Experiment 2

To familiarize and understand the use and functioning of System Calls used for Operating system and network programming in Linux.

Some system calls of Linux operating systems

1. Ps

This command tells which all processes are running on the system when ps runs.

ps -ef

UID	PID	PPID	C	STIME TTY	TIME	CMD
root	1	0	0	13:55 ?	00:00:01	/sbin/init
root	2	0	0	13:55 ?	00:00:00	[kthreadd]
root	3	2	0	13:55 ?	00:00:00	[ksoftirqd/0]
root	4	2	0	13:55 ?	00:00:01	[kworker/0:0]
Root	5	2	0	13:55 ?	00:00:00	[kworker/0:0H]
root	7	2	0	13:55 ?	00:00:00	[rcu_sched]
root	8	2	0	13:55 ?	00:00:00	[rcuos/0]

This command gives processes running on the system, the owners of the processes and the names of the processes. The above result is an abridged version of the output.

2. fork

This system call is used to create a new process. When a process makes a fork system call, a new a process is created which is identical to the process creating it. The process which calls fork is called the parent process and the process that is created is called the child process. The child and parent processes are identical, i.e, the child gets a copy of the parent's data space, heap and stack, but have different physical address spaces. Both processes start execution from the line next to the fork. Fork returns the process id of the child in the parent process and returns 0 in the child process.

```
#include<stdio.h>
void main()
{
int pid;
pid = fork();
if(pid > 0)
{
printf (“ Iam parent\n”);
}
else
{
printf(“Iam child\n”);
}
}
```

The parent process prints the first statement and the child prints the next statement.

3. exec

New programs can be run using exec system calls. When a process calls exec, the process is completely replaced by the new program. The new program starts executing from its main function.

A new process is not created, process id remains the same, and the current process's text, data, heap, and stack segments are replaced by the new program. exec has many flavors one of which is execv.

execv takes two parameters. The first is the pathname of the program that is going to be executed. The second is a pointer to an array of pointers that hold the addresses of arguments. These arguments are the command line arguments for the new program.

4. wait

When a process terminates, its parent should receive some information regarding the process like the process id, the termination status, amount of CPU time taken etc. This is possible only if the parent process waits for the termination of the child process. This waiting is done by calling the wait system call. When the child process is running, the parent blocks when wait is called. If the child terminates normally or abnormally, wait immediately returns with the termination status of

the child. The wait system call takes a parameter which is a pointer to a location in which the termination status is stored.

5. Exit

When exit function is called, the process undergoes a normal termination.

6. open

This system call is used to open a file whose pathname is given as the first parameter of the function. The second parameter gives the options that tell the way in which the file can be used.

open(filepathname , O_RDWR);

This causes the file to be read or written. The function returns the file descriptor of the file.

7. read

This system call is used to read data from an open file.

read(fd, buffer, sizeof(buffer));

The above function reads sizeof(buffer) bytes into the array named buffer. If the end of file is encountered, 0 is returned, else the number of bytes read is returned.

8. write

Data is written to an open file using write function.

write(fd, buffer, sizeof(buffer));

System calls for network programming in Linux

1. Creating a socket

int socket (**int** domain, **int** type, **int** protocol);

This system call creates a socket and returns a socket descriptor. The domain parameter specifies a communication domain; this selects the protocol family which will be used for communication. These families are defined in <sys/socket.h>. In this program the AF_INET family is used. The type parameter indicates the communication semantics. SOCK_STREAM is used for tcp

connection while SOCK_DGRAM is used for udp connection. The protocol parameter specifies the protocol used and is always 0. The header files used are <sys/types.h> and <sys/socket.h>.

Experiment 3

Implementation of Client-Server communication using Socket Programming and TCP as transport layer protocol

Aim: Client sends a string to the server using tcp protocol. The server reverses the string and returns it to the client, which then displays the reversed string.

Description:

Steps for creating a TCP connection by a client are:

1. Creation of client socket

int socket(int domain, int type, int protocol);