Operating Systems (CS3000)

Lecture – 15

(Inter Process Communication - 2)

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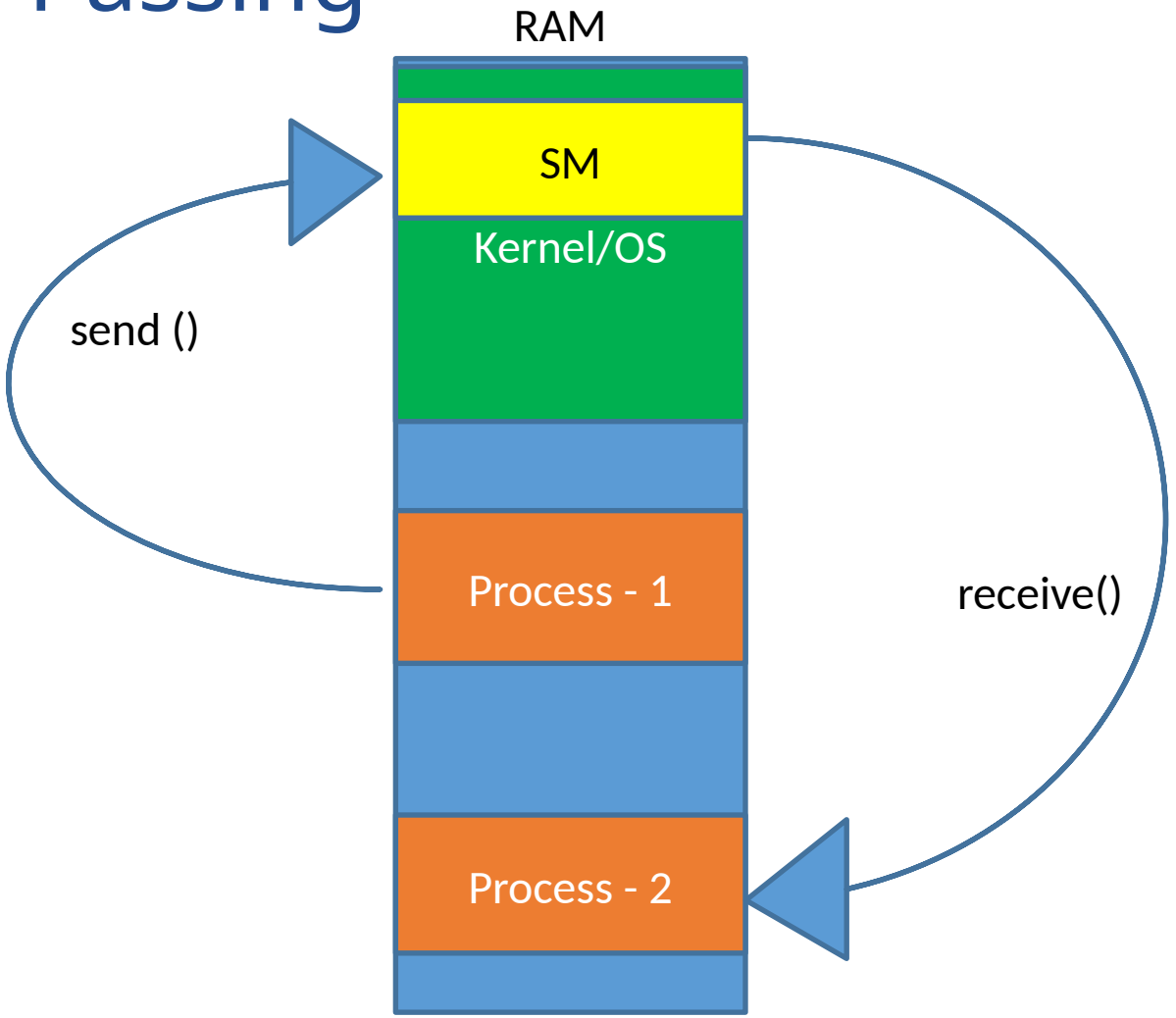
Problem with SM

- Synchronization needed between the processes

Message Passing

- SM is created in Kernel
- System calls are used
  - send(): Write to SM
  - receive(): Read from SM



IPC using Message Queues

- linked list of messages
- stored within the kernel
- identified by a message queue identifier.
- Functions
  - **msgget()** – To create a message queue/Open Existing
  - **msgsnd()** – To write message to message queue by Sender/New messages are added to the end of the queue
  - **msgrcv()** – To retrieve message from message queue by Receiver
  - **msgctl()** – The control function

IPC using Message Queues

- Sender
  - Create the MQ
  - Add data to the MQ
- Receiver
  - Retrieve the data from MQ
  - Delete the MQ

IPC using Message Queues

- int msgget(key_t key, int msgflg);
  - creates a new message queue
  - On success, msgget()returns the message queue identifier (a positive integer).
  - On failure, it returns -1and sets errnoto indicate the error.

IPC using Message Queues

- int msgsnd(int **msqid**, void ***msgp**, size_t **msgsz**, int **msgflg**);
  - send a message to the message queue specified by the msqid parameter.
  - It is returned by the msgget() function and used to identify the message queue to send the message to.
  - The *msgp parameter points to a user-defined buffer that must contain the following:
    - A field of type long int that specifies the type of the message.
    - An array that contains the actual content of the message.

IPC using Message Queues

- int msgsnd(int msqid, void *msgp, size_t msgsz, int msgflg);
  - The following structure is an example of what the user-defined buffer might look like for a message that has 5 bytes of data.

```
struct mymsg
{
        long int mtype;       /* message type */
        char mtext[5];        /* message text */
}
```

  - The value of mtype must be greater than zero. When messages are received with msgrcv(), the message type can be used to select the messages.
  - The message data can be any length up to the system limit.

IPC using Message Queues

- int msgsnd(int msqid, void *msgp, size_t msgsz, int msgflg);
-
  - msgsz: Length of the data part of the message to be sent.
  - msgflg: If the message queue is full, the msgflg parameter specifies the action to be taken. The actions are as follows:
    - 0: Suspended
    - IPC_NOWAIT: do not wait for space to become available on the message queue and return immediately.

IPC using Message Queues

- int **msgrcv**(int msqid, void *msgp, size_t msgsz, long int msgtyp, int msgflg);

  - The msgrcv() function reads a message from the message queue specified by the msqid parameter and places it in the user-defined buffer pointed to by the *msgp parameter.
  - The *msgp parameter points to a user-defined buffer that must contain the following:
    - A field of type long int that specifies the type of the message.
    - A data part that contains the data bytes of the message.

IPC using Message Queues

- int msgrcv(int msqid, void *msgp, size_t msgsz, long int msgtyp, int msgflg);

```
struct mymsg
  {
        long int mtype; /* message type */
        char mtext[5]; /* message text */
}
```

- The value of mtype is the type of the received message, as specified by the sender of the message.
- The msgsz parameter specifies the size in bytes of the data part of the message.
  - The received message is truncated to msgsz bytes if it is larger than msgsz.

IPC using Message Queues

- int msgrcv(int msqid, void *msgp, size_t msgsz, long int msgtyp, int msgflg);

- The msgtyp parameter specifies the type of message to receive from the message queue as follows:
  - If msgtyp = 0, read the first message in the queue.
    - the messages will the retrieved in the same order in which they were written into the message queue
  - If msgtyp > 0, the first message of type “msgtyp” is only received.
  - If msgtyp < 0, the first message of the lowest type that is less than or equal to the absolute value of msgtyp is received.

IPC using Message Queues

- int msgrcv(int msqid, void *msgp, size_t msgsz, long int msgtyp, int msgflg);
  - If a message of the desired type is not available on the message queue, the msgflg parameter specifies the action to be taken. The actions are as follows:
  - If the IPC_NOWAIT flag is set in the msgflg parameter, msgrcv() returns immediately with a return value of -1.
  - If 0 : suspend the process

IPC using Message Queues

- int msgctl(int msqid, int cmd, struct msqid_ds *buf);
- The msgctl() function allows the caller to control the message queue specified by the msqid parameter.
  - msqid Message queue identifier, a positive integer. It is returned by the msgget() function and used to identify the message queue on which to perform the control operation.
  - cmd Command, the control operation to perform on the message queue.
  - buf Pointer to the message queue data structure to be used to get or set message queue information.
    - msqid_ds

```c
#include <unistd.h>
#include <sys/ipc.h>
#include <sys/shm.h>
#include <sys/msg.h>
#define MAX_TEXT 10//Maximum length of the msg that can be sent

struct my_msg {
        long int msg_type;
        char some_text[MAX_TEXT];
};
int main()
{
        int running=1;
        int msgid;
        struct my_msg some_data;
        char buffer[10];
        msgid=msgget((key_t)3333, 0666|IPC_CREAT);
        printf("msg queue id %d\n", msgid);

        if(msgid == -1)
        {
                printf("Error in creating queue\n");
                exit(0);
        }

        while(running)
        {
                printf("Enter some text\n");
                scanf("%s", buffer);
                some_data.msg_type=1;
                strcpy(some_data.some_text, buffer);

                if(msgsnd(msgid, &some_data, MAX_TEXT, 0)==-1)
                {

                        printf("Msg not sent\n");
                }
                if(strncmp(buffer, "*",1)==0)
                {
                        running=0;
                }
        }

        return 0;
}
```

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        msgid=msgget((key_t)3333, 0666|IPC_CREAT);
        printf("msg queue id %d\n", msgid);

        if(msgid == -1)
        {
                printf("Error in creating queue\n");
                exit(0);
        }
```

```c
        while(running)
        {
                printf("Enter some text\n");
                scanf("%s", buffer);
                some_data.msg_type=1;
                strcpy(some_data.some_text, buffer);

                if(msgsnd(msgid, &some_data, MAX_TEXT, 0)==-1)
                {

                        printf("Msg not sent\n");
                }
                if(strncmp(buffer, "*",1)==0)
                {
                        running=0;
                }
        }

        return 0;
}
```

Thank You

Any Questions?