**SQL Stored Procedure**

1. **What is a stored procedure in SQL, and how does it differ from a standard SQL query?**

A stored procedure in SQL is a precompiled collection of one or more SQL statements that are stored in the database and can be executed as a single unit. Stored procedures can include control-flow logic (such as IF, WHILE, BEGIN...END), accept input parameters, return output values, and handle exceptions.

|  |  |  |
| --- | --- | --- |
| **Feature** | **Stored Procedure** | **Standard SQL Query** |
| **Definition** | Predefined and stored in the database | Written and executed on the fly |
| **Reusability** | Can be reused multiple times | Must be rewritten or copied each time |
| **Logic and Control** | Supports control structures (loops, conditions) | Does not support procedural logic |
| **Performance** | Compiled and optimized once | Parsed and compiled each time it's run |
| **Security** | Can restrict access via permission control | Less control unless wrapped in procedures |
| **Parameters** | Supports input/output parameters | Typically does not |

**2. Advantages of Using Stored Procedures**

1. **Improved Performance**
   * Stored procedures are precompiled and stored in the database, which means they can be executed faster than dynamically run queries.
2. **Reusability and Maintainability**
   * Common logic can be encapsulated into a procedure and reused, reducing code duplication and simplifying maintenance.
3. **Security**
   * Access to data can be restricted by granting permissions to execute stored procedures without giving direct access to the tables.
4. **Reduced Network Traffic**
   * Since multiple SQL statements are grouped into one procedure, it reduces the number of round-trips between application and database server.
5. **Encapsulation of Business Logic**
   * Business rules and logic can be centralized in the database layer, making changes easier and reducing the risk of inconsistent logic across applications.
6. **Error Handling**
   * Stored procedures can include error-handling mechanisms, making the application more robust.
7. **Modularity**
   * Breaks down complex processes into manageable chunks that can be independently tested and maintained.