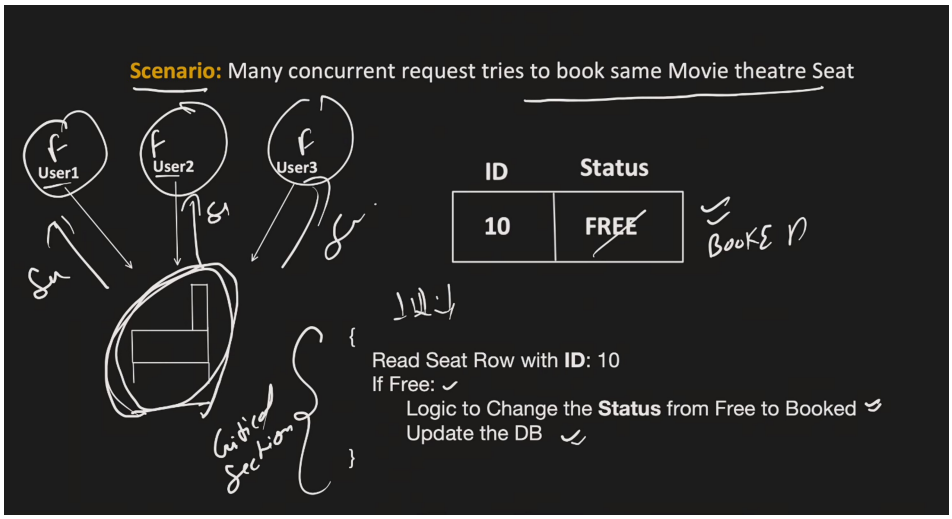
Distributed Concurrency Control

Wednesday, October 18, 2023 3:20 PM

This will help us to understand how to handle multiple concurrent request.

Many Concurrent request tries to book same Movie Theatre Seat.



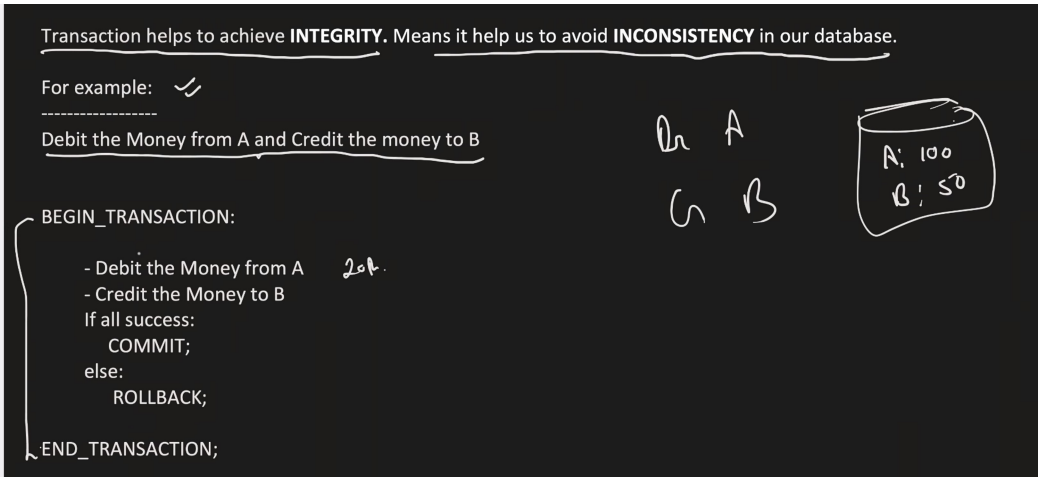
Use Synchronized () for the critical Section:
Synchronized()
{
Read Seat Row with ID : 10
If Free :
Logic to change the status from FREE to Booked.
Update the DB.
}

But this solution will not work for distributed system, as we have different process, and Synchronized will work on Threads, not on process.

NOW we will jump to Distributed Concurrency Control

What is the usage of a Transaction?

- Transaction Helps to achieve INTEGRITY. Means it help us to avoid INCONSISTENCY in our DATABASE.



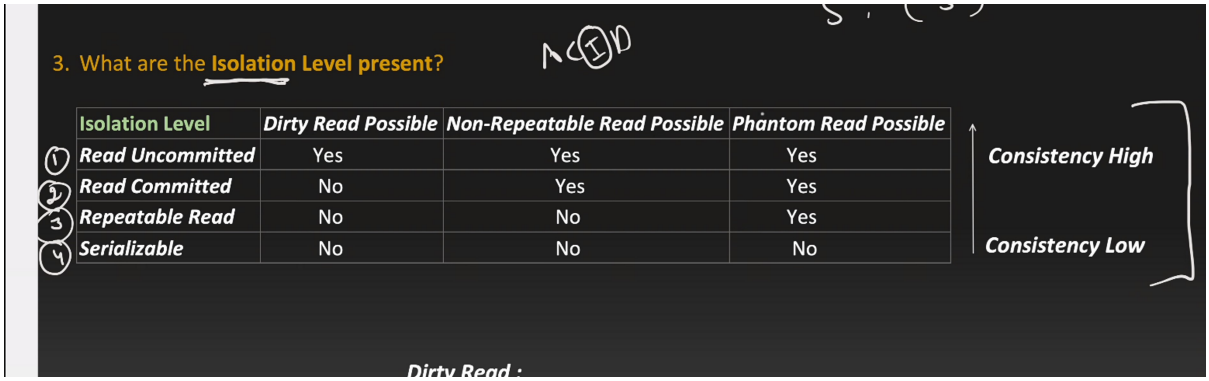
What is DB Locking ?

- DB Locking, help us to make sure that no other transaction update the locked rows.
- Shared lock / Read Lock -- Only read can happen, Multiple Transaction can come into picture and can read the DB.
- Exclusive lock - if one transaction has taken on Exclusive lock then no other transaction can take shared or exclusive lock.

LockType	Another Shared Lock	Another Exclusive Lock
Have Shared Lock	Yes	No
Have Exclusive Lock	No	No

What are the Isolation Level Present ?

Isolation means, whenever transactions works it feels like they are running alone apart from actual scenario where there are multiple Transactions running in parallel.



READ UNCOMMITTED : Use it only when READ is required.

	ISOLATION LEVEL	Locking Strategy
(0)	***Read Uncommitted***	**Read** : No Lock acquired **Write**: No Lock acquired
(1)	***Read Committed***	**Read**: Shared Lock acquired and Released as soon as Read is done **Write**: Exclusive Lock acquired and keep till the end of the transaction
(2)	***Repeatable Read***	**Read**: Shared Lock acquired and Released only at the end of the Transaction **Write**: Exclusive Lock acquired and Released only at the end of the Transaction
(3)	***Serializable***	Same as Repeatable Read Locking Strategy + apply Range Lock and lock is release only at the end of the Transaction.

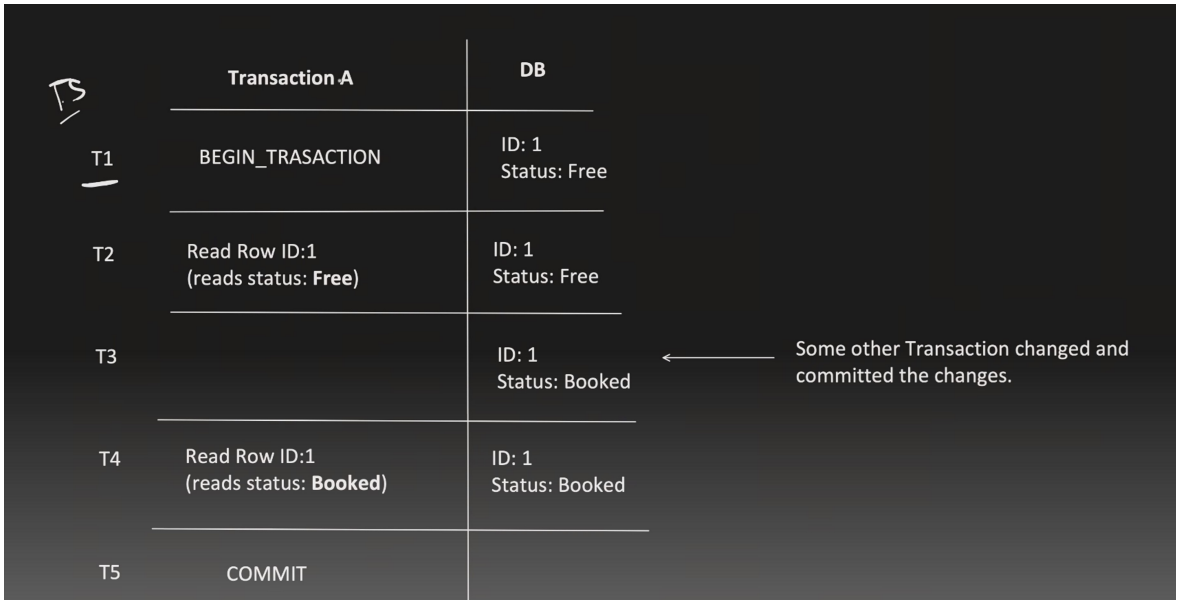
Dirty Read :

If Transaction A is reading the data which is writing by Transaction B and not yet even committed.
If Transaction B does the rollback, then whatever data read by Transaction A is known Dirty Read.

Timeline	Transaction A	Transaction B	DB
T1	BEGIN_TRASACTION	BEGIN_TRASACTION	ID: 1 Status: Free
T2	Update Row ID:1, Status: Booked		ID: 1 Status: Booked (Not Committed by Transaction B Yet)
T3		Read Row ID:1 (Got status as Booked)	ID: 1 Status: Booked (Not Committed by Transaction B Yet)
T4	Some Issue faced here	Some Computation	ID: 1 Status: Booked (Not Committed by Transaction B Yet)
T5	Rollback	Commit	ID: 1 Status: Free

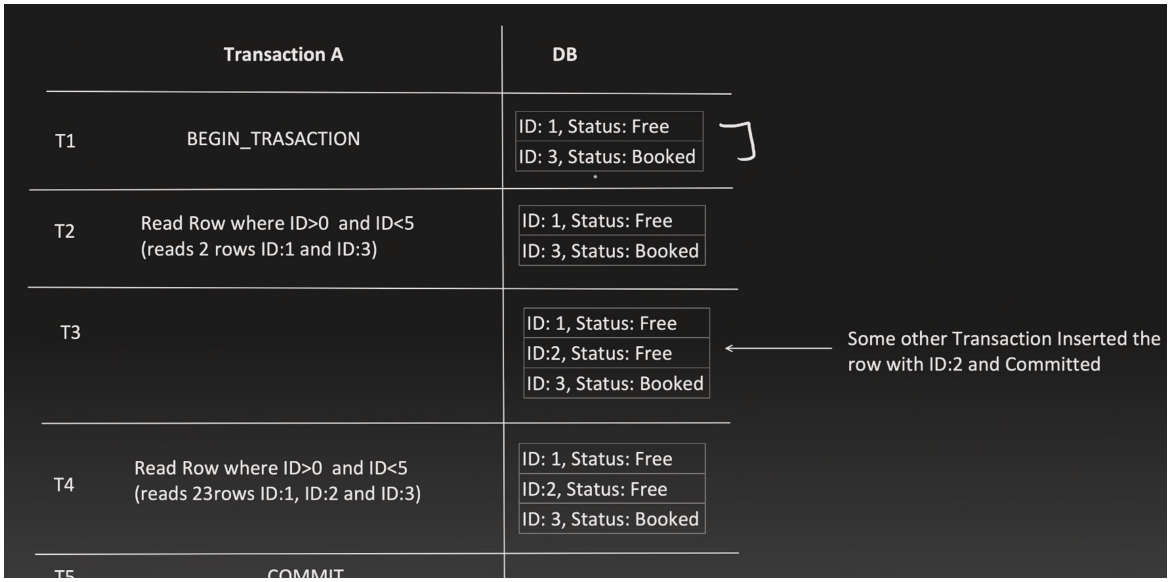
Non - Repeatable Read:

If suppose Transaction A, reads the same row several times, and there is a chance that it reads different value.



Phantom Read :

If Suppose Transaction A, executes same query several times and there is a chance that the rows returned are different.



Optimistic Concurrency Control (OCC):

- Isolation Level used Below Repeatable Read
- Much Higher Concurrency
- No change of DeadLock
- In Case of conflict, overhead of transaction rollback and retry logic is there.

Pessimistic Concurrency Control (PCC)

- Isolation Level used REPEATABLE READ and SERIALIZABLE
- Less Concurrency compared to Optimistic
- Deadlock is possible, then transactions stuck in deadlock forced to do rollback.
- Putting a long lock, sometimes timeout issue comes and rollback need to be done.

Optimistic Concurrency Control (OCC) :

	Transaction A	Transaction B	DB
T1	BEGIN_TRASACTION	BEGIN_TRASACTION	ID: 1 Status: Free Version: 1
T2	Read Row ID:1 (Row Version is 1)	Read Row ID:1 (Row Version is 1)	ID: 1 Status: Free Version: 1
T3	Select for Update (Version Validation happens)		ID: 1 Status: Free (Exclusive Lock by Txn A) Version: 1
T4	Update Row ID:1, Status: Booked, Version:2		ID: 1 Status: Booked (Exclusive Lock by Txn A) Version:2
T5	COMMIT		ID: 1 Status: Booked Version:2
T6		Select for Update (Version Validation happens)	ID: 1 Status: Booked (Exclusive Lock by Txn B) Version:2