

# Fiche Operating System

Pierre Colson

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Markdown version on [github](#)

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More fiches [here](#)

## Fork

- After creating a new process using `fork()` the two porcesses will share open files but **not** the stack, the heap, globla memory, and code area
- The two process will share the file current position and combine the write operations. (exo 1.3 from second exam of 2018)
- code fork example

```
int main () {
    if (pid == 0) {
        // child
        return 0;
    } else {
        //mother
    }
    wait(NULL);
    //executed when the child has terminated
    return 0;
}
```

## Stack

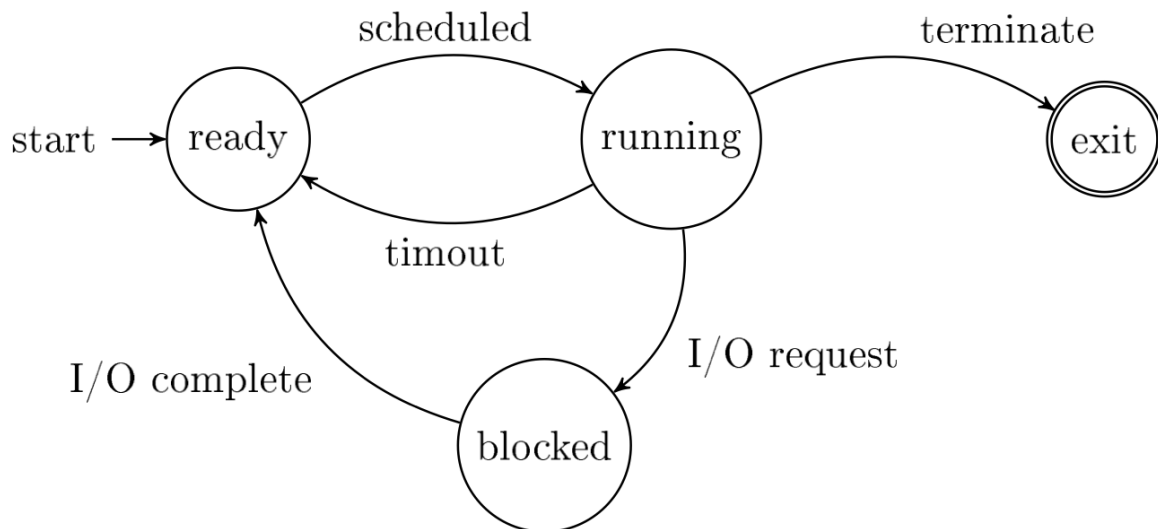
- On the stack :
  - ESP = current stack pointer
  - EBP = base pointer for the current stack frame
  - under the base stack pointer : previous EBP, return IP, location for returned element, arguments.

## Pipes

- When you read from or write to a pipe you will use the regular library procedures that are used for files
- Pipes have built in flow control. If the consumer does not read from the pipe the producer will be suspended when tries to write the filled pipe.

## Scheduling

- State diagram for scheduling processes :



- $T_{turnaround} = T_{completion} - T_{arrival}$
- First come First Serve
- Shortest job first
- Shortest time to completion first
- $T_{response} = T_{firstscheduled} - T_{arrival}$
- Round robin : give a time slice for each task

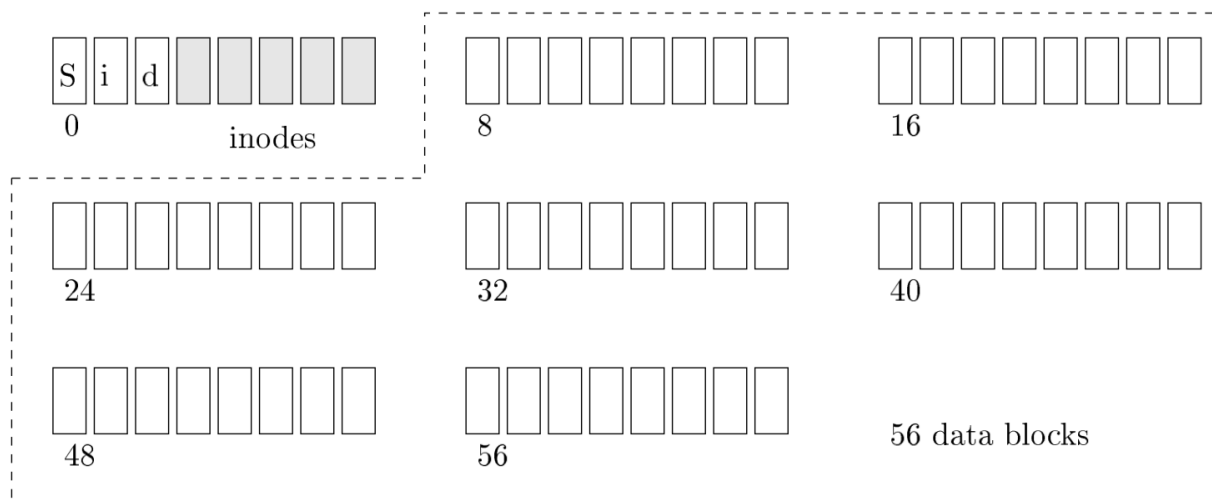
## Sockets

- SOCK\_DGRAM : A one way, medium oriented, unreliable disorderd socket
- SOCK\_STREAM : A bi-directional, change-oriented, reliable, orderly channel with flow control
- SOCK\_SEQPACKET : A bi-directional, message oriented reliable, orderly channel with flow control

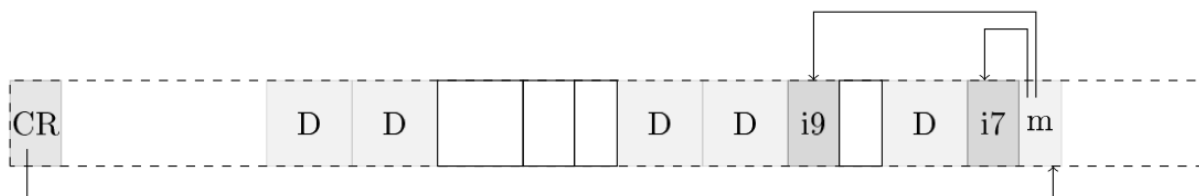
- The big difference is that SOCK STREAM is a double direction connection providing a sequence of bytes while SOCK DGRAM is a one directional channel for messages of limited size.
- The advantages SOCK DGRAM is that the receiver will receive one message at the time and need not to think about how to divide a sequence of bytes into messages. If the messages are of limited size it is almost always better to use SOCK DGRAM. The order is however not guaranteed not that messages actually arrive. If this is important one has to implement a protocol to keep the order and request resending.

## File System

- We represent files using an inode with pointers to data blocks with the contents of the files. The inode also contains metadata for the file but can be represented with e.g 256 bytes. The first segment contains information about the file system. The second and third segment have bitmaps that describe which inodes and data blocks are free.

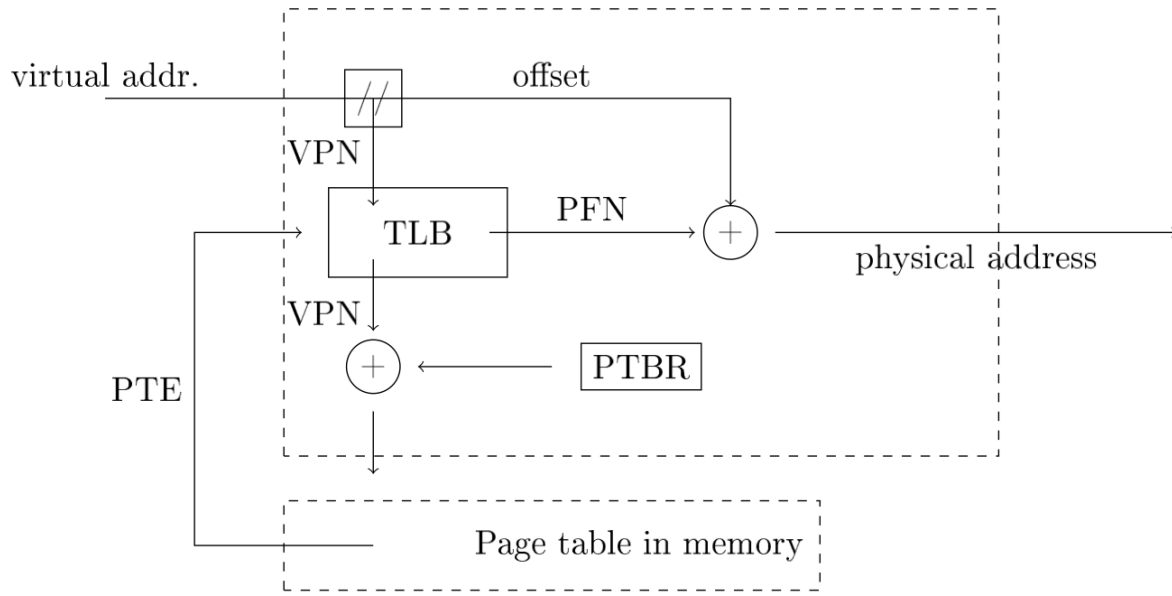


- The content of a directory gives us : name, type, and inode number. The type can be file, folder, soft link etc. for all properties of a file (size, created, changed, owner etc) of a file we must retrieve the file's inode.
- Each inode contains information about how many hard links there are to file. When we delete the last link, the file will be deleted (its data will remain on the disk but its not accessible via the file system).
- Log file system : An inode map is always written last in a write and is a mapping from inode ID to the block for the respective inodes. A structure CR (Checking point region) is in a fixed position and holds a pointer to the last written inode map.



## Other

- Don't forget to free the memory after allocating on the heap.
- Question 1.6 for the first 2018 exam.  
If we just do `sched_yield()` the operating system will pick us up again for execution, regardless of whether the lock is free or not. If we instead use `futex_wait()` then we will be suspended until a process wakes up (which is done by the process that releases the lock). When we wake up we must try to take the lock again.
- Language as Java has automatic memory management. The systems allocate structure on the heap which, when it starts to get full, collect garbage. The garbage collection identifies structures that are no longer needed and reuses that space in the continued execution.
- A Zombie process is a process that is terminated but where the parent process has not yet retrieved the result. When / if the parent process picks up the result through a call to `wait()`, the process can be removed from the system. If the parent process has terminated, the process is inherited by `init` which will pick up its results.
- memory mapping of a running process :
  - The first three segments are code, read only data and global data
  - Then there is a segment for the heap
  - The segment marked with `lib-2.23.so` is a shared library/
  - In the uppermost region we find the segment of the stack (starting by `7ffd6...`) Cf exo 1.2 from second exam of 2018
- The problem is that we release the lock and then suspend on the conditional variable on two operations. If the process is interrupted between these operations, another process might : call `get()`, take the lock, remove the item from the buffer and signal. If we don't suspend on the conditional we will never wake up. Cf question 2.1 from first exam 2019
- The clock algorithm approximates LRU (least recently used). It only notes that a page has been used since the last turn, not how often or when it was accessed. If it is time to swap a page and all pages are marked as being used, the algorithm will clear the markers one by one and then swap the first page. It could be that this page was the page that was accessed most recently and thus should not be swapped.
- A paging MMU with TLB



- Different types :

```
drwxrwxr-x 2 johanmon johanmon 4096 dec 21 17:43 bar.doc
-rwxrwxr-x 1 johanmon johanmon 8464 dec 21 22:25 cave
lrwxrwxrwx 1 johanmon johanmon    7 dec 21 17:43 foo.pdf -> ./gurka
-rw-rw-r-- 1 johanmon johanmon    7 dec 21 17:42 gurka
prw-r--r-- 1 johanmon johanmon    0 dec 21 22:25 sesame
```

**Answer:** *bar.doc* is a directory, *cave* is an executable file, *foo.pdf* is a symbolic (soft) link, *gurka* is a regular file and *sesame* is a *pipe*