

Sachin mittal

GATE CS 2017

Rank: 33

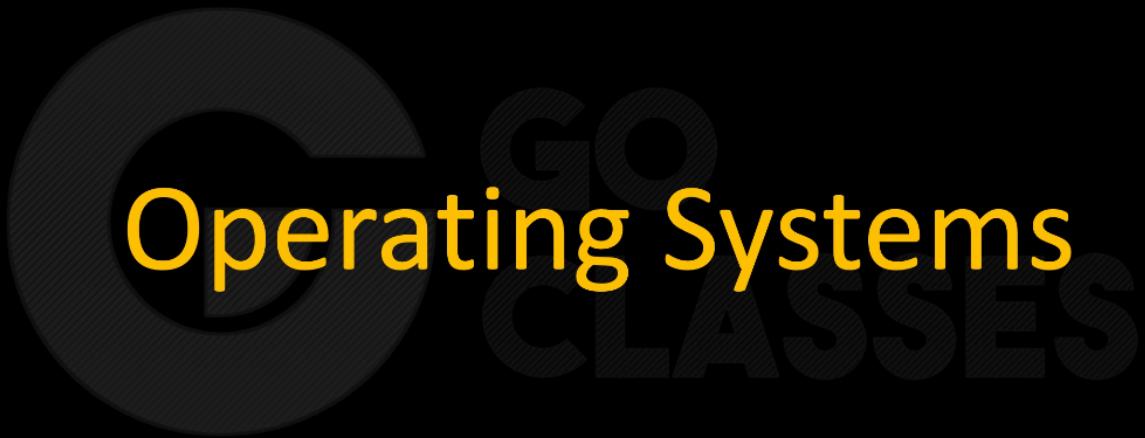
IITSC , CSA

(2017 - 19)

- Xerox labs (Research engineer)
- Amazon (Applied scientist)



Operating Systems





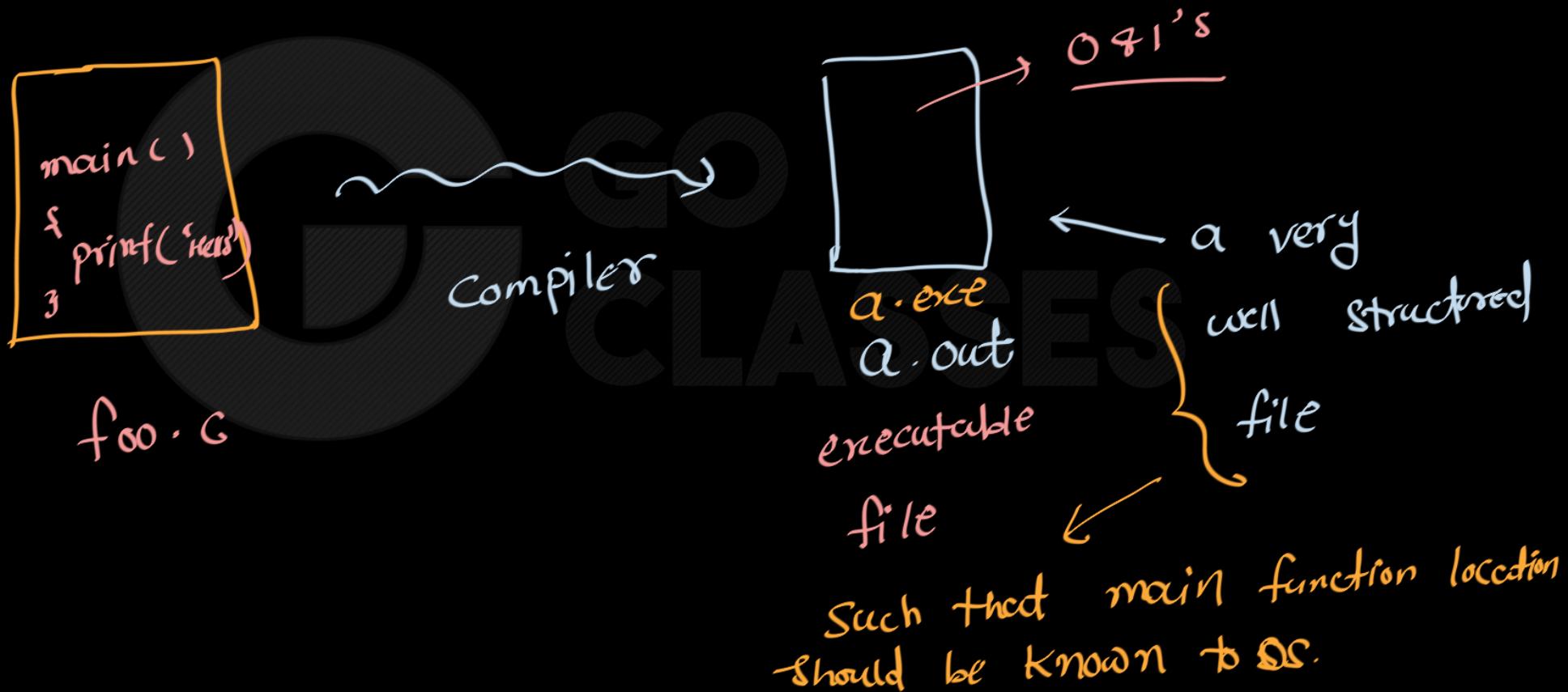
Reference Books

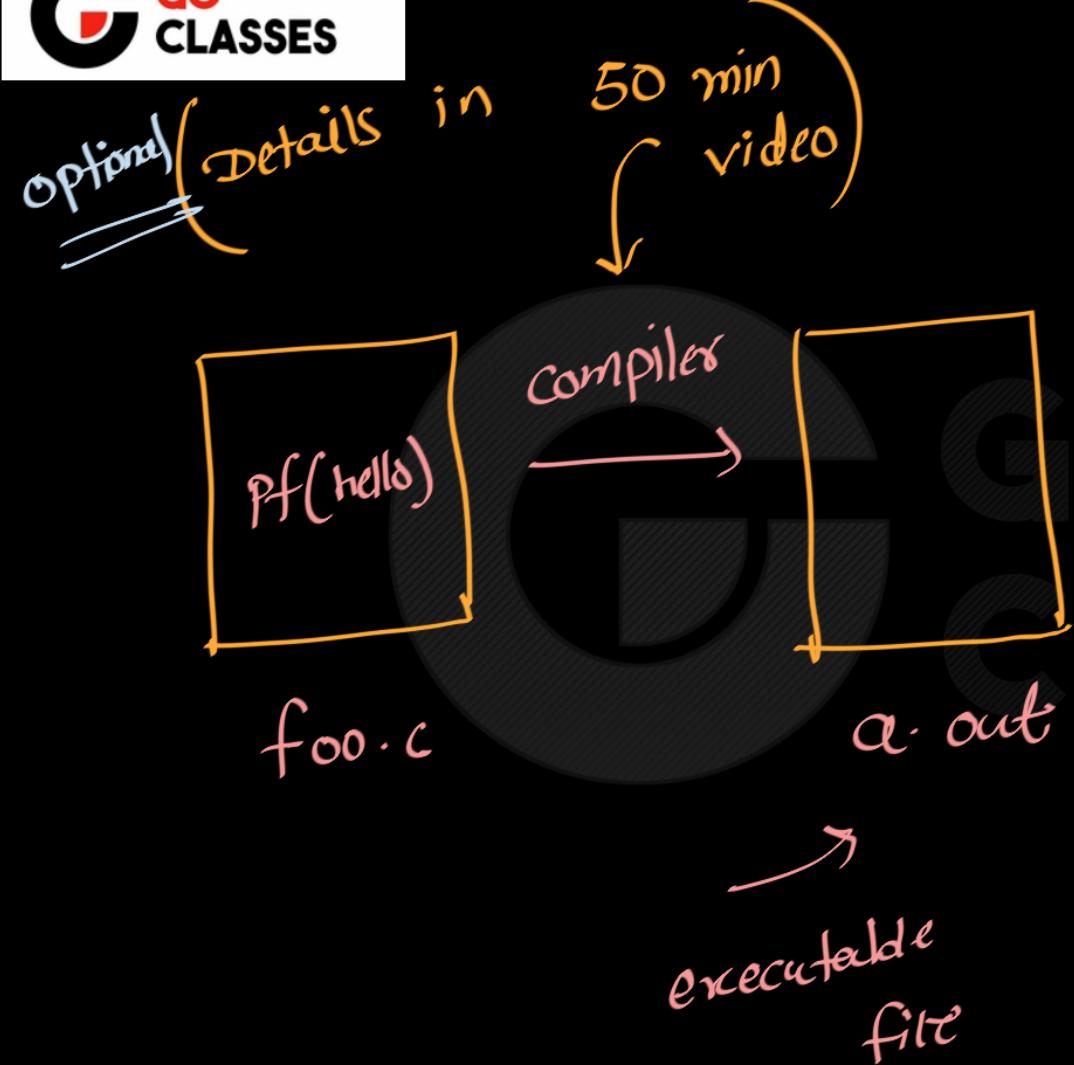
- Operating System Concepts by **Galvin**
- Operating Systems Internals and Design Principles by **William Stallings**
- Modern Operating Systems by **Tanenbaum**
- Operating Systems: Three Easy Pieces

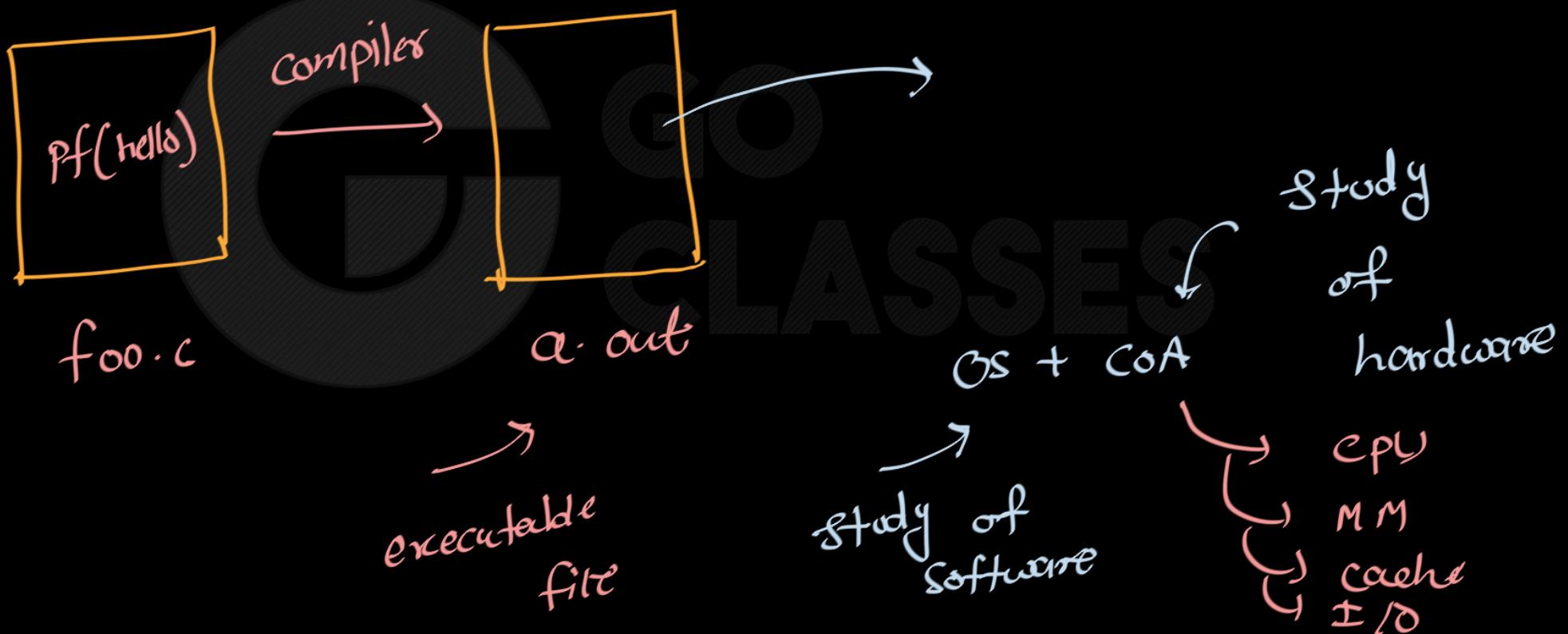


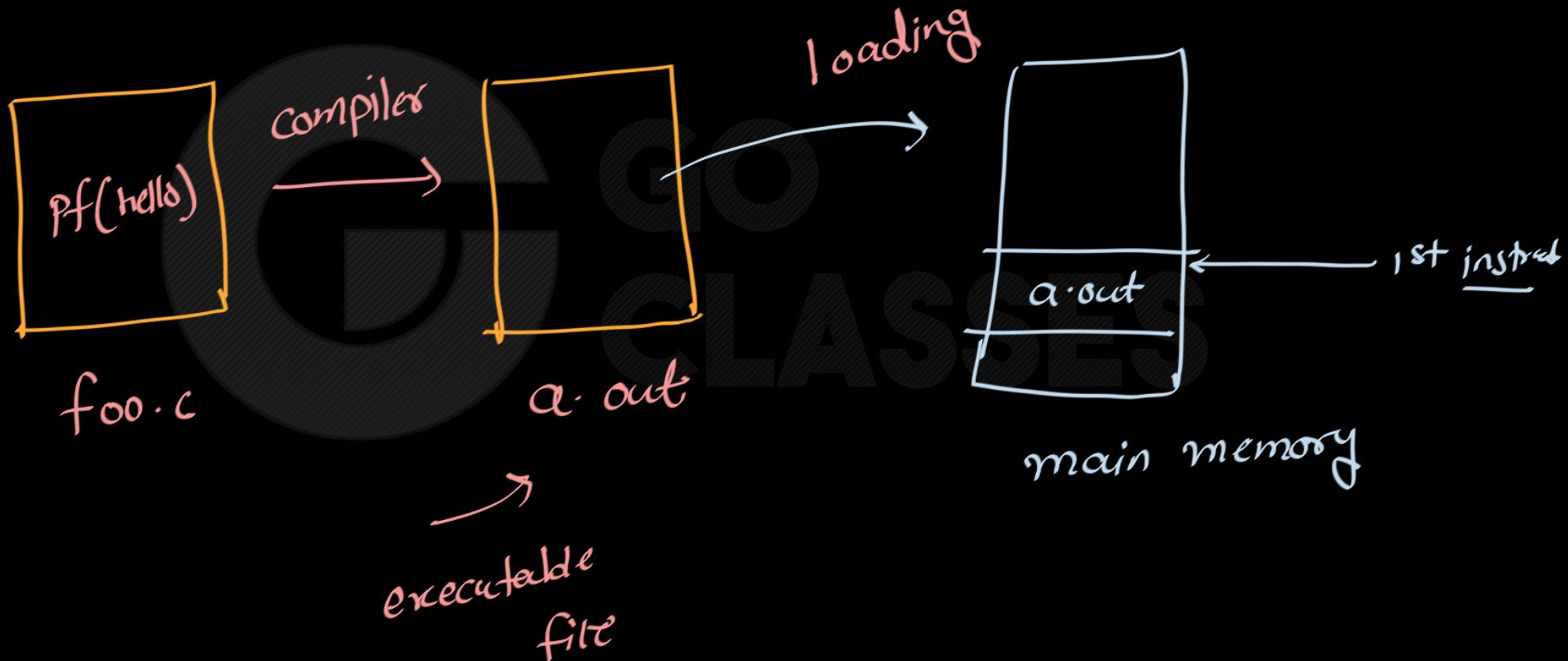
GATE Syllabus

- System calls, processes, threads, inter-process communication, concurrency and synchronization.
- Deadlock.
- CPU and I/O scheduling.
- Memory management and virtual memory.
- File systems.

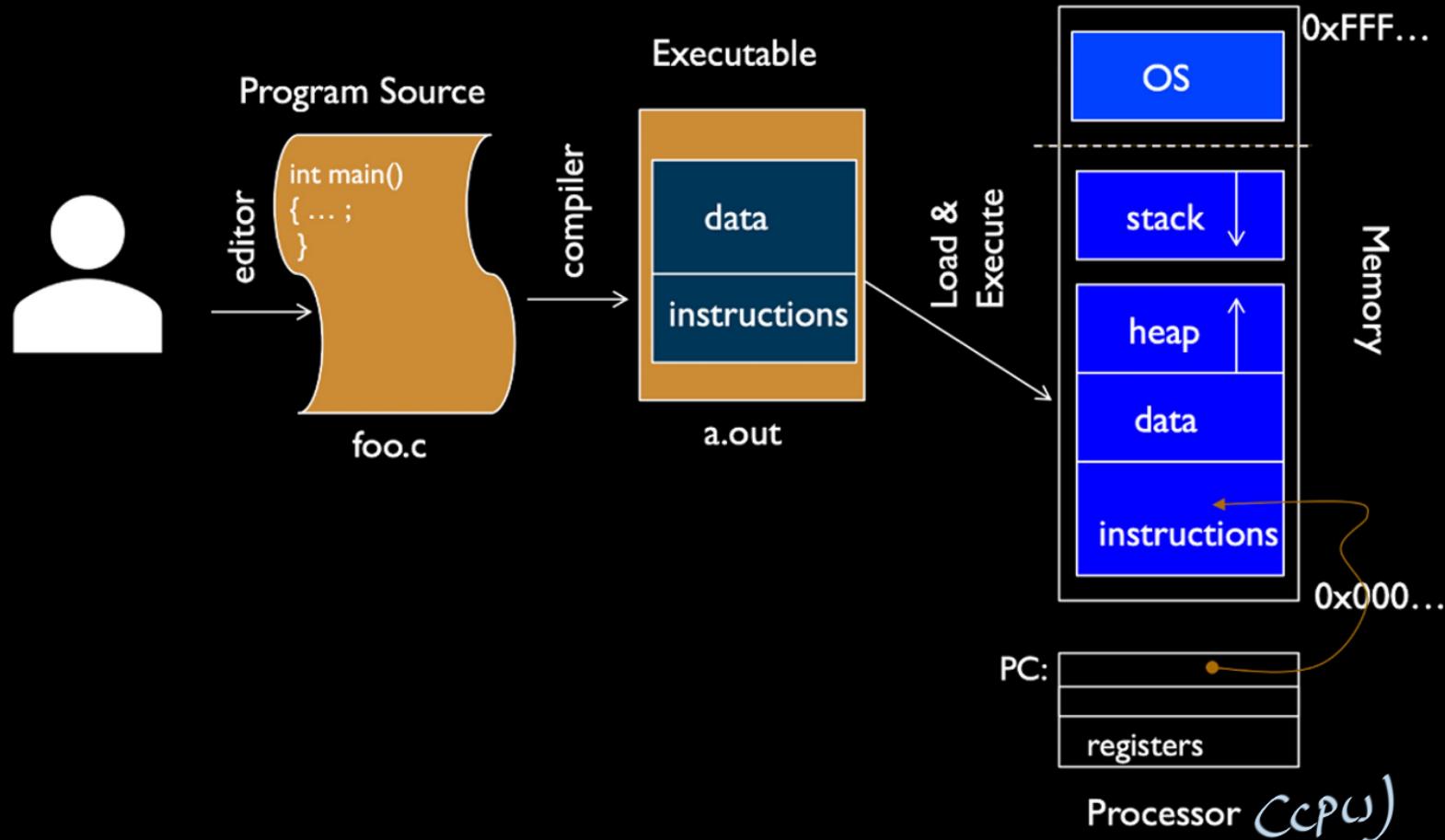








Operating Systems





The Journey of a Program

From Writing to running



50:47

The Journey of a Program | The Big Picture | Compiler, Linker, Assembler, and Loader.

938 views • 2 months ago



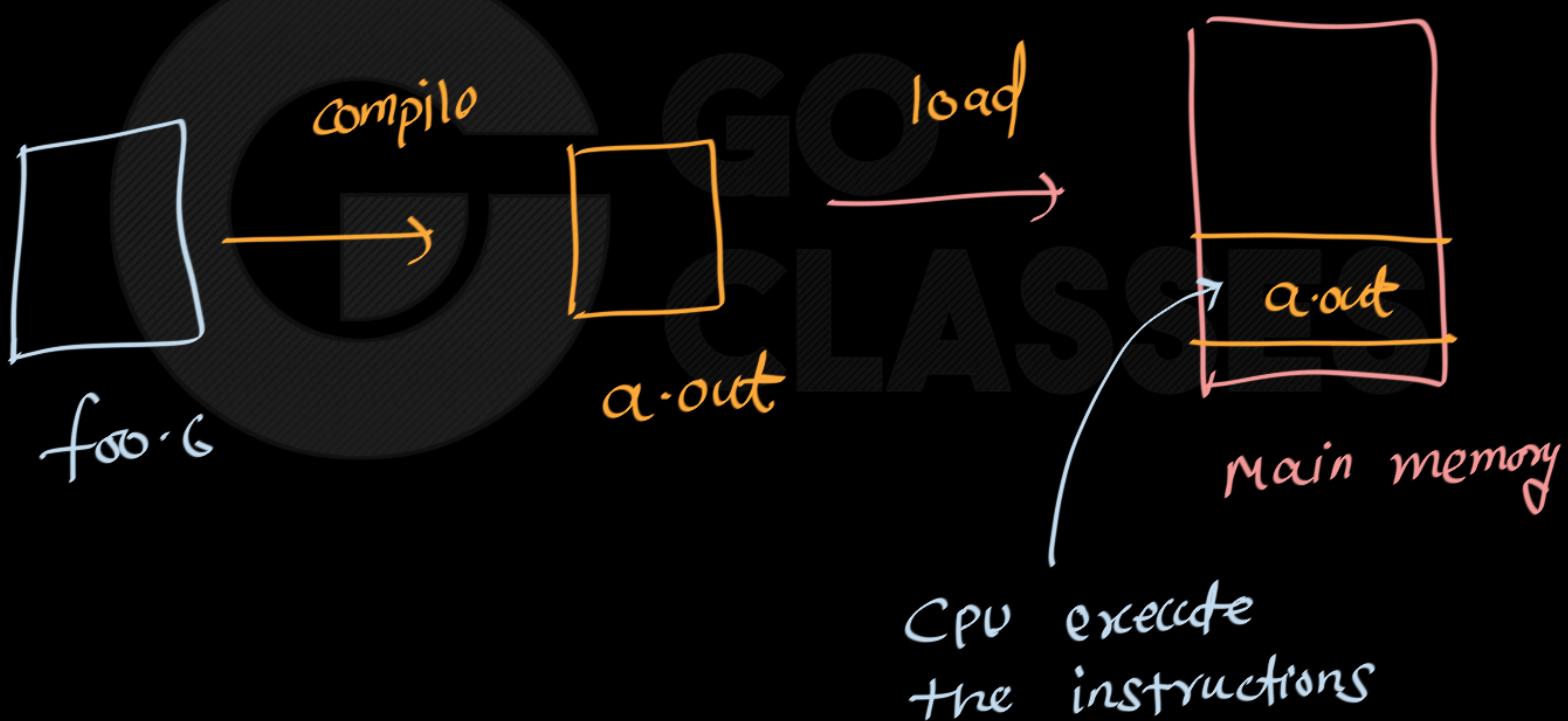
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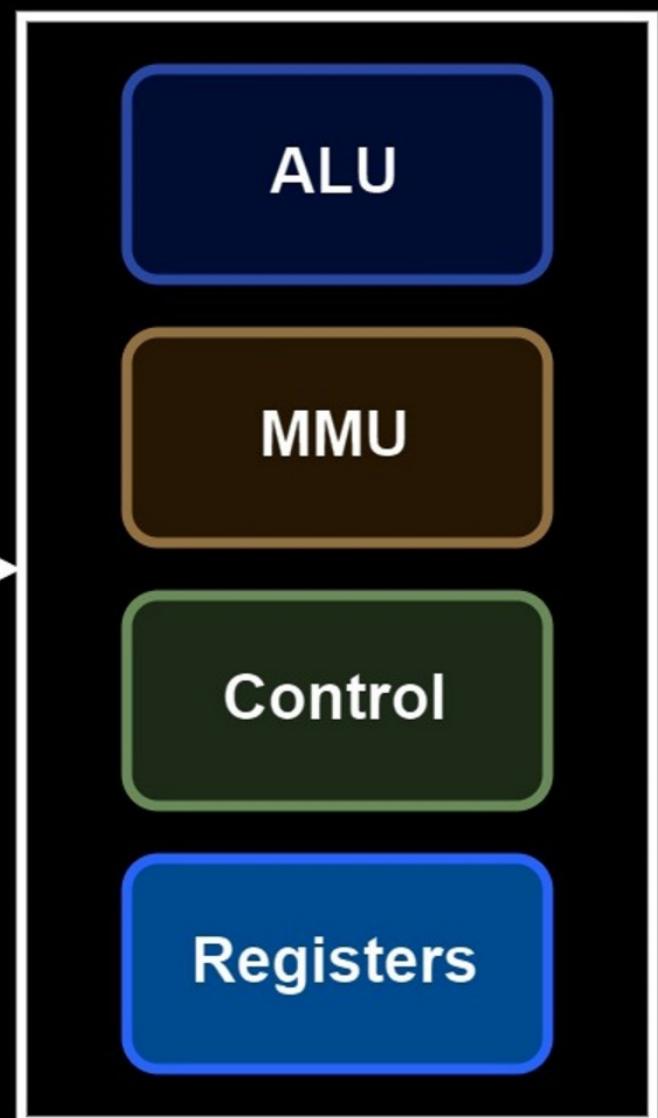
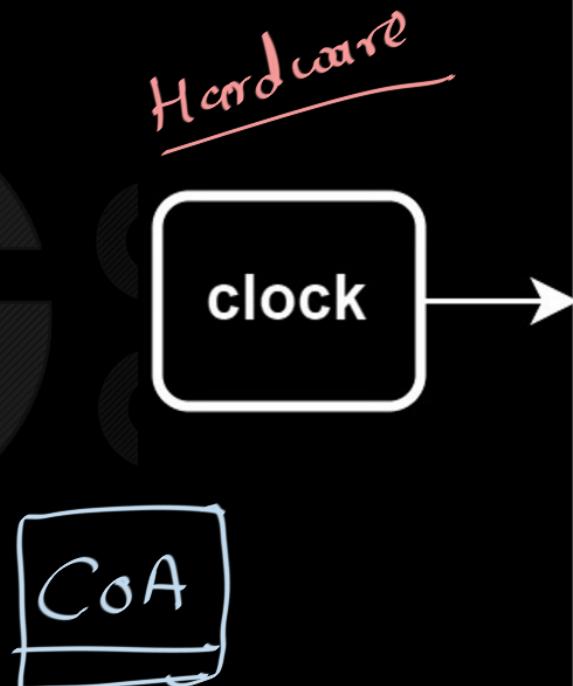
Summary

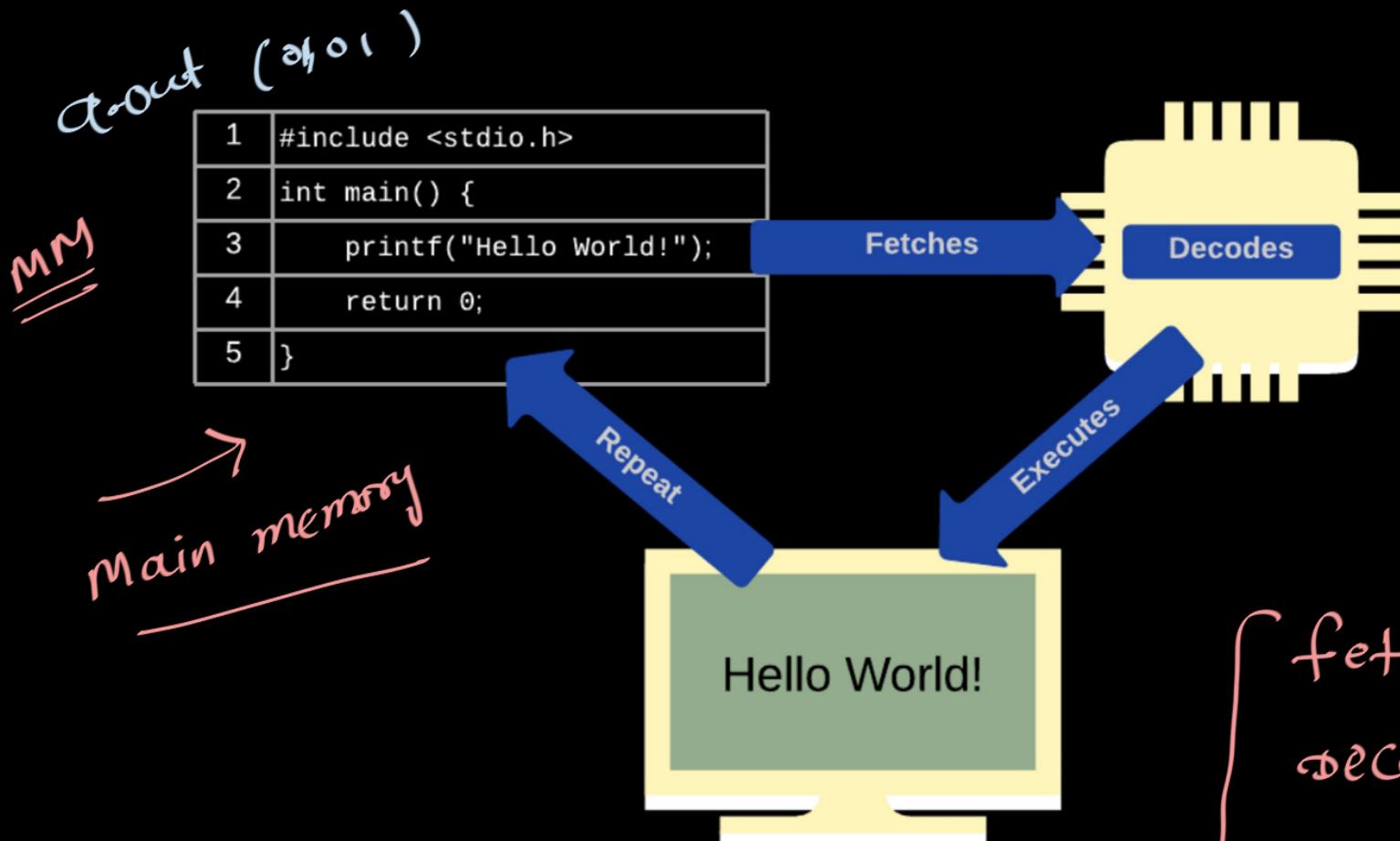




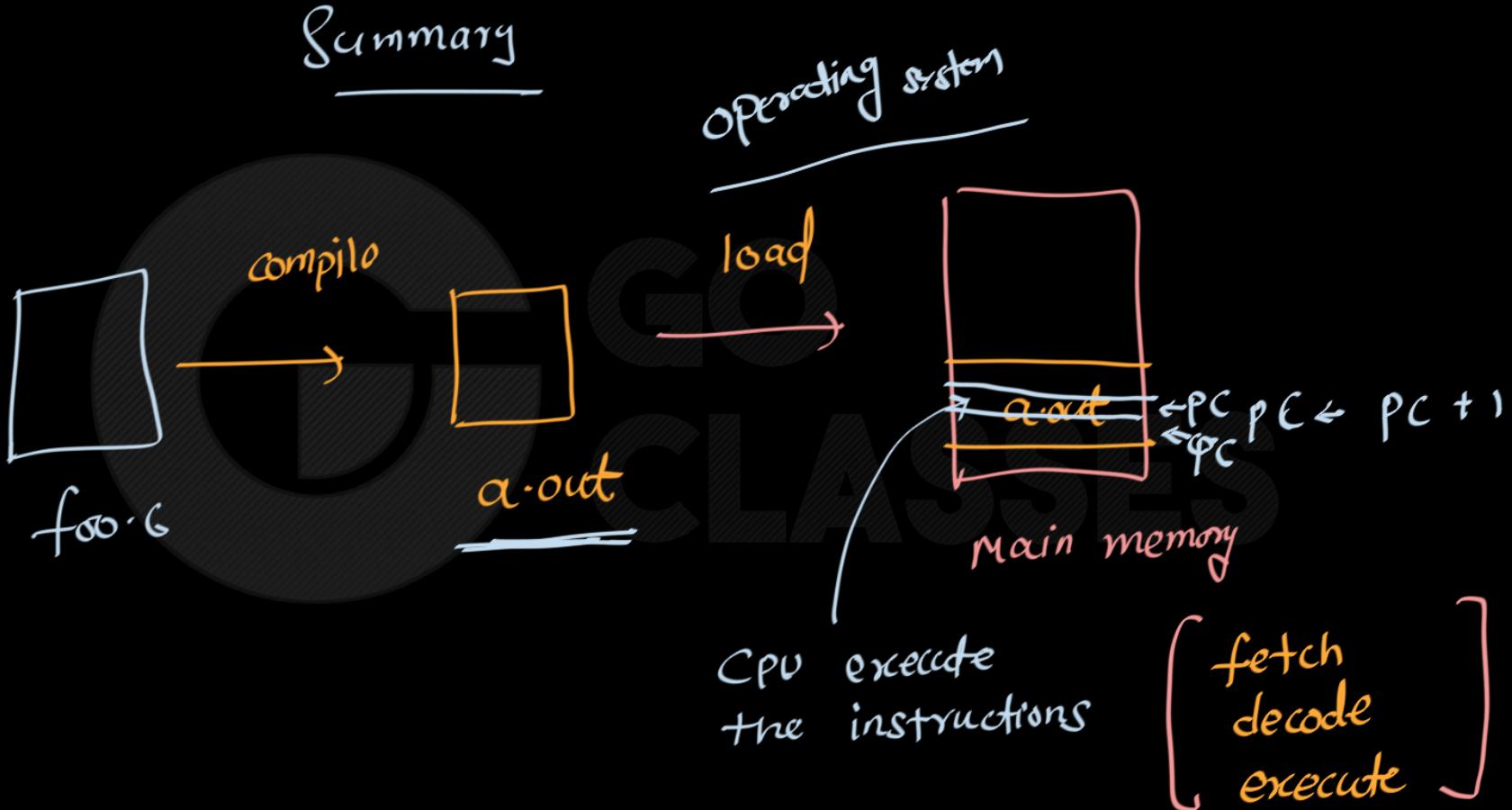
CPU or Processor

- Arithmetic and Logical Unit – addition/subtraction, logical and/or/not, if..else etc.
- Memory Management Unit – Reading and writing to the memory
- Control – Understanding code

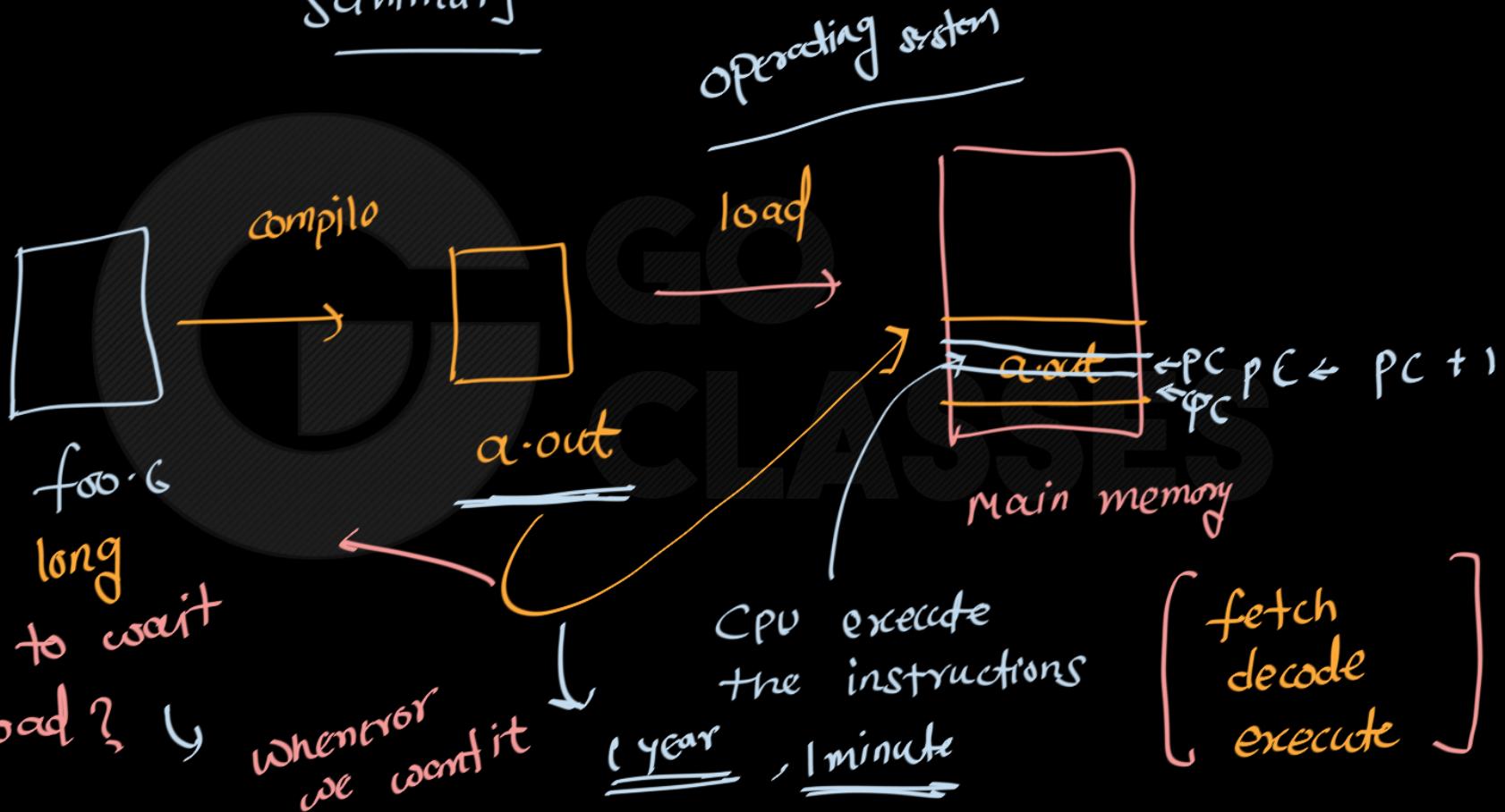




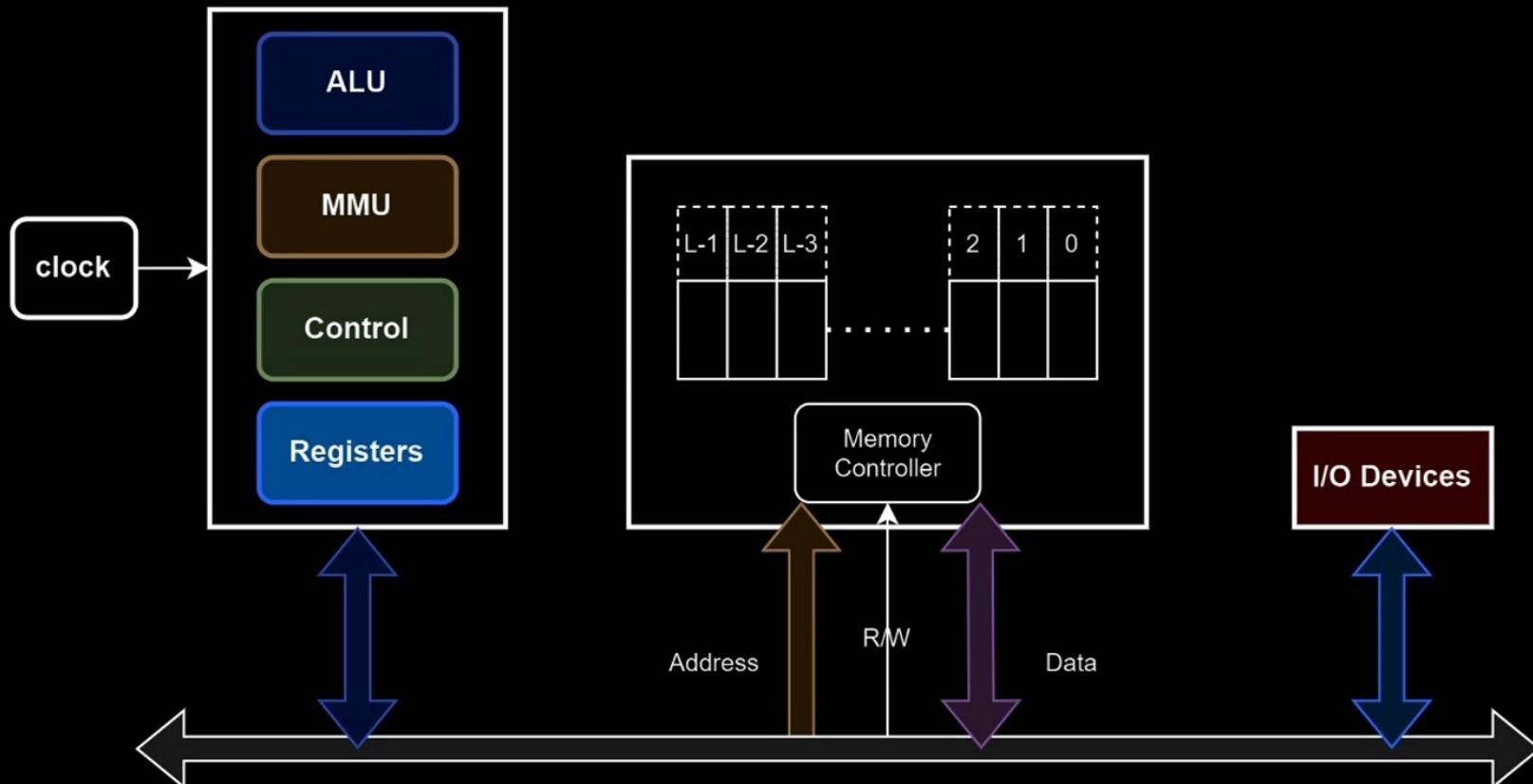
{
 fetch
 decodes
 execute
} =
inf
cycle



Summary



Hardware





Operating Systems

Running a small program on CPU

Consider following program

```
a = 1;  
b = 2;  
c = a + b;
```

without OS



a-out

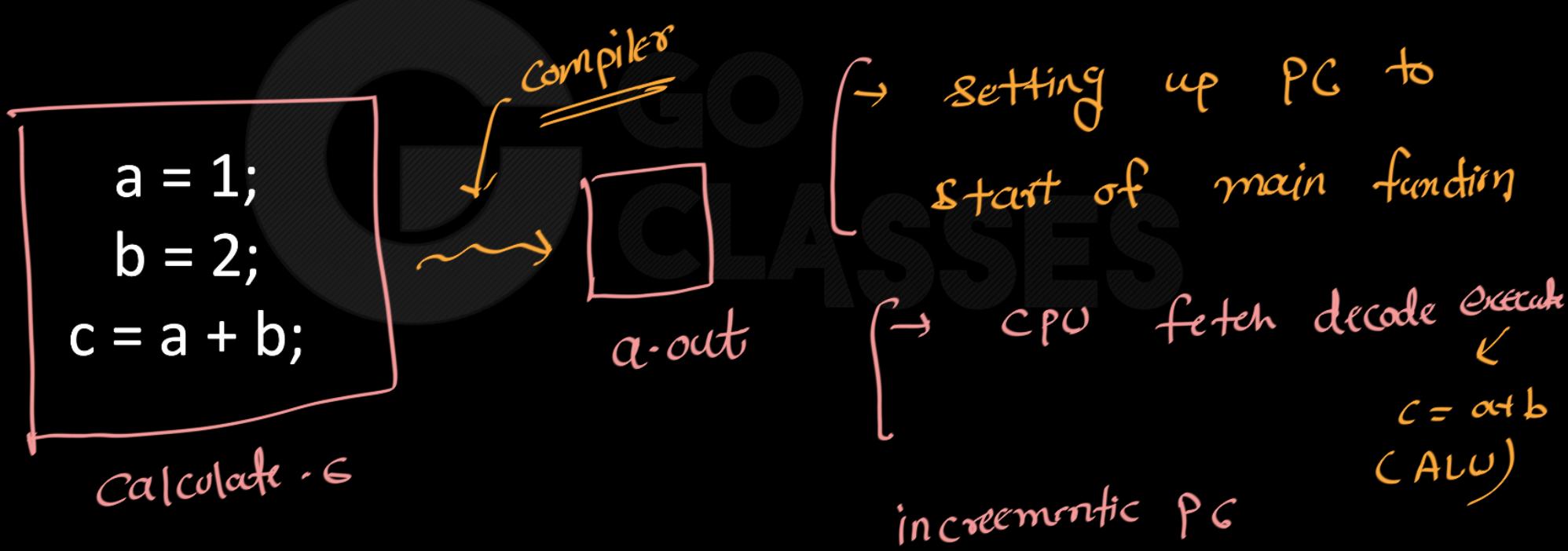
PC : is a register whose value tells next instruction to execute



Operating Systems

Running a small program on CPU

Consider following program



Why "printf" need OS support?

- because CPU does not own the monitor
- monitor is external (called I/O device)
- CPU has to take permission from monitor



print ('hello')

manually

→ initial pc setup

→ fetch decode execute

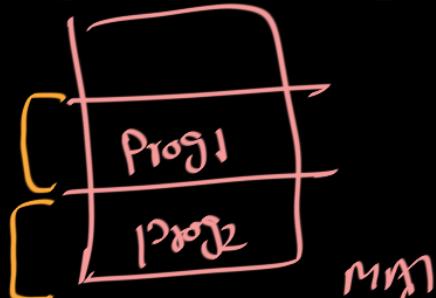
→ manually grant permission

to monitor

→ $pc = pc + 1$

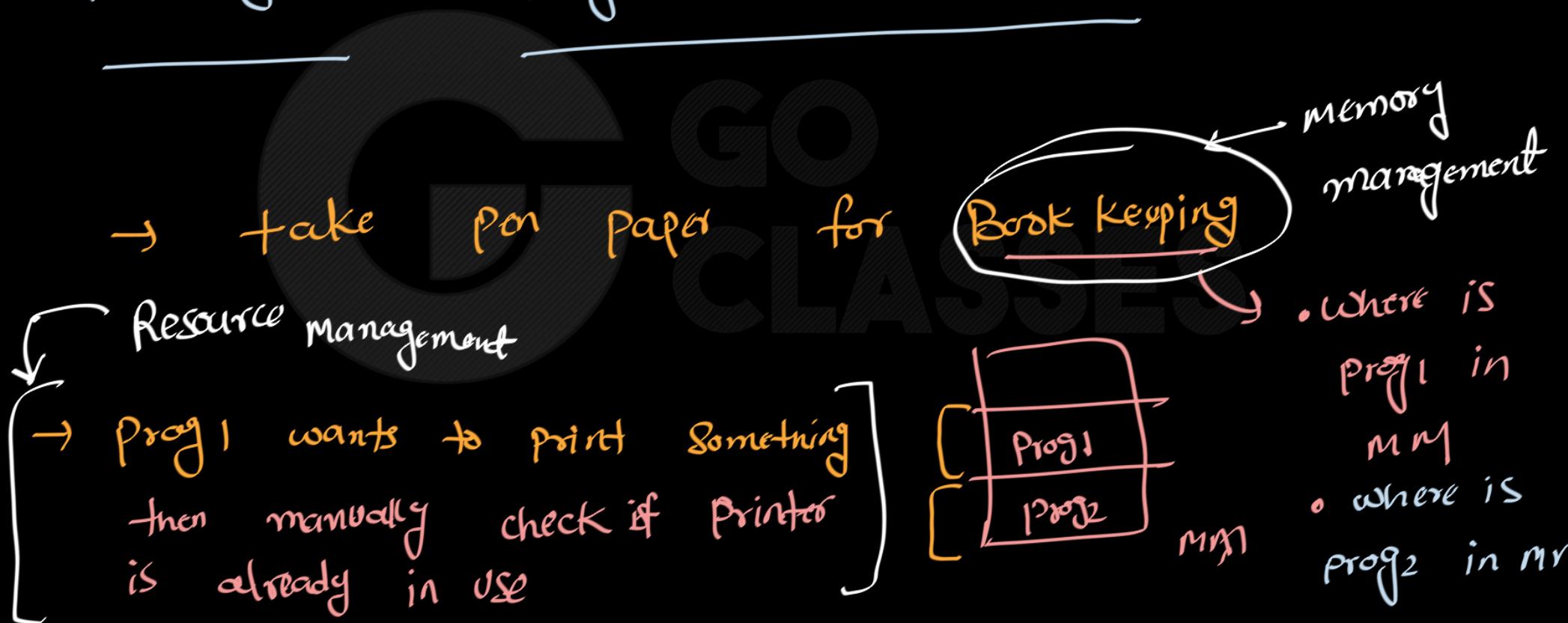
Running 2 Programs without OS.

- take paper for Book Keeping
- Prog1 wants to print something then manually check if printer is already in use



- where is prog1 in mm
- where is prog2 in mm

Running 2 programs without OS.



All of these things we just talked about

are not limited to any special person
(superman)

→ All of these tasks are general things
that every user wants to do.

master theorem

$$T(n) =$$

GO
 $\alpha T(n/b) + f(n)$
CLASSES

$$n^{\log_b a} \Leftrightarrow f(n) \quad T(n) =$$

why need OS?

-
- manually too hectic
 - these tasks are very very common task
 - even if we ask users to do it manually then first they need to become computer scientist.



Running a small program on CPU

```
a = 1;  
b = 2;  
c = a + b;
```

To run this we need to do following

1. Write this program into some memory with address **P**
2. Tell CPU that your program is located at some address **A**. This can be done by setting program counter (PC) to A.
3. CPU runs the program using fetch-decode execute cycle
4. Program ends and you get the results



Operating Systems

Now you know why we need an OS

what OS do ?

→ Manage

Memory

→ manage

Resources (I/o devices)

→ manage

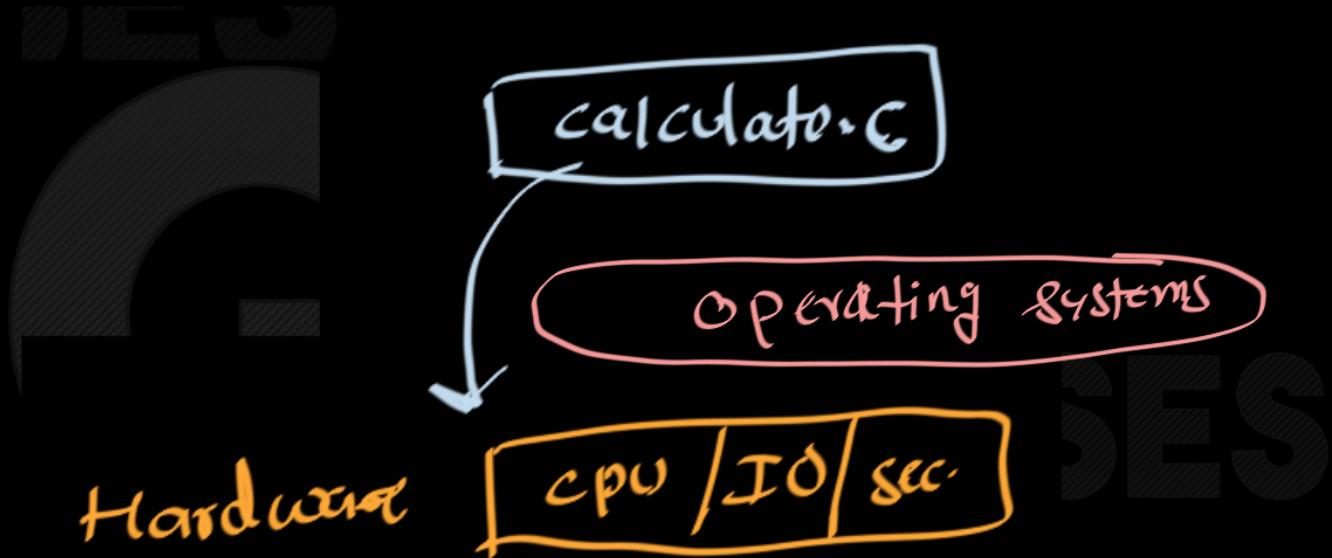
file system.

Making life easy

calculator.c

Hardware

cpu / I/O / sec



Now you know why we need an OS

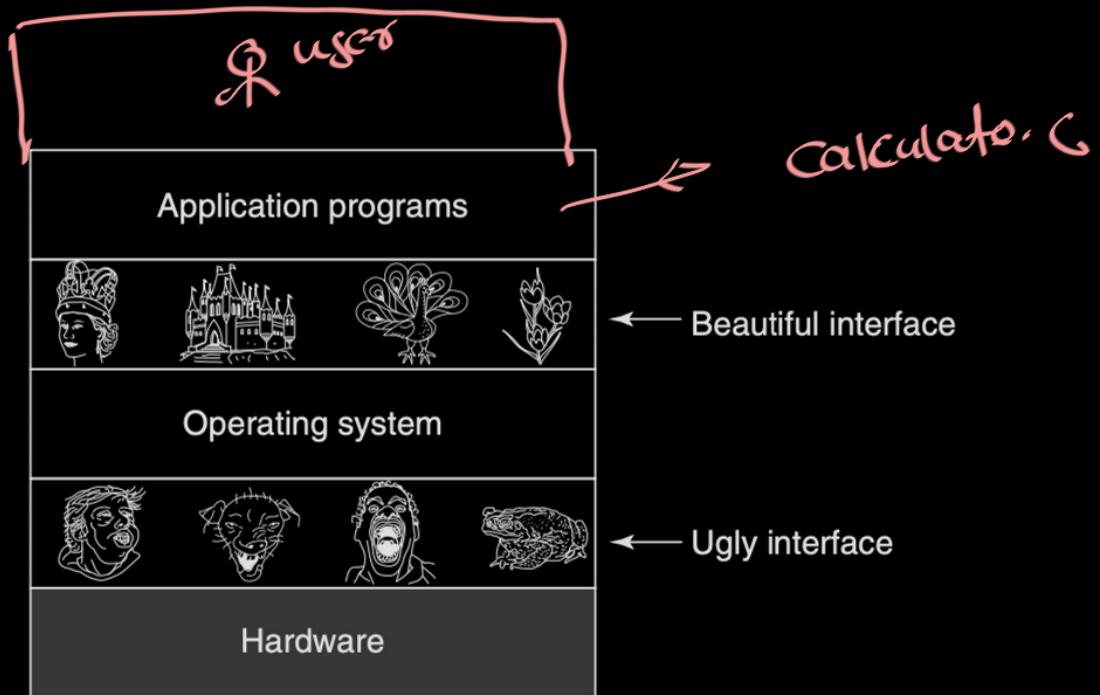
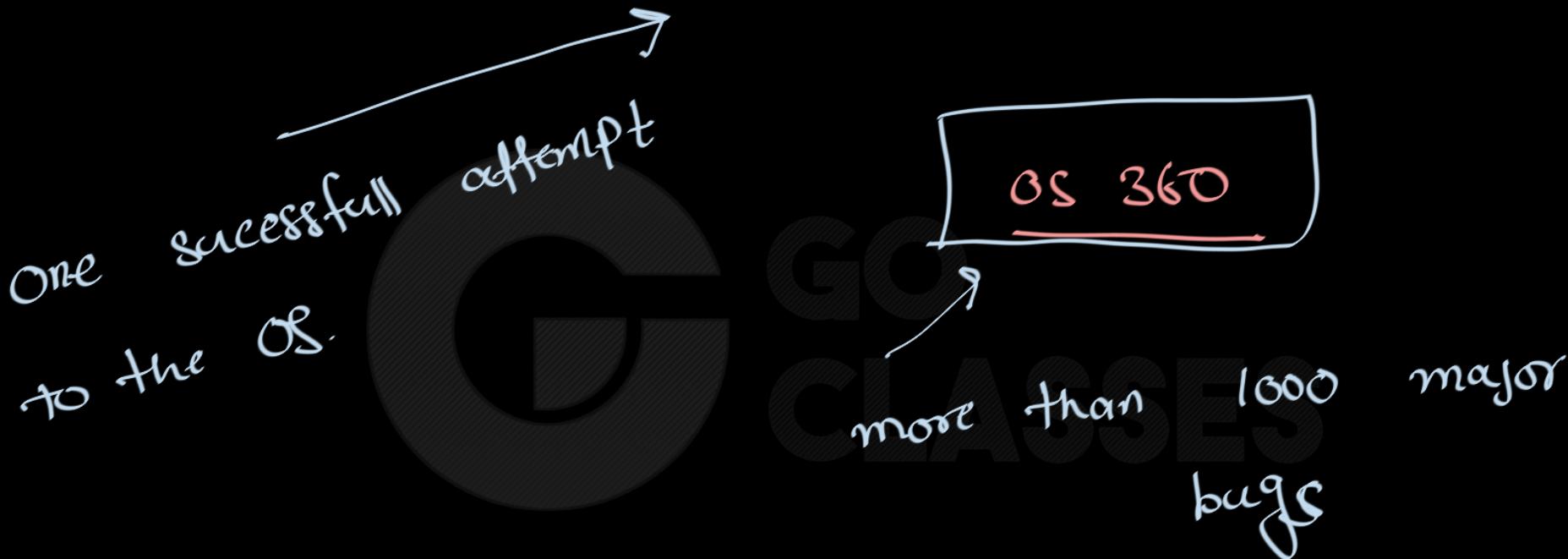


Figure 1-2. Operating systems turn ugly hardware into beautiful abstractions.



The First Version of UNIX





The First Version of UNIX

- 2 to 3 people developed it
- took too in 2 to 3 years

unix inspired =>

windows
mac
linux

Executable
file name

\$ browser
Shell

OS

after you put the
file name then
OS will search
for the file
inside secondary
Storage and will load
to main memory.

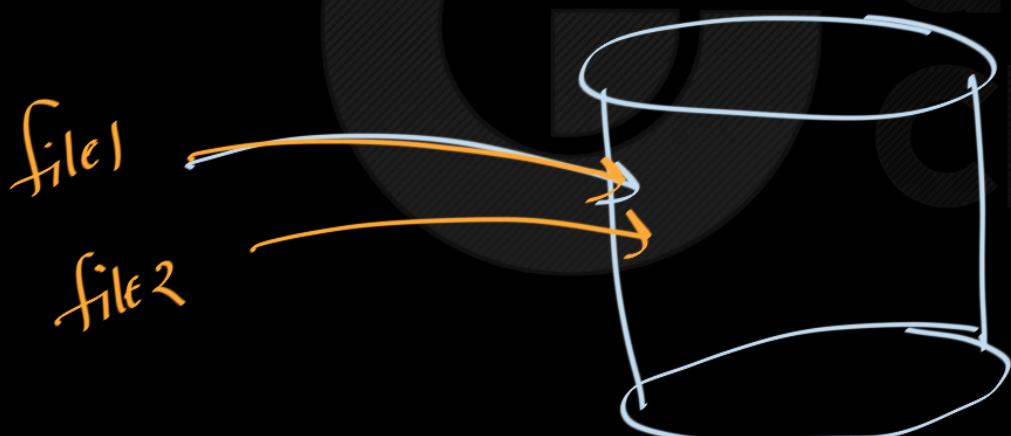
OS is responsible for

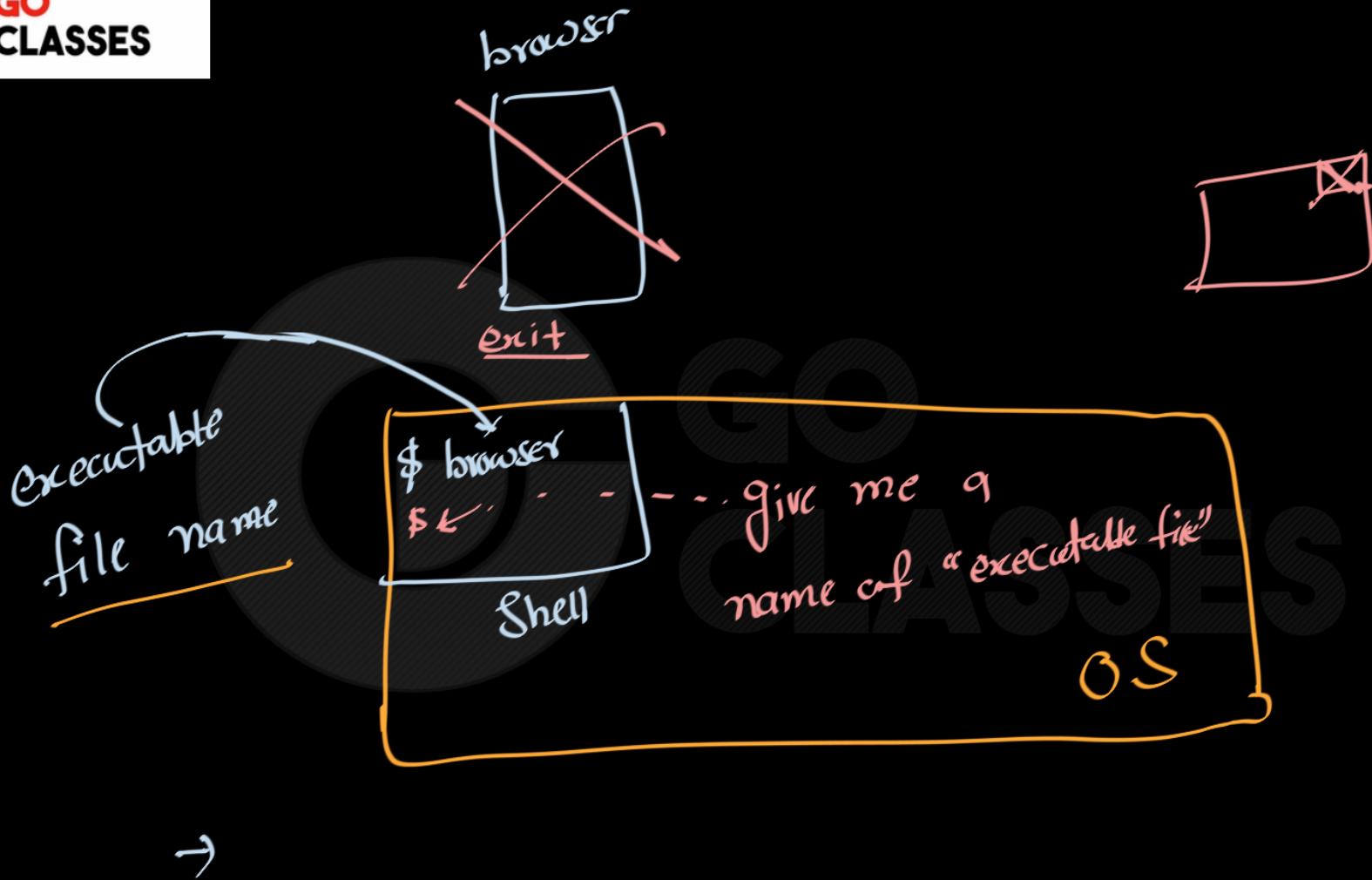
→ how to store file

→ contiguous

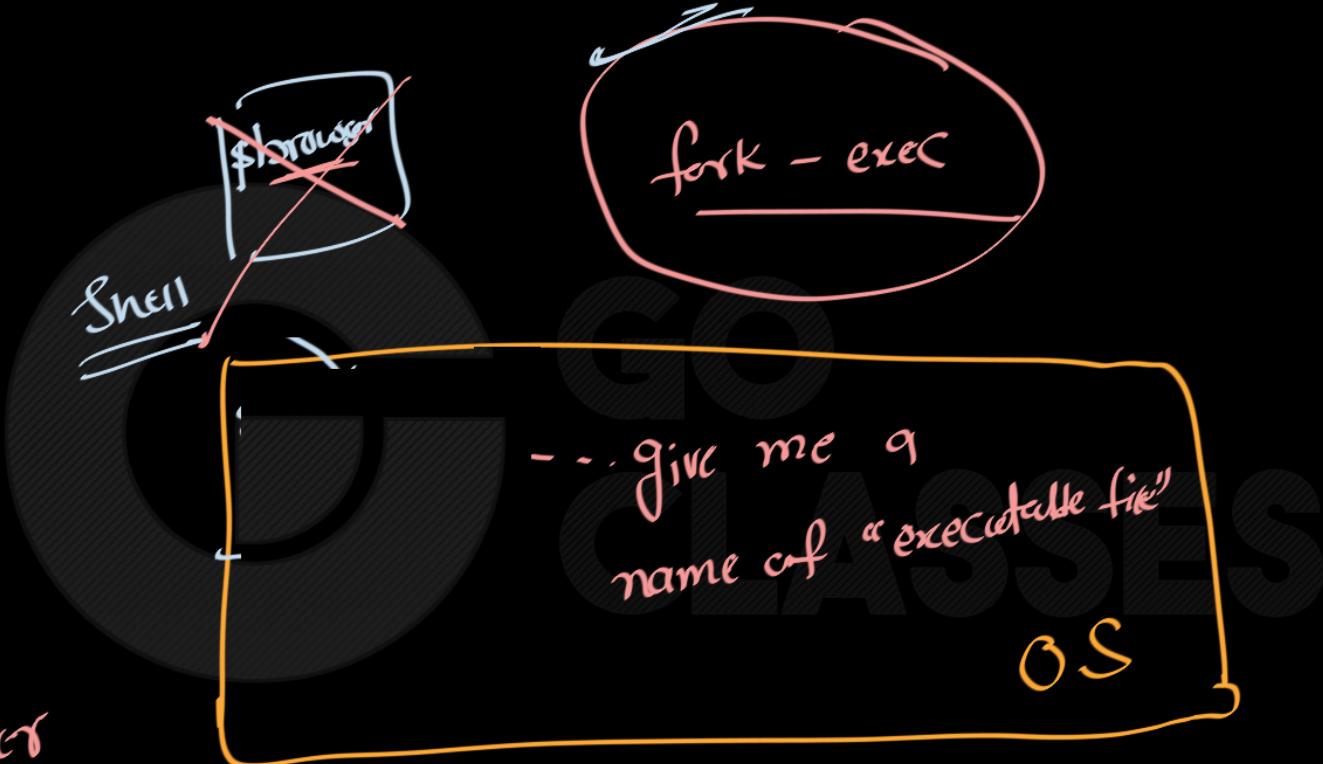
→ non-contiguous

→ where is file 1





kill shell
run browser
exit browser
again run shell





What should be there in an OS ?

- Memory manager
- security
- file management
- process management

{ if you have only
one CPU then
you can run only
one process at a
time



What Operating Systems Do

(slide from
Gralvin)

We can also view a computer system as consisting of hardware, software, and data. The operating system provides the means for proper use of these resources in the operation of the computer system. An operating system is similar to a government. Like a government, it performs no useful function by itself. It simply provides an *environment* within which other programs can do useful work.

→ Security

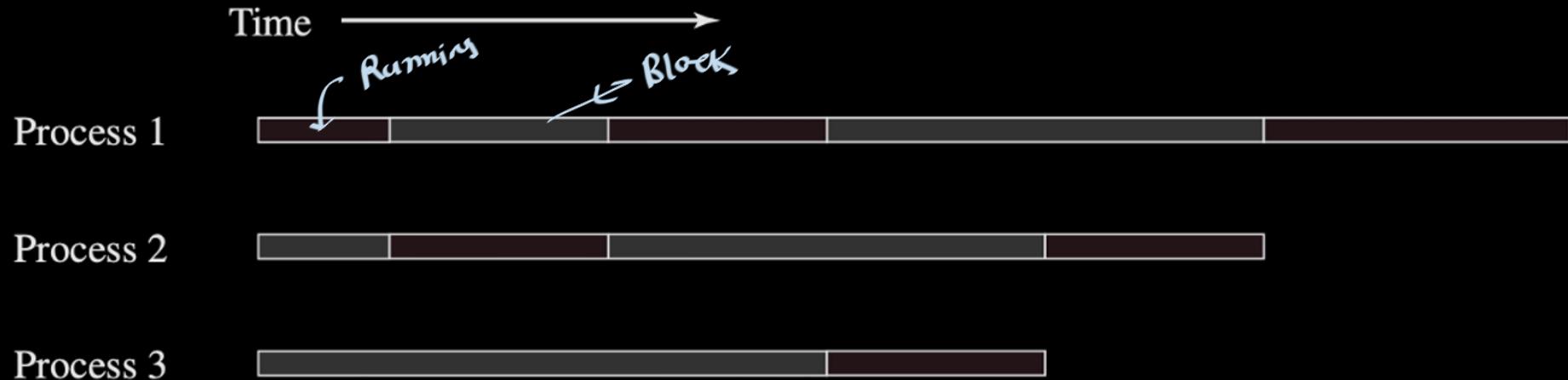
→ managing resources

→ Tax → the government

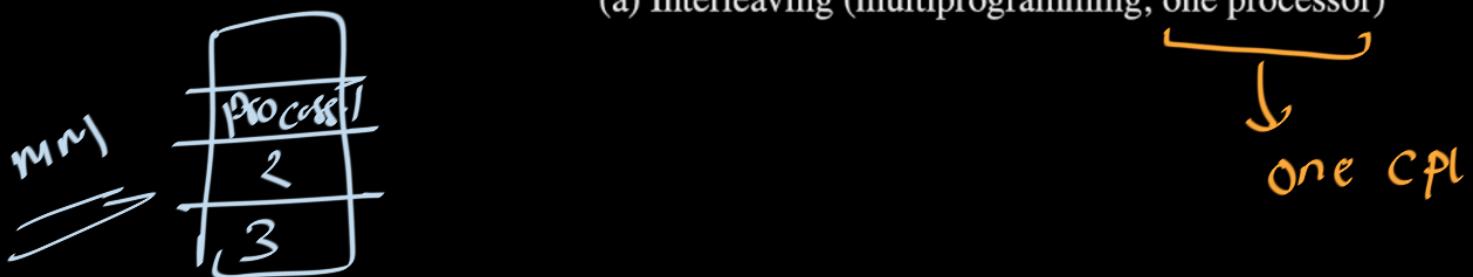
Complex functions lead to overhead



Operating Systems



(a) Interleaving (multiprogramming; one processor)



OS → it provides virtualisation

