

# Lecture 12: Plumbing and Porcelain

# Schedule

- Today (11/28): Plumbing and Porcelain
- Last Class (12/5): Final Exam

# The .git Folder

```
$ ls .git
```

```
config
```

local configuration (not --global)

```
description
```

```
HEAD
```

**the head**

```
hooks/
```

scripts that run on various events

```
info/
```

staging area metadata

```
objects/
```

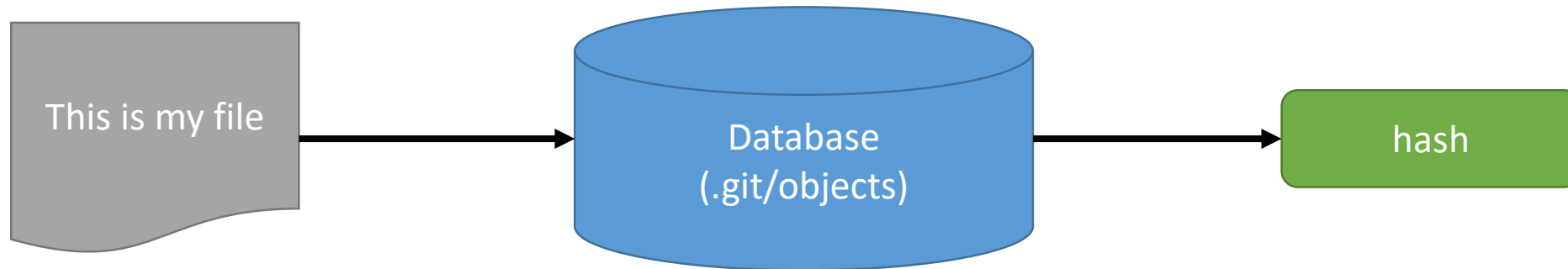
**content database**

```
refs/
```

**branches, tags, remotes**

# Object Database

Key-value data store addressable by SHA-1 hash



# Adding Files to Object Database

```
$ git hash-object -w <filename>
```

Adds object to database and returns SHA-1 hash of file + header

```
$ git cat-file -p <hash>
```

Pretty-prints an object in the database

Objects live in `.git/objects`:

```
$ find .git/objects -type f
```

```
.git/objects/7d/b4ad2eaea38d5714120aa20bac869ed69de756
```

```
.git/objects/c6/1a4dbe8af3b1a3c3338367fce1be14596fe80e
```

# Update Index

```
$ git update-index --add --cacheinfo 100644 \  
  <hash> <filename>
```

Add object from database to index

```
$ git write-tree
```

Creates tree object and returns hash

# Committing

```
$ git commit-tree <tree hash> -p <parent commit hash> \  
  -m "message"
```

Creates a commit with the given tree and parent

Returns commit hash

Does not move any refs!

Now we can do:

```
$ git log <commit hash>
```

# Refs and Moving Branches

```
$ git update-ref refs/heads/<branch name> <commit hash>
```

Moves branch to point to different commit

```
$ git symbolic-ref HEAD refs/heads/<branch name>
```

Moves the HEAD

Remote refs live in refs/remotes/<remote name>/<branch name>



# Packfiles

List size of object directory

```
$ du -sh .git/objects
```

List sizes of each object

```
$ find .git/objects -type f | xargs du -h
```

Run garbage collection and packing

```
$ git gc
```

List contents of packfile

```
$ git verify-pack -v <path to pack>
```

# Data Recovery

```
$ git reflog
```

Lists any changes to refs in reverse-chronological order