Basic Tools to Learn

- head, tail
- cd
- mkdir
- ls
- cp
- mv
- rm

- diff
- comm
- cut
- cat
- wc
- grep
- who

Unix manual

- man example
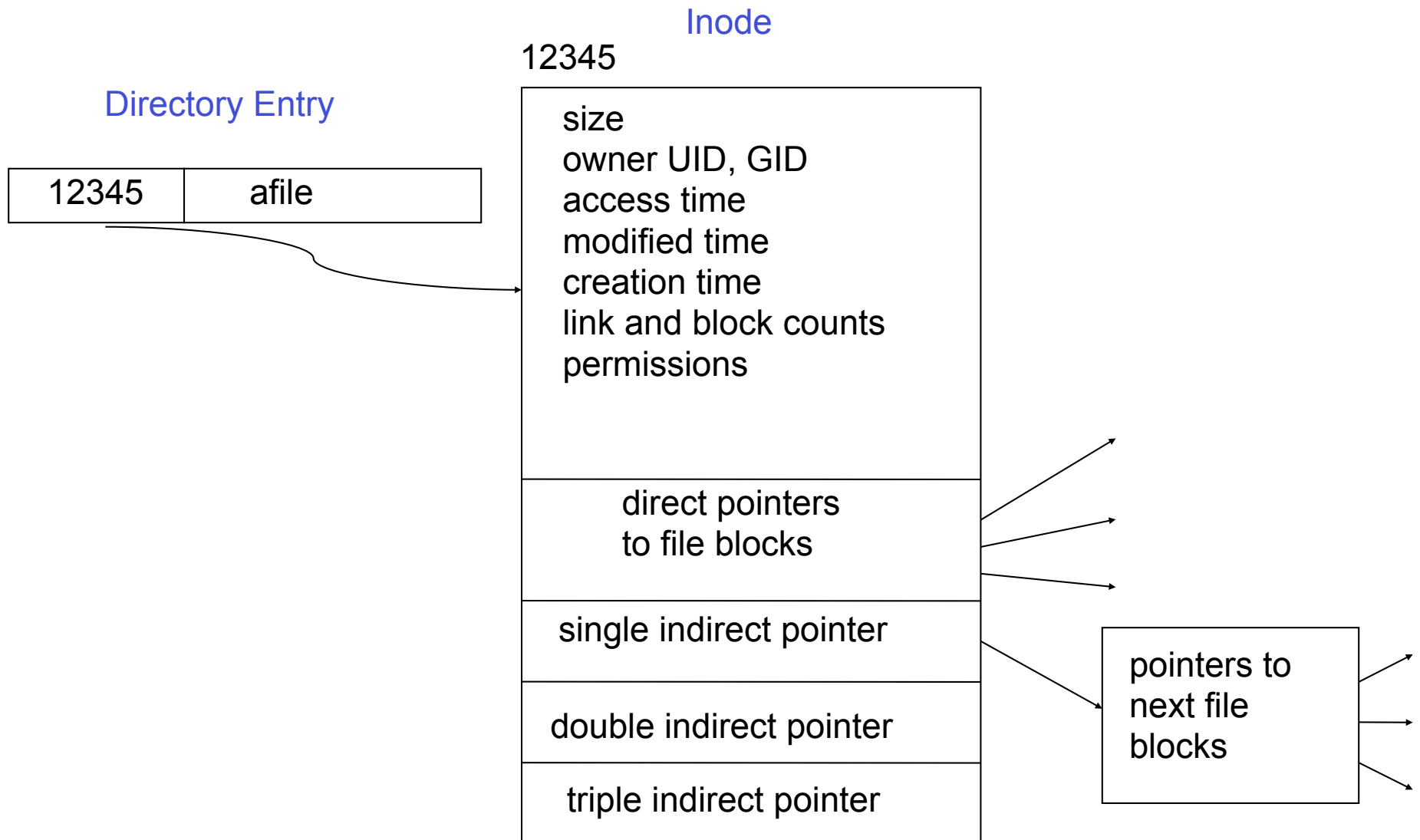- don't memorize - look it up!
- it grows on you

Files and Directories

- "Everything is a file."
- Unix provides a file interface for all Input/Output.
  - regular files
  - directories
  - devices
    - video
    - keyboard
    - sound
    - network
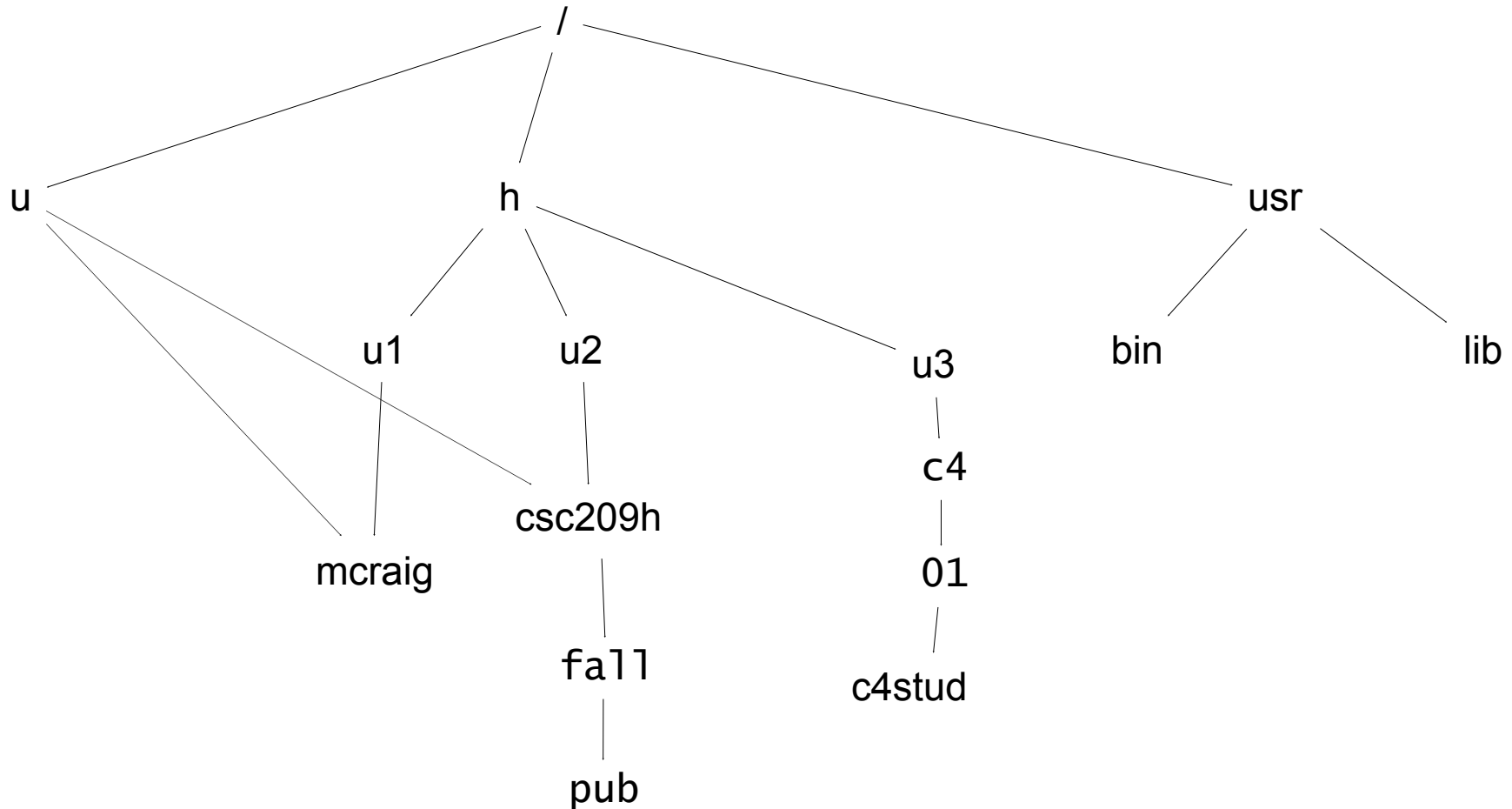- File interface = open, read, write, close

File System Hierarchy

- Everything starts in the "root" directory whose name is "/"
- A directory is a file that contains directory entries.
- A directory entry maps a file name to an inode.
- An inode is the data structure that contains information about a file, including which disk blocks contain the file data.

Inodes and Directory Entries

Inode
12345

Directory Entry

12345	afile

size
owner UID, GID
access time
modified time
creation time
link and block counts
permissions

direct pointers
to file blocks

single indirect pointer

double indirect pointer

triple indirect pointer

pointers to
next file
blocks

File System Hierarchy

Directories and Links

directory file

```
2              .
2              ..
14             u
46505          home
139412         cdrom
201345         lib
```

```
% ls -l /

drwxr-xr-x    2 root    root    4096 Nov  8 17:56 bin/
drwxr-xr-x    2 root    root    4096 Aug 10 14:46 cdrom/
drwxrwsr-x    2 root    staff   4096 Feb  8  2002 home/
drwxr-xr-x    6 root    root    4096 Sep  2 15:26 lib/
lrwx------    1 root    root       6 Sep  2 15:32 u -> /cdf/u/
```

Stat

```
greywolf% stat csc209h
 File: `csc209h'
  Size: 512              Blocks: 2              IO
  Block: 8192    directory
Device: 16h/22d Inode: 27612        Links: 7
Access: (0755/drwxr-xr-x)  Uid: (     0/
 root)   Gid: (  517/ csc209h)
Access: 2010-01-06 11:32:44.293409000 -0500
Modify: 2010-01-04 12:06:15.987312000 -0500
Change: 2010-01-04 12:06:15.987312000 -0500
```
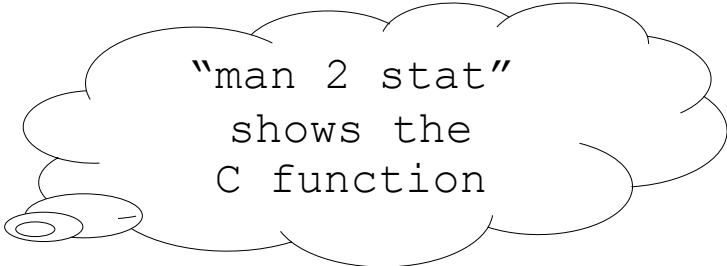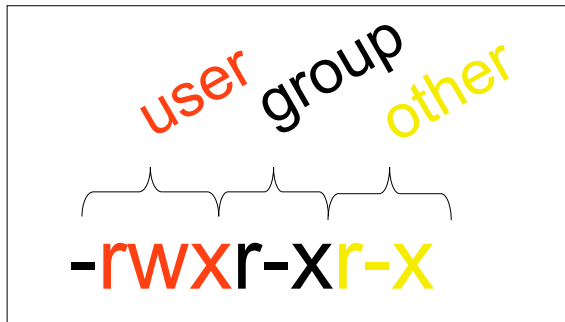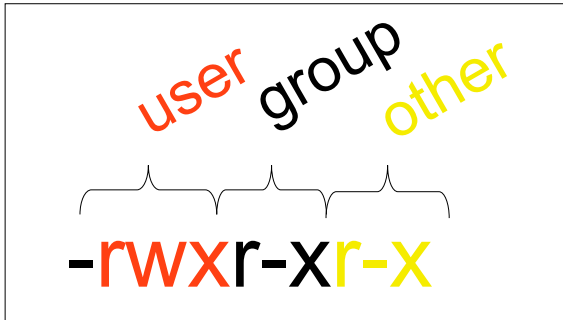
"man 2 stat"
shows the
C function

Permissions

-rwxr-xr-x

user group other

- **File permissions**
  - read, write, execute – pretty much what you think
- **Directory permissions**
  - read – you can run ls on the directory
  - write – you can create and delete files in the directory
  - execute – you can "pass through" the directory when searching subdirectories.

chmod

- ## chmod 755 <filename>
  - 3 numbers between 0 and 7, the octal value for that category of user
  - Quiz — what is the command to set the permissions of the file classlist to be world readable but writeable only by the file owner and members of the group.

- ## Another approach
  - chmod u+rwx
  - chmod go-x
  - adds or removes permissions for those categories of users

Globbing

- A little like regular expressions but different syntax
- * matches any number of any character
- ? matches any one character
- [list of characters]
- [1-5] or [a-z] or [a-xz]