

*IMP Concept

Problems in Concurrency Control:

OR

Problems caused by concurrency control

OR

Anomalies due to interleaved execution

OR

problems caused by interleaved execution

Definition of conflict: two or more different transactions accessing the same variable and at least one of them is a write operation

When concurrent transactions are executed in an uncontrolled manner, several problems can occur. The concurrency control has the following three main problems:

- **Lost updates. (WW CONFLICT)**
- **Dirty read (or uncommitted data). (WR CONFLICT)**
- **Unrepeatable read (or inconsistent retrievals). (RW CONFLICT)**

Lost Update Problem :

A lost update problem occurs when two transactions that access the same database items have their operations in a way that makes the value of some database item incorrect.

In other words, if transactions T1 and T2 both read a record and then update it, the effects of the first update will be overwritten by the second update.

Example:

Consider the situation given in figure that shows operations performed by two transactions, Transaction- A and Transaction- B with respect to time.

Transaction- A	Time	Transaction- B
----	t0	----
Read X x=10	t1	----
----	t2	Read X x=10

Update X 10 =20 x=20	t3	----
----	t4	Update X 20=20 blind write
----	t5	----

At time t1 , Transactions-A reads value of X.

At time t2 , Transactions-B reads value of X.

At time t3,Transactions-A writes value of X on the basis of the value seen at time t1.

At time t4,Transactions-B writes value of X on the basis of the value seen at time t2.

So,update of Transactions-A is lost at time t4,because Transactions-B overwrites it without looking at its current value.

Such type of problem is referred as the Update Lost Problem, as update made by one transaction is lost here.

Blind write ::: write the data with out read

Dirty Read Problem :

Dirty read --- read uncommitted data

A dirty read problem occurs when one transaction updates a database item and then the transaction fails for some reason.The updated database item is accessed by another transaction before it is changed back to the original value.In other words, a transaction T1 updates a record, which is read by the transaction T2.

Then T1 aborts and T2 now has values which have never formed part of the stable database.

Example:

Consider the situation given in figure :

Transaction- A	Time	Transaction- B
----	t0	---- x=0
----	t1	Update X x=10 not committed
Read X x=10 uncommitted read	t2	----
----	t3	Rollback x=0
----	t4	----

At time t1 , Transactions-B writes value of X.

At time t2 , Transactions-A reads value of X.

At time t3 , Transactions-B rollbacks.So,it changes the value of X back to that of prior to t1.

So,Transaction-A now has value which has never become part of the stable database.

Such type of problem is referred as the Dirty Read Problem, as one transaction reads a dirty value which has not been committed.

Inconsistent Retrievals Problem :

Unrepeatable read (or inconsistent retrievals) occurs when a transaction calculates some summary (aggregate) function over a set of data while other transactions are updating the data.

The problem is that the transaction might read some data before they are changed and other data after they are changed, thereby yielding inconsistent results.

In an unrepeatable read, the transaction T1 reads a record and then does some other processing during which the transaction T2 updates the record. Now, if T1 rereads the record, the new value will be inconsistent with the previous value.

Example:

Consider the situation given in figure that shows two transactions operating on three accounts :

Account-1	Account-2	Account-3
Balance = 200	Balance = 250	Balance = 150

Transaction- A	Time	Transaction- B
----	t0	----
Read Balance of Acc-1 sum <-- 200 Read Balance of Acc-2	t1	----
Sum <-- Sum + 250 = 450	t2	----
----	t3	Read Balance of Acc-3
----	t4	Update Balance of Acc-3 150 --> 150 - 50 --> 100
----	t5	Read Balance of Acc-1
----	t6	Update Balance of Acc-1 200 --> 200 + 50 --> 250
---- Read Balance of Acc-3 100	t7	COMMIT
Sum <-- Sum + 250 = 550	t8	----

Transaction-A is summing all balances;while, Transaction-B is transferring an amount 50 from Account-3 to Account-1.

Here,the result produced by Transaction-A is 550,which is incorrect. if this result is written in database, database will be in inconsistent state, as actual sum is 600.

Here,Transaction-A has seen an inconsistent state of database, and has performed inconsistent analysis.