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Disclaimer: this paper was partially written with ChatGPT's 4o model, with heavy manual modifications to fit my purposes and learned nomenclatures.

SQL Functions

Introduction

In SQL Server, User-Defined Functions (UDFs) are custom routines created to encapsulate reusable logic, helping keep queries clean, consistent, and more maintainable. They act like mini-programs that can be used inside queries, returning values based on provided inputs. For teams working with complex datasets or repeating calculations, UDFs become essential tools to simplify the SQL codebase. The function types vary in how they're structured and used, but each offers a different way to handle logic, performance, and maintainability.

SQL UDF

A SQL UDF is most useful when there's a need to abstract and reuse logic across multiple queries. For example, if a report needs to convert raw date values into a formatted string like "June, 2025" in multiple views, defining a function to format the date once prevents repetition and ensures consistency. UDFs are also ideal when applying business logic like converting NULLs to zeros (e.g. for January/first month inventory data compared to a nonexistent previous month in the same year). They also help when filtering or transforming columns in a view or stored procedure while keeping the main query readable.

Scalar, Inline, and Multi-Statement Functions

There are three main types of SQL functions: Scalar, Inline Table-Valued, and Multi-Statement Table-Valued. Scalar functions return a single value and are used in expressions or `SELECT` clauses. Inline table-valued functions return a table from a single `SELECT` statement and perform well, much like parameterized views. Multi-statement table-valued functions also return a table but allow multiple steps and variable declarations, though they typically perform slower than inline functions.

Summary

SQL UDFs are a good way to encapsulate logic and improve the reusability of code in databases. Knowing which type to use helps developers write cleaner, more efficient SQL. Scalar functions simplify single-value calculations, inline functions are great for query-like use cases, and multi-statement functions handle more complex workflows.