Bharathidasan University

Centre for Differently Abled Persons

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- Course Code : 23UCAEC04A
- Course Title : Database Management Systems
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Online
Computing
DBMS
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Business

CONCURRENCY CONTROL

Concurrency Control

In the concurrency control, the multiple transactions can be executed simultaneously.

Locking method for Concurrency Control

Locking is an operation that secures the permission to read, and permission to write a data item.

1. **Binary Locks**
2. **Shared/Exclusive Locks**

Binary Locks:

A binary lock has two states:

- Locked
- Unlocked.

Shared/Exclusive Locks (Read/Write Locks):

There are three states:-

- Read locked
- Write locked
- Unlocked

Database Recovery System

- Database recovery is the process of restoring the database to a correct (consistent) state in the event of a failure.

Types of Database Failures

There are three types of database failures

1. System Crash

A system crash usually refers to any kind of bugs or hardware malfunction in the operating system or the database software.

2. Media Failure

Media failures are caused by a head crash or unreadable media.

It is possible for entire data loss.

3. Application Software Error

When the resource limit is exceeded, logical or internal errors occur, resulting in database failure

Types of Database Recovery

When a DBMS recovers from a crash, it should maintain the following −

It should check the states of all the transactions, which were being executed.

The DBMS must ensure the atomicity of the transaction in this case.

Log-based Recovery

Log is a sequence of records, which maintains the records of actions performed by a transaction.

Recovery with Concurrent Transactions

When more than one transaction is being executed in parallel, the logs are interleaved.

To ease this situation, most modern DBMS use the concept of 'checkpoints'.

Checkpoint

Checkpoint is a mechanism where all the previous logs are removed from the system and stored permanently in a storage disk.

TRANSACTION CONCEPTS

- A transaction is a program including a collection of database operations.

- The operations performed in a transaction are insert, delete, update or retrieve data.

For example,

a data update operation can be divided into three tasks

read_item() − reads data item from storage to main memory.
modify_item() − change value of item in the main memory.
write_item() − write the modified value from main memory to storage.

Transaction Operation

The low-level operations performed in a transaction are −

1.begin_transaction − specifies start of transaction execution.

2. read_item or write_item − Database operations that may be interleaved with main memory operations as a part of transaction

3. end_transaction − specifies end of transaction.

4. commit − specify the transaction has been successfully completed in its entirety

5. rollback − The transaction has been unsuccessful and so all temporary changes in the database are undone

Transaction States

A transaction may go through a subset of five states, active, partially committed, committed, failed and aborted.

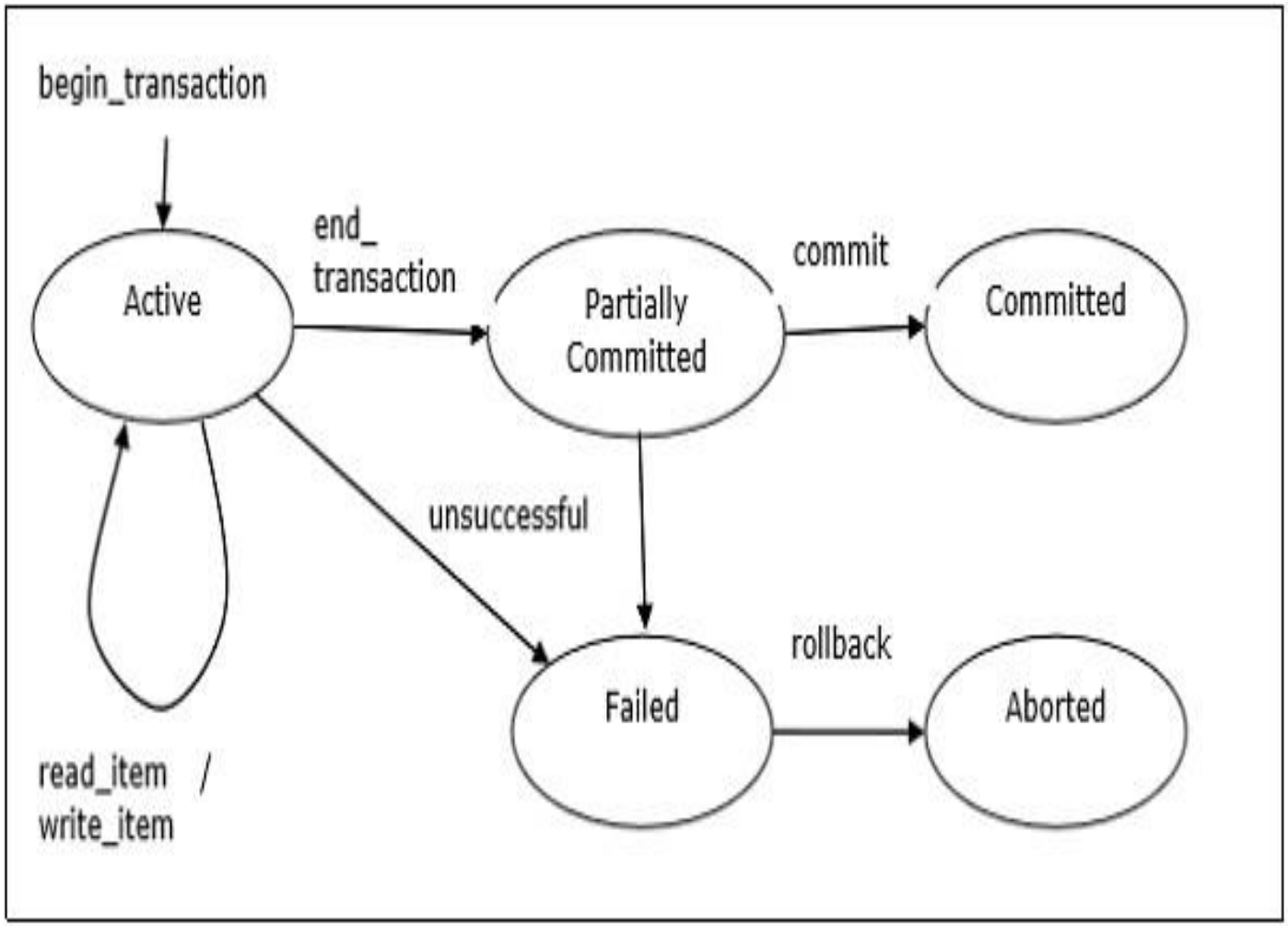
1. **Active** − The initial state where the transaction enters is the active state.

2. **Partially Committed** − The transaction enters this state after the last statement of the transaction has been executed.

3. Committed − The transaction is successful and system checks commit signal.

4. Failed − The transaction is in failed state when it is discovered that normal execution can no longer proceed or system checks fail.

5. Aborted − The transaction has been rolled back after failure and the database has been restored back


begin_transaction
Active
end_
transaction
Partially
Committed
commit
Committed
unsuccessful
Failed
rollback
Aborted
read_item /
write_item

Properties of Transaction

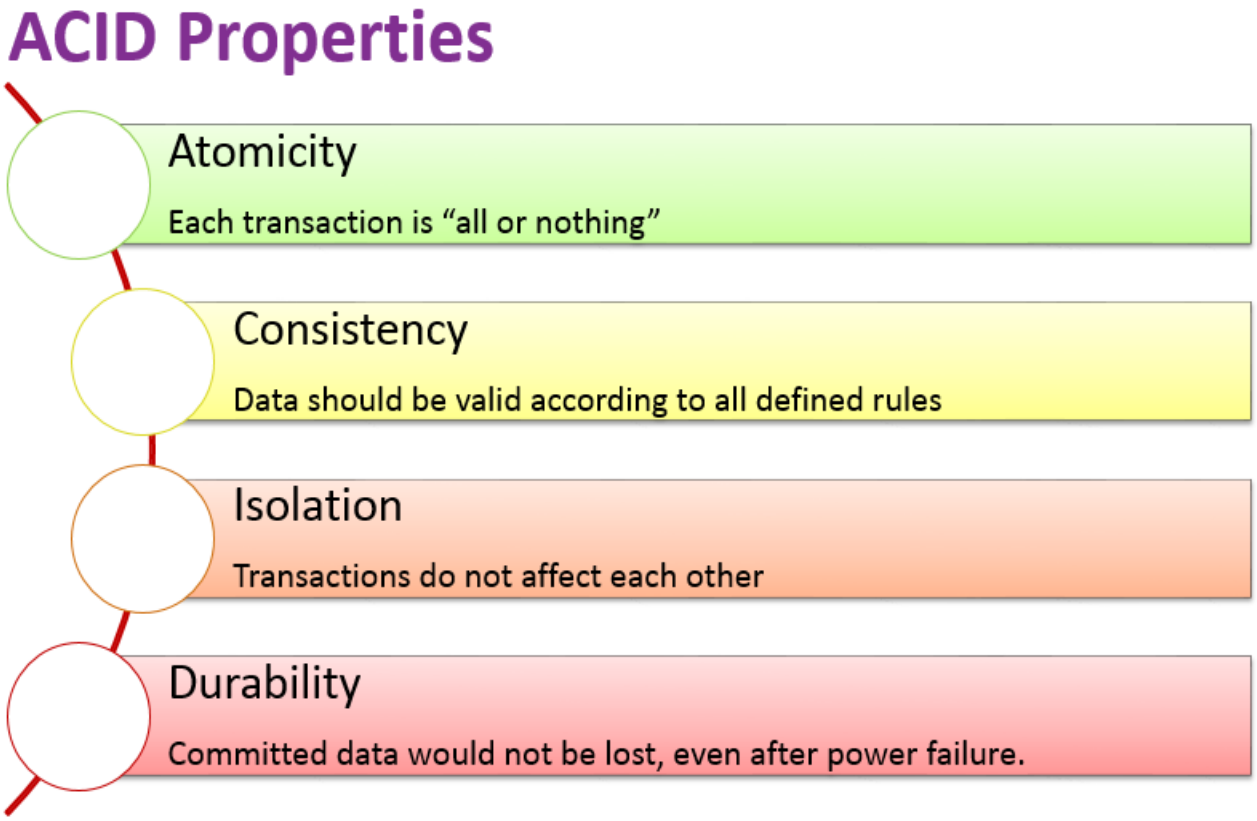
Any transaction must maintain the ACID properties, Atomicity, Consistency, Isolation, and Durability.

Atomicity − This property states that either it is performed in its entirety or not performed at all.

Consistency − A transaction should take the database from one consistent state to another consistent state.

Isolation − A transaction should be executed as if it is the only one in the system.

Durability − If a committed transaction brings about a change it should be durable in the database and not lost in case of any failure.



THANK YOU