Presentation Week 2 - System Calls: Gateway to OS kernel

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System Call Categories

- process control
- file/directory manipulation
- device manipulation
- information maintenance
- communication

Process Control

- chdir()
- end, abort
- load, execute
- create process(eg: fork()), terminate process
- get/set process attributes
- wait for time
- wait/signal event
- allocate and free memory

Device Management

- request device, release device
- read, write, reposition
- get/set device attributes
- logically attach or detach devices

Information Maintenance

- get/set time or date
- get/set system data
  - number of current users
  - amount of free memory
  - (numerous other statistics)

Communication

- create, delete communication connection
- send, receive messages
- transfer status information
- attach or detach remote devices

File Structure System Calls

- create/delete file
- open, close
- read, write, reposition
- get/set file attributes
- chmod()
- chown()
- stat()
- fstat()

System Calls Examined - Mostly File Strucute System Calls

- int $chmod(constchar * path, mode_t mode)$;
- int $chown(constchar * path, uid_t owner, gid_t group)$;
- int $stat(char * path, structstat * buf)$;

$chmod(constchar * path, mode_t mode)$ - example

- Changes Permission of the file given by the path

```
int flag;
flag = chmod ("/home/dawit/Desktop/Xmod.sh",
    ↪ 0777); /* Use octal encoding */
if (flag == -1) perror ("mychmod.c");
```

```
dawit@dawit-ThinkPad-S3-Yoga-14:~/Desktop$ ls -lG Xmod.sh
-rwxrwxrwx 1 dawit 53 Dec  2 14:37 Xmod.sh
```

Octal notation of file system permissions

- The three rightmost digits refer to permissions for the file owner, the group, and other users
- The optional first octal digit specifies setuid, setgid, and sticky flags.

#	Permission	rwx
7	read, write and execute	rwx
6	read and write	rw-
5	read and execute	r-x
4	read only	r--
3	write and execute	-wx
2	write only	-w-
1	execute only	--x
0	none	---

$chown(const char * path, uid_t owner, gid_t group)$- example

- change owner and group of a File

```
int flag;
flag = chown ("test.txt", -1, 62); /* Leave
    ↪ user ID
unchanged */
if (flag == -1) perror("mychown.c");
```

```
dawit@dawit-ThinkPad-S3-Yoga-14:~/Desktop$ ls -l Xmod.sh
-rwxrwxrwx 1 dawit dawit 53 Dec  2 14:37 Xmod.sh
dawit@dawit-ThinkPad-S3-Yoga-14:~/Desktop$ ls -l Xmod.sh
-rwxrwxrwx 1 dawit 62 53 Dec  2 14:37 Xmod.sh
```

stat() - system call

- gives file's current status

```
struct stat {
    dev_t     st_dev;     /* ID of device containing file
    ino_t     st_ino;     /* inode number */
    mode_t    st_mode;    /* protection */
    nlink_t   st_nlink;   /* number of hard links */
    uid_t     st_uid;     /* user ID of owner */
    gid_t     st_gid;     /* group ID of owner */
    dev_t     st_rdev;    /* device ID (if special file) *
    off_t     st_size;    /* total size, in bytes */
    blksize_t st_blksize; /* blocksize for filesystem I/O
    blkcnt_t  st_blocks;  /* number of blocks allocated */
    time_t    st_atime;   /* time of last access */
    time_t    st_mtime;   /* time of last modification */
    time_t    st_ctime;   /* time of last status change */
};
```

stat(*char* ∗ *path*, *structstat* ∗ *buf*) - example


```
struct stat fileStat;
int flag;
flag = stat("/home/dawit/Desktop/Xmod.sh", &
    ↪ fileStat); /* Use octal encoding */
printf("Information for %s\n","/home/dawit/
    ↪ Desktop/Xmod.sh");
printf("---------------------------------\n");
printf("File Size: \t\t%d bytes\n",fileStat.
    ↪ st_size);
printf("Time of last access: \t%s",ctime(&
    ↪ fileStat.st_atime)); /* time of last
    ↪  access */
printf("File Permissions: \t");
printf( (S_ISDIR(fileStat.st_mode)) ? "d" :
    ↪ "-");
printf( (fileStat.st_mode & S_IRUSR) ? "r" :
    ↪  "-");
```

```
dawit@dawit-ThinkPad-S3-Yoga-14:~/Desktop/CSC311$ ./mysta
Information for /home/dawit/Desktop/Xmod.sh
---------------------------
File Size:                53 bytes
Time of last access:      Fri Dec 11 00:56:15 2015
File Permissions:         -r-x-wx-wx
```

Notable Person- Fred Brooks

- born April 19, 1931
- BSc. in Phsics ,Duke University , 1953
- Ph.D. in Applied Mathematics, Harvard University , 1956
- Oversaw the development IBM Systems/360 computers and the OS/360 software package
- Coined the term "Computer Architecture"
- "The most important single decision I ever made was to change the IBM 360 series from a 6-bit byte to an 8-bit byte, thereby enabling the use of lowercase letters."
- "Adding manpower to a late software project makes it later." - Brooks

The END!!!