

Presentation Week 2 - System Calls: Gateway to OS kernel

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System Call Categories

Presentation
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System Calls:
Gateway to
OS kernel
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- process control
- file/directory manipulation
- device manipulation
- information maintenance
- communication

Process Control

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- `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

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

Information Maintenance

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

Communication

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

File Structure System Calls

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

System Calls Examined - Mostly File Strucute

System Calls

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- `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

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- 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(constchar * path, uid_t owner, gid_t group)`- example

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- 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\t%d bytes\n", fileStat.  
    ↪ st_size);  
printf("Time of last access: \t\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
```

Fred Brooks

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Dawit Tsigie

- 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' Law

The END!!!