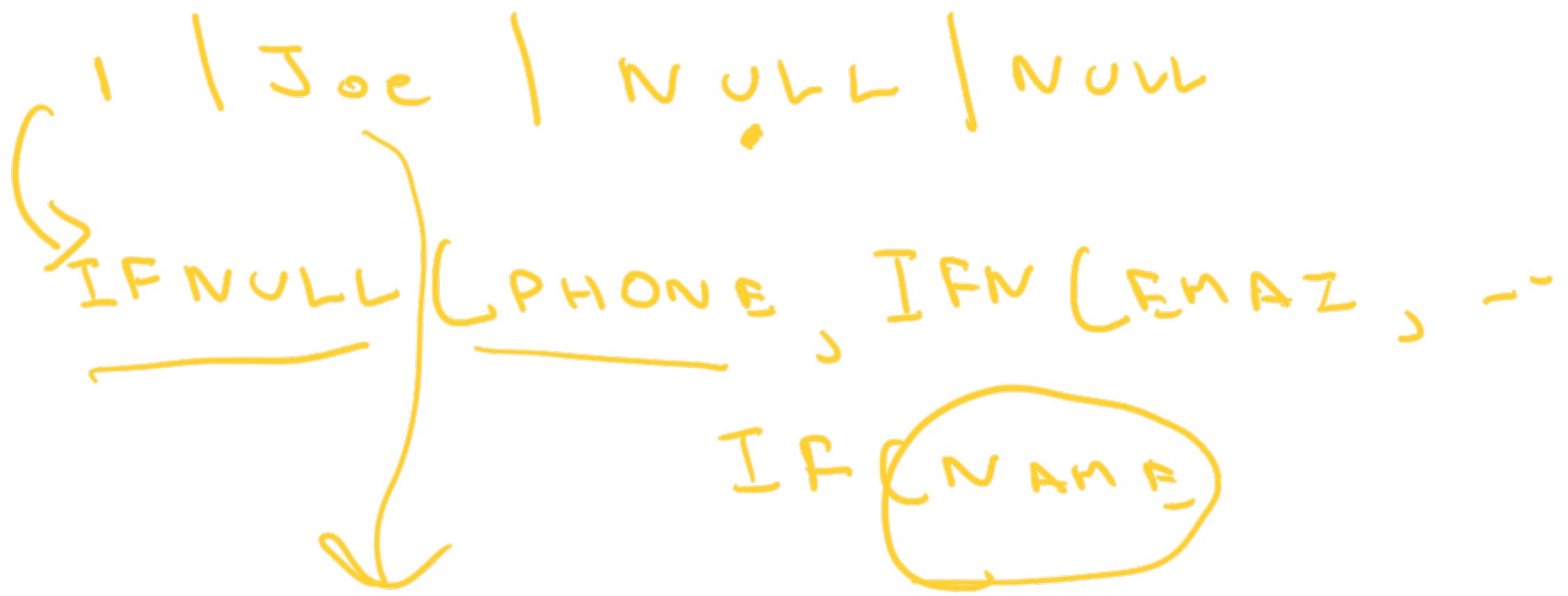


SQL - Transactions



Joe bloggs



```
phone != null ? phone  
: email != null ?  
email
```

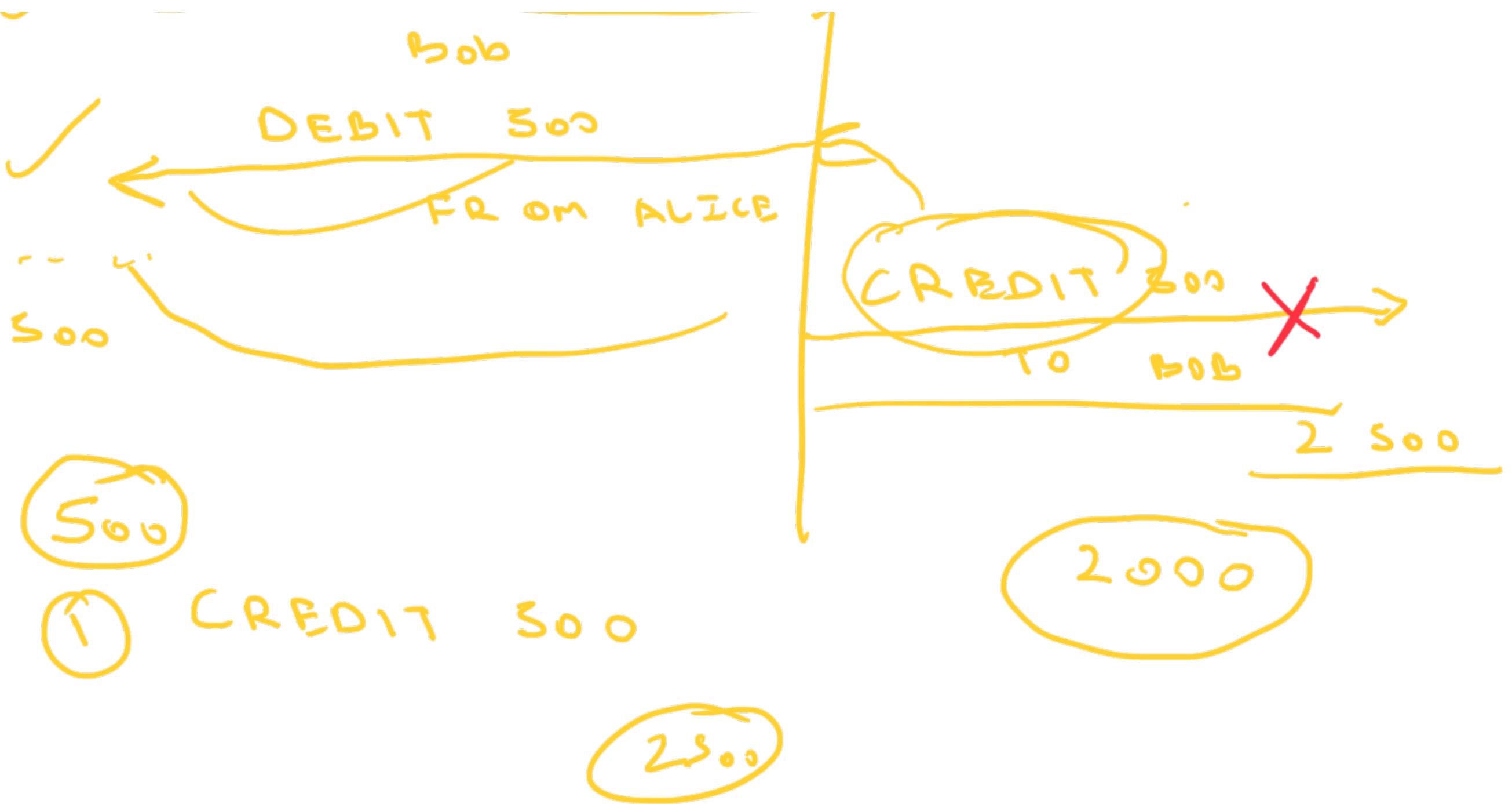
COALESCE

COALESCE (phone, email,
NO_CON, name)

Transactions

- ↗ why & what
- ↗ How - TCU
- ACID
- Concurrency in transactions





A

— Atomicity — All or nothing

O

Atomicity \rightarrow Single operation



Operation

READ

WRITE

ALICE

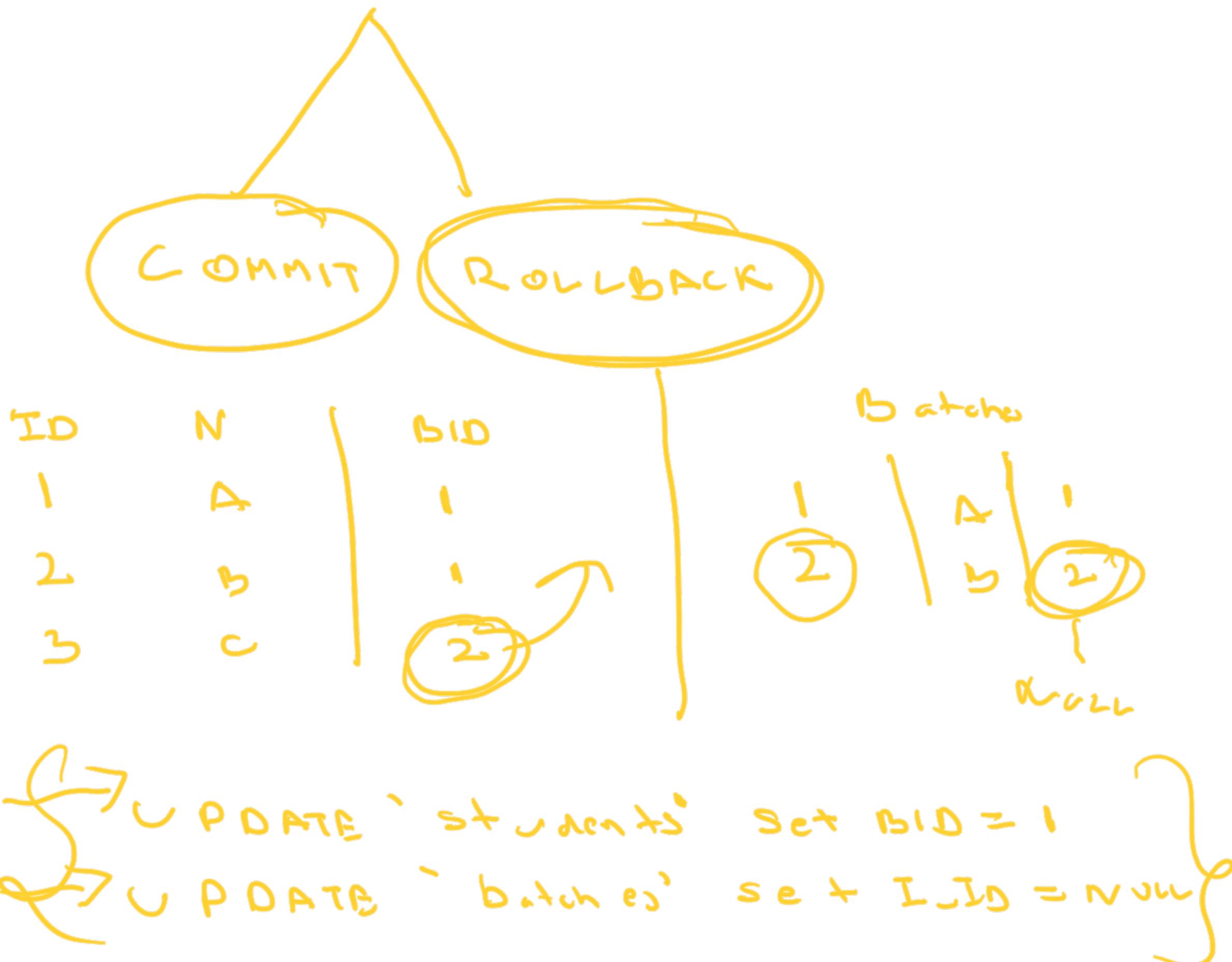
- (1) $D_{\text{Alice}} \leftarrow \text{READ}(A)$
- (2) $D_{\text{Alice}} - \frac{1}{500}$
- (3) $\text{WRITE}(A, B_a)$

BOB

- (1) $D_{\text{Bob}} \leftarrow \text{READ}(B)$
- (2) $B + \frac{1}{500}$
- (3) $\text{WRITE}(B, B_b)$

TC

↳ Transaction Control Lang.



→ START TRANSACTION

→ UPDATE STUDENTS

→ UPDATE BATCHES

COMMIT

→ STAR TRANSACTION

STUDENTS = READ();

IF NO STUDENT

ROLLBACK

BEGIN

ALICE = READC()

ALICE -= 500

WRITE

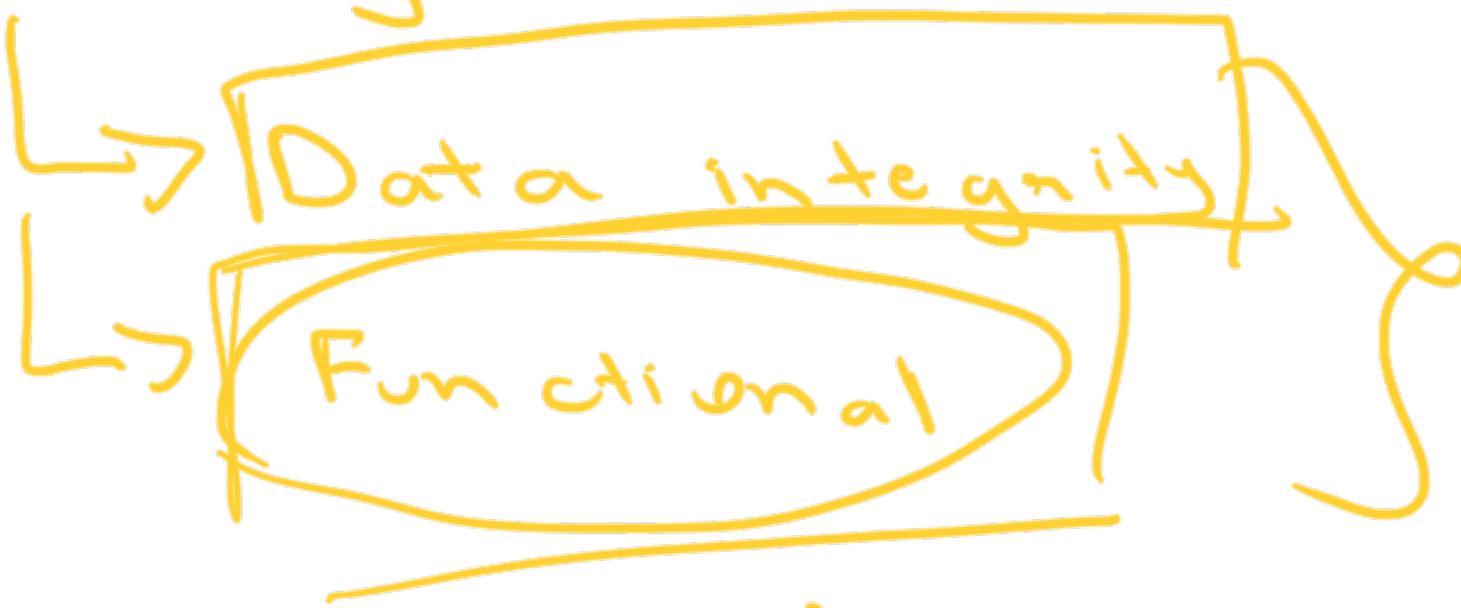
BOB = READC()

IF (ERROR)

ROLLBACK



Consistency

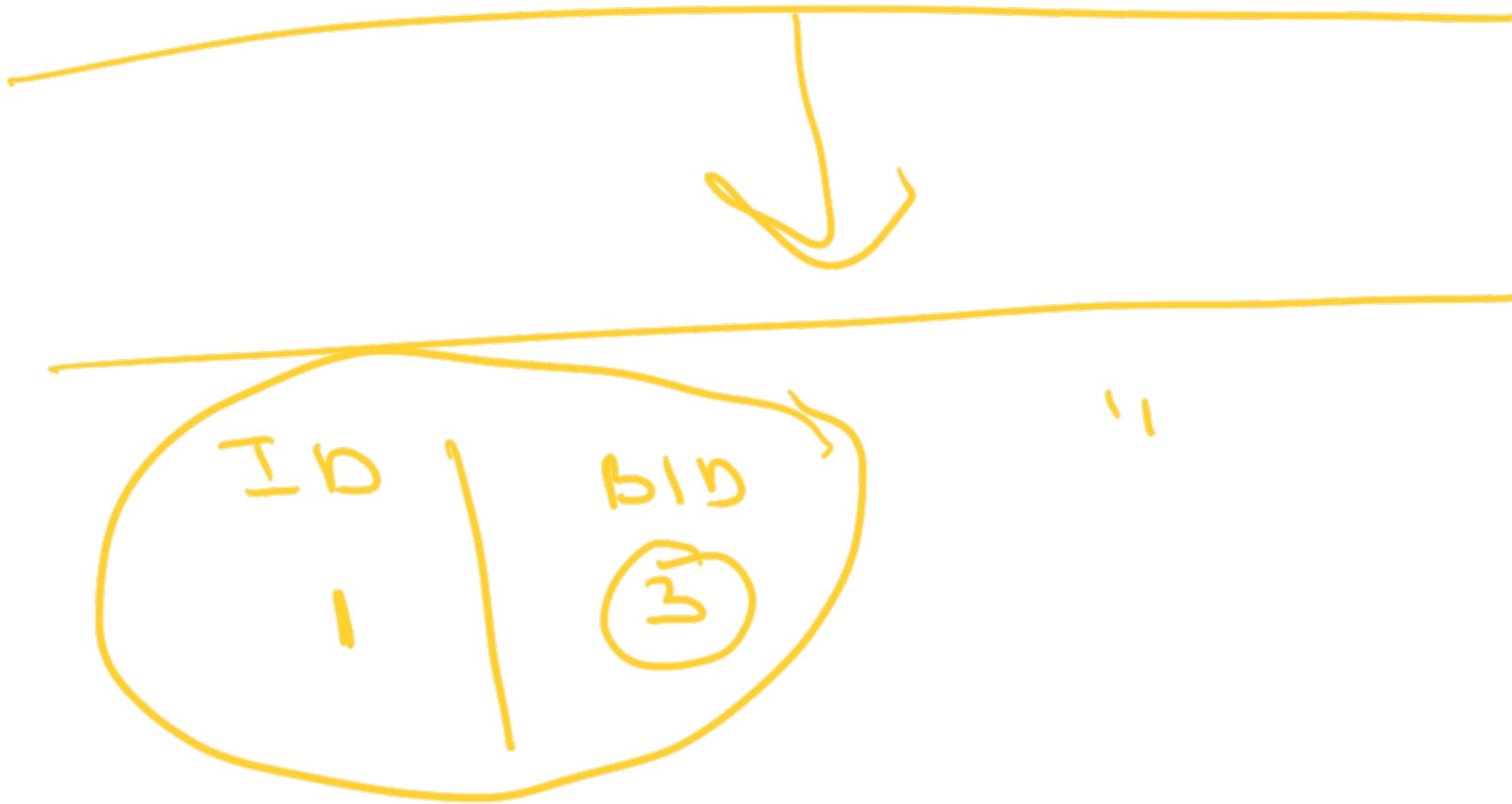


Student
ID | B10

Batch

1 1 1 2

1 1 1 A
2 . B



A L I C E
2 0 0 0

B o b
5 0 0 0

7 0 0 0

| | | | |
|--------------|-----------|-----------|-----------|
| (1) DEBIT | 500 | | |
| - - - - - | - - - - - | - - - - - | - - - - - |
| | 1500 | | |
| | | 5000 | 6500 |
| + (2) CREDIT | 500 | | |
| | | | |
| | 15 00 | 5000 | 6500 |

Checksum

= Hash

Reconciliation

Le agen

Double entry bookkeeping



Credit + debit



①

$$b = 1000$$

$$b- = 500$$



$$S_{600}$$

$$b = 3000$$

$$b- = 1000$$

$$2000$$

②

$$b = 2000$$

$$B+ = 500$$



$$b = 2000$$

$$B+ = 1000$$



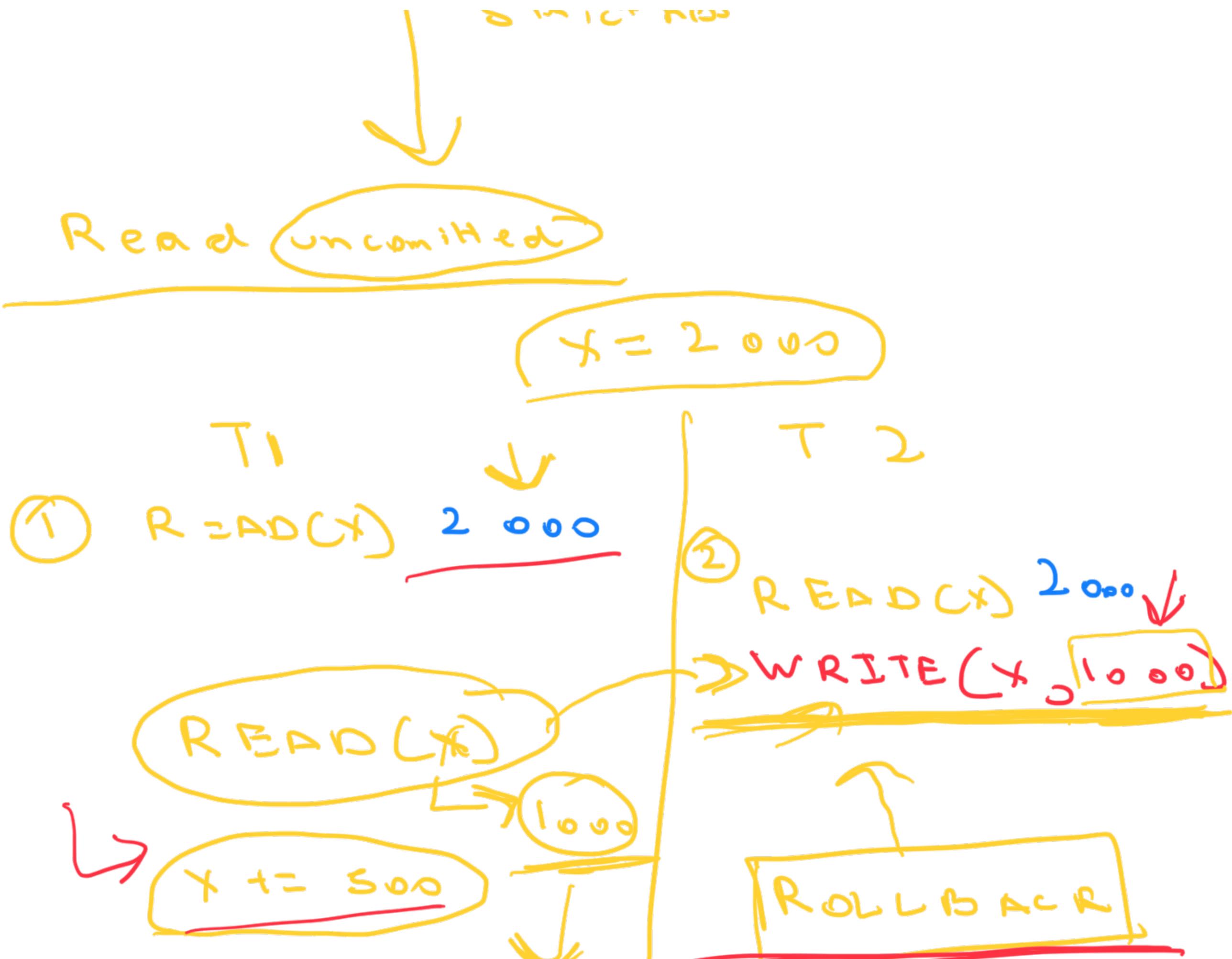
Isolation

3'seo



4 isolation levels

connection



~~WRITER(X)~~

~~DIRTY READ~~



→ Read uncommitted data

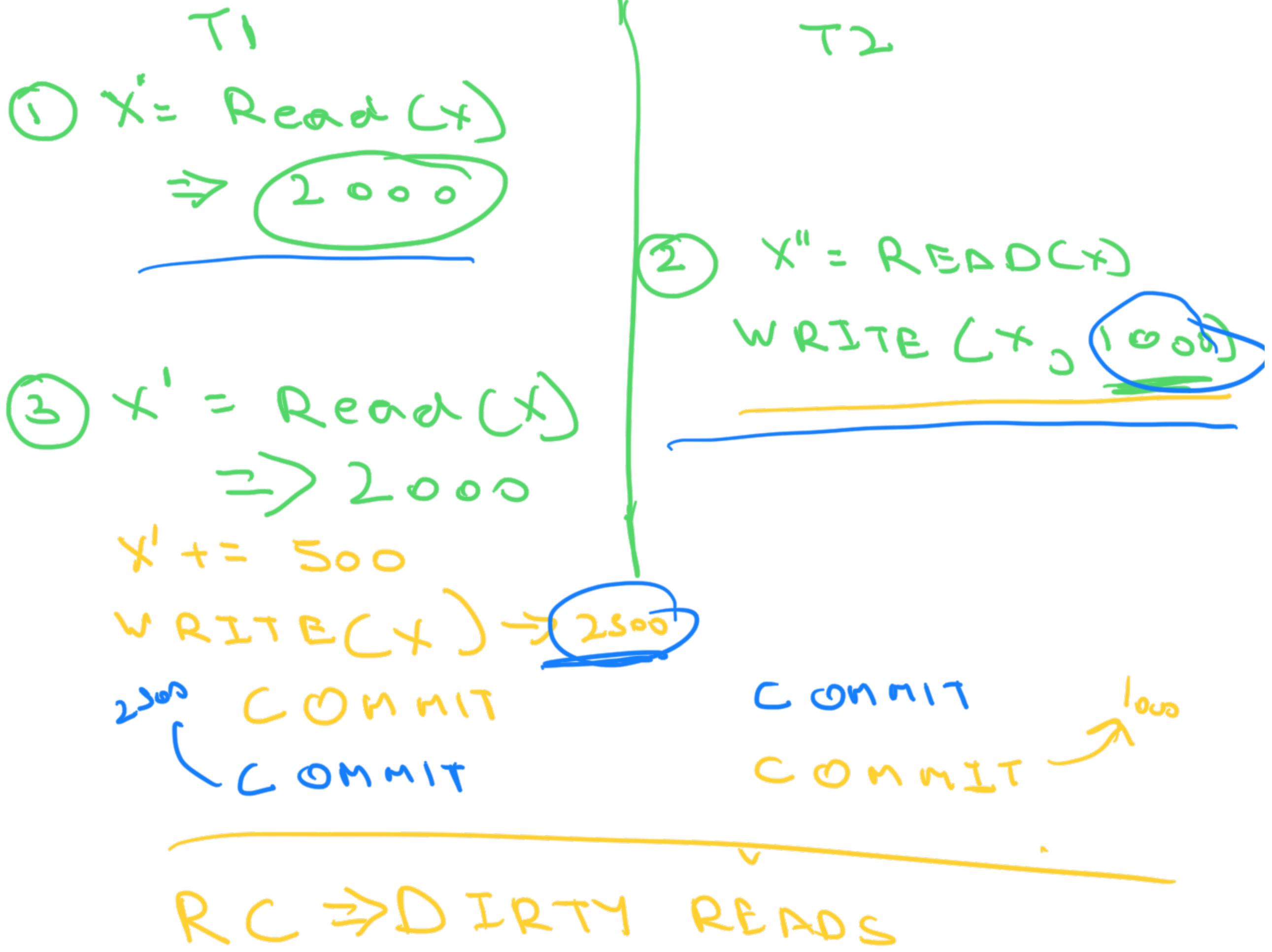
- Messaging
- Video player

②

Read committed

→ Committed values

$$x = 2000$$



LOST UPDATE

$x = 1000$

①

1
READ $\rightarrow 2000$

T2

2
READ $\rightarrow 2000$
WRITE $\rightarrow \underline{1000}$
COMMIT

②

READ $\rightarrow 1000$

T1

Select students = 100

Gen erate coupon

Read students → 161
UPDATE

T2

Students → 101
COMMIT

Non-Repeatable
Read

Repeatable Read

↳ Default

$x = 2000$

T₁

READ(x) → 2000

T₂

Write(x, 1000)
↳ 1000

READ(x) → RC(1000)
READ(x) → RC(2000)
READ(x) → RR(2000)

READ(x) → RUC(1000)
READ(x) → RC(1000)
COMMIT

$x = 2000$

Serializable

↳ Only 1 transaction

$$x = 2000$$

① T_1
 $x' = \text{READ}(x)$

T_2
② $x' = \text{READ}(x)$

1