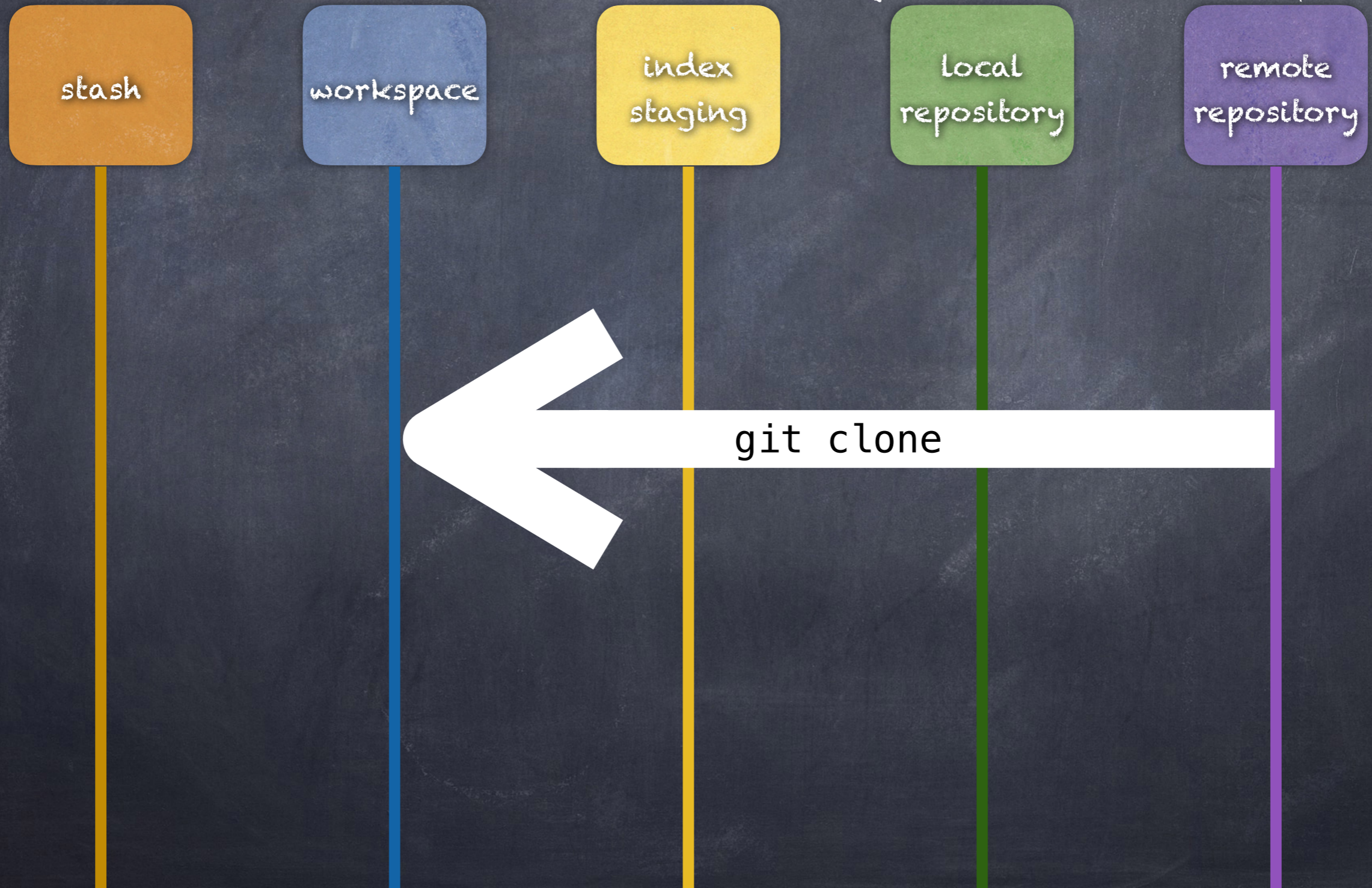
Grab files from remote



Create a commit combining
the contents of two branches



Let's start by cloning an existing repository



git-intro-carl-alphonse-1 Private Edit Pins Watch 0 Fork 0 Star 0

generated from [UB-CSE306/base-GitIntro](#)

main 1 Branch 0 Tags Add file Code

github-classroom[bot] Initial commit

README.md Initial commit

README

GitIntro

A first repo to show students how to interact with repo on GitHub

Local Codespaces

Clone

HTTPS SSH **GitHub CLI**

git@github.com:UB-CSE306/git-intro-carl-a:

Use a password-protected SSH key.

Open with GitHub Desktop

Download ZIP

About

git-intro-carl-alphonse-1 created by GitHub Classroom

- Readme
- Activity
- Custom properties
- 0 stars
- 0 watching
- 0 forks

Releases

No releases published

[Create a new release](#)

Packages

No packages published

[Publish your first package](#)

Clone the repo

```
% git clone git@github.com:UB-CSE306/git-intro-carl-alphonse-1.git
Cloning into 'git-intro-carl-alphonse-1'...
remote: Enumerating objects: 3, done.
remote: Counting objects: 100% (3/3), done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 3 (delta 0), reused 2 (delta 0), pack-reused 0
Receiving objects: 100% (3/3), done.
```

```
% ls -la
```

```
total 0
```

```
drwxr-xr-x  3 alphonse  staff   96 Feb  4 18:10 .
drwxr-xr-x 19 alphonse  staff  608 Feb  4 18:09 ..
drwxr-xr-x  4 alphonse  staff  128 Feb  4 18:10 git-intro-carl-
alphonse-1
```

```
% cd git-intro-carl-alphonse-1
```

```
% ls -la
```

```
total 8
```

```
drwxr-xr-x  4 alphonse  staff  128 Feb  4 18:10 .  
drwxr-xr-x  3 alphonse  staff   96 Feb  4 18:10 ..  
drwxr-xr-x 12 alphonse  staff  384 Feb  4 18:10 .git  
-rw-r--r--  1 alphonse  staff   77 Feb  4 18:10 README.md
```

```
% cd .git
```

```
% ls -la
```

```
total 40
```

```
drwxr-xr-x 12 alphonc  staff  384 Feb  4 18:10 .  
drwxr-xr-x  4 alphonc  staff  128 Feb  4 18:10 ..  
-rw-r--r--  1 alphonc  staff   21 Feb  4 18:10 HEAD  
-rw-r--r--  1 alphonc  staff  320 Feb  4 18:10 config  
-rw-r--r--  1 alphonc  staff   73 Feb  4 18:10 description  
drwxr-xr-x 15 alphonc  staff  480 Feb  4 18:10 hooks  
-rw-r--r--  1 alphonc  staff  137 Feb  4 18:10 index  
drwxr-xr-x  3 alphonc  staff   96 Feb  4 18:10 info  
drwxr-xr-x  4 alphonc  staff  128 Feb  4 18:10 logs  
drwxr-xr-x  4 alphonc  staff  128 Feb  4 18:10 objects  
-rw-r--r--  1 alphonc  staff  112 Feb  4 18:10 packed-refs  
drwxr-xr-x  5 alphonc  staff  160 Feb  4 18:10 refs
```

```
-rw-r--r--    1 alphonc  staff    21 Feb  4 18:10 HEAD
-rw-r--r--    1 alphonc  staff   320 Feb  4 18:10 config
-rw-r--r--    1 alphonc  staff    73 Feb  4 18:10 description
drwxr-xr-x   15 alphonc  staff   480 Feb  4 18:10 hooks
-rw-r--r--    1 alphonc  staff   137 Feb  4 18:10 index
drwxr-xr-x    3 alphonc  staff    96 Feb  4 18:10 info
drwxr-xr-x    4 alphonc  staff   128 Feb  4 18:10 logs
drwxr-xr-x    4 alphonc  staff   128 Feb  4 18:10 objects
-rw-r--r--    1 alphonc  staff   112 Feb  4 18:10 packed-refs
drwxr-xr-x    5 alphonc  staff   160 Feb  4 18:10 refs
```


pointer to the current branch

-rw-r--r--	1	alphonc	staff	21	Feb	4	18:10	HEAD
-rw-r--r--	1	alphonc	staff	320	Feb	4	18:10	config
-rw-r--r--	1	alphonc	staff	73	Feb	4	18:10	description
drwxr-xr-x	15	alphonc	staff	480	Feb	4	18:10	hooks
-rw-r--r--	1	alphonc	staff	137	Feb	4	18:10	index
drwxr-xr-x	3	alphonc	staff	96	Feb	4	18:10	info
drwxr-xr-x	4	alphonc	staff	128	Feb	4	18:10	logs
drwxr-xr-x	4	alphonc	staff	128	Feb	4	18:10	objects
-rw-r--r--	1	alphonc	staff	112	Feb	4	18:10	packed-refs
drwxr-xr-x	5	alphonc	staff	160	Feb	4	18:10	refs

% more HEAD
ref: refs/heads/main

-rw-r--r--	1	alphonc	staff	21	Feb	4	18:10	HEAD
-rw-r--r--	1	alphonc	staff	320	Feb	4	18:10	config
-rw-r--r--	1	alphonc	staff	73	Feb	4	18:10	description
drwxr-xr-x	15	alphonc	staff	480	Feb	4	18:10	hooks
-rw-r--r--	1	alphonc	staff	137	Feb	4	18:10	index
drwxr-xr-x	3	alphonc	staff	96	Feb	4	18:10	info
drwxr-xr-x	4	alphonc	staff	128	Feb	4	18:10	logs
drwxr-xr-x	4	alphonc	staff	128	Feb	4	18:10	objects
-rw-r--r--	1	alphonc	staff	112	Feb	4	18:10	packed-refs
drwxr-xr-x	5	alphonc	staff	160	Feb	4	18:10	refs

workspace

index
staging

local repository

HEAD



main

staging area

-rw-r--r--	1	alphonc	staff	21	Feb	4	18:10	HEAD
-rw-r--r--	1	alphonc	staff	320	Feb	4	18:10	config
-rw-r--r--	1	alphonc	staff	73	Feb	4	18:10	description
drwxr-xr-x	15	alphonc	staff	480	Feb	4	18:10	hooks
-rw-r--r--	1	alphonc	staff	137	Feb	4	18:10	index
drwxr-xr-x	3	alphonc	staff	96	Feb	4	18:10	info
drwxr-xr-x	4	alphonc	staff	128	Feb	4	18:10	logs
drwxr-xr-x	4	alphonc	staff	128	Feb	4	18:10	objects
-rw-r--r--	1	alphonc	staff	112	Feb	4	18:10	packed-refs
drwxr-xr-x	5	alphonc	staff	160	Feb	4	18:10	refs

content
(blobs, trees, commits)

-rw-r--r--	1	alphonse	staff	21	Feb	4	18:10	HEAD
-rw-r--r--	1	alphonse	staff	320	Feb	4	18:10	config
-rw-r--r--	1	alphonse	staff	73	Feb	4	18:10	description
drwxr-xr-x	15	alphonse	staff	480	Feb	4	18:10	hooks
-rw-r--r--	1	alphonse	staff	137	Feb	4	18:10	index
drwxr-xr-x	3	alphonse	staff	96	Feb	4	18:10	info
drwxr-xr-x	4	alphonse	staff	128	Feb	4	18:10	logs
drwxr-xr-x	4	alphonse	staff	128	Feb	4	18:10	objects
-rw-r--r--	1	alphonse	staff	112	Feb	4	18:10	packed-refs
drwxr-xr-x	5	alphonse	staff	160	Feb	4	18:10	refs

workspace

fileA

index
staging

local repository

HEAD

main

commit

tree

fileA

content (blobs, trees, commits)

The [git man page](#) seems to be surprisingly bereft of an official definition, other than this (emphasis mine):

The **object database** contains objects of three main types: **blobs, which hold file data**; trees, which point to blobs and other trees to build up directory hierarchies; and commits, which each reference a single tree and some number of parent commits.

The repeated use of the term "object database" across git documentation suggests a borrowing of "blob" specifically from DBMSs.

In its article on [Binary large objects](#) Wikipedia defines the term as "a collection of binary data stored as a single entity in a database management system", further offering the following:

Blobs were originally just amorphous chunks of data invented by Jim Starkey at DEC, who describes them as "the thing that ate Cincinnati, Cleveland, or whatever" from "the 1958 Steve McQueen movie", referring to The Blob.

Later, Terry McKiever, a marketing person for Apollo, felt that it needed to be an acronym and invented the backronym Basic Large Object. Then Informix invented an alternative backronym, Binary Large Object.

So, though it's not a definitive answer, the term "blob" has a conventional and well-defined usage across computer science as an opaque string of binary data, and git adheres to that definition without further specifying it.

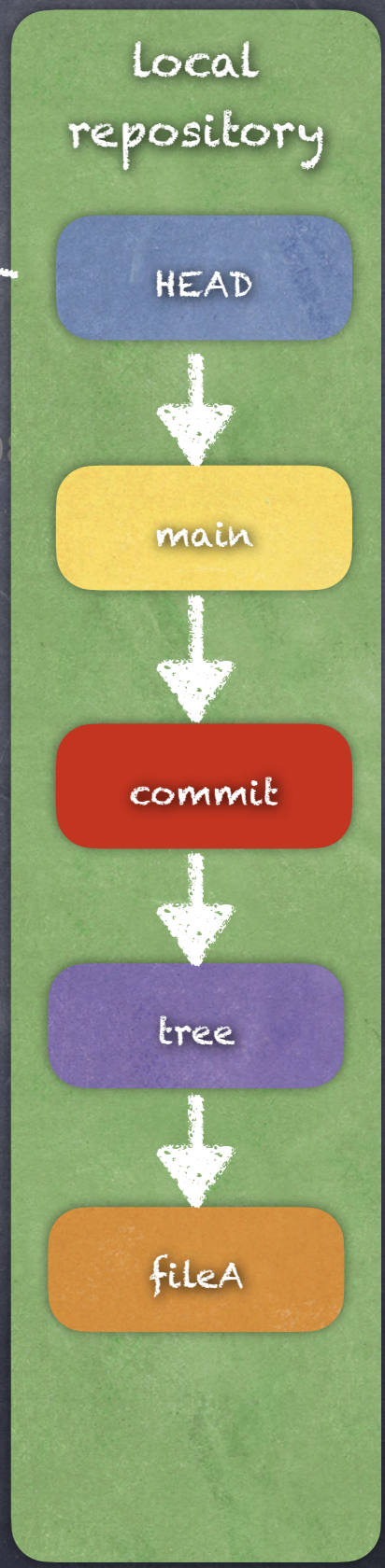
answered Jul 24 '15 at 17:12

[Jeff Bowman](#)
33.9k65685

```
alphonc@dhcp-10-83-16-71 .git % cat HEAD
ref: refs/heads/main
alphonc@dhcp-10-83-16-71 .git % cat refs/heads/main
2303f4622cbb330c9fb021cd216cd657e4942592
alphonc@dhcp-10-83-16-71 .git % git cat-file -t HEAD
commit
alphonc@dhcp-10-83-16-71 .git % git cat-file -t 2303f
commit
alphonc@dhcp-10-83-16-71 .git % git cat-file -p 2303f
tree e7c77e150f84d16ec763bd46dcffebfd8f2873f4
author github-classroom[bot] <66690702+github-classroom[bot]@users.noreply.github.com> 17070
committer GitHub <noreply@github.com> 1707088127 +0000
pgpsig -----BEGIN PGP SIGNATURE-----
```

```
wsFcBAABCAAQBQJlwBj/CRC1aQ7uu5UhlAAAbt8QAJvL5XVgE7xXxNDM+ZqUWQgp
nAdFnL03n0fMqHskU9hG8FFnSw3D0DZinpZ4se7cwqFdvDoH8ePcXDrZHKqmDq5c
o6jwkejRAuFwwaYgqu5jn1YsdpNpPPFWjSmHZHQawF6TNI0D+V2n4YjhjJcmLdqp
iJ4WmeB4oGqcEUVr0m11mgcZSeCusrQV4yKTvKtWzJoh6Z5U0nYlk0aNxdD6gZ/9
lIUdR0/2NrpqUmoR2w1V9+0F334LLK5l0Ny2CDV3DIKv0DDM80TD6DhStZBBYIsm
ji0wxHbbh4wH2o3QH/eqwV850GtAvaryKal9WfhtKkoBkEY7Tu9F63biuFbeXyjY
URrT2AgfH0vIa0twtrFx0KaD5FJyux6YXXX/gbP0/uu4DIxiLI4wQdCDAt9VGHkJ
44CyucSgG0Zfai5x08tC88V80mwXXVHok9+Swood+pJ5E14qsBs9MYxenYH6cc45
+Dh4gEq4bDj77TkTAlGaaXlHy2Sp+R0Cn0/iiUo16g/7tmPyCMZ8YB6+Fo0pCa7q
NBGDnspHM0oKX7Ms1Gki03HeXws8NJUzbslnZg9oPP7pD9d83dQvKxfWa+LXl+L3
wwh5jNYepteA/3BIpAcdgFsvkJpZ5qleZQe6AGTR5rUNZtm2xy7UEqLVAjucpREZ
PHhEGRBDBD1EWHvQiArh
=onC9
-----END PGP SIGNATURE-----
```

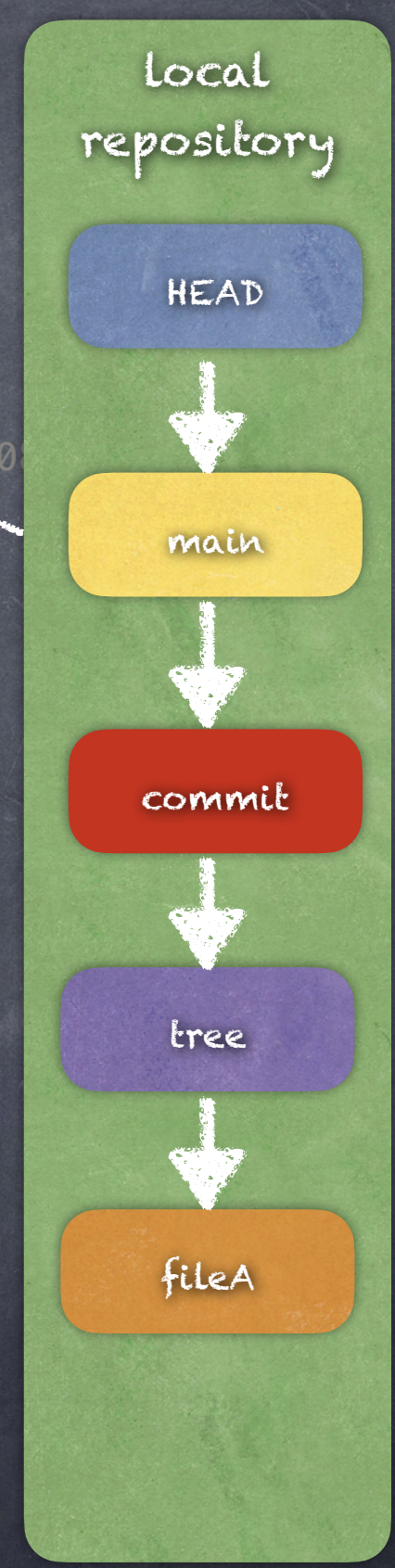
```
Initial commit%
alphonc@dhcp-10-83-16-71 .git % git cat-file -t e7c77
tree
alphonc@dhcp-10-83-16-71 .git % git cat-file -p e7c77
100644 blob da80e272f601badf16da372517a26bba132b5bab README.md
alphonc@dhcp-10-83-16-71 .git % git cat-file -t da80e
blob
alphonc@dhcp-10-83-16-71 .git % git cat-file -p da80e
# GitIntro
A first repo to show students how to interact with repo on GitHub
```




```
alphonc@dhcp-10-83-16-71 .git % cat HEAD
ref: refs/heads/main
alphonc@dhcp-10-83-16-71 .git % cat refs/heads/main
2303f4622cbb330c9fb021cd216cd657e4942592
alphonc@dhcp-10-83-16-71 .git % git cat-file -t HEAD
commit
alphonc@dhcp-10-83-16-71 .git % git cat-file -t 2303f
commit
alphonc@dhcp-10-83-16-71 .git % git cat-file -p 2303f
tree e7c77e150f84d16ec763bd46dcffebfd8f2873f4
author github-classroom[bot] <66690702+github-classroom[bot]@users.noreply.github.com> 17070
committer GitHub <noreply@github.com> 1707088127 +0000
gpgsig -----BEGIN PGP SIGNATURE-----
```

```
wsFcBAABCAAQBQJlwBj/CRC1aQ7uu5UhlAAAbt8QAJvL5XVgE7xXxNDM+ZqUWQgp
nAdFnL03n0fMqHskU9hG8FFnSw3D0DZinpZ4se7cwqFdvDoH8ePcXDrZHKqmDq5c
o6jwkejRAuFwwaYgqu5jn1YsdpNpPPFWjSmHZHQawF6TNI0D+V2n4YjhjJcmLdqp
iJ4WmeB4oGqcEUVr0m11mgcZSeCusrQV4yKTvKtWzJoh6Z5U0nYlk0aNxdD6gZ/9
lIUdR0/2NrpqUmoR2w1V9+0F334LLK5l0Ny2CDV3DIKv0DDM80TD6DhStZBBYIsm
ji0wxHbbh4wH2o3QH/eqwV850GtAvaryKal9WfhtKkoBkEY7Tu9F63biuFbeXyjY
URrT2AgfH0vIa0twtrFx0KaD5FJyux6YXXX/gbP0/uu4DIxiLI4wQdCDAt9VGhkJ
44CyucSgG0Zfai5x08tC88V80mwXXVHok9+Swood+pJ5E14qsBs9MYxenYH6cc45
+Dh4gEq4bDj77TkTAlGaaXlHy2Sp+R0Cn0/iiUo16g/7tmPyCMZ8YB6+Fo0pCa7q
NBGDnspHM0oKX7Ms1Gki03HeXws8NJUzbslnZg9oPP7pD9d83dQvKxfWa+LXl+L3
wwh5jNYepteA/3BIpAcdgFsvkJpZ5qleZQe6AGTR5rUNZtm2xy7UEqLVAjucpREZ
PHhEGRBDBD1EWHvQiArh
=onC9
-----END PGP SIGNATURE-----
```

```
Initial commit%
alphonc@dhcp-10-83-16-71 .git % git cat-file -t e7c77
tree
alphonc@dhcp-10-83-16-71 .git % git cat-file -p e7c77
100644 blob da80e272f601badf16da372517a26bba132b5bab README.md
alphonc@dhcp-10-83-16-71 .git % git cat-file -t da80e
blob
alphonc@dhcp-10-83-16-71 .git % git cat-file -p da80e
# GitIntro
A first repo to show students how to interact with repo on GitHub
```



https://git-scm.com/docs/git-cat-file

NAME

git-cat-file - Provide contents or details of repository objects

SYNOPSIS

```
git cat-file <type> <object>
git cat-file (-e | -p) <object>
git cat-file (-t | -s) [--allow-unknown-type] <object>
git cat-file (--textconv | --filters)
    [<rev>:<path|tree-ish> | --path=<path|tree-ish> <rev>]
git cat-file (--batch | --batch-check | --batch-command) [--batch-all-
objects]
    [--buffer] [--follow-symlinks] [--unordered]
    [--textconv | --filters] [-Z]
```

DESCRIPTION

Output the contents or other properties such as size, type or delta information of one or more objects.

This command can operate in two modes, depending on whether an option from the `--batch` family is specified.

In non-batch mode, the command provides information on an object named on the command line.

In batch mode, arguments are read from standard input.

OPTIONS

<object>

The name of the object to show. For a more complete list of ways to spell object names, see the "SPECIFYING REVISIONS" section in [gitrevisions\[7\]](#).

-t

Instead of the content, show the object type identified by `<object>`.

-s

Instead of the content, show the object size identified by `<object>`. If used with `--use-mailmap` option, will show the size of updated object after replacing idents using the mailmap mechanism.

-e

Exit with zero status if `<object>` exists and is a valid object. If `<object>` is of an invalid format, exit with non-zero status and emit an error on stderr.

-p

Pretty-print the contents of `<object>` based on its type.

Local repository

HEAD



main



commit



tree



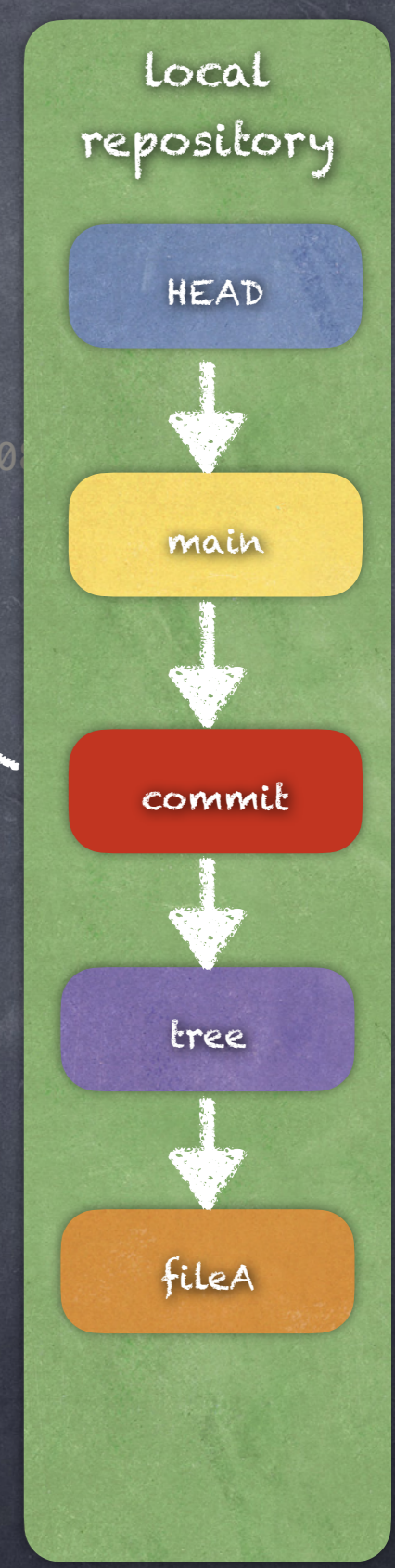
fileA

ply.github.com> 17070

```
alphonc@dhcp-10-83-16-71 .git % cat HEAD
ref: refs/heads/main
alphonc@dhcp-10-83-16-71 .git % cat refs/heads/main
2303f4622cbb330c9fb021cd216cd657e4942592
alphonc@dhcp-10-83-16-71 .git % git cat-file -t HEAD
commit
alphonc@dhcp-10-83-16-71 .git % git cat-file -t 2303f
commit
alphonc@dhcp-10-83-16-71 .git % git cat-file -p 2303f
tree e7c77e150f84d16ec763bd46dcffebfd8f2873f4
author github-classroom[bot] <66690702+github-classroom[bot]@users.noreply.github.com> 17070
committer GitHub <noreply@github.com> 1707088127 +0000
pgpsig -----BEGIN PGP SIGNATURE-----
```

```
wsFcBAABCAAQBQJlwBj/CRC1aQ7uu5UhlAAAbt8QAJvL5XVgE7xXxNDM+ZqUWQgp
nAdFnL03n0fMqHskU9hG8FFnSw3D0DZinpZ4se7cwqFdvDoH8ePcXDrZHKqmDq5c
o6jwkejRAuFwwaYgqu5jn1YsdpNpPPFWjSmHZHQawF6TNI0D+V2n4YjhjJcmLdqp
iJ4WmeB4oGqcEUVr0m11mgcZSeCusrQV4yKTvKtWzJoh6Z5U0nYlk0aNxdD6gZ/9
lIUdR0/2NrpqUmoR2w1V9+0F334LLK5l0Ny2CDV3DIKv0DDM80TD6DhStZBBYIsm
ji0wxHbbh4wH2o3QH/eqwV850GtAvaryKal9WfhtKkoBkEY7Tu9F63biuFbeXyjY
URrT2AgfH0vIa0twtrFx0KaD5FJyux6YXXX/gbP0/uu4DIxiLI4wQdCDAt9VGHkJ
44CyucSgG0Zfai5x08tC88V80mwXXVHok9+Swood+pJ5E14qsBs9MYxenYH6cc45
+Dh4gEq4bDj77TkTAlGaaXlHy2Sp+R0Cn0/iiUo16g/7tmPyCMZ8YB6+Fo0pCa7q
NBGDnspHM0oKX7Ms1Gki03HeXws8NjUzbslnZg9oPP7pD9d83dQvKxfWa+LXl+L3
wwh5jNYepteA/3BIpAcdgFsvkJpZ5qleZQe6AGTR5rUNZtm2xy7UEqLVAjucpREZ
PHhEGRBDBD1EWHvQiArh
=onC9
-----END PGP SIGNATURE-----
```

```
Initial commit%
alphonc@dhcp-10-83-16-71 .git % git cat-file -t e7c77
tree
alphonc@dhcp-10-83-16-71 .git % git cat-file -p e7c77
100644 blob da80e272f601badf16da372517a26bba132b5bab README.md
alphonc@dhcp-10-83-16-71 .git % git cat-file -t da80e
blob
alphonc@dhcp-10-83-16-71 .git % git cat-file -p da80e
# GitIntro
A first repo to show students how to interact with repo on GitHub
```



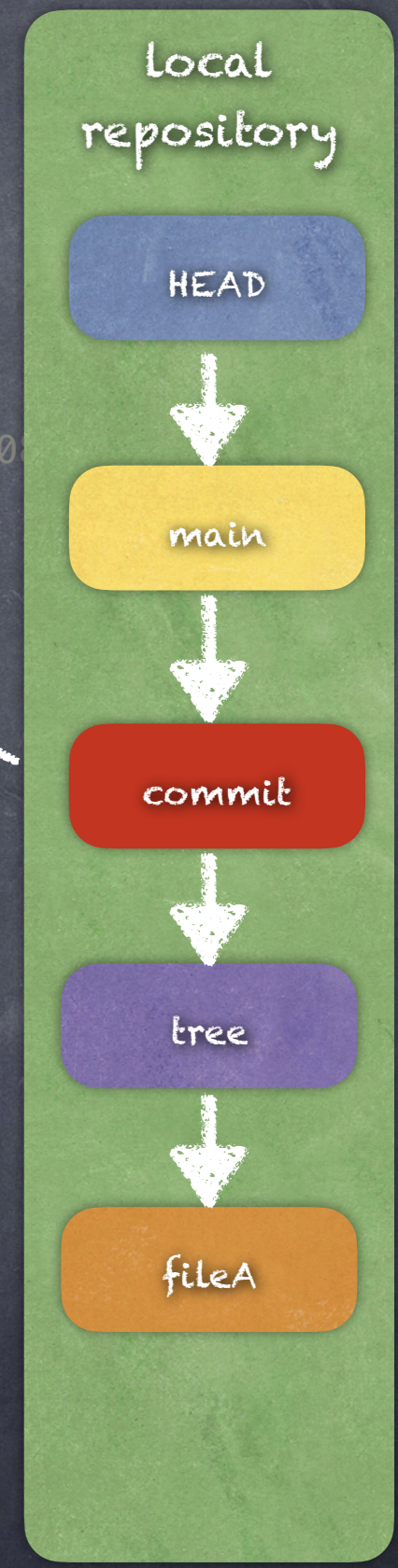
```
alphonc@dhcp-10-83-16-71 .git % cat HEAD
ref: refs/heads/main
alphonc@dhcp-10-83-16-71 .git % cat refs/heads/main
2303f4622cbb330c9fb021cd216cd657e4942592
alphonc@dhcp-10-83-16-71 .git % git cat-file -t HEAD
commit
alphonc@dhcp-10-83-16-71 .git % git cat-file -t 2303f
commit
```

Could even do:

```
alphonc@dhcp-10-83-16-71 .git % git cat-file -t refs/heads/main
commit
```

```
-----BEGIN PGP SIGNATURE-----
i10D10/2Nf pqum0R2w1V9+0F354LkS t0Ny2CDV3D1RV0DDM801D0DHS tZBBT1Sll
ji0wxHbbh4wH2o3QH/eqwV850GtAvaryKa19WfhtKkoBkEY7Tu9F63biuFbeXyjY
URrT2AgfH0vIa0twtrFx0KaD5FJyux6YXXX/gbP0/uu4DIxiLI4wQdCDAt9VGhkJ
44CyucSgG0Zfai5x08tC88V80mwXXVHok9+Swood+pJ5E14qsBs9MYxenYH6cc45
+Dh4gEq4bDj77TkTAlGaaXlHy2Sp+R0Cn0/iiUo16g/7tmPyCMZ8YB6+Fo0pCa7q
NBGDnspHM0oKX7Ms1Gki03HeXws8NJuZbslnZg9oPP7pD9d83dQvKxfWa+LXl+L3
wwh5jNYepteA/3BIpAcdgFsvkJpZ5qleZQe6AGTR5rUNZtm2xy7UEqLVAjucpREZ
PHhEGRBDBD1EWHvQiArh
=onC9
-----END PGP SIGNATURE-----
```

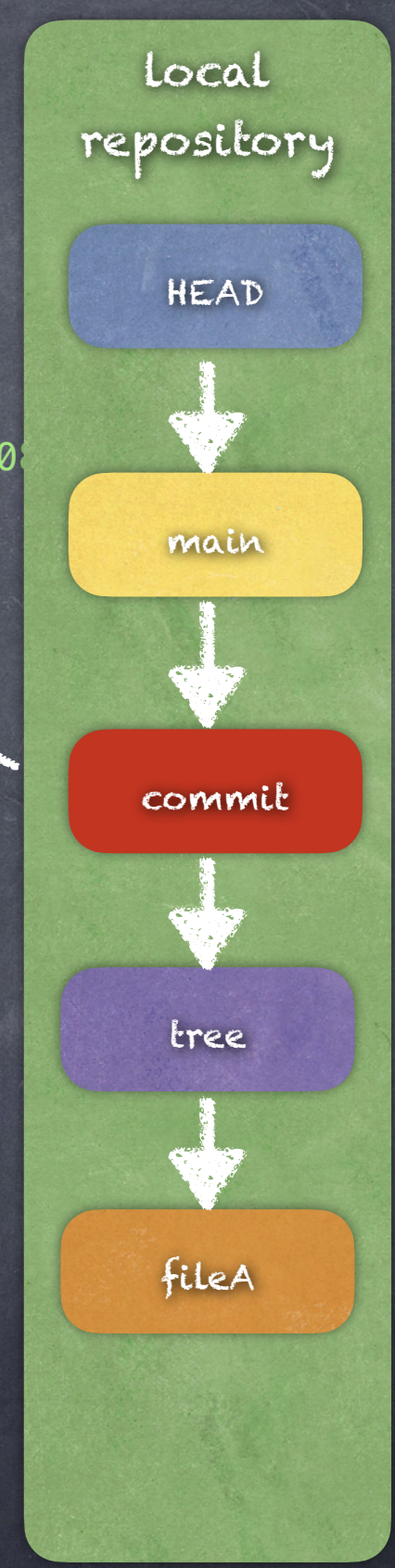
```
Initial commit%
alphonc@dhcp-10-83-16-71 .git % git cat-file -t e7c77
tree
alphonc@dhcp-10-83-16-71 .git % git cat-file -p e7c77
100644 blob da80e272f601badf16da372517a26bba132b5bab README.md
alphonc@dhcp-10-83-16-71 .git % git cat-file -t da80e
blob
alphonc@dhcp-10-83-16-71 .git % git cat-file -p da80e
# GitIntro
A first repo to show students how to interact with repo on GitHub
```



```
alphonc@dhcp-10-83-16-71 .git % cat HEAD
ref: refs/heads/main
alphonc@dhcp-10-83-16-71 .git % cat refs/heads/main
2303f4622cbb330c9fb021cd216cd657e4942592
alphonc@dhcp-10-83-16-71 .git % git cat-file -t HEAD
commit
alphonc@dhcp-10-83-16-71 .git % git cat-file -t 2303f
commit
alphonc@dhcp-10-83-16-71 .git % git cat-file -p 2303f
tree e7c77e150f84d16ec763bd46dcffebfd8f2873f4
author github-classroom[bot] <66690702+github-classroom[bot]@users.noreply.github.com> 17070
committer GitHub <noreply@github.com> 1707088127 +0000
pgpsig -----BEGIN PGP SIGNATURE-----
```

```
wsFcBAABCAAQBQJlwBj/CRC1aQ7uu5UhlAAAbt8QAJvL5XVgE7xXxNDM+ZqUWQgp
nAdFnL03n0fMqHskU9hG8FFnSw3D0DZinpZ4se7cwqFdvDoH8ePcXDrZHKqmDq5c
o6jwkejRAuFwwaYgqu5jn1YsdpNpPPFWjSmHZHQawF6TNI0D+V2n4YjhjJcmLdqp
iJ4WmeB4oGqcEUVR0m11mgcZSeCusrQV4yKTvKtWzJoh6Z5U0nYlk0aNxdD6gZ/9
lIUDr0/2NrpqUmoR2w1V9+0F334LLK5l0Ny2CDV3DIKv0DDM80TD6DhStZBBYIsm
ji0wxHbbh4wH2o3QH/eqwV850GtAvaryKal9WfhtKkoBkEY7Tu9F63biuFbeXyjY
URrT2AgfH0vIa0twtrFx0KaD5FJyux6YXXX/gbP0/uu4DIxiLI4wQdCDAt9VGHkJ
44CyucSgG0Zfai5x08tC88V80mwXXVHok9+Swood+pJ5E14qsBs9MYxenYH6cc45
+Dh4gEq4bDj77TkTAlGaaXlHy2Sp+R0Cn0/iiUo16g/7tmPyCMZ8YB6+Fo0pCa7q
NBGDnspHM0oKX7Ms1Gki03HeXws8NJUzbslnZg9oPP7pD9d83dQvKxfWa+LXl+L3
wwh5jNYepteA/3BIpAcdgFsvkJpZ5qleZQe6AGTR5rUNZtm2xy7UEqLVAjucpREZ
PHhEGRBDBD1EWHvQiArh
=onC9
-----END PGP SIGNATURE-----
```

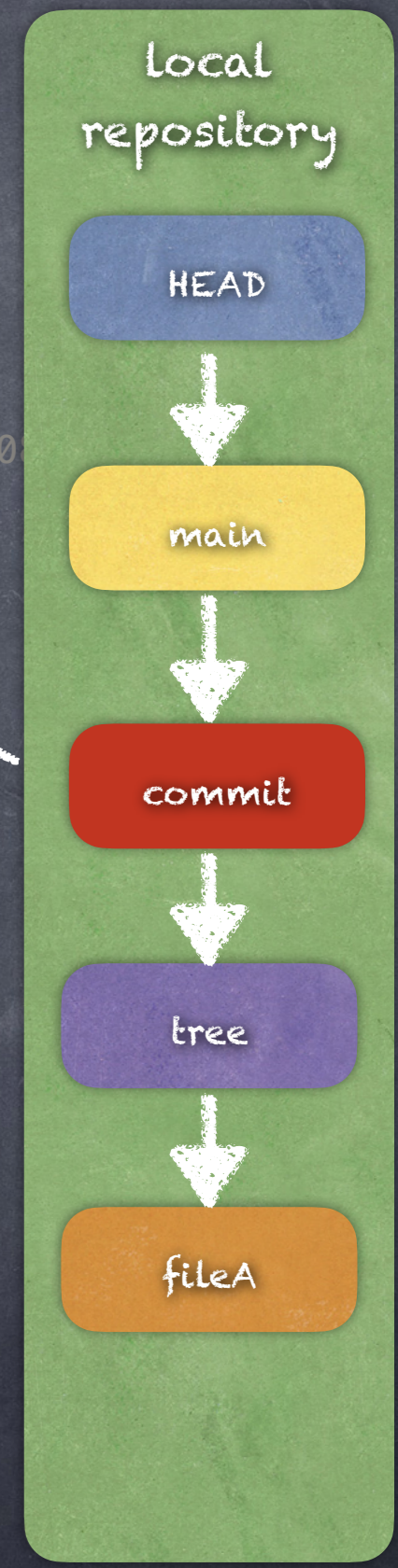
```
Initial commit%
alphonc@dhcp-10-83-16-71 .git % git cat-file -t e7c77
tree
alphonc@dhcp-10-83-16-71 .git % git cat-file -p e7c77
100644 blob da80e272f601badf16da372517a26bba132b5bab README.md
alphonc@dhcp-10-83-16-71 .git % git cat-file -t da80e
blob
alphonc@dhcp-10-83-16-71 .git % git cat-file -p da80e
# GitIntro
A first repo to show students how to interact with repo on GitHub
```



```
alphonc@dhcp-10-83-16-71 .git % cat HEAD
ref: refs/heads/main
alphonc@dhcp-10-83-16-71 .git % cat refs/heads/main
2303f4622cbb330c9fb021cd216cd657e4942592
alphonc@dhcp-10-83-16-71 .git % git cat-file -t HEAD
commit
alphonc@dhcp-10-83-16-71 .git % git cat-file -t 2303f
commit
alphonc@dhcp-10-83-16-71 .git % git cat-file -p 2303f
tree e7c77e150f84d16ec763bd46dcffebfd8f2873f4
author github-classroom[bot] <66690702+github-classroom[bot]@users.noreply.github.com> 17070
committer GitHub <noreply@github.com> 1707088127 +0000
pgpsig -----BEGIN PGP SIGNATURE-----
```

```
wsFcBAABCAAQBQJlwBj/CRC1aQ7uu5UhlAAAbt8QAJvL5XVgE7xXxNDM+ZqUWQgp
nAdFnL03n0fMqHskU9hG8FFnSw3D0DZinpZ4se7cwqFdvDoH8ePcXDrZHKqmDq5c
o6jwkejRAuFwwaYgqu5jn1YsdpNpPPFWjSmHZHQawF6TNI0D+V2n4YjhjJcmLdqp
iJ4WmeB4oGqcEUVR0m11mgcZSeCusrQV4yKTvKtWzJoh6Z5U0nYlk0aNxdD6gZ/9
lIUdR0/2NrpqUmoR2w1V9+0F334LLK5l0Ny2CDV3DIKv0DDM80TD6DhStZBBYIsm
ji0wxHbbh4wH2o3QH/eqwV850GtAvaryKal9WfhtKkoBkEY7Tu9F63biuFbeXyjY
URrT2AgfH0vIa0twtrFx0KaD5FJyux6YXXX/gbP0/uu4DIxiLI4wQdCDAt9VGhkJ
44CyucSgG0Zfai5x08tC88V80mwXXVHok9+Swood+pJ5E14qsBs9MYxenYH6cc45
+Dh4gEq4bDj77TkTAlGaaXlHy2Sp+R0Cn0/iiUo16g/7tmPyCMZ8YB6+Fo0pCa7q
NBGDnspHM0oKX7Ms1Gki03HeXws8NJUzbslnZg9oPP7pD9d83dQvKxfWa+LXl+L3
wwh5jNYepteA/3BIpAcdgFsvkJpZ5qleZQe6AGTR5rUNZtm2xy7UEqLVAjucpREZ
PHhEGRBDBD1EWHvQiArh
=onC9
-----END PGP SIGNATURE-----
```

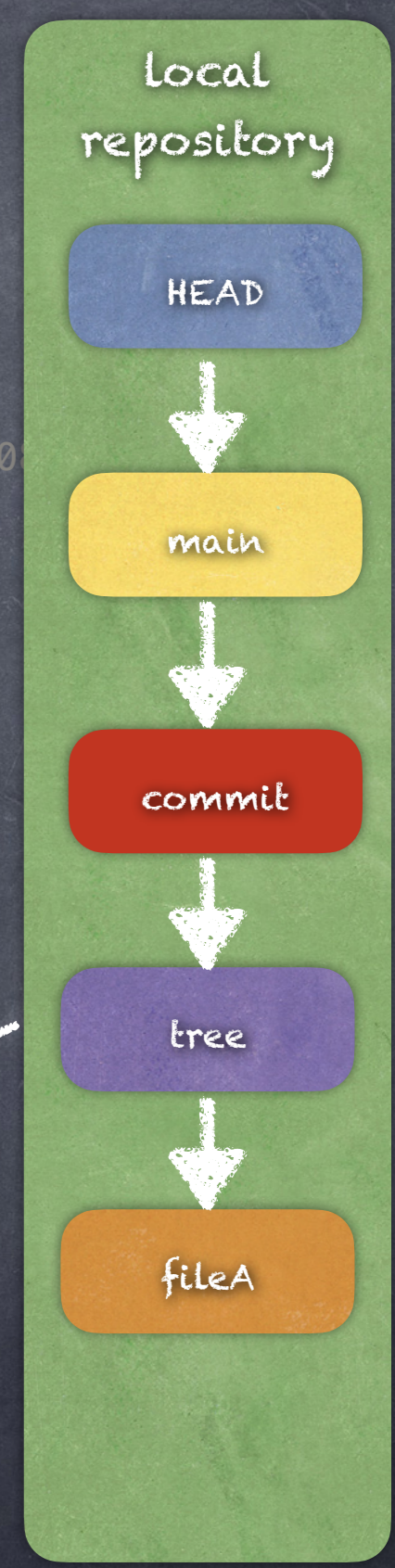
```
Initial commit%
alphonc@dhcp-10-83-16-71 .git % git cat-file -t e7c77
tree
alphonc@dhcp-10-83-16-71 .git % git cat-file -p e7c77
100644 blob da80e272f601badf16da372517a26bba132b5bab README.md
alphonc@dhcp-10-83-16-71 .git % git cat-file -t da80e
blob
alphonc@dhcp-10-83-16-71 .git % git cat-file -p da80e
# GitIntro
A first repo to show students how to interact with repo on GitHub
```



```
alphonc@dhcp-10-83-16-71 .git % cat HEAD
ref: refs/heads/main
alphonc@dhcp-10-83-16-71 .git % cat refs/heads/main
2303f4622cbb330c9fb021cd216cd657e4942592
alphonc@dhcp-10-83-16-71 .git % git cat-file -t HEAD
commit
alphonc@dhcp-10-83-16-71 .git % git cat-file -t 2303f
commit
alphonc@dhcp-10-83-16-71 .git % git cat-file -p 2303f
tree e7c77e150f84d16ec763bd46dcffebfd8f2873f4
author github-classroom[bot] <66690702+github-classroom[bot]@users.noreply.github.com> 17070
committer GitHub <noreply@github.com> 1707088127 +0000
pgpsig -----BEGIN PGP SIGNATURE-----
```

```
wsFcBAABCAAQBQJlwBj/CRC1aQ7uu5UhlAAAbt8QAJvL5XVgE7xXxNDM+ZqUWQgp
nAdFnL03n0fMqHskU9hG8FFnSw3D0DZinpZ4se7cwqFdvDoH8ePcXDrZHKqmDq5c
o6jwkejRAuFwwaYgqu5jn1YsdpNpPPFWjSmHZHQawF6TNI0D+V2n4YjhjJcmLdqp
iJ4WmeB4oGqcEUVr0m11mgcZSeCusrQV4yKTvKtWzJoh6Z5U0nYlk0aNxdD6gZ/9
lIUdR0/2NrpqUmoR2w1V9+0F334LLK5l0Ny2CDV3DIKv0DDM80TD6DhStZBBYIsm
ji0wxHbbh4wH2o3QH/eqwV850GtAvaryKal9WfhtKkoBkEY7Tu9F63biuFbeXyjY
URrT2AgfH0vIa0twtrFx0KaD5FJyux6YXXX/gbP0/uu4DIxiLI4wQdCDAt9VGHkJ
44CyucSgG0Zfai5x08tC88V80mwXXVHok9+Swood+pJ5E14qsBs9MYxenYH6cc45
+Dh4gEq4bDj77TkTAlGaaXlHy2Sp+R0Cn0/iiUo16g/7tmPyCMZ8YB6+Fo0pCa7q
NBGDnspHM0oKX7Ms1Gki03HeXws8NjUzbslnZg9oPP7pD9d83dQvKxfWa+LXl+L3
wwh5jNYepteA/3BIpAcdgFsvkJpZ5qleZQe6AGTR5rUNZtm2xy7UEqLVAjucpREZ
PHhEGRBDBD1EWHvQiArh
=onC9
-----END PGP SIGNATURE-----
```

```
Initial commit%
alphonc@dhcp-10-83-16-71 .git % git cat-file -t e7c77
tree
alphonc@dhcp-10-83-16-71 .git % git cat-file -p e7c77
100644 blob da80e272f601badf16da372517a26bba132b5bab README.md
alphonc@dhcp-10-83-16-71 .git % git cat-file -t da80e
blob
alphonc@dhcp-10-83-16-71 .git % git cat-file -p da80e
# GitIntro
A first repo to show students how to interact with repo on GitHub
```



```

alphonc@dhcp-10-83-16-71 .git % cat HEAD
ref: refs/heads/main
alphonc@dhcp-10-83-16-71 .git % cat refs/heads/main
2303f4622cbb330c9fb021cd216cd657e4942592
alphonc@dhcp-10-83-16-71 .git % git cat-file -t HEAD
commit
alphonc@dhcp-10-83-16-71 .git % git cat-file -t 2303f
commit
alphonc@dhcp-10-83-16-71 .git % git cat-file -p 2303f
tree e7c77e150f84d16ec763bd46dcffebfd8f2873f4
author github-classroom[bot] <66690702+github-classroom[bot]@users.noreply.github.com> 17070
committer GitHub <noreply@github.com> 1707088127 +0000
pgpsig -----BEGIN PGP SIGNATURE-----

```

```

wsFcBAABCAAQBQJlwBj/CRC1aQ7uu5UhlAAAbt8QAJvL5XVgE7xXxNDM+ZqUWQgp
nAdFnL03n0fMqHskU9hG8FFnSw3D0DZinpZ4se7cwqFdvDoH8ePcXDrZHKqmDq5c
o6jwkejRAuFwwaYgqu5jn1YsdpNpPPFWjSmHZHQawF6TNI0D+V2n4YjhjJcmLdqp
iJ4WmeB4oGqcEUvr0m11mgcZSeCusrQV4yKTvKtWzJoh6Z5U0nYlk0aNxdD6gZ/9
lIUdR0/2NrpqUmoR2w1V9+0F334LLK5l0Ny2CDV3DIKv0DDM80TD6DhStZBBYIsm
ji0wxHbbh4wH2o3QH/eqwV850GtAvaryKal9WfhtKkoBkEY7Tu9F63biuFbeXyjY
URrT2AgfH0vIa0twtrFx0KaD5FJyux6YXXX/gbP0/uu4DIxiLI4wQdCDAt9VGHkJ
44CyucSgG0Zfai5x08tC88V80mwXXVHok9+Swood+pJ5E14qsBs9MYxenYH6cc45
+Dh4gEq4bDj77TkTAlGaaXlHy2Sp+R0Cn0/iiUo16g/7tmPyCMZ8YB6+Fo0pCa7q
NBGDnspHM0oKX7Ms1Gki03HeXws8NjUzbslnZg9oPP7pD9d83dQvKxfWa+LXl+L3
wwh5jNYepteA/3BIpAcdgFsvkJpZ5qleZQe6AGTR5rUNZtm2xy7UEqLVAjucpREZ
PHhEGRBDBD1EWHvQiArh
=onC9
-----END PGP SIGNATURE-----

```

```

Initial commit%
alphonc@dhcp-10-83-16-71 .git % git cat-file -t e7c77
tree
alphonc@dhcp-10-83-16-71 .git % git cat-file -p e7c77
100644 blob da80e272f601badf16da372517a26bba132b5bab README.md
alphonc@dhcp-10-83-16-71 .git % git cat-file -t da80e
blob
alphonc@dhcp-10-83-16-71 .git % git cat-file -p da80e
# GitIntro
A first repo to show students how to interact with repo on GitHub

```

