Advanced Programming in the UNIX Environment

Week 03, Segment 4:
chmod(2) and chown(2)

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chmod(2), lchmod(2), fchmod(2)

```
#include <sys/stat.h>
#include <fcntl.h>

int chmod(const char *path, mode_t mode);
int lchmod(const char *path, mode_t mode);
int fchmod(int fd, mode_t mode);
int fchmodat(int fd, const char *path, mode_t mode, int flag);
```

Returns: 0 if OK, -1 on error

Changes the permission bits on the file. Must be either euid 0 or euid == st_uid.

mode can be any of the bits from our discussion of st_mode as well as:

- S_ISUID – setuid
- S_ISGID – setgid
- S_ISVTX – sticky bit (aka “saved text”)
- S_IRWXU – user read, write and execute
- S_IRWXG – group read, write and execute
- S_IRWXO – other read, write and execute

Terminal — 80×24

```
                perror("can't chmod file");
                exit(EXIT_FAILURE);
        }

        /* set absolute mode to rw-r--r-- */
        if (chmod("file1", S_IRUSR | S_IWUSR | S_IRGRP | S_IROTH) == -1) {
                perror("can't chmod file1");
                exit(EXIT_FAILURE);
        }

apue$ cc chmod.c
apue$ touch file file1
apue$ ls -l file file1
-rw-------  1 jschauma  users  0 Sep 12 20:10 file
-rw-------  1 jschauma  users  0 Sep 12 20:10 file1
apue$ ./a.out
apue$ ls -l file file1
--w---S---  1 jschauma  users  0 Sep 12 20:10 file
-rw-r--r--  1 jschauma  users  0 Sep 12 20:10 file1
apue$ chmod g+x file
apue$ ls -l file file1
--w---s---  1 jschauma  users  0 Sep 12 20:10 file
-rw-r--r--  1 jschauma  users  0 Sep 12 20:10 file1
apue$
```

chown(2), lchown(2), fchown(2)

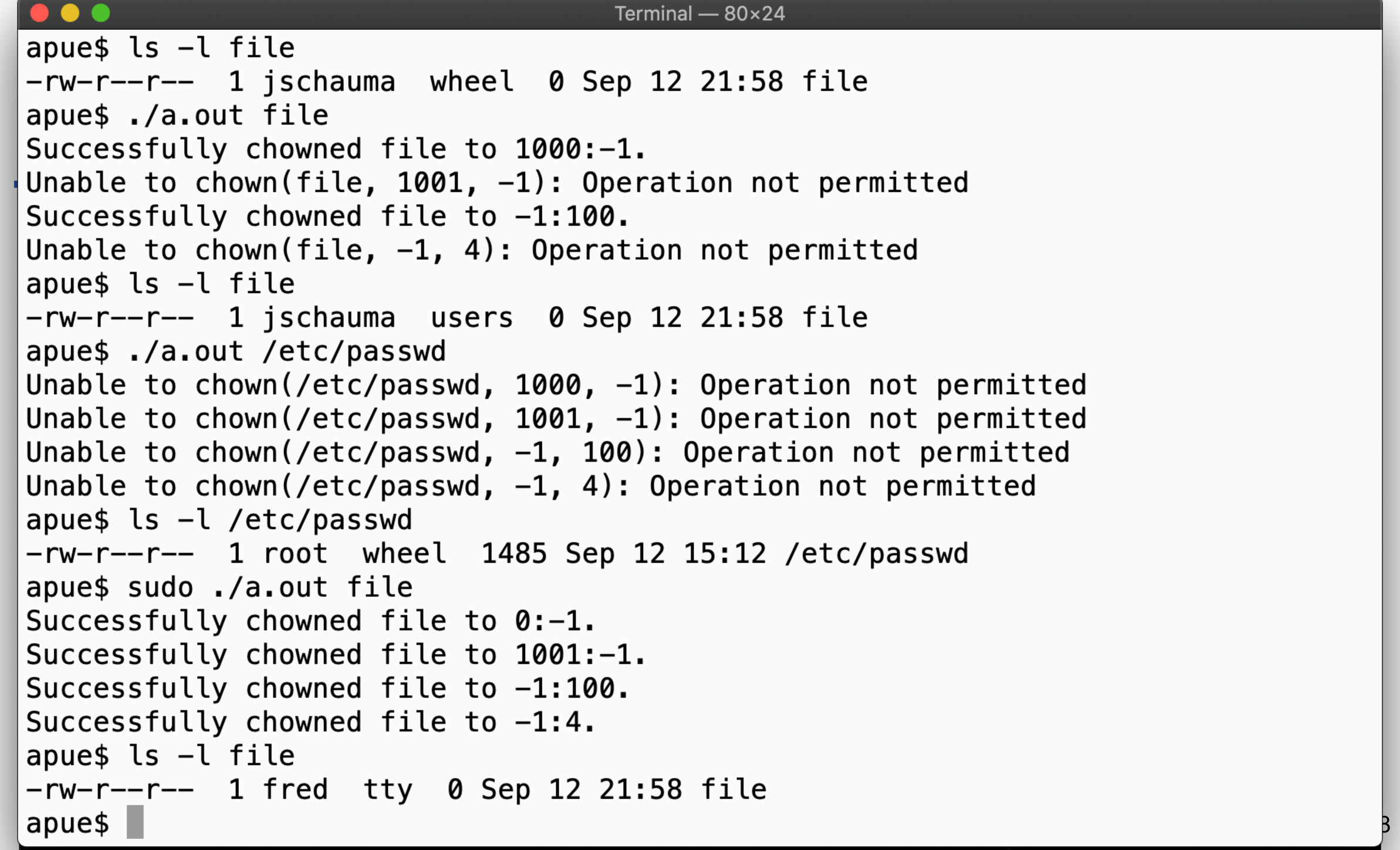
```
#include <unistd.h>
#include <fcntl.h>

int chown(const char *path, uid_t owner, gid_t group);
int lchown(const char *path, uid_t owner, gid_t group);
int fchown(int fd, uid_t owner, gid_t group);
int fchownat(int fd, const char *path, uid_t owner, gid_t group, int flag);
                                                    Returns: 0 if OK, -1 on error
```

Changes st_uid and st_gid for a file. Generally requires euid 0. (Some SVR4's let users chown their files to anybody. POSIX allows either, depending on _POSIX_CHOWN_RESTRICTED.)

owner or *group* can be -1 to indicate that it should remain the same.

Non-superusers can change the st gid field if both:

- euid == st_uid; and
- *owner* == st_uid and *group* == egid (or one of the supplementary group IDs)


Terminal — 80×24
apue$ ls -l file
-rw-r--r-- 1 jschauma wheel 0 Sep 12 21:58 file
apue$ ./a.out file
Successfully chowned file to 1000:-1.
Unable to chown(file, 1001, -1): Operation not permitted
Successfully chowned file to -1:100.
Unable to chown(file, -1, 4): Operation not permitted
apue$ ls -l file
-rw-r--r-- 1 jschauma users 0 Sep 12 21:58 file
apue$ ./a.out /etc/passwd
Unable to chown(/etc/passwd, 1000, -1): Operation not permitted
Unable to chown(/etc/passwd, 1001, -1): Operation not permitted
Unable to chown(/etc/passwd, -1, 100): Operation not permitted
Unable to chown(/etc/passwd, -1, 4): Operation not permitted
apue$ ls -l /etc/passwd
-rw-r--r-- 1 root wheel 1485 Sep 12 15:12 /etc/passwd
apue$ sudo ./a.out file
Successfully chowned file to 0:-1.
Successfully chowned file to 1001:-1.
Successfully chowned file to -1:100.
Successfully chowned file to -1:4.
apue$ ls -l file
-rw-r--r-- 1 fred tty 0 Sep 12 21:58 file
apue$

chmod(2) and chown(2)

chmod(2) and chown(2) consistently follow the semantics of the other calls we've seen.

Only root and the owner of a file can change its permissions.

Only root can change the owner of a file, but the owner may change the group ownership of a file.

Changing file permissions and ownerships has significant security implications.

Coming up next: default file ownership and permissions for newly created files.