Lab Experiment No. 1

File-related System Calls Implementation

Aim: To get acquainted with how the system calls are invoked for file-related functionalities.

1). creat () : This system call is used to create a file.

Syntax : int fd = creat(“filename” ,S_IREAD | S_IWRITE);

create.c

```
#include <stdio.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <fcntl.h>
#include <unistd.h>
#include <stdlib.h>
int main(){
int fd;
fd = creat("File1.txt", S_IREAD | S_IWRITE);
if (fd != -1){
printf("Created file opened for read/write access\n");
printf("File1 is currently empty\n");
}
else
printf("Error in opening file\n");

close(fd);
exit (0);
}
```

OS — -zsh — 80×24

```
mymac@Saurabhs-MacBook-Air OS % cd
mymac@Saurabhs-MacBook-Air ~ % cd Desktop
mymac@Saurabhs-MacBook-Air Desktop % mkdir OS
mymac@Saurabhs-MacBook-Air Desktop % cd OS
mymac@Saurabhs-MacBook-Air OS % touch create.c
mymac@Saurabhs-MacBook-Air OS % open -ev create.c
mymac@Saurabhs-MacBook-Air OS % gcc create.c
mymac@Saurabhs-MacBook-Air OS % ./a.out
Created file opened for read/write access
File1 is currently empty
mymac@Saurabhs-MacBook-Air OS %
```

2). open() : Used to open a file. Returns a file descriptor specifying the position of this opened file in table of open files for current process.

Syntax : fd = open(path , flags , mode(optional));

Flags: O_RDONLY, O_RDWR, O_APPEND, O_WRONLY.

Mode: for permissions(User,Groups, other)

3). read() : Read from the file descriptor. returns the bytes read on success. Returns 0 when end of file is reached, returns -1 when error is occurred.

Syntax : size_t read(int fd , void * buff , size_t count);

==> It attempts to read upto count bytes from file descriptor in to the buffer buff.

opening.c

```
#include <fcntl.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <stdlib.h>
#include <stdio.h>
#include <unistd.h>
static char message[] = "HELLO WORLD";
int main()
{
int fd;
char buffer[80];
fd = open("file2.txt",O_RDWR | O_CREAT | O_EXCL, S_IREAD | S_IWRITE);
if (fd != -1)
{
printf("File has been opened for READ/WRITE access\n");
write(fd, message, sizeof(message));
lseek(fd, 0, 0); /* go back to the beginning of the file */
if (read(fd, buffer, sizeof(message)) == sizeof(message))
printf("\"%s\" Message has been written to file \n", buffer);
else
printf("error in reading file \n");
close (fd);
}
else
printf("File already exists\n");

exit(0);
}
```

```
mymac@Saurabhs-MacBook-Air OS % gcc opening.c
mymac@Saurabhs-MacBook-Air OS % ./a.out
File already exists
mymac@Saurabhs-MacBook-Air OS % gcc opening.c
mymac@Saurabhs-MacBook-Air OS % ./a.out
File has been opened for READ/WRITE access
"HELLO WORLD" Message has been written to file
mymac@Saurabhs-MacBook-Air OS %
```

4). lseek : Position a pointer to a specified position in a file (Used for random access when reading or writing). Reposition read/write file affect.

Syntax : lseek(int fd , off_t offset , int whence);

seeking.c

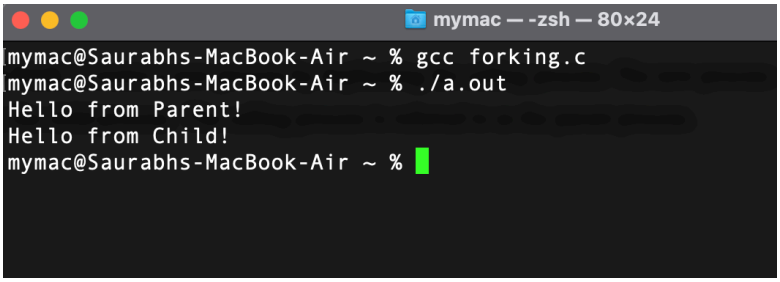
```
#include <fcntl.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <stdlib.h>
#include <stdio.h>
#include <unistd.h>
int main()
{
int fd;
long position;
fd = open("file2.txt", O_RDONLY);
if ( fd != -1)
{
position = lseek(fd, 0, 2); /* seek 0 bytes from end-of-file */
if (position != -1)
printf("The length of file2.txt is %ld bytes.\n", position);
else
perror("lseek error");
}
else
printf("can't open file2.txt\n");
close(fd);
}
```

```
mymac@Saurabhs-MacBook-Air OS % touch seeking.c
mymac@Saurabhs-MacBook-Air OS % open -ev seeking.c
mymac@Saurabhs-MacBook-Air OS % gcc seeking.c
mymac@Saurabhs-MacBook-Air OS % ./a.out
The length of file2.txt is 12 bytes.
mymac@Saurabhs-MacBook-Air OS %
```

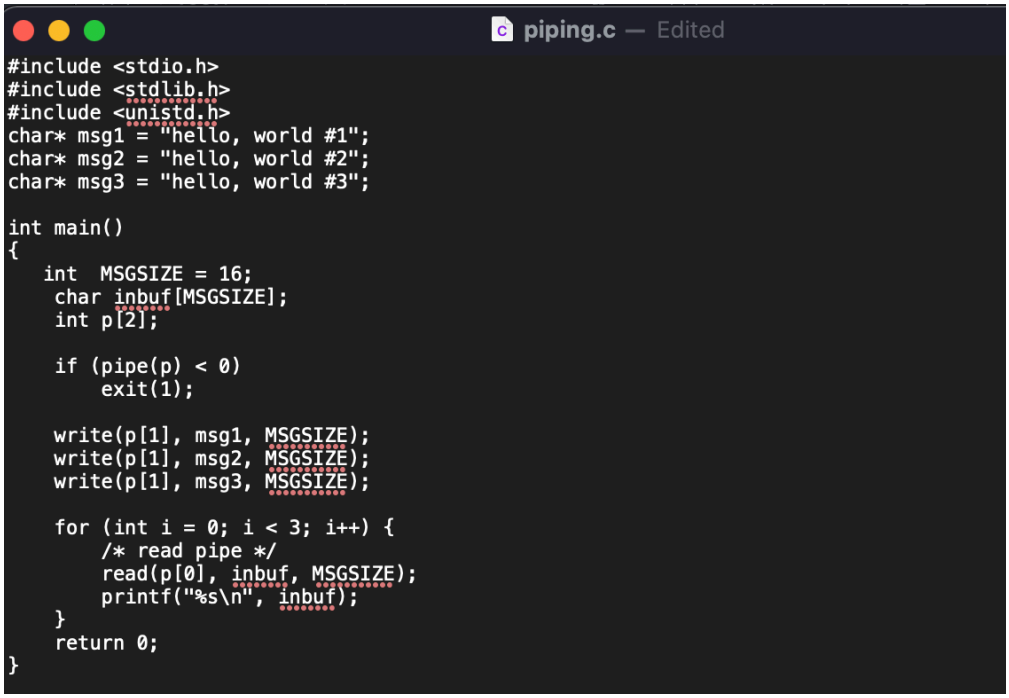
5). Fork : Creates a new process by duplicating the calling process. The new process is referred to as the child process. The calling process is referred to as the parent process.

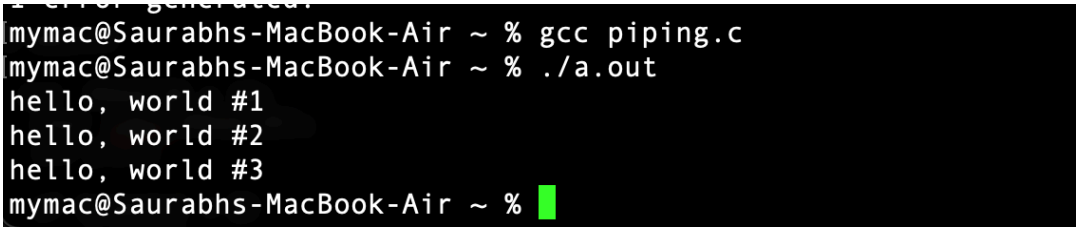
forking.c

```
#include <stdio.h>
#include <unistd.h>
#include <sys/types.h>
int main()
{
    fork();
    fork();
    fork();
    printf("HELLO My Friends \n");
    return 0;
}
```



6). pipe() : Pipe is one-way communication only i.e we can use a pipe such that One process write to the pipe, and the other process reads from the pipe. It opens a pipe, which is an area of main memory that is treated as a **"virtual file"**.





7). wait() : A call to wait() blocks the calling process until one of its child processes exits or a signal is received. After child process terminates, parent continues its execution after wait system call instruction.

waiting.c

```c
#include<stdio.h>
#include<stdlib.h>
#include<sys/wait.h>
#include<unistd.h>

int main()
{
    pid_t cpid;
    if (fork()== 0)
        exit(0);            /* terminate child */
    else
        cpid = wait(NULL); /* reaping parent */
    printf("Parent pid = %d\n", getpid());
    printf("Child pid = %d\n", cpid);

    return 0;
}
```

mymac — -zsh — 84×24

```
mymac@Saurabhs-MacBook-Air ~ % touch waiting.c
mymac@Saurabhs-MacBook-Air ~ % open -ev waiting.c
mymac@Saurabhs-MacBook-Air ~ % gcc waiting.c
mymac@Saurabhs-MacBook-Air ~ % ./a.out
Parent pid = 7969
Child pid = 7971
mymac@Saurabhs-MacBook-Air ~ %
```