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Lab 6 :IPC – 2: Message Queue, Shared Memory

Lab Exercises:

1. **Process A wants to send a number to Process B. Once received, Process B has to check whether the number is palindrome or not. Write a C program to implement this interprocess communication using a message queue.**

   Sender

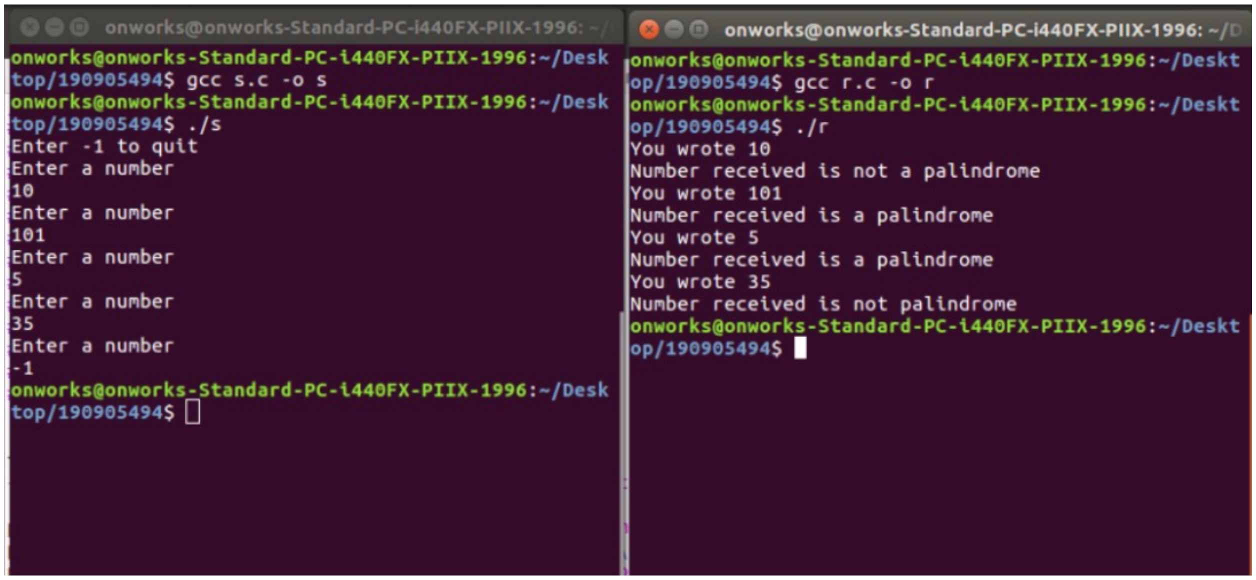
```
#include<stdio.h>
#include<stdlib.h>
#include<unistd.h>
#include<sys/types.h>
#include<limits.h>
#include<fcntl.h>
#include<sys/msg.h>
#include<sys/stat.h>
#include<string.h>
#include<sys/msg.h>
#include<sys/ipc.h>
#include<errno.h>
#define MAX_TEXT 512

struct my_msg_st
{
  long int my_msg_type;
  int msg;
};
```

```
int main(int argc, char const *argv[])
{
    int running=1;
    struct my_msg_st some_data;
    int msgid;
    int num;
    msgid=msgget((key_t)1234,0666|IPC_CREAT);

    if(msgid==-1)
    {
        fprintf(stderr, "msgget failed with error%d\n",errno );
        exit(EXIT_FAILURE);
    }

    printf("Enter -1 to quit\n");

    while(running)
    {
        printf("Enter a number\n");
        scanf("%d",&num);
        some_data.my_msg_type=1;
        some_data.msg=num;
        if (msgsnd(msgid,(void*)&some_data,MAX_TEXT,0)==-1){
            fprintf(stderr, "msgsnd failed\n" );
            exit(EXIT_FAILURE);
        }
        if(num==-1)
            running=0;
    }

    exit(EXIT_SUCCESS);
}
```

Receiver

```
#include<stdio.h>
#include<stdlib.h>
#include<unistd.h>
#include<sys/types.h>
#include<limits.h>
#include<fcntl.h>
#include<sys/msg.h>
#include<sys/stat.h>
#include<string.h>
#include<sys/msg.h>
#include<sys/ipc.h>
#include<errno.h>
#define MAX_TEXT 512

struct my_msg_st
{
    long int my_msg_type;
    int msg;
};
 int reverse(int x)
{
    int y = 0;
    while(x > 0)
    {
        y *= 10;
        y += x % 10;
        x /= 10;
    }
    return y;
}

int main(int argc, char const *argv[])
{
    int running=1;
    struct my_msg_st some_data;
    long int msg_to_receive=0;
    int msgid;
    int num;
    msgid=msgget((key_t)1234,0666|IPC_CREAT);

    if(msgid==-1)
    {
        fprintf(stderr, "msgget failed with error%d\n",errno );
        exit(EXIT_FAILURE);
    }
    while(running)
    {
        if (msgrcv(msgid,(void*)&some_data,BUFSIZ,msg_to_receive,0)==-1)
        {
            fprintf(stderr, "msgrc failedwith error %d\n",errno );
            exit(EXIT_FAILURE);
            }
                printf("You wrote  %d\n",some_data.msg);


            if(some_data.msg == reverse(some_data.msg))
              printf("Number received is a palindrome\n");
            else
              printf("Number received is not a palindrome\n");
            if(some_data.msg==-1)
              running=0;
          }
          if(msgctl(msgid,IPC_RMID,0)==-1){
            fprintf(stderr, "msgctl(IPC_RMID) failed\n");
            exit(EXIT_FAILURE);
          }
          exit(EXIT_SUCCESS);
        }
```

Output



```
onworks@onworks-Standard-PC-i440FX-PIIX-1996:~/Desk
top/190905494$ gcc s.c -o s
onworks@onworks-Standard-PC-i440FX-PIIX-1996:~/Desk
top/190905494$ ./s
Enter -1 to quit
Enter a number
10
Enter a number
101
Enter a number
5
Enter a number
35
Enter a number
-1
onworks@onworks-Standard-PC-i440FX-PIIX-1996:~/Desk
top/190905494$
```

```
onworks@onworks-Standard-PC-i440FX-PIIX-1996:~/Deskt
op/190905494$ gcc r.c -o r
onworks@onworks-Standard-PC-i440FX-PIIX-1996:~/Deskt
op/190905494$ ./r
You wrote 10
Number received is not a palindrome
You wrote 101
Number received is a palindrome
You wrote 5
Number received is a palindrome
You wrote 35
Number received is not palindrome
onworks@onworks-Standard-PC-i440FX-PIIX-1996:~/Deskt
op/190905494$
```

2.) Implement a parent process, which sends an English alphabet to a child process using shared memory. The child process responds with the next English alphabet to the parent. The parent displays the reply from the Child.

```
#include<stdio.h>

#include<stdlib.h>

#include<unistd.h>

#include<sys/types.h>

#include<sys/ipc.h>

#include<sys/shm.h>


/*

Status codes

0 -> nothing written yet by parent process

1 -> alphabet written by parent process

2 -> answer written by child process

-1 -> exit

*/


struct shared_str

{

   int status;

   char alphabet;

};


int main(int argc, char const *argv[])

{

   int shmid = shmget((key_t)1234,sizeof(struct shared_str),0666|IPC_CREAT);

   pid_t pid = fork();
```

```
if(pid < 0)
{
   printf("Error in fork()\n");
   exit(-1);
}

else if(pid == 0)
{ //child process
   struct shared_str* shared_mem = shmat(shmid,(void*)0,0);

   if(shared_mem == (void*)-1)
   {
      printf("shmat() failed\n");
      exit(-1);
   }

   printf("Memory attached at %p for child process\n",shared_mem);

   while(1)
   {
      if(shared_mem->status < 0)
      {
         if(shmdt(shared_mem) == -1)
         {
            printf("shmdt failed\n");
            exit(-1);
         }
```

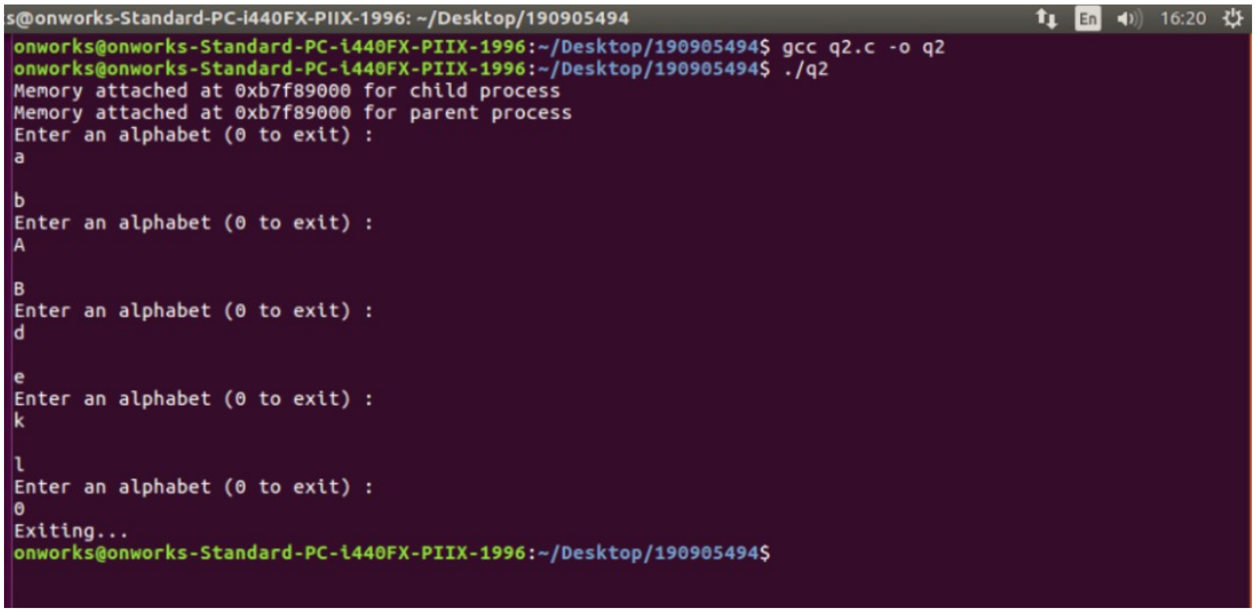
```
            break;
        }

        if(shared_mem->status == 1)
        {
            char c = shared_mem->alphabet;
            printf("\n");

            if((int)c >= 65 && (int)c <= 90)
            { //uppercase
                c = ((c - 'A' + 1)%26) + 'A';
            }

            else if((int)c >= 97 && (int)c <= 122)
            { //lowecase
                c = ((c - 'a' + 1)%26) + 'a';
            }

            else
            {
                printf("Non-alphabetic character received\n");
                //do nothing
            }
            shared_mem->alphabet = c; //write to shared memory
            shared_mem->status = 2;
        }
    }
}
```

```
else
{ //parent process
   sleep(1);
   struct shared_str* shared_mem = shmat(shmid,(void*)0,0);

   if(shared_mem == (void*)-1)
   {
      printf("shmat() failed\n");
      exit(-1);
   }

   printf("Memory attached at %p for parent process\n",shared_mem);
   shared_mem->status = 0;

   while(1)
   {
      if(shared_mem->status == 1)
      {
         continue;
      }

      if(shared_mem->status == 2)
      {
         printf("%c\n",shared_mem->alphabet);
      }

      shared_mem->status = 0;
```

```
        char c,nl;
        printf("Enter an alphabet (0 to exit) : \n");
        scanf("%c",&c);
        scanf("%c",&nl);

        if(c == '0')
        {
            shared_mem->status = -1;
            printf("Exiting...\n");

            if(shmdt(shared_mem) == -1)
            {
                printf("shmdt failed\n");
                exit(-1);
            }

            if(shmctl(shmid,IPC_RMID,0) == -1)
            {
                printf("shmctl failed\n");
                exit(-1);
            }
            break;
        }

        shared_mem->alphabet = c;
        shared_mem->status = 1;
    }
}
```

```
    return 0;

}
```

Output



```
s@onworks-Standard-PC-i440FX-PIIX-1996: ~/Desktop/190905494
onworks@onworks-Standard-PC-i440FX-PIIX-1996:~/Desktop/190905494$ gcc q2.c -o q2
onworks@onworks-Standard-PC-i440FX-PIIX-1996:~/Desktop/190905494$ ./q2
Memory attached at 0xb7f89000 for child process
Memory attached at 0xb7f89000 for parent process
Enter an alphabet (0 to exit) :
a

b
Enter an alphabet (0 to exit) :
A

B
Enter an alphabet (0 to exit) :
d

e
Enter an alphabet (0 to exit) :
k

l
Enter an alphabet (0 to exit) :
0
Exiting...
onworks@onworks-Standard-PC-i440FX-PIIX-1996:~/Desktop/190905494$
```