

IPC: Shared Memory

Subject:- Unix Operating System

System Lab Class :- TYIT

Name

PRN

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Assignment No 8a

Title-Write a program to perform IPC using shared memory to illustrate the passing of a simple piece of memory (a string) between the processes if running simultaneously.

Objective:

1. To learn about IPC through message queue.
2. Use of system call and IPC mechanism to write effective application programs

Theory:

Shared Memory is an efficient means of passing data between programs. One program will create a memory portion which other processes (if permitted) can access. Communication between processes using shared memory requires processes to share some variable and it completely depends on how the programmer will implement it. One way of communication using shared memory can be imagined like this: Suppose process1 and process2 are executing simultaneously and they share some resources or use some information from another process, process1 generates information about certain computations or resources being used and keeps it as a record in shared memory. When process2 needs to use the shared information, it will check in the record stored in shared memory and take note of the information generated by process1 and act accordingly. Processes can use shared memory for extracting information as a record from other processes as well as for delivering any specific information to other processes. The server maps a shared memory in its address space and also gets access to a synchronization mechanism.

The server obtains exclusive access to the memory using the synchronization mechanism and copies the file to memory. The client maps the shared memory in its address space. Waits until the server releases the exclusive access and uses the data.

To use shared memory, we have to perform 2 basic steps:

- Request to the operating system a memory segment that can be shared between processes. The user can create/destroy/open this memory using a shared memory object: An object that represents memory that can be mapped concurrently into the address space of more than one process..
- Associate a part of that memory or the whole memory with the address space of the calling process. The operating system looks for a big enough memory address range in the calling process' address space and marks that address range as an special range

Data Dictionary:

SR.NO	Variable/Function	Data Type	Use
1.	shmid	int	Store value of identifier of System V shared memory
2.	key	Key_t	Used to pass the key to shmget
3.	c	char	Used to check character

Program-

Server-

```
#include <sys/types.h>
#include <sys/ipc.h>
#include <sys/shm.h>
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#define SHMSZ 30
void main()
{
    char c;
    int shmid;
    key_t key;
    char *shm, *s;
    key = 5858;
    if ((shmid = shmget(key, SHMSZ, IPC_CREAT | 0666)) < 0) {
        perror("shmget");
        exit(1);
    }
    if ((shm = shmat(shmid, NULL, 0)) == (char *) -1) {
        perror("shmat");
        exit(1);
    }
    s = shm;
    for (c = 'a'; c <= 'z'; c++)
        *s++ = c;
    *s = NULL;
    while (*shm != '#')
        sleep(1);
    exit(0);
}
```

Client-

```
#include <sys/types.h>
#include <sys/ipc.h>
#include <sys/shm.h>
#include <stdio.h>
#include <stdlib.h>
```

```

#define SHMSZ 30
void main()
{
    int shmid;
    key_t key;
    char *shm, *s;
    key = 5858;
    if ((shmid = shmget(key, SHMSZ, 0666)) < 0) {
        perror("shmget");
        exit(1);
    }
    if ((shm = shmat(shmid, NULL, 0)) == (char *) -1) {
        perror("shmat");
        exit(1);
    }
    for (s = shm; *s != NULL; s++)
        putchar(*s);
    putchar('\n');
    shm = '#';
    exit(0);
}

```

Output-



```

aditi@aditi-Lenovo-ideapad-330S-14IKB-U:~/ADnOR/Assignments/8A$ gcc 8A1.c
8A1.c: In function 'main':
8A1.c:26:4: warning: assignment to 'char' from 'void *' makes integer from pointer without a cast [-Wint-conversion]
   26 | *s = NULL;
      |    ^
aditi@aditi-Lenovo-ideapad-330S-14IKB-U:~/ADnOR/Assignments/8A$ ./a.out

aditi@aditi-Lenovo-ideapad-330S-14IKB-U:~/ADnOR/Assignments/8A$ ./a.out
abcdefghijklmnopqrstuvwxyz

```

Conclusion-

Memory shared between client and server using IPC-SHM functions. The data placed can be accessed by both.

Reference-

Dave's Programming in C Tutorials