MINDANAO UNIVERSITY OF
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“Transaction Management and Concurrency Control”

Database Management 2 (IT 34)

Concurrency Problems

If locking is not available and several users access a database concurrently, problems may occur if their transactions use the same data at the same time. Concurrency problems include:

- Lost or buried updates.
- Uncommitted dependency (dirty read).
- Inconsistent analysis (nonrepeatable read).
- Phantom reads.

Lost Updates

- Lost updates occur when two or more transactions select the same row and then update the row based on the value originally selected. Each transaction is unaware of other transactions. The last update overwrites updates made by the other transactions, which results in lost data.

Uncommitted Dependency (Dirty Read)

- Uncommitted dependency occurs when a second transaction selects a row that is being updated by another transaction. The second transaction is reading data that has not been committed yet and may be changed by the transaction updating the row.

Inconsistent Analysis (Nonrepeatable Read)

- Inconsistent analysis occurs when a second transaction accesses the same row several times and reads different data each time. Inconsistent analysis is similar to uncommitted dependency in that another transaction is changing the data that a second transaction is reading.

Inconsistent Analysis (Nonrepeatable Read)

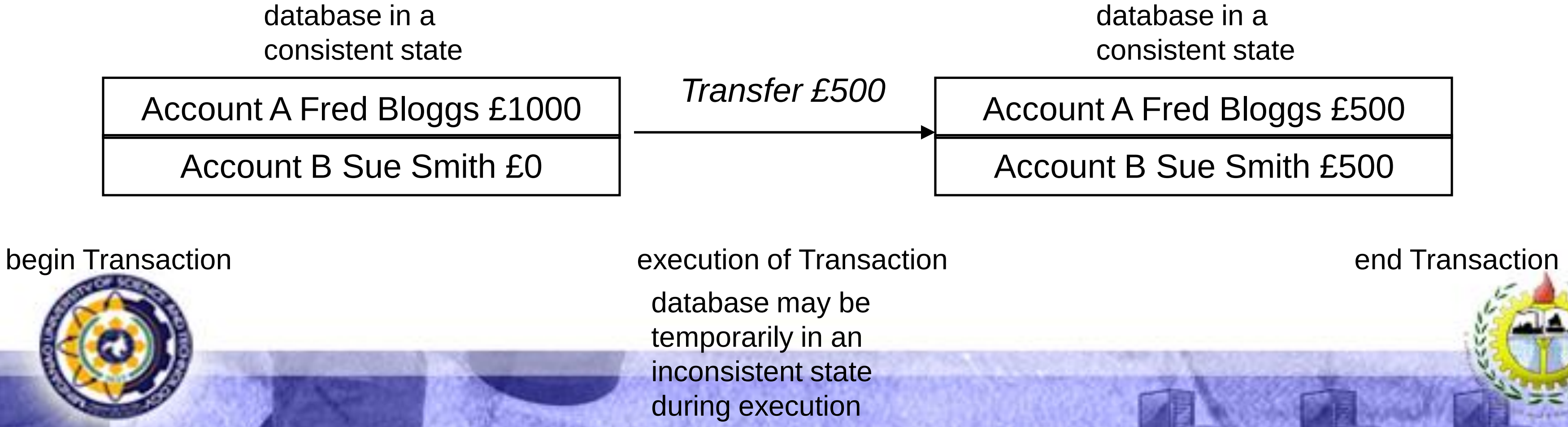
- However, in inconsistent analysis, the data read by the second transaction was committed by the transaction that made the change. Also, inconsistent analysis involves multiple reads (two or more) of the same row and each time the information is changed by another transaction; thus, the term nonrepeatable read.

Phantom Reads

- Phantom reads occur when an insert or delete action is performed against a row that belongs to a range of rows being read by a transaction. The transaction's first read of the range of rows shows a row that no longer exists in the second or succeeding read, as a result of a deletion by a different transaction. Similarly, as the result of an insert by a different transaction, the transaction's second or succeeding read shows a row that did not exist in the original read.

What is a transaction

- A transaction is the basic logical unit of execution in an information system. A transaction is a sequence of operations that must be executed as a whole, taking a consistent (& correct) database state into another consistent (& correct) database state;
- A collection of actions that make consistent transformations of system states while preserving system consistency
- An indivisible unit of processing



database in a consistent state

Account A Fred Bloggs £1000

Account B Sue Smith £0

Transfer £500

database in a consistent state

Account A Fred Bloggs £500

Account B Sue Smith £500

begin Transaction

execution of Transaction

database may be temporarily in an inconsistent state during execution

end Transaction

Desirable Properties of ACID Transactions

A *Atomicity*: a transaction is an atomic unit of processing and it is either performed entirely or not at all

C *Consistency* Preservation: a transaction's correct execution must take the database from one correct state to another

I *Isolation/Independence*: the updates of a transaction must not be made visible to other transactions until it is committed (solves the temporary update problem)

D *Durability* (or Permanency): if a transaction changes the database and is committed, the changes must never be lost because of subsequent failure

o *Serialisability*: transactions are considered serialisable if the effect of running them in an interleaved fashion is equivalent to running them serially in some order

Isolation Level

- The level at which a transaction is prepared to accept inconsistent data is termed the isolation level. The isolation level is the degree to which one transaction must be isolated from other transactions. A lower isolation level increases concurrency, but at the expense of data correctness. Conversely, a higher isolation level ensures that data is correct, but can affect concurrency negatively.

Isolation Level

These isolation levels allow different types of behavior.

Isolation level	Dirty read	Nonrepeatable read	Phantom
Read uncommitted	Yes	Yes	Yes
Read committed	No	Yes	Yes
Repeatable read	No	No	Yes
Serializable	No	No	No

"Giving the best what we have in making what you are and what you can be"

End of the Presentation

future starts here!