Sunbeam Institute of Information Technology
Pune and Karad

Module - Concepts of Operating System

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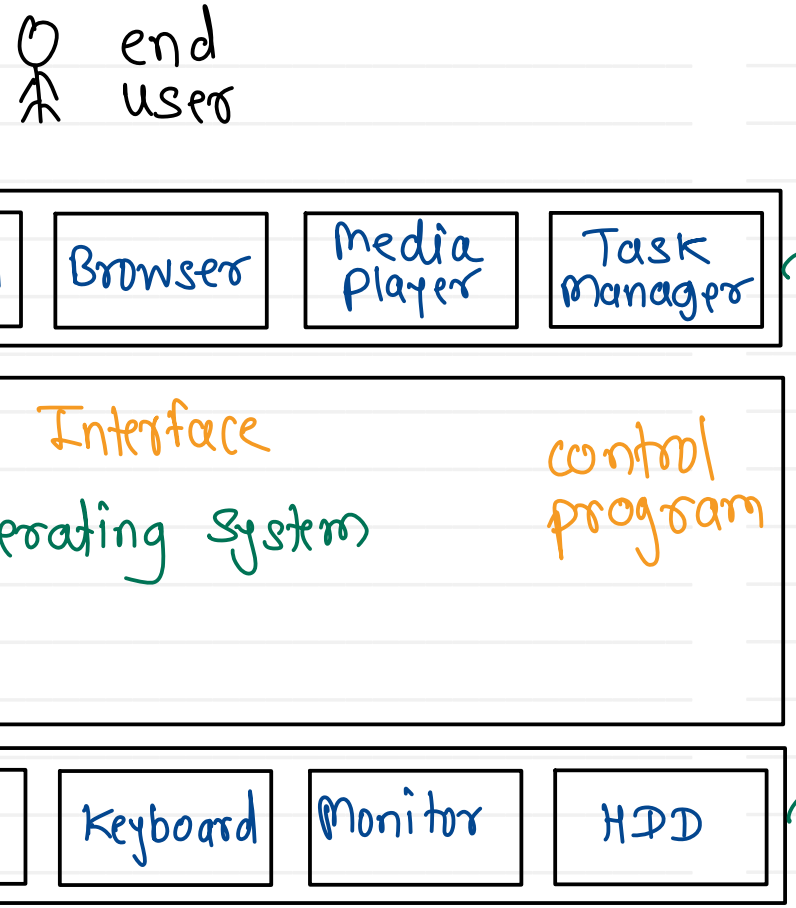
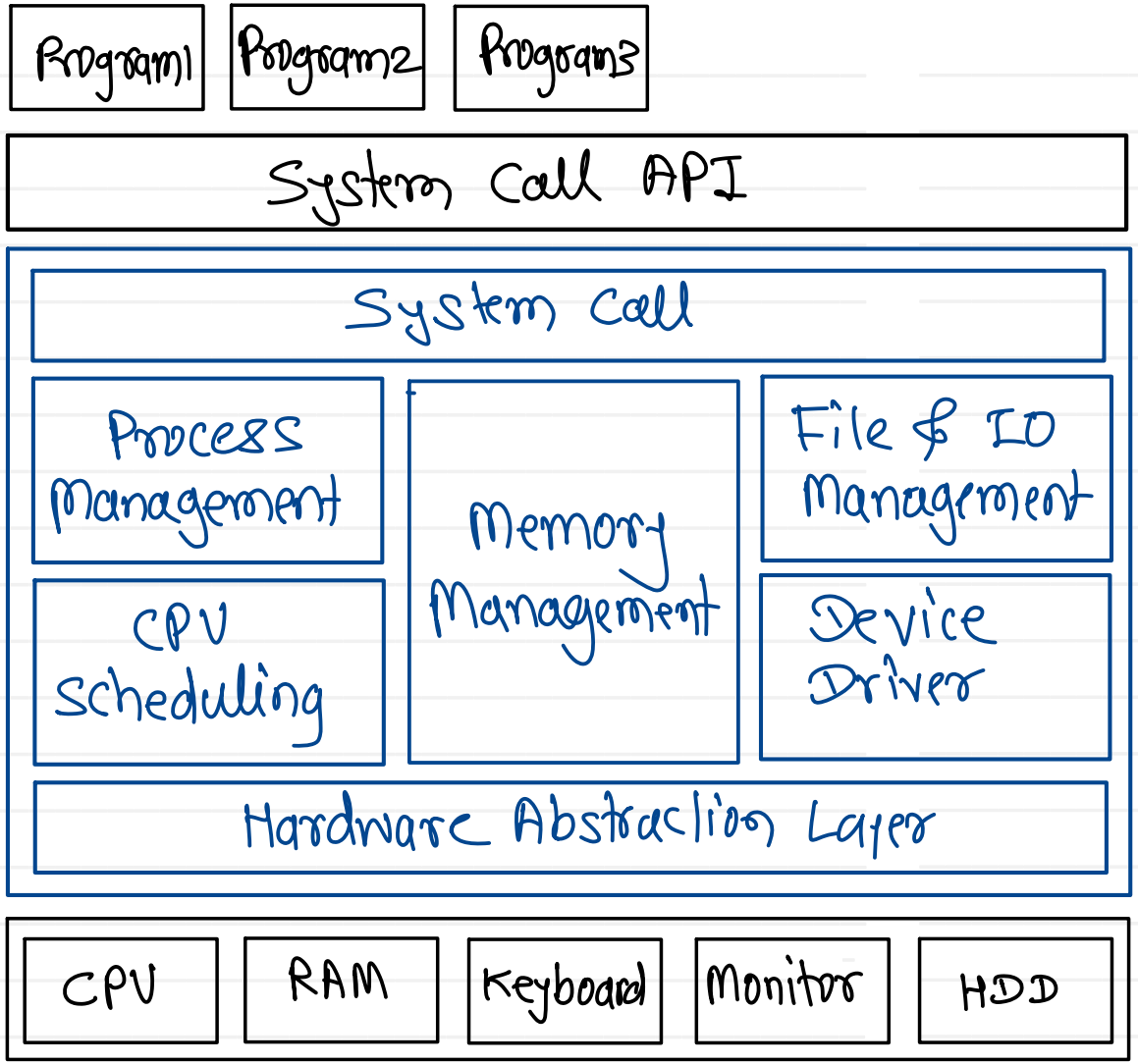
Operating system



- interface bet^n end user & hardware
- interface bet^n Application s/w and hardware
- control program which controls execution of the programs running on the top of it.
- resource allocator / manager which allocates limited h/w resources to the programs running inside system.

CD/DVD/ISO - Core OS (Kernel) + Appl^n s/w + system Utilities

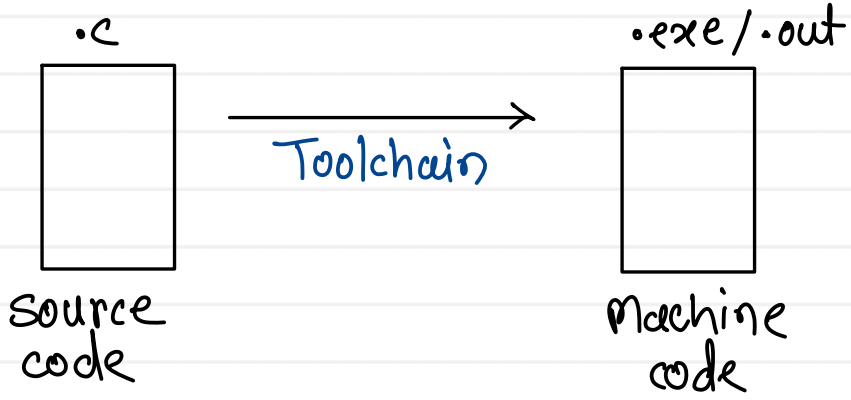
Linux kernel architecture



- User interfacing
- Networking
- Security & protection

Program compilation steps

Process : Program in execution
Program : set of instruction to the CPU (machine)



GCC (GNU C compiler)
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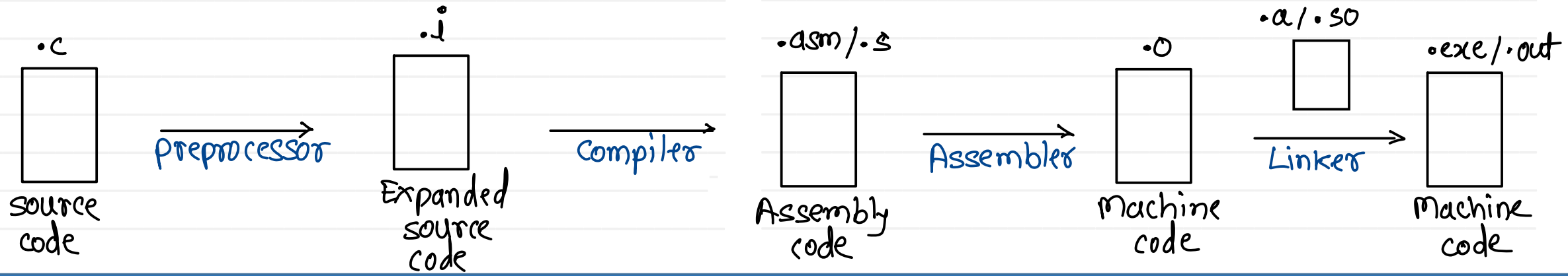
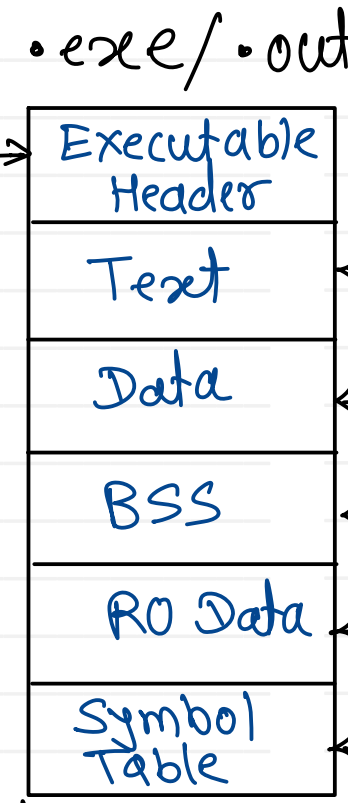
Toolchain
- set of tools which works on source code one by one (in chain) to convert it into machine code.
- preprocessor, compiler, assembler, linker, debugger, ...



Program



- info about executable file
- type of executable (CLI/GUI/library)
- address of entry point function
- info about remaining sections of executable (size, start, end)
- magic number (2 or 4 bytes)
  - identity to file format

Window - .exe → Portable Executable (MZ)

Linux - .out → Executable Linking Format (& ELF)

(Executable) (sectioned binary)

.class → 0xCAFEBABE

Text → instructions of program in machine code format.

Data → static & global variable (initialized)
`int num1 = 10;`

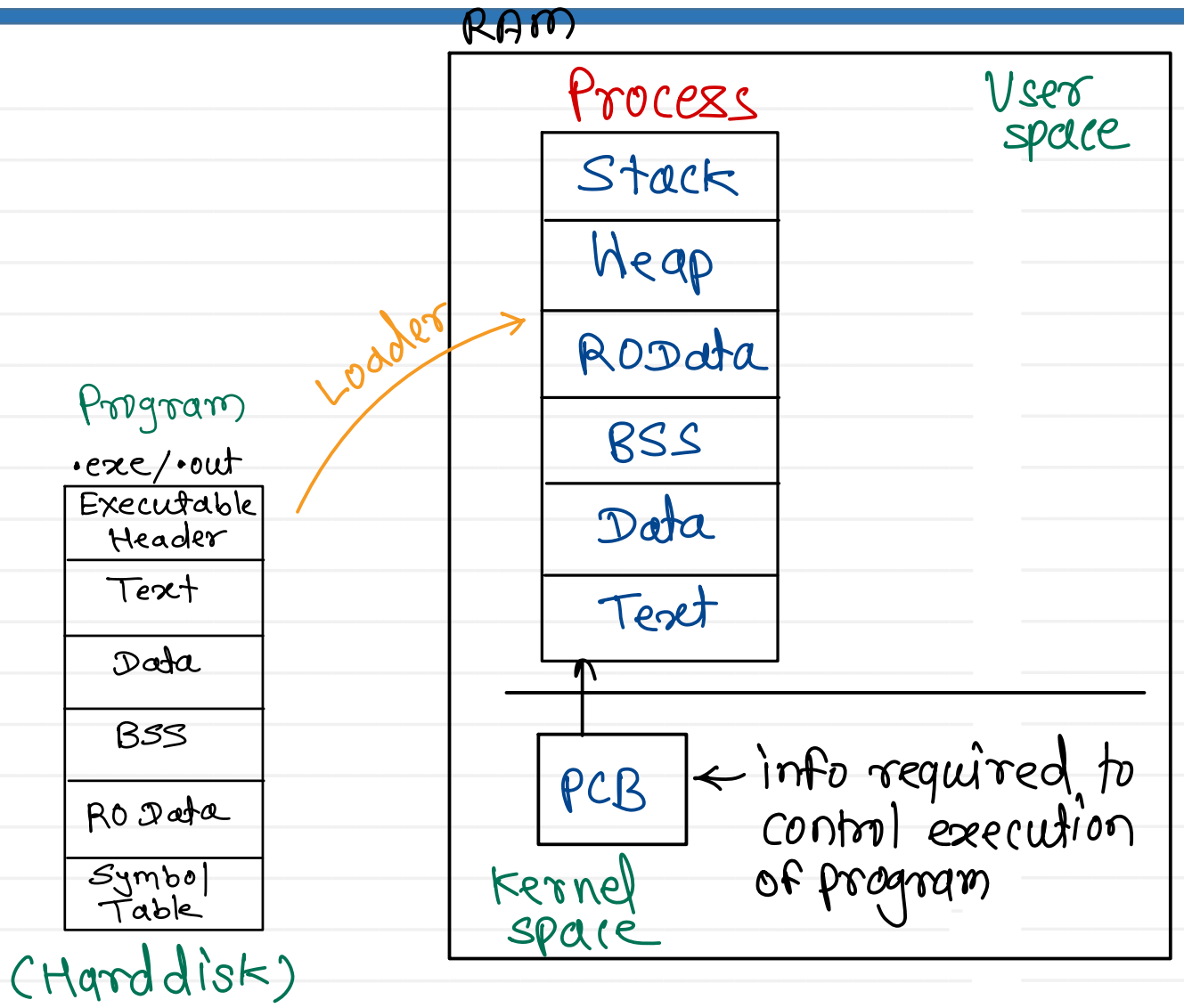
BSS → static & global variable (uninitialized)
`int num2;`

RO Data → read only data (eg. string constants)
`char *ptr = "sunbeam";`

Symbol Table → info about symbols

symbols
- variables (type, name, addr, section)
- functions (return type, name, addr, no. of args, type of args)

Process



PCB – Process Descriptor

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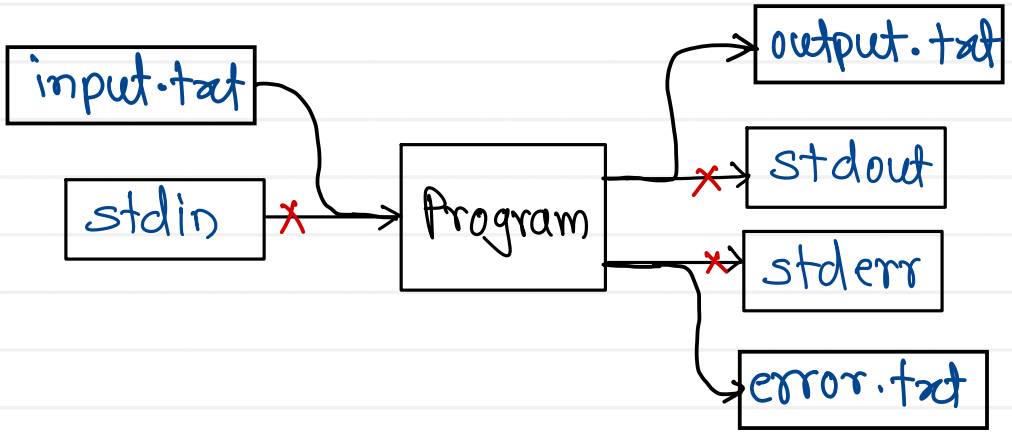
struct task_struct (sched.h)

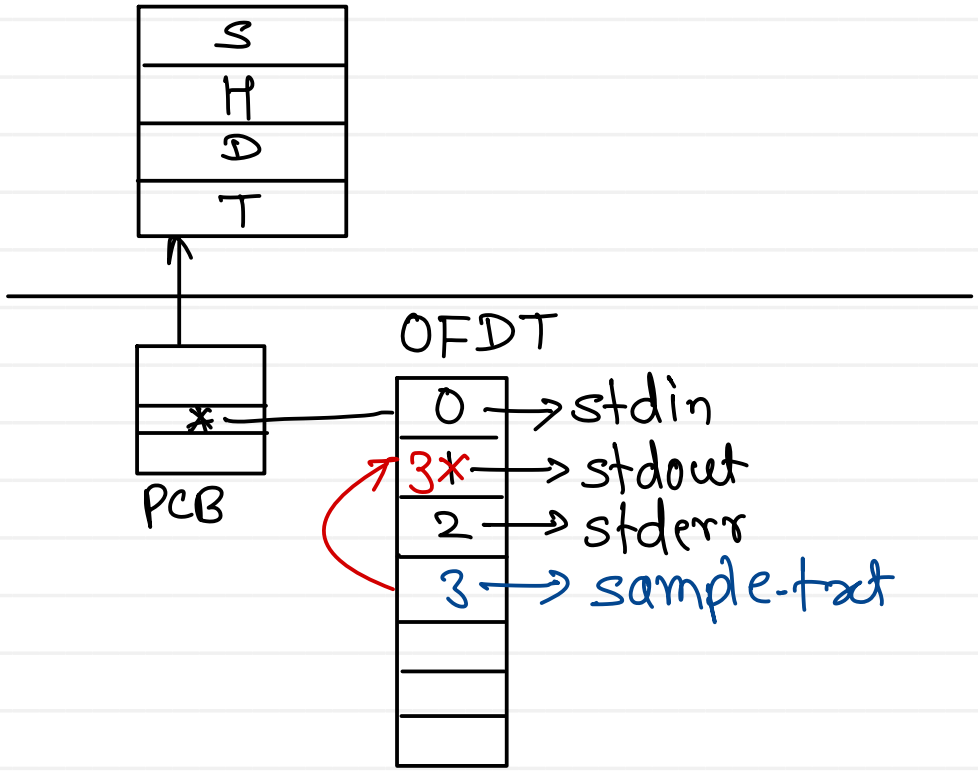
1. pid, ppid
2. exit status
3. mem info (base, limit, segment/page table)
4. sched info (algo, prio, state...)
5. file info (opened files ....)
6. IPC info (signals .....)
7. execution context
8. kernel stack

Redirection

- Each program opens three standard files
  1. stdin
  2. stdout
  3. stderr
- Input output is done with these files only.
- But we can change direction of input/output/error to some user defined file and it is called as "redirection"

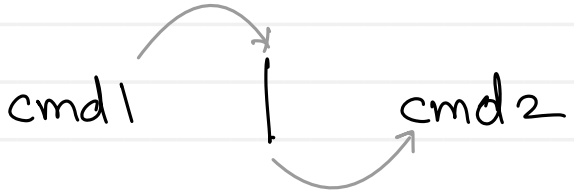


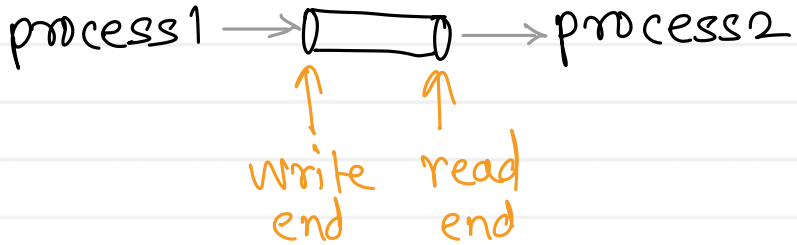
cat > sample.txt



Pipe

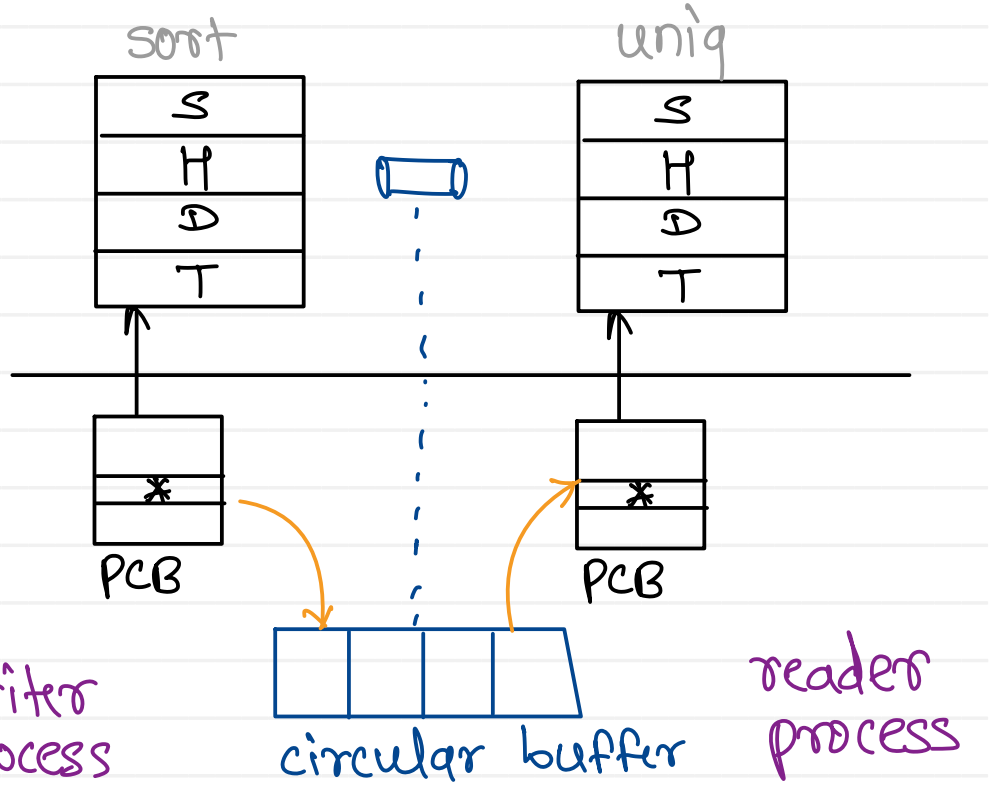
- pipe used to combine multiple commands where output of first command is given to input of second command.
- pipe is one of the IPC mechanism





- pipes are always unidirectional.

sort numbers.txt | uniq



Thank you!!!

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