



Stored Procedures

.NET

SQL Server creates an execution plan for a Procedure and stores it in the cache. In subsequent executions, the plan is reused so that the Stored Procedure can execute faster and with reliable performance.

[HTTPS://WWW.SQLSERVERTUTORIAL.NET/SQL-SERVER-STORED-PROCEDURES/](https://www.sqlservertutorial.net/sql-server-stored-procedures/)

Function vs. Stored Procedure

<https://www.c-sharpcorner.com/UploadFile/996353/difference-between-stored-procedure-and-user-defined-function/>

Differences between Stored Procedure and User Defined Function in SQL Server

User Defined Function	Stored Procedure
Function must return a value.	Stored Procedure may or not return values.
Will allow only Select statements, it will not allow us to use DML statements.	Can have select statements as well as DML statements such as insert, update, delete and so on
It will allow only input parameters, doesn't support output parameters.	It can have both input and output parameters.
It will not allow us to use try-catch blocks.	For exception handling we can use try catch blocks.
Transactions are not allowed within functions.	Can use transactions within Stored Procedures.
We can use only table variables, it will not allow using temporary tables.	Can use both table variables as well as temporary table in it.
Stored Procedures can't be called from a function.	Stored Procedures can call functions.
Functions can be called from a select statement.	Procedures can't be called from Select/Where/Having and so on statements. Execute/Exec statement can be used to call/execute Stored Procedure.
A UDF can be used in join clause as a result set.	Procedures can't be used in Join clause

Stored Procedures – Overview

https://www.w3schools.com/sql/sql_stored_procedures.asp

<https://docs.microsoft.com/en-us/sql/relational-databases/stored-procedures/stored-procedures-database-engine?view=sql-server-ver15>

A **Stored Procedure** is a SQL query that you have saved as a **Function** so it can be reused. The execution plan is saved so the query runs faster than if it were written new each time it was used.

A commonly used SQL query can be saved as a **Stored Procedure**, and then called when needed. **Stored procedures** can have parameters and act based on the parameter values passed.

SSMS has some built-in **Stored Procedures**.

1. Use keywords 'CREATE PROCEDURE'
2. Give the procedure a name
3. Use the keyword 'AS'
4. Write the query

```
CREATE PROCEDURE  
procedure_name  
AS  
sql_statement
```

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Stored Procedures:

- Accept **INPUT** parameters
- Can return multiple values in the form of **OUTPUT** parameters.
- Contain programming statements that perform operations on the database, include calling other procedures.
- Return a status value to a calling program to indicate success, failure, and the reason for failure.
- Allow easy reuse and code maintenance
- Improve performance
- Reduce network traffic.

Stored Procedures – Types

<https://docs.microsoft.com/en-us/sql/relational-databases/stored-procedures/stored-procedures-database-engine?view=sql-server-ver15#types-of-stored-procedures>

There are four types of Stored Procedures

Type	Description
User-Defined	Created in a user-defined database or in any system database except the Resource database. Can be developed in SQL or as a reference to a method.
Temporary	Stored in tempdb . There are two types: local and global . Local temp procedures have # as the first character of their names, are visible only to the current user connection, and are deleted when the connection is closed. Global temporary procedures have ## as the first two characters of their names, are visible to any user after they are created, and are deleted at the end of the last session using the procedure.
System	Included with SQL Server. They are physically stored in the internal, hidden Resource database and logically appear in the sys schema of every system- and user-defined database.
Extended User-Defined	Extended procedures enable creating external routines in a programming language such as C. These procedures are DLLs that an instance of SQL Server can dynamically load and run.

Stored Procedure – Create, Execute, Delete

<https://www.sqlservertutorial.net/sql-server-stored-procedures/basic-sql-server-stored-procedures/>

<https://docs.microsoft.com/en-us/sql/relational-databases/stored-procedures/create-a-stored-procedure?view=sql-server-ver15>

This *Stored Procedure* is called **GetAllCustomerNames**.

It will produce a table with two columns, **CustomerId** and **FirstName**, from the **Customers** table, where the **addressId** (FK) is 1.

Execute with **EXEC**.

Drop with **DROP PROCEDURE**.

```
--Simple Stored Procedure
CREATE PROCEDURE GetAllCustomerNames
AS
SELECT CustomerId, FirstName
FROM Customers
WHERE addressID = 1;

EXEC GetAllCustomerNames;
DROP PROCEDURE GetAllCustomerNames;
```

SQL – Scalar Variables

Sometimes we want to store intermediate values.

- We can split queries into several parts.
- SQL Server supports **scalar** variables and **table-valued** variables.
- They only exist for the duration of that "batch" of commands

```
DECLARE @maxid INT;  
SELECT @maxid = MAX(TypeId) FROM Poke.Type;  
SET @maxid = (SELECT MAX(TypeId) FROM Poke.Type); -- another way to set variable  
INSERT INTO Poke.Type (TypeId, Name) VALUES (@maxid + 1, 'Earth');
```


Declaring Scalar Variables

<https://docs.microsoft.com/en-us/sql/relational-databases/stored-procedures/specify-parameters?view=sql-server-ver15#passing-values-into-parameters>

To declare a variable in SQL:

- Declare the variable by using the **DECLARE** keyword.
- Follow **DECLARE** with **@<variableName> <datatype>**.
- Use the Keyword **SET**.
- Use **@[variableName] = [value]**
- The variable can be passes as an argument into a *Procedure*.

```
DECLARE @ProductID INT,  
        @CheckDate datetime;  
  
SET @ProductID = 819;  
  
SET @CheckDate = '20050225';  
  
EXEC dbo.uspGetProductID  
    @ProductID,  
    @CheckDate;
```

Stored Procedure with Parameters

<https://docs.microsoft.com/en-us/sql/relational-databases/stored-procedures/specify-parameters?view=sql-server-ver15>

The parameter values supplied with a **Procedure** call must be constants or a variable. A **Function** name cannot be used as a parameter value.

When creating a **Procedure** and declaring a parameter name, the parameter name must begin with a single @ and must be unique in the scope of the procedure.

Parameters must also be defined with a data type when they are declared in a **CREATE PROCEDURE** statement.

```
--Stored Procedure with variables
CREATE PROCEDURE GetCustomerShe
    @LastName nvarchar(50),
    @FirstName nvarchar(50)
AS
    SELECT FirstName, LastName, Remarks
    FROM Customers
    WHERE FirstName = @FirstName
    AND
        LastName = @LastName
    AND
        Remarks LIKE 'S_e%';

EXEC GetCustomerShe
    @LastName = 'Moore',
    @FirstName = 'Maya';

DROP PROCEDURE GetCustomerShe;
```

Table-Valued Parameter

<https://docs.microsoft.com/en-us/sql/relational-databases/tables/use-table-valued-parameters-database-engine?view=sql-server-ver15>

Table-valued parameters are declared by using user-defined table types. You can use **table-valued parameters** to send multiple rows of data to a SQL statement or a routine, such as a **Stored Procedure** or **Function**, without creating a temporary table or many parameters.

A **Table-valued Parameter** is scoped to the **Stored Procedure** or **Function**, exactly like other parameters.

Table-valued Parameters must be passed as input **READONLY** parameters to routines. You cannot perform DML operations such as **UPDATE**, **DELETE**, or **INSERT** on a **Table-valued Parameter** in the body of a routine.

```
/* Create a table type. */
CREATE TYPE LocationTableType AS TABLE
    ( LocationName VARCHAR(50), CostRate INT );
/*Create a procedure to receive data for table-valued parameter.*/
CREATE PROCEDURE dbo.usp_InsertProductionLocation
    @TVP LocationTableType READONLY
AS
    SET NOCOUNT ON
    INSERT INTO AdventureWorks2012.Production.Location
        ( Name, CostRate, Availability, ModifiedDate )
    SELECT *, 0, GETDATE()
    FROM @TVP;
/* Declare a variable that references the type. */
DECLARE @LocationTVP AS LocationTableType;
/* Add data to the table variable. */
INSERT INTO @LocationTVP (LocationName, CostRate)
    SELECT Name, 0.00
    FROM AdventureWorks2012.Person.StateProvince;
/* Pass the table variable data to a stored procedure. */
EXEC usp_InsertProductionLocation @LocationTVP;
```

Stored Procedure – OUT Parameter

<https://docs.microsoft.com/en-us/sql/relational-databases/stored-procedures/specify-parameters?view=sql-server-ver15#specifying-parameter-direction>

The direction of a parameter is either INPUT (default) or **OUTPUT**, meaning the procedure returns a value to the calling program.

To specify an **OUTPUT** parameter, the **OUTPUT** keyword must be specified in the definition of the parameter in the **CREATE PROCEDURE** statement.

The procedure returns the current value of the **OUTPUT** parameter to the calling program when the procedure exits.

The calling program must also use the **OUTPUT** keyword when executing the procedure to save the parameter's value in a variable that can be used in the calling program.

```
CREATE PROCEDURE HowManyOrdersByCustomer (
    @CustomerNumber INT, --customerID
    @OrderCount INT OUTPUT
) AS
BEGIN
    SELECT
        CustomerID AS CustomersID
    FROM Orders
    WHERE CustomerID = @CustomerNumber;
    -- @@ROWCOUNT is a system variable that returns
    -- the number of rows read by the previous statement.
    SELECT @OrderCount = @@ROWCOUNT;
END;

DECLARE @HowMany INT; -- declare the OUTPUT variable
-- call the method with the 2 parameters
EXEC HowManyOrdersByCustomer 1, @HowMany OUTPUT;
SELECT @HowMany AS 'Ten times the total';
```

Procedure with Try/Catch

```
GO
CREATE OR ALTER PROCEDURE Poke.UpdateAllDateModified(@param INT, @rowschanged INT OUTPUT)
AS
BEGIN
    BEGIN TRY
        IF (NOT EXISTS (SELECT * FROM Poke.Pokemon))
        BEGIN
            RAISERROR ('No data found in table', 15, 1);
        END
        SET @rowschanged = (SELECT COUNT(*) FROM Poke.Pokemon);
        UPDATE Poke.Pokemon SET DateModified = GETDATE();
    END TRY
    BEGIN CATCH
        PRINT 'Error'
    END CATCH
END
GO
```

This procedure updates all the **DateModified** values to the current time and returns the number of rows modified.

```
DECLARE @result INT;
EXECUTE Poke.UpdateAllDateModified 123, @result OUTPUT;
SELECT @result;
```

SQL – Value-Typed Variables

```
DECLARE @@mytable AS TABLE (  
    Id INT,  
    Name NVARCHAR(20)  
);  
INSERT INTO @@mytable  
SELECT TypeId, Name FROM Poke.Type;
```