Operating Systems Design Lab
Computer Engineering Department
Spring 2023/2024
Lab 7: IPC Using Message Queues

Objectives

1. To understand inter-process communication using message queues.

Prelab

1. Read the section that addresses message queues in the lab manual.
2. Read the manual pages of the following systems calls:

```
#include <sys/types.h>
#include <sys/ipc.h>
#include <sys/msg.h>

int msgget(key_t key, int msgflg);
int msgsnd(int msqid, const void *msgp, size_t msgsz, int msgflg);
ssize_t msgrcv(int msqid, void *msgp, size_t msgsz, long msgtyp, int msgflg);
```

Experiment

1. Write two programs and name them send.c and receive.c to send and receive messages from a message queue respectively. The send program is executed as follows:

   ./send key type data

   it writes the text message “data ” into the message queue whose key is “key”, where “type” is the type of the written message. The receive function, on the other hand, is executed as follows:

   ./receive key type

   it reads a message of type “type” from the message queue whose key is “key” if such message exists, and blocks otherwise. Test your code and show your work to your lab instructor.

   Use the following message format:

```
struct Message{
long type;
char data[15];
}
```

2. Assume you have two processes, a parent and a child. The parent prints the numbers from 1 to 5, while the child prints the characters from A to E. Use a single message queue to synchronize the two processes such that they produce the following output:

➔The program is executed as follows: ./run key

```
1
A
2
B
....
5
E
```

3. Use message queues to synchronize three processes P_1, P_2, and P_3 as follows (where P_1 is the parent of the othertwo):

(a) P_1 reads a string from the standard input and sends it to P_2

(b) P_3 converts the string to lowercase and sends it to P_2

(c) P_2 prints the converted string to the output screen.

The three processes redo the above tasks forever until the user enters "EXIT" as an input string.

➔The program is executed as follows:

./run key