INTER-PROCESS COMMUNICATION AND SYNCHRONISATION:

Lesson-17: Pipe

1. Pipe Function

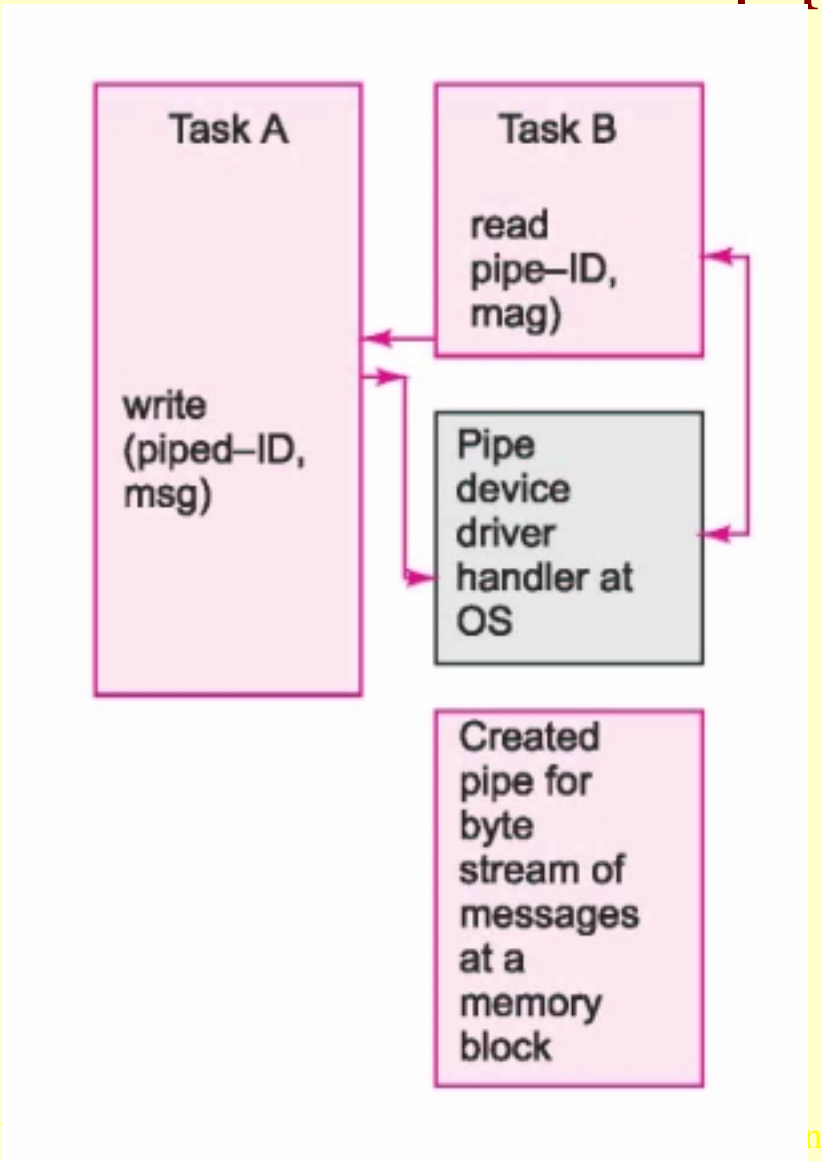
Pipe

- Pipe is a device used for the inter process communication
- Pipe has the functions create, connect and delete and functions similar to a device driver (open, write, read, close)

Writing and reading a Pipe

- A message-pipe— a device for inserting (writing) and deleting (reading) from that between two given inter-connected tasks or two sets of tasks.
- Writing and reading from a pipe is like using a C command *fwrite with a file name* to write into a named file, and C command *fread with a file name* to read into a named file.

Pipe-device write and read using device driver Functions in a created pipe



Write and read using Pipe

- 1. One task using the function fwrite in a set of tasks can write *to* a pipe at the back pointer address, *pBACK.
- 2. One task using the function fwrite in a set of tasks can read from a pipe at the front pointer address, *pFRONT

Pipe as IO Stream

- Pipes are also like Java *PipedInputOutputStreams*. Java defines the classes for the input output streams

Pipe Messages

- In a pipe there may be no fixed number of bytes per message with an initial pointer for the back and front and there may be a limiting final back pointer.
- A pipe can therefore be limited and have a variable number of bytes per message between the initial and final pointers.

Unidirectional feature in Pipe

- Pipe is unidirectional. One thread or task inserts into it and other one deletes from it.

2. Pipe-device Functions

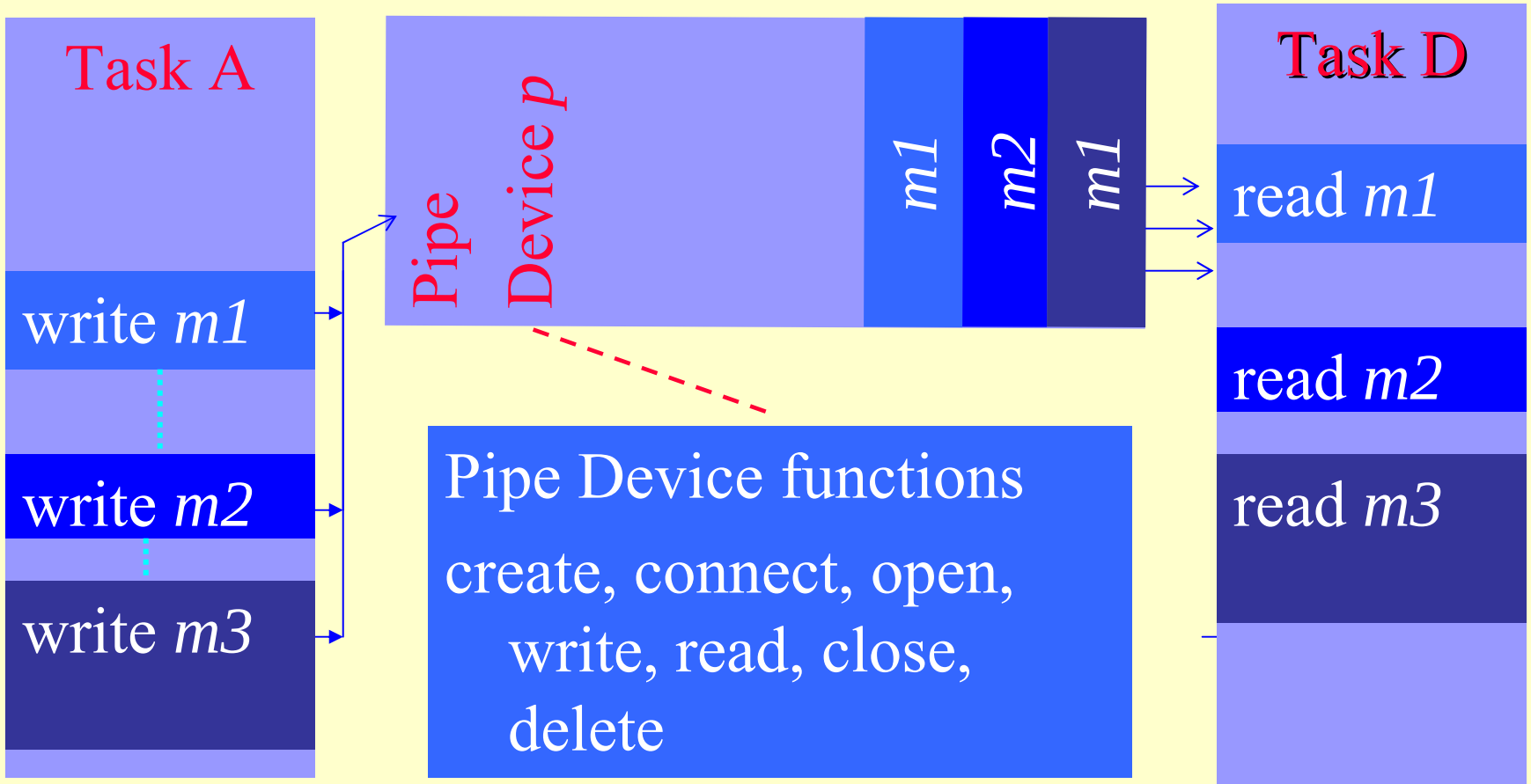
Pipe-device Functions

1. pipeDevCreate ─ for creating a device
2. open ( ) ─ for opening the device to enable its use from beginning of its allocated buffer, its use with option and restrictions or permissions defined at the time of opening.
3. connect ( ) ─ for connecting a thread or task inserting bytes into the pipe to the thread or task deleting bytes from the pipe.
4. write ( ) ─ function for inserting (writing) into the pipe from the bottom of the empty memory space in the buffer allotted to it.

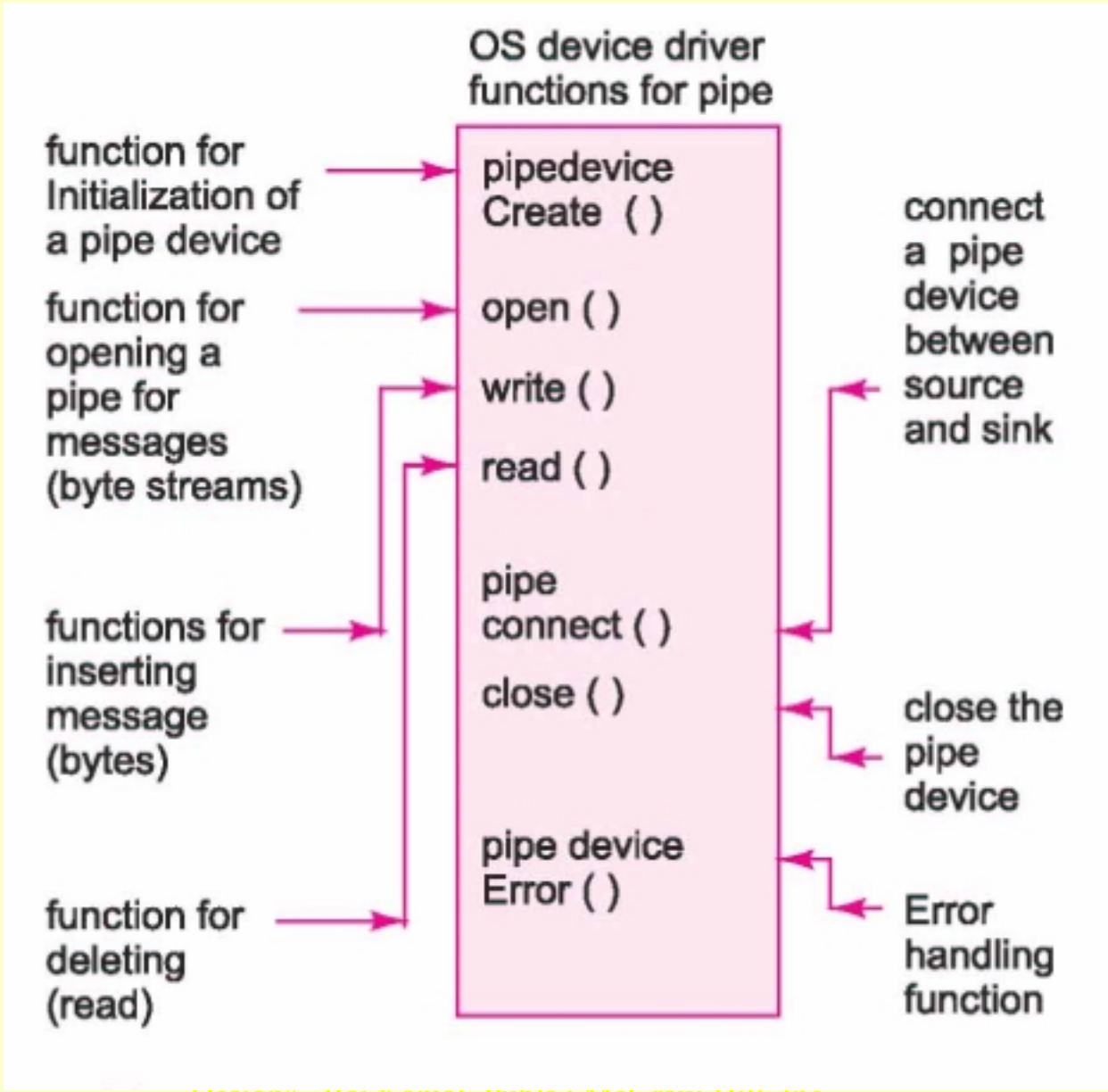
Pipe-device Functions…

5. read ( )─ function for deleting (reading) from the pipe from the bottom of the unread memory spaces in the buffer filled after writing into the pipe.
6. close ( ) ─ for closing the device to enable its use from beginning of its allocated buffer only after opening it again..

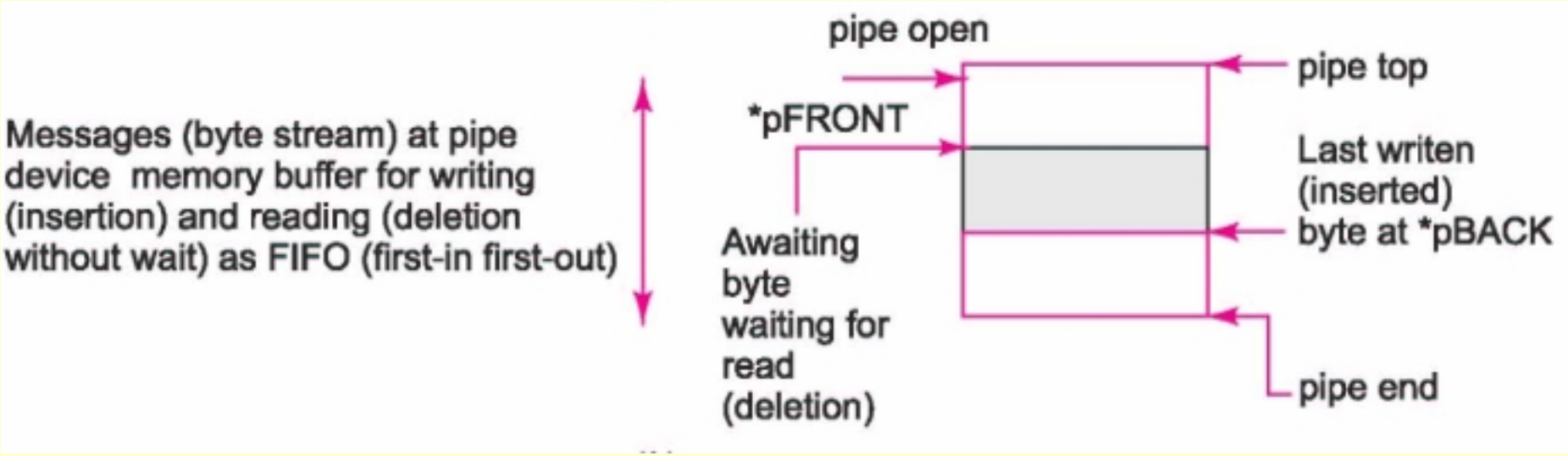
Task A sending messages into a pipe and task D receiving that



Pipe-device Functions



Pipe-messages in a message-block with its top pointed by *pFRONT and end by *pBACK



3. IPC Pipe device functions Application Example

pipeCardInfo creation in Smart card

- *pipeDevCreate ("/pipe/pipeCardInfo", 4, 32) /** Create a pipe *pipeCardInfo*, which can save four messages each of 32 bytes maximum */

pipeCardInfo open in Smart card

- *fd = open ((“/pipe/pipeCardInfo”,O_WR, 0)* /* Open a write only device. First argument is pipe ID */pipe/pipeCardInfo*, second argument is option O_WR for write only and third argument is 0 for unrestricted permission.*/ .

Task_Send_Card_Info in Smart Card

```
static void Task_Send_Card_Info (void
   *taskPointer) {
.
while (1) {
.
.
cardTransactionNum = 0; /* At start of the
   transactions with the machine*/
```

Task_Send_Card_Info sending into pipe

write (fd, cardTransactionNum, 1) /* Write 1 byte for transaction number after card insertion */

write (fd, cardFabricationkey, 16) /* Write 16 bytes for fabrication key */

Task_Send_Card_Info sending into pipe…

write (fd, cardPersonalisationkey, 16) /* Write 16 bytes for personalisation */

write (fd, cardPIN, 16) /* Write 16 bytes for PIN, personal identification number granted by the authoriser bank */

.

};

Summary

We learnt

OS provides the IPC functions for pipe

- DevCreate, Open, connect, write, read and close functions.
- Limit of the total number of messages and maximum size per message can also be provided when creating a pipe

- Pipe is device for a stream of messages that connects the two tasks and the pipe functions are similar to the device functions and IO stream functions.

End of Lesson-17: Pipe