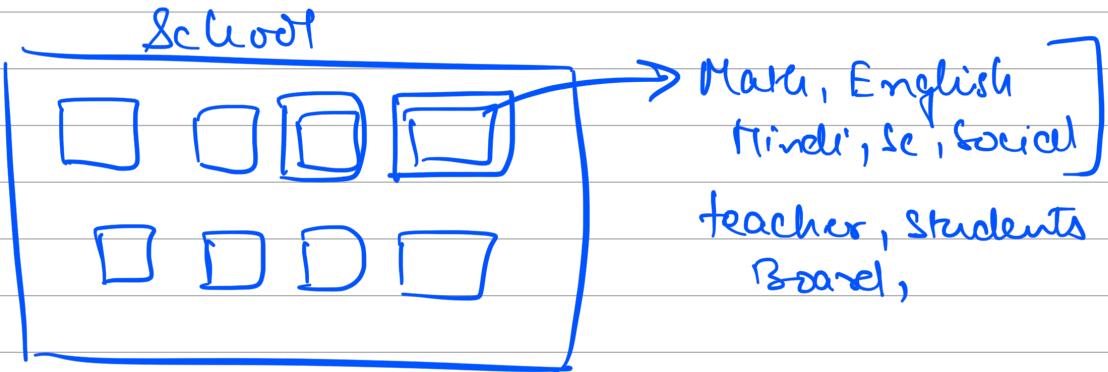
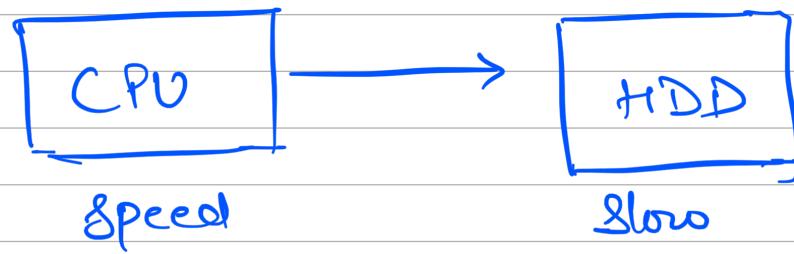


Agenda

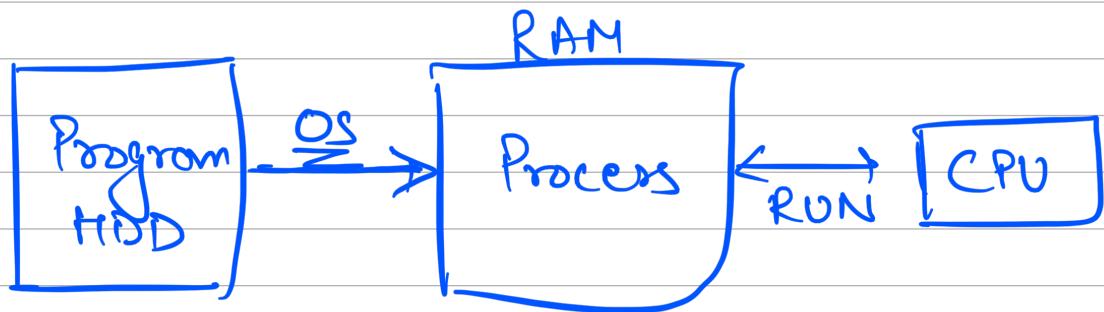
- ① Process
- ② Threads



⇒ Program in an execution is called PROCESS



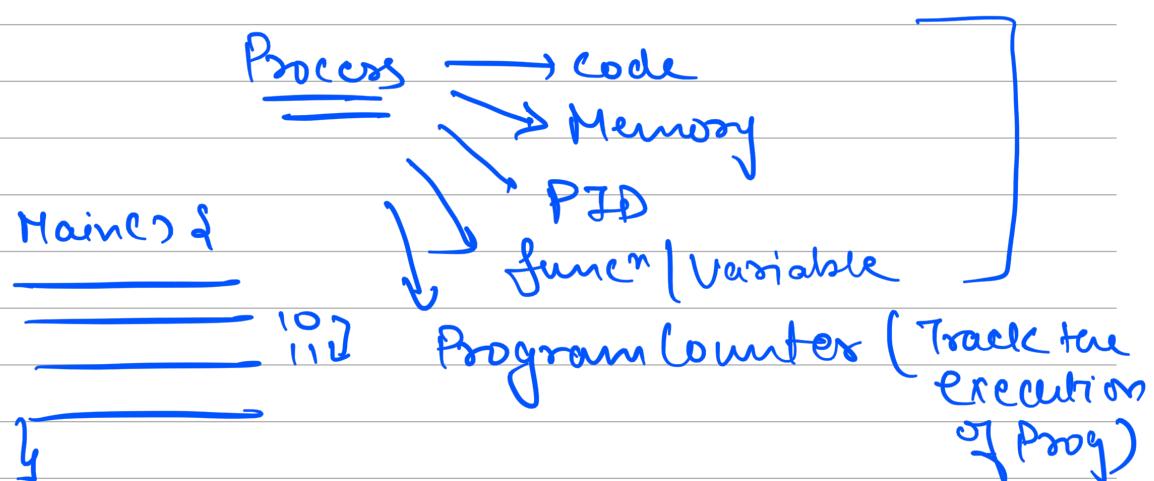
⇒ CPU can't talk to HDD directly due to speed difference.



{
· .exe windows
· .dmg Mac
· .apk Android



We download a program & as soon as we run the prog., OS brings the prog from HDD to RAM & it becomes Process



PCB (Process Control Block)

It stores all the info. related to a process

⇒ Each process have its own PCB

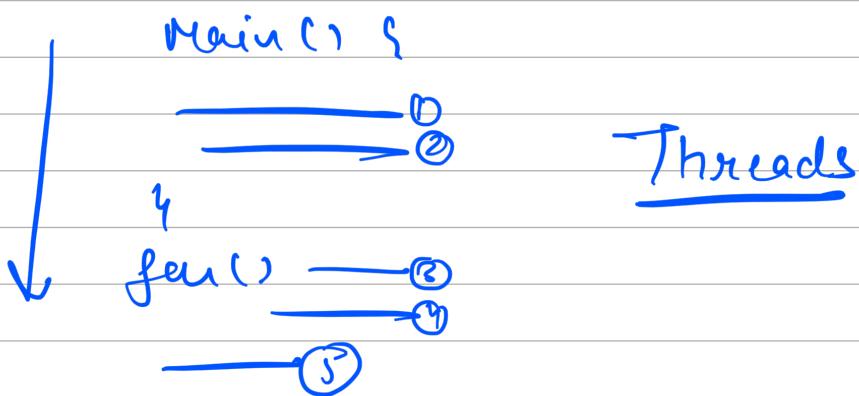
[Word Processor (Google Doc)]

"Text, hi, how's going"

→ Autosave
→ Grammar Check
→ Auto suggestion
→ Indentation
→ Check
→ Spell

for update ✓ check

z) All the features are running in parallel

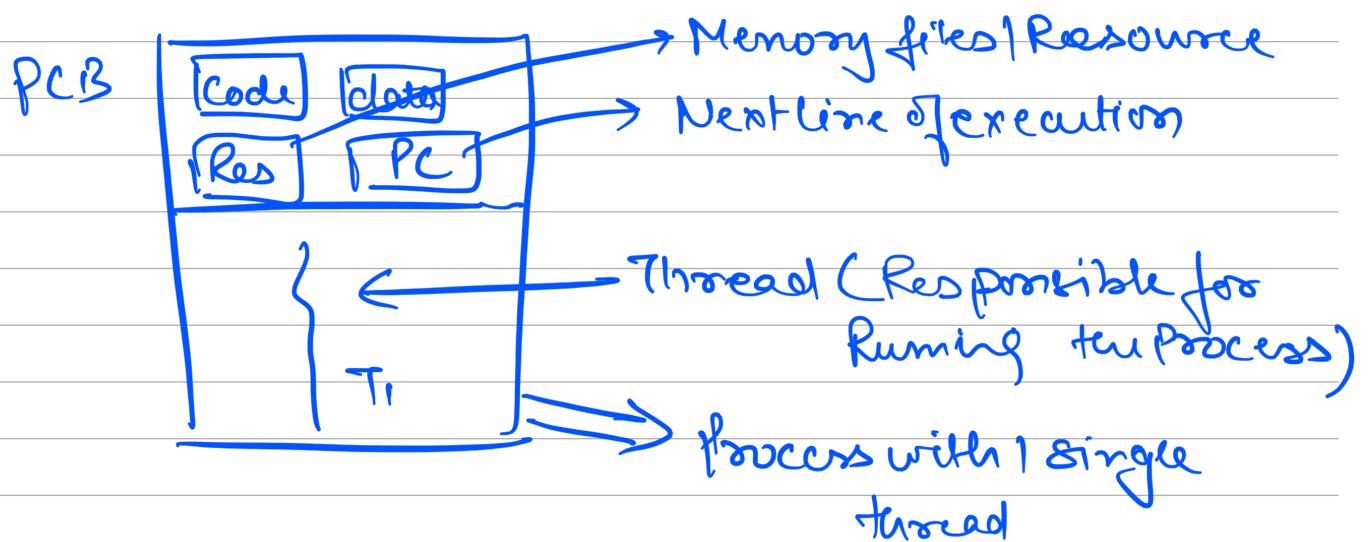


Thread: unit of execute

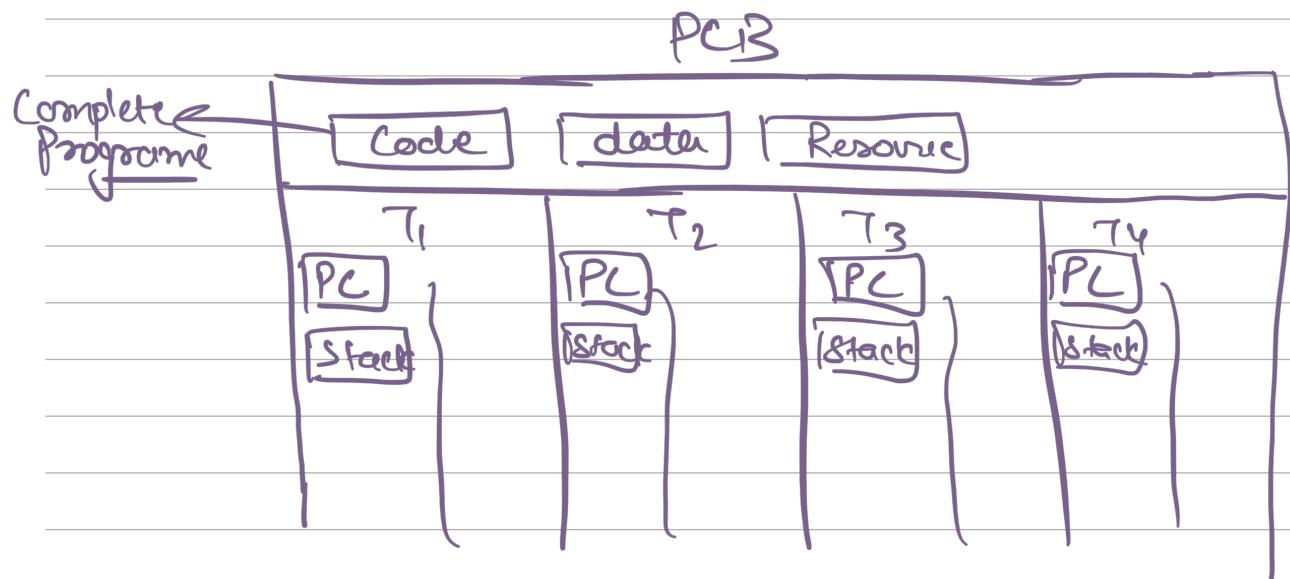
↳ CPU executes thread

↳ Whenever anything is running on a machine
CPU runs a thread which actually runs
the code

Program with just Main → single threaded process



Multithreaded System



z) CPU will run threads in parallel

Process vs Threads

① Process don't share code

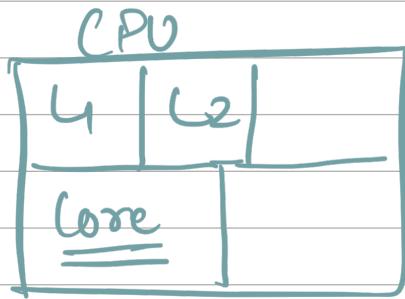
② Data sharing; All threads share the data such as code, etc for a process but process can't access each other data

↓
IPC (Inter Process Communication)

③ Process will take more time to start

④ Process will take more memory

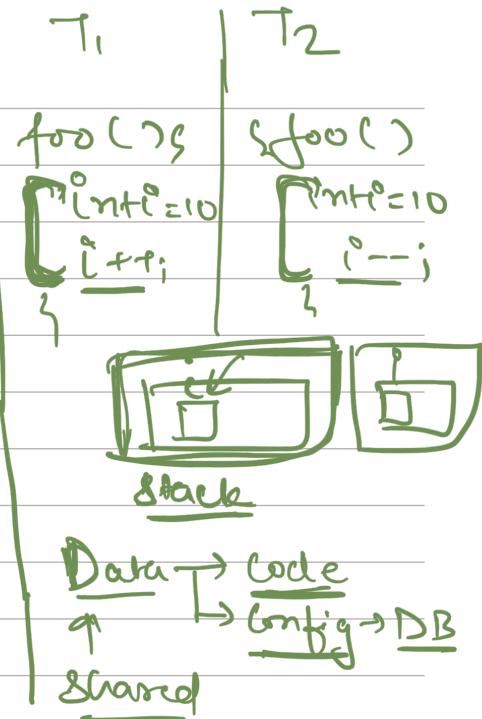
Multi vs Single Core



Core executes one thread
⇒ single core CPU

How many threads can run parallelly = 1

Everything is sequential



CPU Scheduler → Assigns thread to CPU (Core) for execution.

- ↳ FIFO
- ↳ Priority
- ↳ Round Robin

⇒ One Core Can execute 1 thread at time

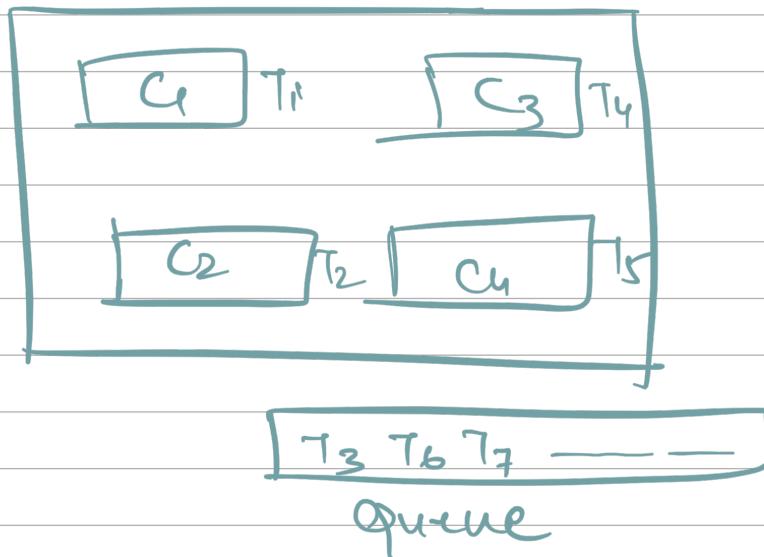
$$\text{Speed} = \frac{2.5 \text{ GHz}}{2.5 \times 10^9 \text{ operation per second}}$$

1 Program = 1 Million = 10^6 operations

$$\text{Program} = \frac{10^6}{2.5 \times 10^9} = \underline{\underline{\text{u ms}}}$$

to complete

Modern CPU



Each core is independent & can execute threads in parallel.

Threads can be of diff process.

Q) OS is assigning the threads based
CPU Scheduling Algo (CPU Scheduler)

Concurrency vs Parallelism

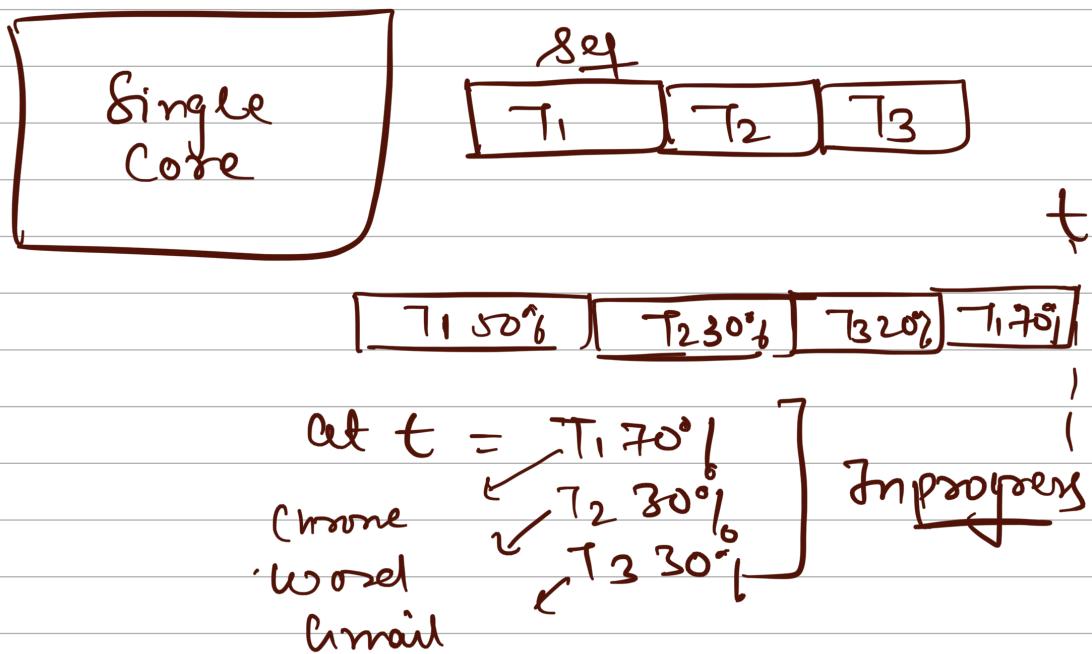


T₁ = In progress

T₂ = In progress

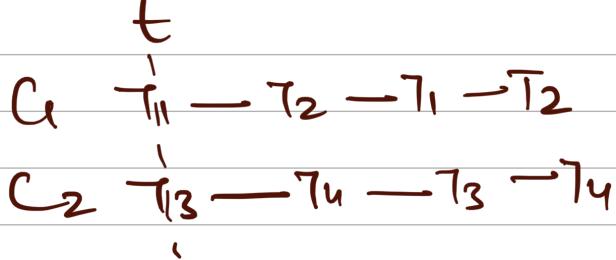
Concurrency: When a system have multiple threads in different stage of execution (In progress) at

Same time, does not necessarily
making progress in parallel



Multiple things are happening in the system but not running parallelly

Parallelism: Currency + making progress parallelly.



at t = T₁ and T₃ are executing parallelly

Steps to create a Thread

Q Print "Hello world" from a different thread

Step① Identify the task - Print HelloWorld

② Create a class for each task

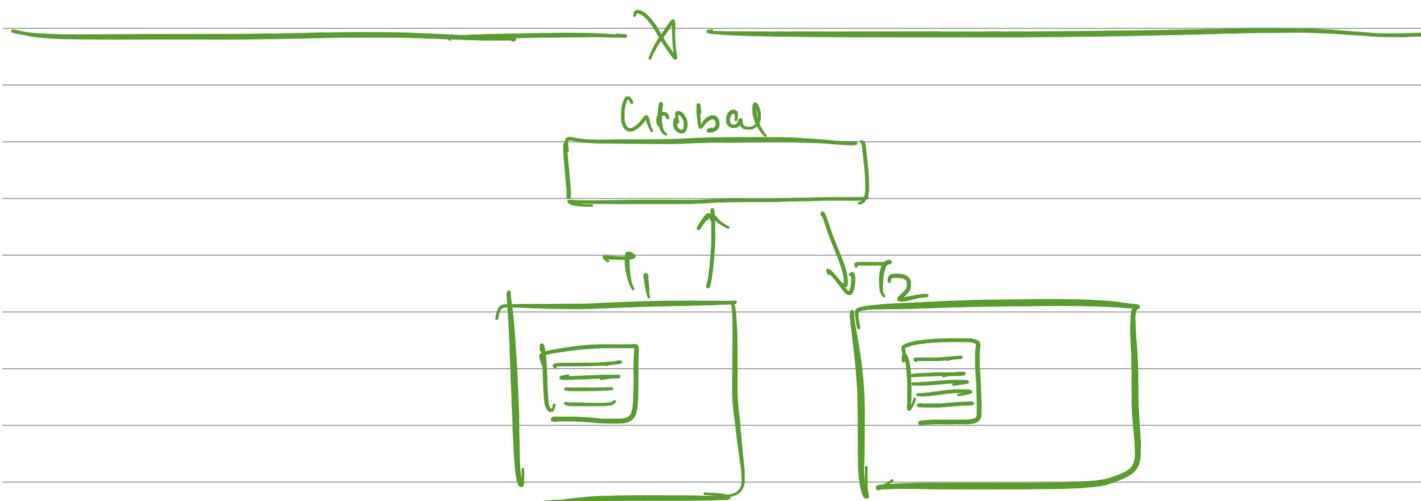
③ Make this class implement
"RUNNABLE" interface or extend Thread

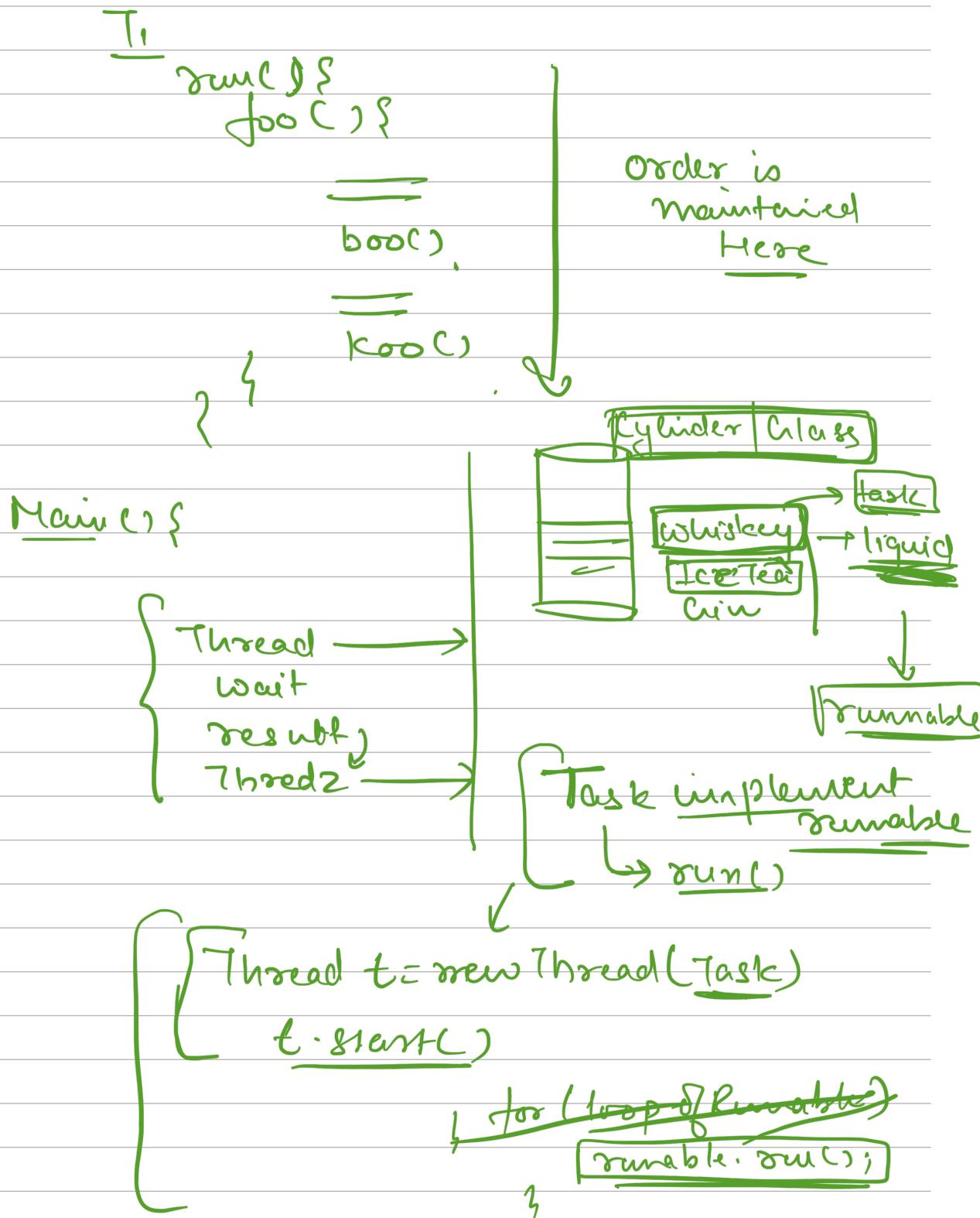
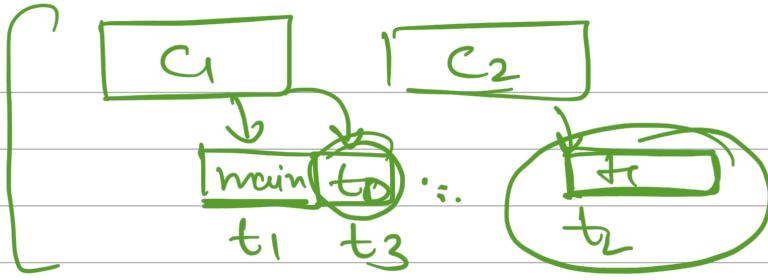
④ Implement RUN() method.

& Write the task code in run() method
which you want to execute.

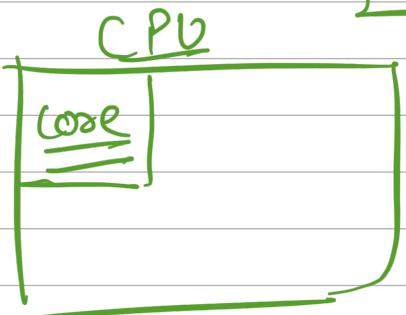
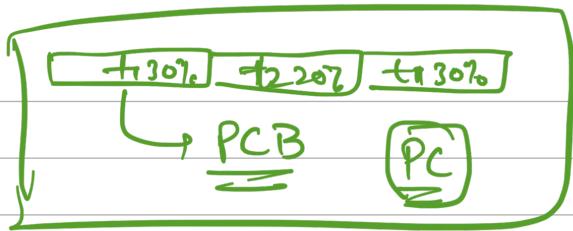
⑤ Create a object of Thread Class
from where you want run the
task in different thread and
pass the object the task to it.

⑥ Start the thread.





Single Core



Core