AUP : Assignment - 3 [File Management]

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Q1

Implement the program for the command: ./prog1 < foo.txt > bar.txt 2> bar1.txt.

Code

```c
#include <stdio.h>
#include <stdlib.h>
#include <pwd.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <unistd.h>
#include <fcntl.h>
#include <errno.h>
#include <dirent.h>

//argv  1 - foo.txt
//  2 - bar.txt
//  3 - bar1.txt

// ./prog1 < foo.txt > bar.txt 2>bar1.txt
//Meaning I undestand
// take input from foo.txt to prog1
// redirect content of foo.txt to bar.txt
//  if successfull content of foo.txt will get copied into bar.txt
//  else error will be redirected to file bar1.txt as "2" represents "stderr"
int main(int argc, char* argv[]){
    int fd1, fd2, fd3;
    fd1 = open(argv[1], O_RDWR| O_CREAT, 0777);
    fd2 = open(argv[2], O_RDWR | O_CREAT| O_APPEND, 0777);
    fd3 = open(argv[3], O_RDWR | O_CREAT| O_APPEND, 0777);

    //Take input from foo.txt into ./prog1 via STDIN
    //dup2(fd1, 0);
    close(0);
    dup(fd1);
//  close(fd1);

//  fd1 = open(argv[1], O_RDWR| O_CREAT, 0777);
    //Redirect content of foo.txt to bar.txt
    if(dup2(fd2, fd1) == -1){
        //redirect STDERR i.e. "2" to bar1.txt if above statement fails
        dup2(fd3, 2);
    }

    close(fd1);
    close(fd2);
    close(fd3);

    return 0;
}

```

Q2

Create a directory with uid and gid as user1 and write permission to "others". Create a new file in this directory by uid and gid as user2. Write a program which invokes functions: open, write, access and chmod on this file by user2. Print the uid and gid of the file and the directory. Also print all the time values of this file and the parent directory after each function call. Write details about your observation.

Code

```

#include <stdio.h>
#include <stdlib.h>
#include <pwd.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <unistd.h>
#include <fcntl.h>
#include <errno.h>
#include <dirent.h>
#include <string.h>

void time(struct stat buf, char* syscall){
    printf("Time after %s syscall \n", syscall);
    printf("a_time : %ld\t", buf.st_atime);
    printf("c_time : %ld\t", buf.st_ctime);
    printf("m_time : %ld\n", buf.st_mtime);
}

int main(int argc, char* argv[]){
    int md;
    //Create dir
    md = mkdir(argv[1], 0777);

    //Get path
    char* PATH;
    //char* PATH2;
    long max;
    max = pathconf("/", _PC_PATH_MAX);
    PATH = (char*)malloc(max);
    //PATH2 = (char*)malloc(max);
    getcwd(PATH, max);
    strcat(PATH, "/");
    strcat(PATH, argv[1]);
    if( chdir(PATH) == 0);
        printf("PATH : %s\n", PATH);

    //getcwd(PATH2, max);
    //printf("After cat : %s\n",PATH2);


    //now change ownership to user1  - chown
        int set_u = atoi(argv[2]);
    struct stat statv1;
    if(stat(argv[1], &statv1) < 0)
        perror("stat error");
    chown(PATH, set_u, statv1.st_uid);


    //now change mode o+w others write - chmod
    if(chmod(PATH, S_IWOTH) < 0){
    perror("chmod error");
        exit(1);
    }

    //create a file inside that directory
    int fd;
    fd = mknod(argv[3], S_IFREG,0);
```

```c
    if(fd == 0)
        printf("File created successfully\n");

    //print uid & gid of file & dir
    //argv[3] -> filename
    struct stat buf;
    if(stat(argv[3], &buf) < 0)
        perror("stat error");

    //change owner to user2
        int setuf = atoi(argv[4]);
        chown(PATH, setuf,buf.st_uid);

    printf("File uid : %d\t File gid : %d\n", buf.st_uid, buf.st_gid);
    printf("Dir uid : %d\t Dir gid : %d\n",statv1.st_uid, statv1.st_gid);

    //open file/
    fd = open(argv[3], O_RDWR | O_CREAT);
    if(fd == -1)
        perror("Open fail");
    time(buf, "open");

    //write into file
    int size = write(fd, "Hello Aditi\n", strlen("Hello Aditi\n"));
    time(buf, "write");

    //access file
    int acc = access(argv[3], F_OK);
    if(acc == -1)
        perror("Error:");
    time(buf, "access");

    //chmod file
    char mode[] = "0777";
    int i;
    i = strtol(mode, 0, 8);
    if(chmod (PATH, i) < 0)
        perror("Error");

    time(buf, "chmod");

    return 0;
}
```

Explanation

- Access time of file is updated when file is opened for reading the contents of file.
- Change time of file is updated when file is executing chown & chmod functionalities.
- Modification time is updated when file is opened for writing contents into the file.

Output

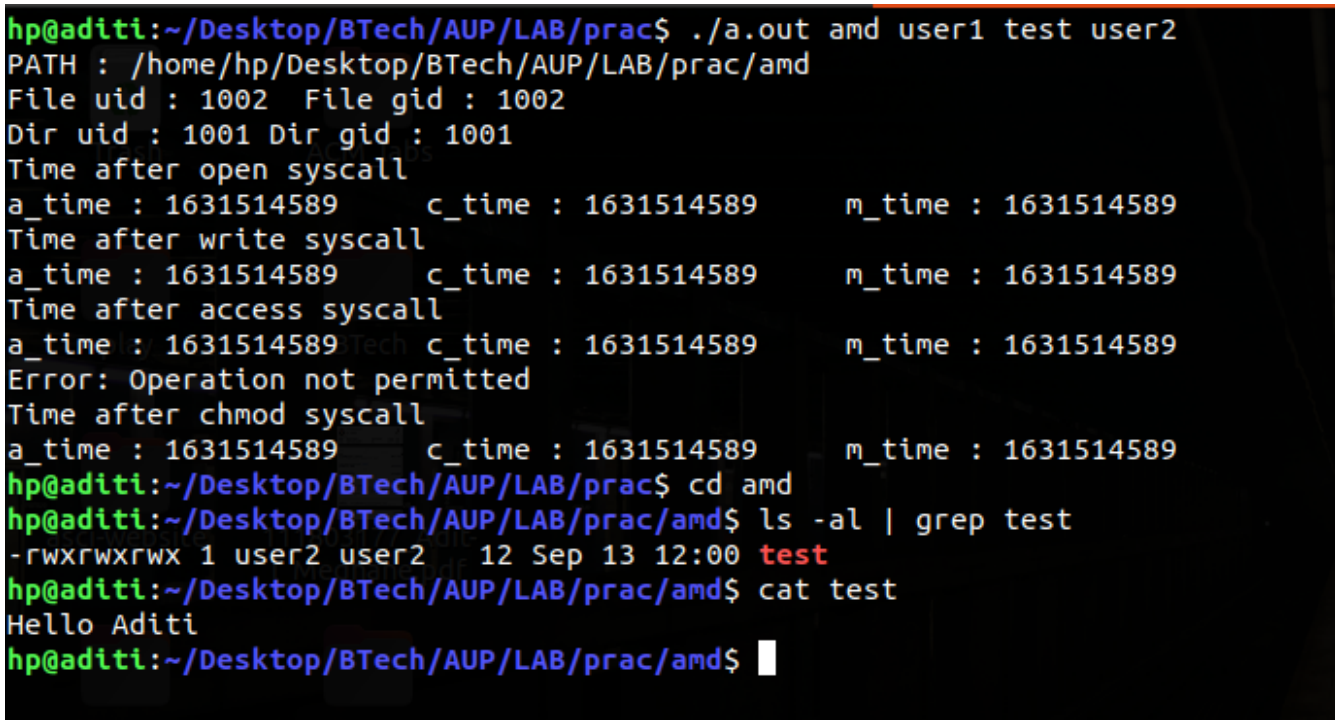


Figure 1: Output

Q3

Write a program that prints the owner, dev, rdev and file type of files. By inputting a directory, the program should read the directory and print the above information for all files in the directory.

Code

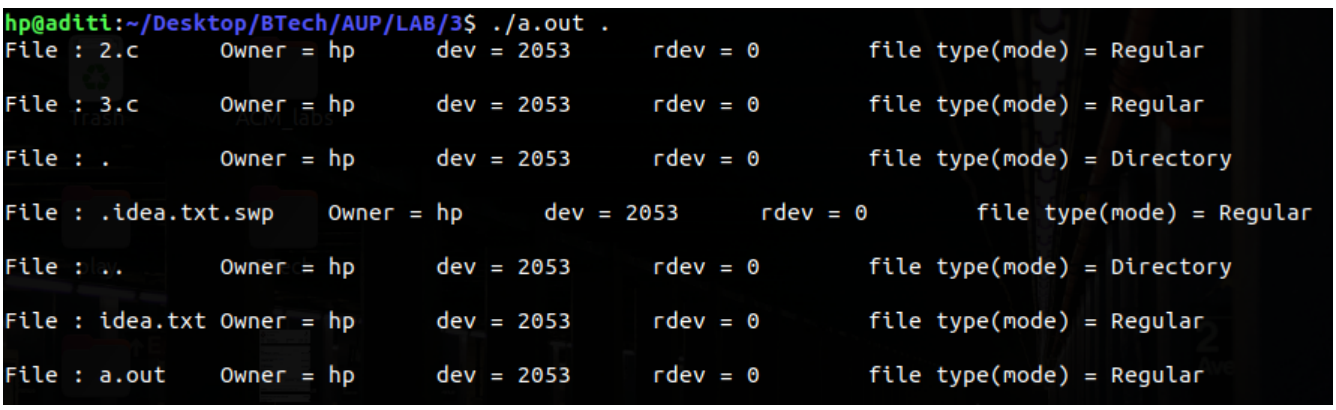
```c
#include <stdio.h>
#include <stdlib.h>
#include <pwd.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <unistd.h>
#include <fcntl.h>
#include <errno.h>
#include <dirent.h>

int main(int argc, char* argv[]){
    int i;
    struct stat buf;

    struct dirent *direntp;
    DIR *dirp;

    dirp = opendir(argv[1]);

    while((direntp = readdir(dirp)) != NULL){
        printf("File : %s\t", direntp->d_name);

            perror("stat error");
        }

        struct passwd *pw = getpwuid(buf.st_uid);
        if(pw != 0)
            printf("Owner = %s\t", pw->pw_name);

        printf("dev = %ld\t", buf.st_dev);
        printf("rdev = %ld\t", buf.st_rdev);
```

```

        //Check all modes & add switch case
        if ((buf.st_mode & S_IFMT) == S_IFREG) {
                    printf("file type(mode) = Regular\n\n");
            }
        if ((buf.st_mode & S_IFMT) ==  S_IFDIR) {
                        printf("file type(mode) = Directory\n\n");
                }
        if ((buf.st_mode & S_IFMT) == S_IFLNK) {
                        printf("file type(mode) = Symbolic Link\n\n");
                }


    }
    closedir(dirp);
    return 0;
}
```

Explanation

- 1) owner name - To get owner name,need to access it from passwd file, using "getpwuid" by providing st_uid from struct stat of respective file in the directory.
- 2)dev - field st_dev from struct stat
- 3) rdev - field st_rdev from struct stat
- 4) file type - with the help of field st_mode, can identify file type.
- 5) To get above information for all files, basically need to travesrse through all files including "." & "..".

Output



```
hp@aditi:~/Desktop/BTech/AUP/LAB/3$ ./a.out .
File : 2.c      Owner = hp      dev = 2053      rdev = 0        file type(mode) = Regular

File : 3.c      Owner = hp      dev = 2053      rdev = 0        file type(mode) = Regular

File : .        Owner = hp      dev = 2053      rdev = 0        file type(mode) = Directory

File : .idea.txt.swp    Owner = hp      dev = 2053      rdev = 0        file type(mode) = Regular

File : ..       Owner = hp      dev = 2053      rdev = 0        file type(mode) = Directory

File : idea.txt Owner = hp      dev = 2053      rdev = 0        file type(mode) = Regular

File : a.out    Owner = hp      dev = 2053      rdev = 0        file type(mode) = Regular
```

Figure 2: Output