

### Data Storage and Caching

Throughout every program you have ever written, you have had to handle data storage in some way. Let's explore our options for data storage:

[1]: \_\_\_\_\_  
Why? How?

[2]: \_\_\_\_\_  
Why? How?

[3]: \_\_\_\_\_  
Why? How?

[4]: \_\_\_\_\_  
Why? How?

[5]: \_\_\_\_\_  
Why? How?

[6]: \_\_\_\_\_  
Why? How?

[7]: \_\_\_\_\_  
Why? How?

### File Systems

All modern systems utilize an Operating System to facilitate the storage of data in units called "files":

```
waf@sp22-cs340-001:~$ ls -la
```

drwxr-xr-x	7	waf	csvm340-cls	4096	Oct 22 11:25	.
drwxr-xr-x	3	root	root	4096	Oct 10 13:42	..
-rw-----	1	waf	csvm340-cls	19	Oct 10 13:56	.bash_history
-rw-r--r--	1	waf	csvm340-cls	220	Oct 10 13:42	.bash_logout
-rw-r--r--	1	waf	csvm340-cls	3771	Oct 10 13:42	.bashrc
drwx-----	2	waf	csvm340-cls	4096	Oct 10 13:42	.cache
drwxr-xr-x	2	waf	csvm340-cls	4096	Oct 22 11:22	cs340
drwxr-xr-x	2	waf	csvm340-cls	4096	Oct 21 14:35	docker
Permission Bits [1]	[3]	File Owner and Group [2]		File Size (bytes) [4] and Date Modified [5]		File Name [6]

[1]: Permission Bits:

d	r	w	x	r	w	x	r	w	x
Dir	User			Group			Other		

[2]: File Owner and File Group

[5]: Last Modified Date:

- Almost all modern operating systems store three different date fields for every single file:
  - a.
  - b.
  - c.
- The date/time fields are always based on **your local computer clock** -- easily modified, easily faked.

[6]: File Name

- "dot" files and directories:

**Q:** Why does local file storage not work on a cloud-scale system?