

SQL Server Architecture-Detailed Flow

1. Client Layer

- **Start:** Client sends a request to SQL Server.
- **Input:** T-SQL Query or Command.

2. SQL Server Relational Engine

- **Query Processing:**
 - **Query Parser:** Parses the T-SQL query for syntax errors.
 - **Algebrizer:** Resolves database objects (tables, columns) and converts the query into an algebrized tree.
 - **Query Optimizer:** Generates an optimal execution plan by evaluating various strategies.
- **Execution Plan:**
 - **Execution Context:** Sets up the runtime environment for query execution.
 - **Plan Cache:** Checks if an execution plan already exists in the cache.
 - **If Yes:** Reuses the cached execution plan.
 - **If No:** Compiles a new execution plan and stores it in the cache.
- **Transaction Management:**
 - **Lock Manager:** Acquires the necessary locks for data integrity.
 - **Transaction Manager:** Handles commit, rollback, and savepoint operations.

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3. SQL Server Storage Engine

- **Access Methods:**
 - **Buffer Manager:** Retrieves data pages from the buffer pool or disk.
 - **Data Manager:** Reads and writes data pages from and to disk.
- **Data Storage:**
 - **File Groups:** Logical grouping of data files.
 - **Data Files:** Stores actual table data (MDF, NDF files).
 - **Log Files:** Stores transaction log data (LDF files).
- **Buffer Pool:**
 - **Data Cache:** Caches data pages in memory to reduce disk I/O.
 - **Procedure Cache:** Stores execution plans for reuse.

4. Execution Phase

- **Query Execution:** Executes the steps in the execution plan, interacting with the storage engine to retrieve or modify data.
- **Return Result:** The result set is returned to the client.
- **End:** Process completed.