<u>Today's Agenda :-</u>

1) <u>Executors</u> & Thread pools

2) Callables

3) Adder Subtractor (A sync problem)

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1 to <u>100</u>

100 thread

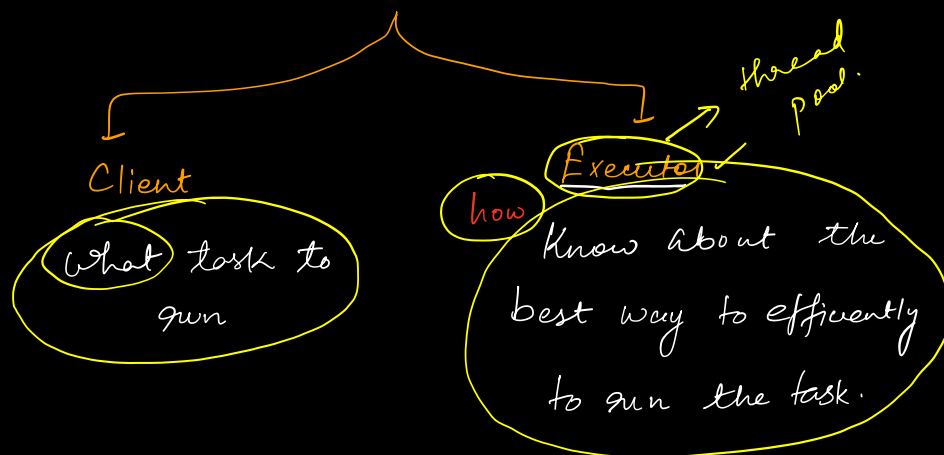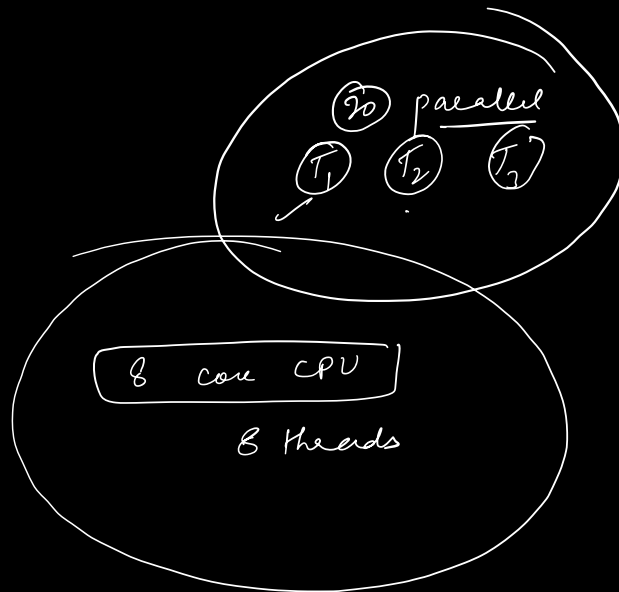10 prod lines   <u>10 orders/day</u>   <u>11 orders</u>
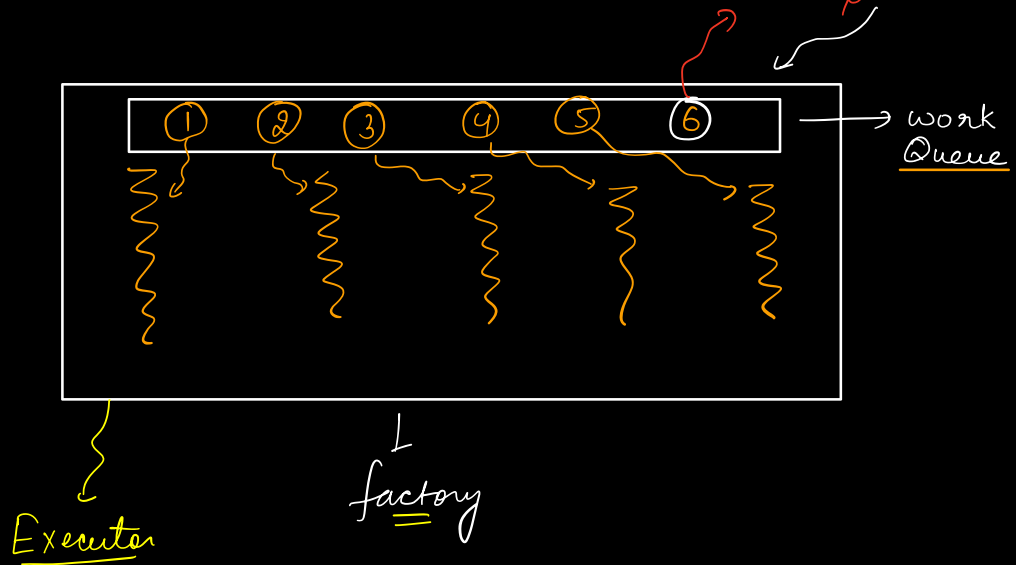

]

1 car   ↳ <u>10 cars</u>

Server

4 & 4 core CPU
=

Client

Creating   Creating
the   the thread
task   and allocating.

⊥
S O L I D
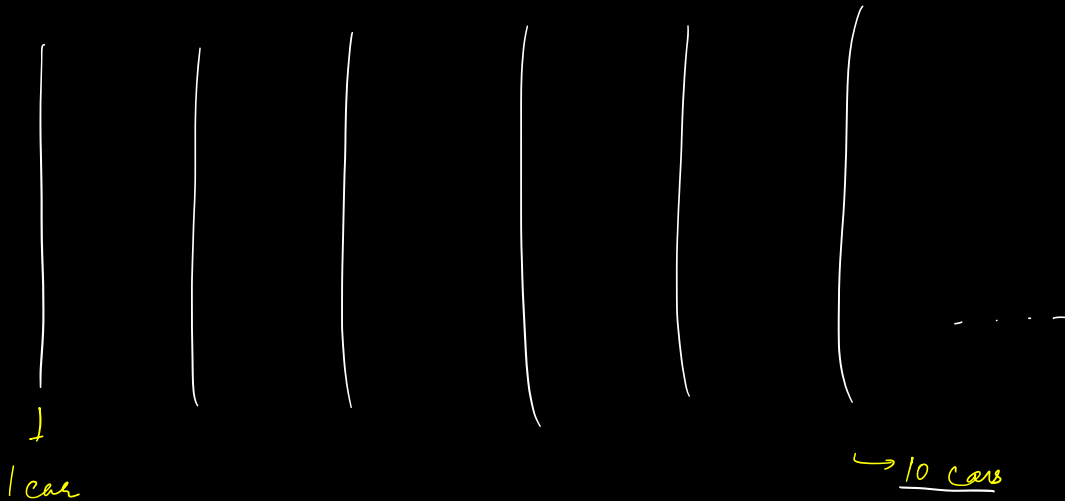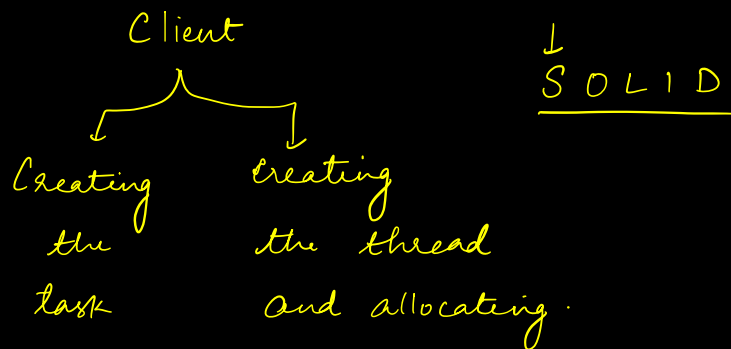
Executor framework :- Dividing the reneopensibil-
in 2 parts

Client
What task to
run

Executor ✓
thread pool.
how
Know about the
best way to efficiently
to run the task.

Thread pool :-

(5)

wait for a thread to be free.

1 2 3 4 5 6 → work Queue

↓ factory

Executor

(30) parallel

T_1 T_2 $T_?$

8 core CPU
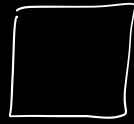
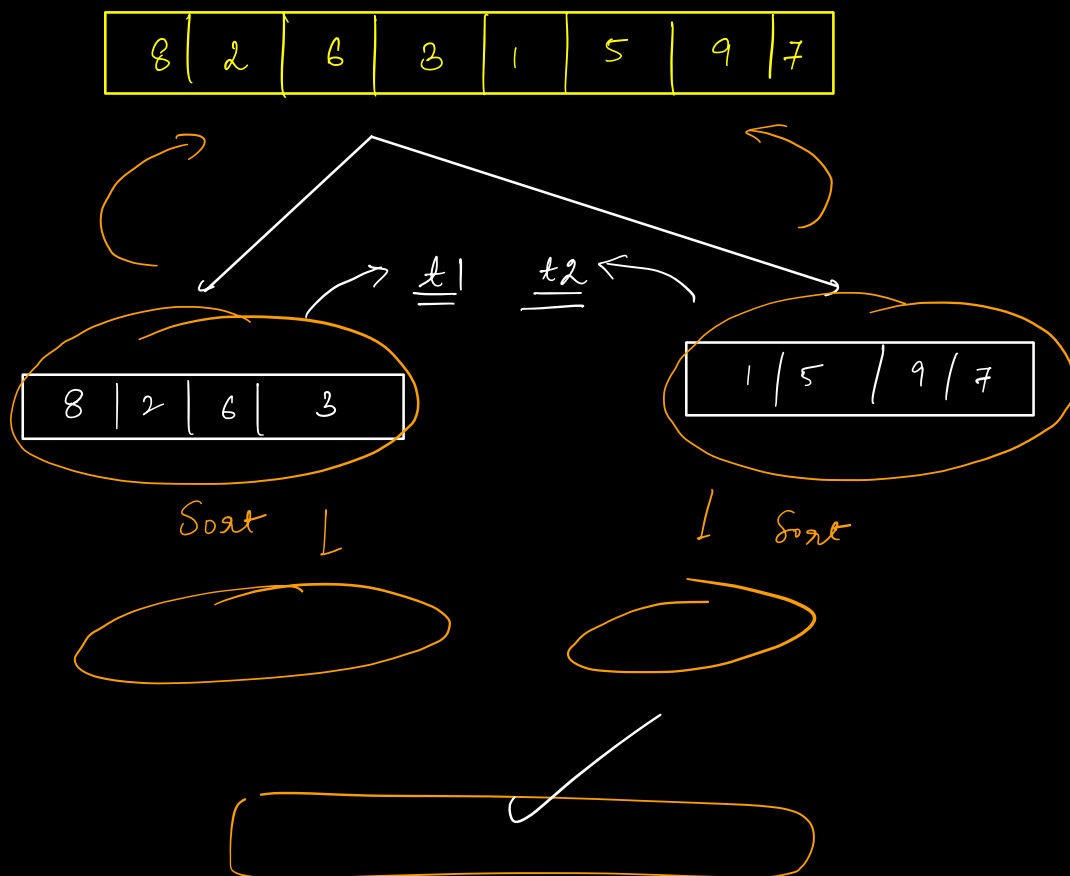8 threads

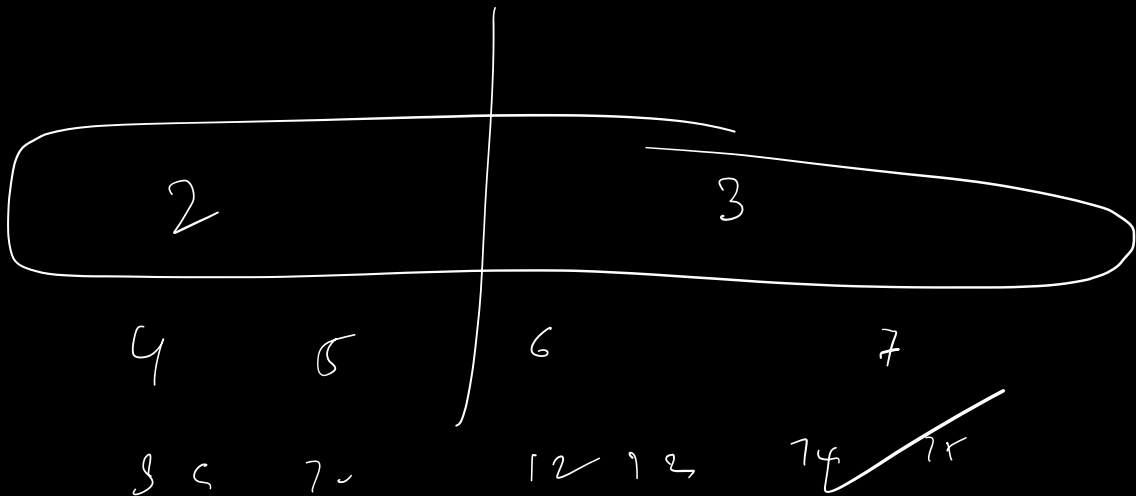Callable = Runnable + Return the data

Merge Sort :- (Divide & Conquer)

| 8 | 2 | 6 | 3 | 1 | 5 | 9 | 7 |

t1   t2

| 8 | 2 | 6 | 3 | | 1 | 5 | 9 | 7 |

Sort   L   L   Sort

Multi-threaded Merge Sort :

Generics ~~Ignore~~

Placeholder

interface **callable**

(T) call → Generic

} any data type can be replaced here.

Sort

Sorter task

1 2 6 5 8 2 8 9   t0

t1   t2

1 2   6 5   8 2   8 5

t3   t4   t8   t9   10

t7

1 5

t5   T
             t6

| 2 | 3 |

4   5   6   7

8 5   7-   12 12   74 / 75
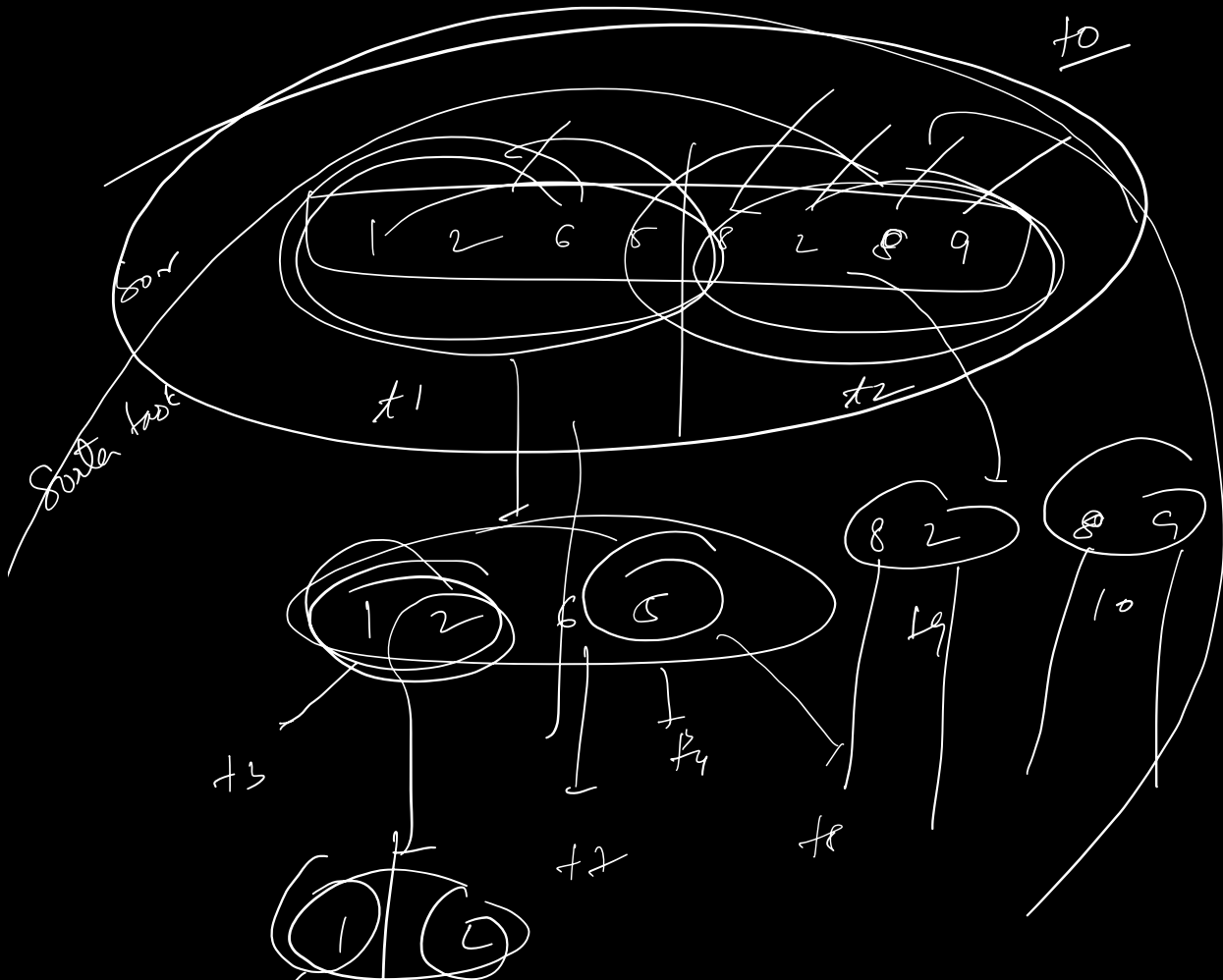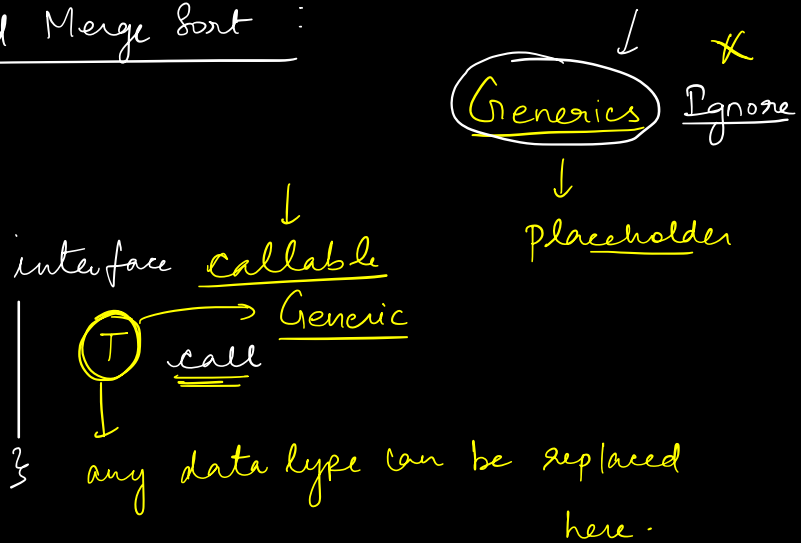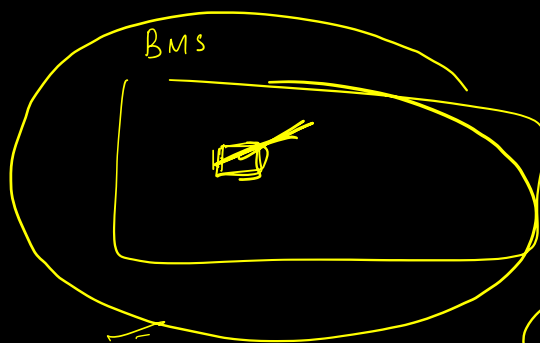
(Jixed)

Sync Problem
   ↳ Adder Subtracter
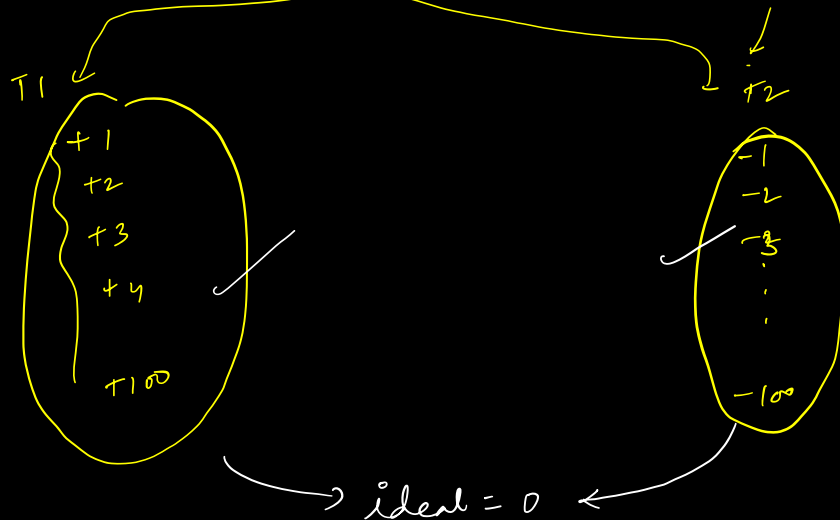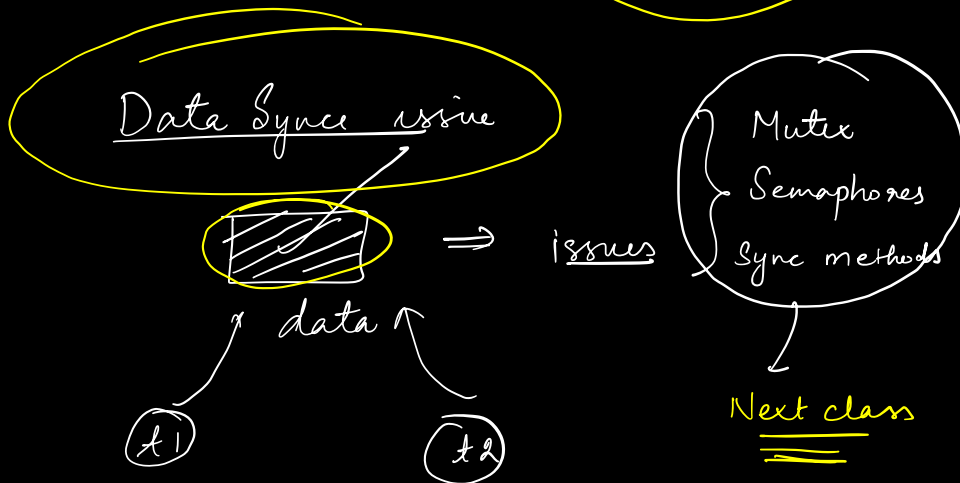   ↳ Agenda for next class

8 Min

Adder Subtractor :-

Adder : → Add 1 to 100
Subtractor → Subtracter 1 to 100   value = 0

T1

+1
+2
+3
+4

+100

T2

-1
-2
-3
.
.
-100

→ ideal = 0 ←

BMS

Dirty Read

cnt

cat

ideal res = 0
≠ (-1)

Adder

$Value += i$ $\neq 1$ $+1$

Registers $t1$

3 ins
$t \leftarrow get(value)$
$t \leftarrow t + i$
$value \leftarrow t$

$Value = 0$

Nullfr

Subtractor

$Value -= i$ -1

$0 - 1$

$t \leftarrow value$ 1
$t \leftarrow t - i$ $\}-1$
$alue \leftarrow t$ $\}-1$

Data Sync issue

$\Rightarrow$ issues

data
$t1$ $t2$

Mutex
Semaphores
Sync methods

Next class
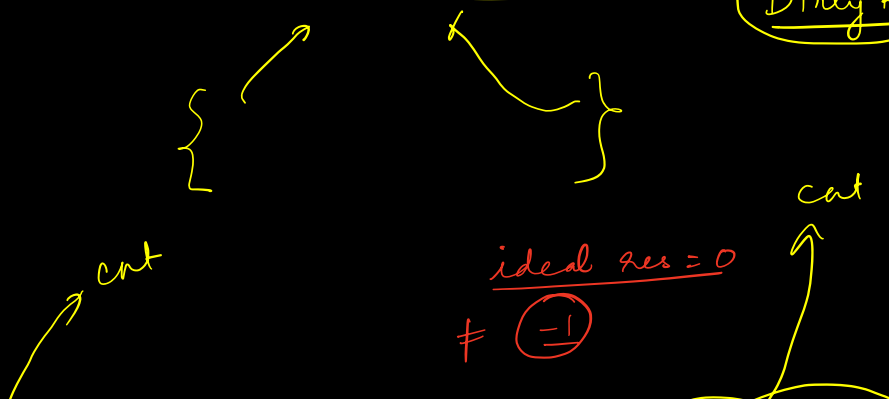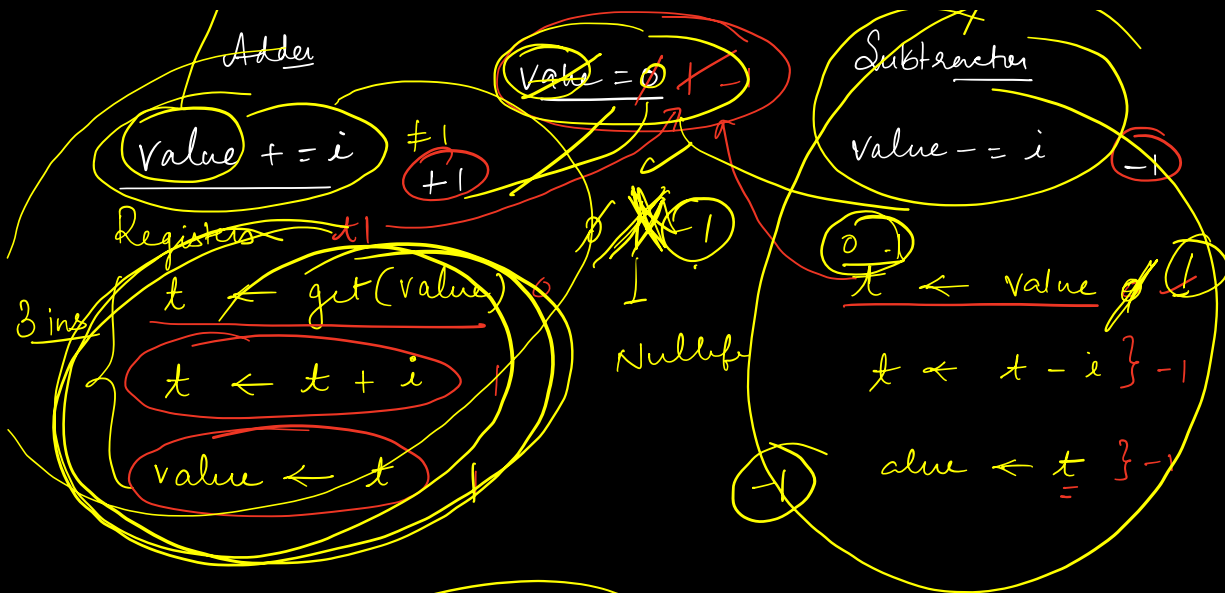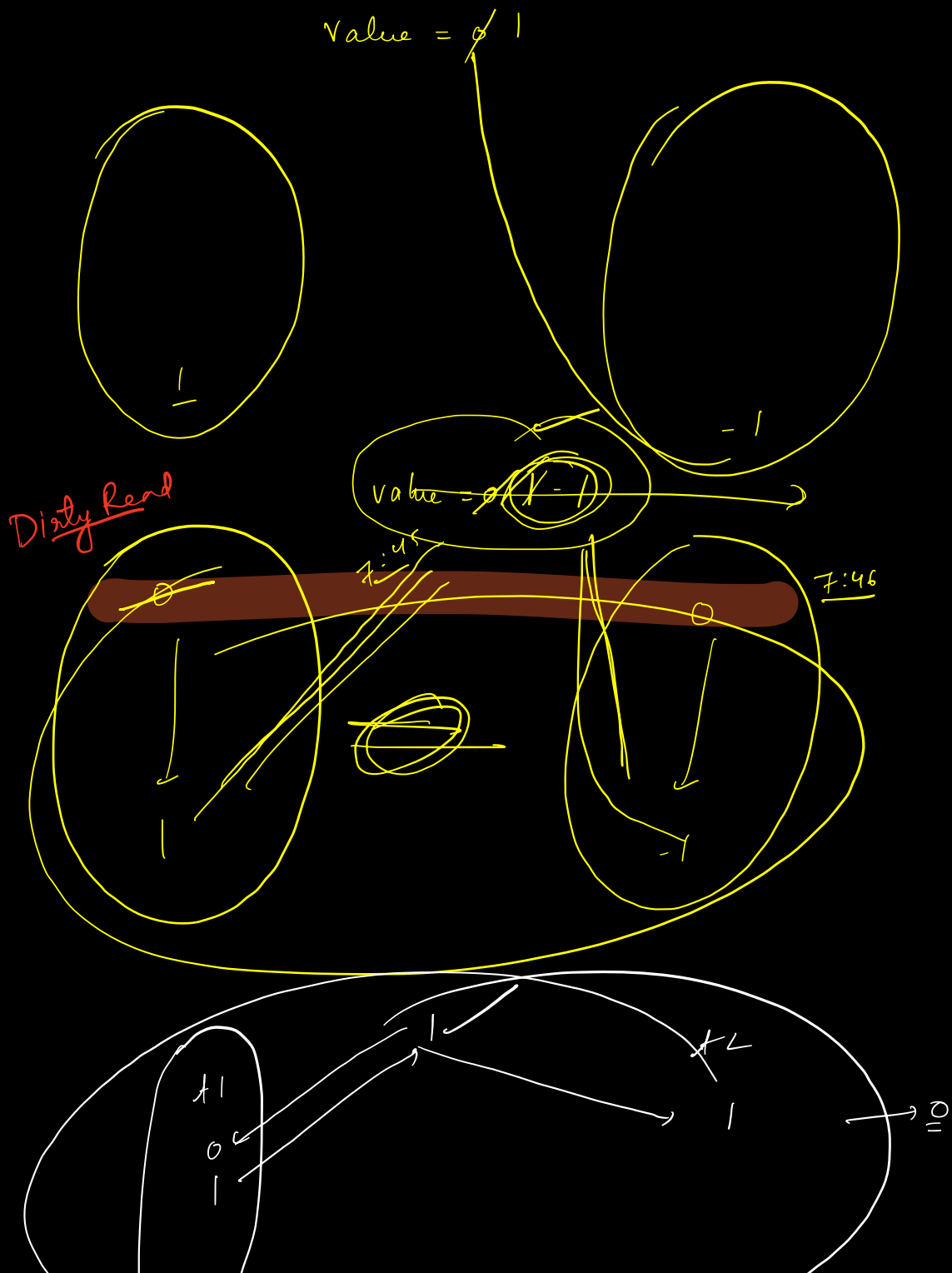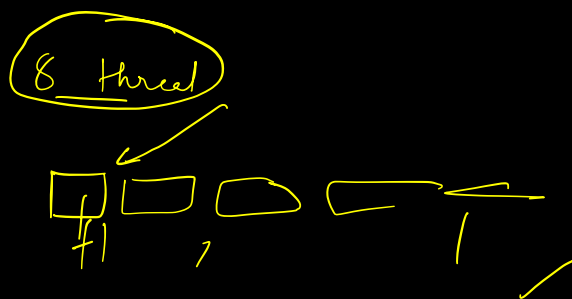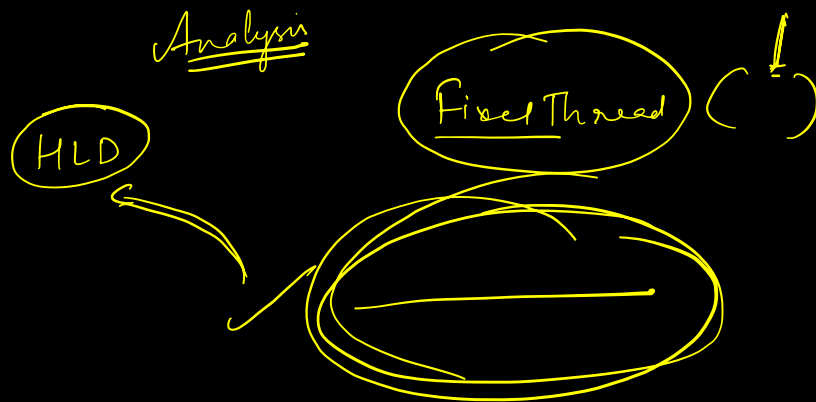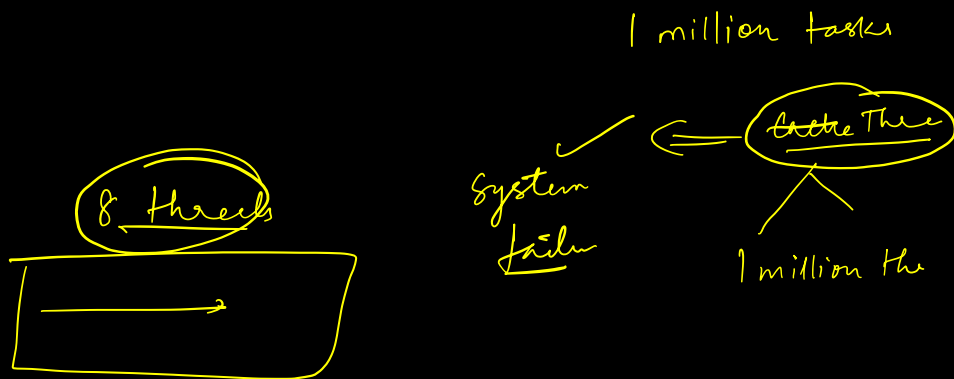
Workers $\simeq$ Threads

Threads
|
Executor Service $\Rightarrow$ thread pool

Callables $\longrightarrow$ Merge sort

Adder | Subtracter $\rightarrow$ sync Problem

O

+1
+2
+3
.
+100

−1
−2
−3
.
−100

B $\longrightarrow$ X

Value = $\emptyset$ 1

Dirty Read

Value = $\emptyset$ $X-1$

7:4?

7:46

1

-1

1

-1

+1

0

1

+1

1

0

1 million tasks

8 threads

system failu ✓ ⟵ task Thre

1 million the

Analysis

HLD   Fixed Thread (!)

8 thread

f1   ,   ⟵

6000
654

Fi (20)

CPU

8 th.

T14

T1   T6   T4   T3 ... — —

T14

20   threads

T4   T2

20

Th

8   8
8 ...
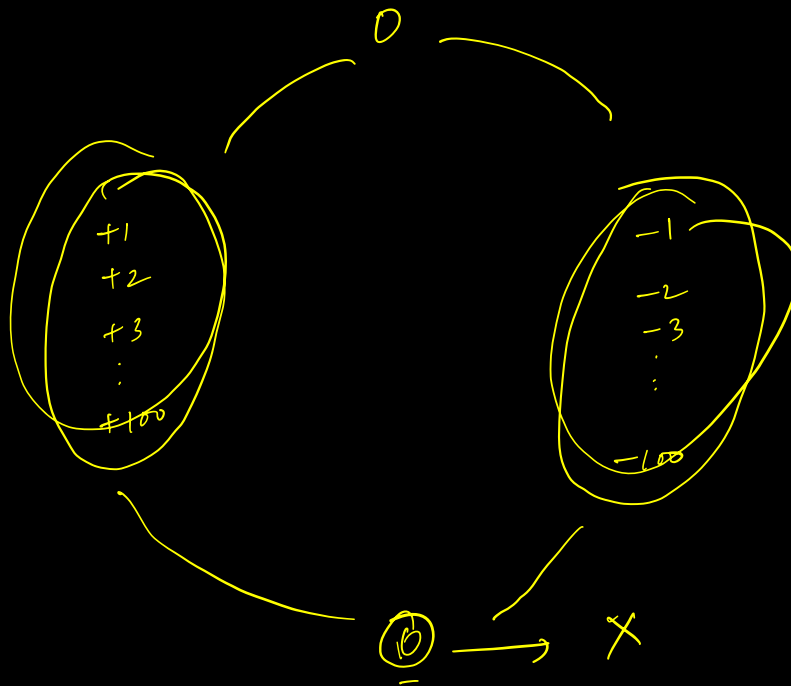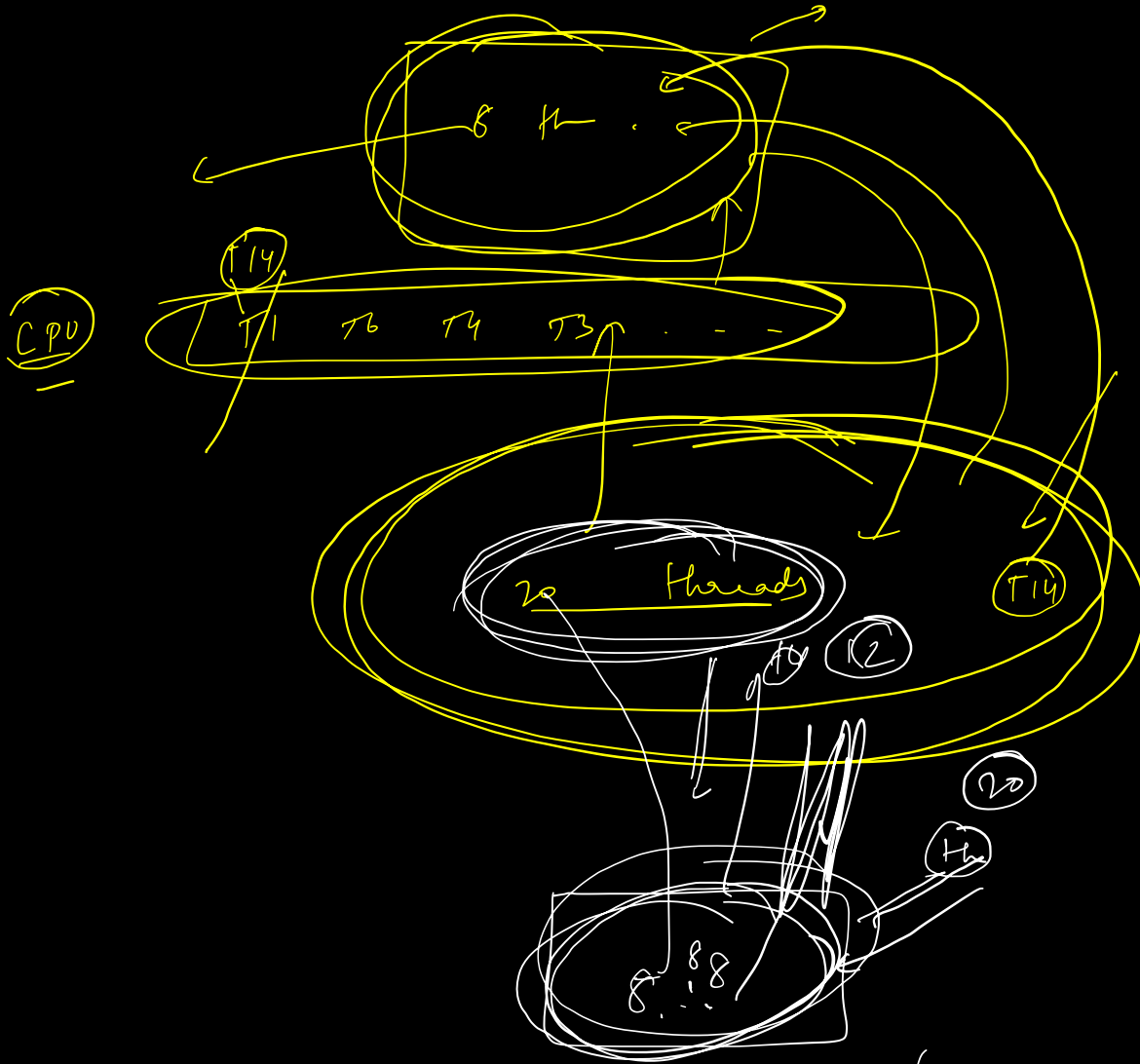
Algo   { FCFS
         SRTF
         SFF

Global

$A \cdot some()$

A^9

Class m

Static some()

$(\mathcal{H})$

$B \cdot som()$

$B \oint$

Static some()

B_i
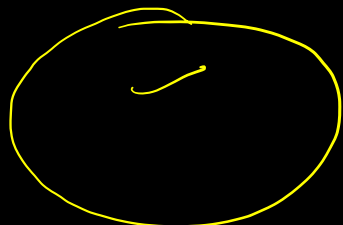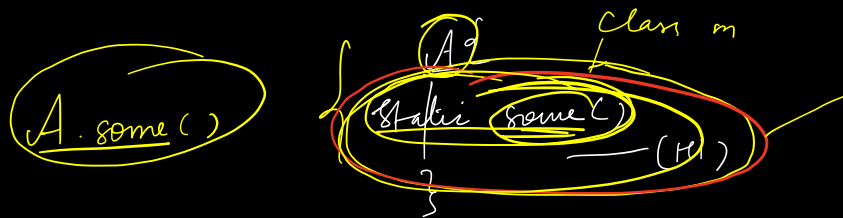
Obj | instance $\simeq$ Static

$A \; b = new \; B();$

RBI

Bank

PhonePe

GPay

Paytm

Clan

Add To Wallet

Send Money

Create Account
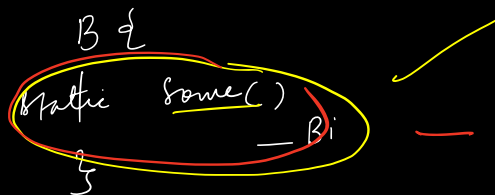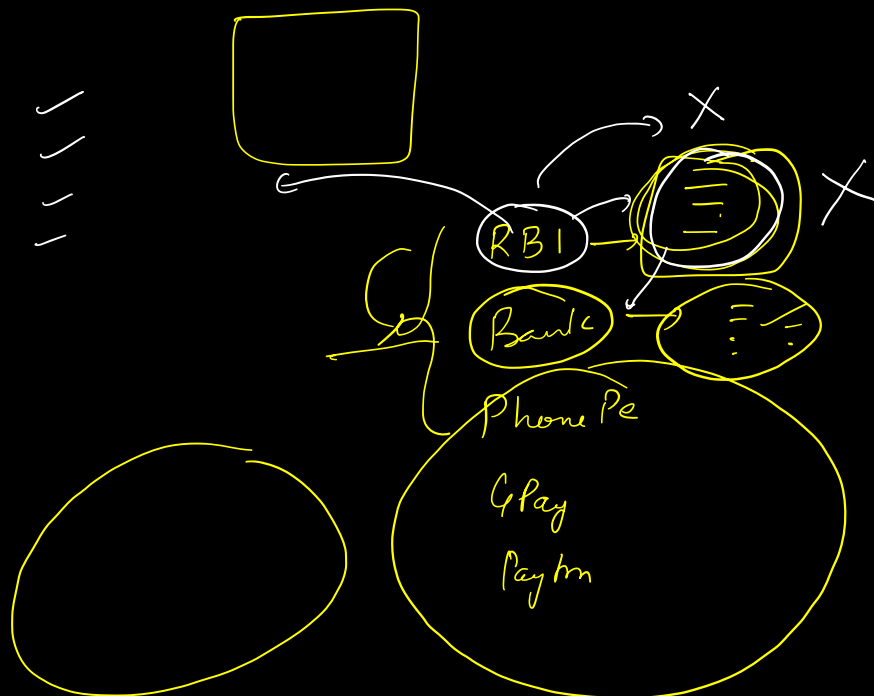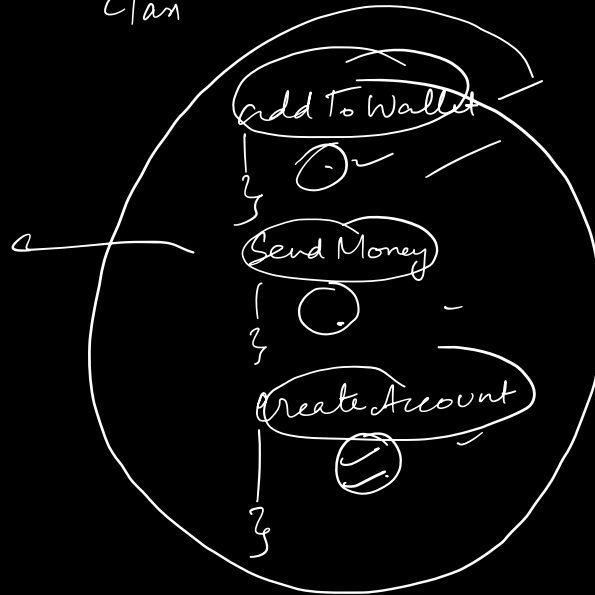
Pass by val
vs
Pass by ref

1 hr

Elaborate your
doubt

Tag
me

do some(   )