

- **TRANSACTION**

-- SQL Server Transactions --

Definition

- A **Transaction** is a sequence of one or more SQL operations (INSERT, UPDATE, DELETE) executed as a **single unit**.
- Ensures that either **all operations succeed or none are applied**.

2. ACID Properties

1. **Atomicity** – All operations in the transaction are completed, or none are applied.
2. **Consistency** – Database remains in a valid and consistent state.
3. **Isolation** – Concurrent transactions do not affect each other.
4. **Durability** – Once committed, changes are permanent even if the system fails.

. Benefits

- Maintains **data integrity** during complex operations.
- Prevents **partial updates** that could corrupt data.
- Essential in critical systems like **banking, e-commerce, and payroll**.

. Example Use Case (Banking)

- **Scenario:** Transfer 500 from Ahmed's account to Sara's account.

```

BEGIN TRANSACTION;
UPDATE Account
SET Balance = Balance - 500
WHERE AccountID = 101; -- Ahmed's account

UPDATE Account
SET Balance = Balance + 500
WHERE AccountID = 103; -- Sara's account

-- وافق على كل التغييرات واحفظها نهائياً في قاعدة البيانات --
-- في حال صار فشل في أي حاجة الغي العملية كلها --
COMMIT;
ROLLBACK;

```

- # If an error occurs, you can **ROLLBACK** to cancel all changes.

. Notes

- Transactions **do not speed up queries**, but **ensure safe and reliable updates**.
- Can be used with **updatable Views** to modify underlying tables safely.
- Often used in operations that must be **all-or-nothing**, like fund transfers, loan processing, or inventory updates.

- **PROCEDURE**

-- Stored Procedures in SQL Server--

What is a Stored Procedure?

A **Stored Procedure** is a group of SQL statements that is saved inside the database and executed as a single unit.

Instead of writing the same SQL queries repeatedly, we can store them once and reuse them by calling the procedure.

Why Do We Use Stored Procedures?

Stored Procedures are used to:

- Simplify complex SQL logic
- Reduce repeated SQL code
- Improve performance
- Increase security
- Ensure data consistency

Stored Procedures and Transactions

Stored Procedures are often used with **Transactions** to ensure data integrity.

A transaction guarantees that:

- All operations are completed successfully (**COMMIT**), or
- None of them are applied if an error occurs (**ROLLBACK**)

This is very important in systems like banking, where money transfers must be accurate.

Real-Life Example (Banking System)

In a banking system, a stored procedure can be used to:

- Transfer money between two accounts
- Deduct an amount from one account
- Add the same amount to another account

If any step fails, the transaction is rolled back to prevent data inconsistency.

Advantages of Stored Procedures

- **Better Performance:** Stored procedures are precompiled, so they execute faster.
- **Security:** Users can be given permission to execute a procedure without accessing tables directly.
- **Maintainability:** Business logic is stored in one place and easy to update.
- **Reusability:** The same procedure can be reused by different applications.

Limitations of Stored Procedures

- Harder to debug compared to normal SQL queries
- Changes require altering the procedure
- Logic is tied to the database (less flexibility in some applications)

Conclusion

Stored Procedures are a powerful feature in SQL Server.

They help manage complex operations, improve performance, and protect data integrity, especially in critical systems such as banking and financial applications.

