Concurrency Control

Concurrency Control is the management procedure that controls concurrent execution of the multiple operations done by different users at the same time on the same database.

As stated above it controls “concurrent execution”. We need to keep a check on it because of the conflicts that might arise due to it.
Like,

- Write-Write Conflict (Lost Update Problem): When an update/write operation is lost as it is overwritten by the update/write operation done by another transaction.
  Eg: T1 transaction performs write on the database, only then T2 transaction starts with it’s write operation on that database only.
  The value updated by T1 is lost. Hence called the Lost Update Problem.
- Write-Read Conflict : It occurs when a transaction reads the data which is written by the other transaction before committing.

Therefore, we need concurrency control to manage these concurrent executions of the operations and help maintain **consistency in the database**.

Other Advantages of Concurrency Control:

- ➢ Increases Throughput
- ➢ Reduces Wait time for Transactions
- ➢ Optimal Resource Utilization

To help us do all that, we have multiple Concurrency Control Protocols:

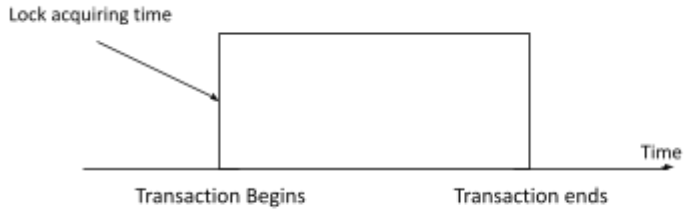
- Lock Based Concurrency Control Protocol
- Timestamp Concurrency Control Protocol

Note: Although there are more protocols (Multi version concurrency control and Validation concurrency control) we will focus on these only for now.

Lock Based Concurrency Control:-

In Lock Based Concurrency Control, any transaction in execution has Lock embedded on it due to which another transaction cannot read or write data until the previous transaction is completed and terminated.

Then after the completion of the first transaction, the lock is acquired by the next transaction and thus now it can read or write data.
By using this mechanism, we isolate a transaction in execution.



Disadvantage:

- The issue with this type of concurrency control is it might lead to Deadlock at some point.

Timestamp Based Concurrency Control:-
The Timestamp Based Concurrency Control is used to order the transactions based on their Timestamps, it ensures that every conflicting operation is executed in that order only and it is ascending order based on transaction's creation time.
Although the priority is high , for the transaction that arrived first for being executed and for determining that priority order, system time or logical counter is used.

For example, Suppose concurrent transactions T1, T2, T3 that arrive at 10:00 AM, 12:00 PM and 9:00 AM respectively.
Now, as T3 arrives the earliest it will be given the priority and will be executed first, then T1 and then last but not the least T2.

The main advantage of using this over Lock Based concurrency control is it is free from deadlocks.
Disadvantage:

- It can cause starvation at a point where a transaction is being restarted and aborted again and again.