Stored procedures

WRITING FUNCTIONS AND STORED PROCEDURES IN SQL SERVER

Meghan Kwartler
IT Consultant

What is a stored procedure?

What?

Routines that

- Accept input parameters
- Perform actions (`EXECUTE` `SELECT` , `INSERT` , `UPDATE` , `DELETE` , and other SP statements)
- Return status (success or failure)
- Return output parameters

Why use stored procedures?

Why?

- Can reduce execution time
- Can reduce network traffic
- Allow for Modular Programming
- Improved Security

What's the difference?

UDFs

- Must return value
  - Table-valued allowed
- Embedded `SELECT` execute allowed
- No output parameters
- No `INSERT`, `UPDATE`, `DELETE`
- Cannot execute SPs
- No Error Handling

SPs

- Return value optional
  - No table-valued
- Cannot embed in `SELECT` to execute
- Return output parameters & status
- `INSERT`, `UPDATE`, `DELETE` allowed
- Can execute functions & SPs
- Error Handling with `TRY...CATCH`

CREATE PROCEDURE with OUTPUT parameter

```
-- First four lines of code
-- SP name must be unique
CREATE PROCEDURE dbo.cuspGetRideHrsOneDay
    @DateParm date,
    @RideHrsOut numeric OUTPUT
AS
.......
```

CREATE PROCEDURE with OUTPUT parameter

```
CREATE PROCEDURE dbo.cuspGetRideHrsOneDay
    @DateParm date,
    @RideHrsOut numeric OUTPUT
AS
SET NOCOUNT ON
BEGIN
SELECT
  @RideHrsOut = SUM(
    DATEDIFF(second, PickupDate, DropoffDate)
  )/ 3600
FROM YellowTripData
WHERE CONVERT(date, PickupDate) = @DateParm
RETURN
END;
```

Output parameters vs. return values

Output parameters

- Can be any data type
- Can declare multiple per SP
- Cannot be table-valued parameters

Return value

- Used to indicate success or failure
- Integer data type only
- 0 indicates success and non zero indicates failure

You're ready to CREATE PROCEDUREs!

WRITING FUNCTIONS AND STORED PROCEDURES IN SQL SERVER

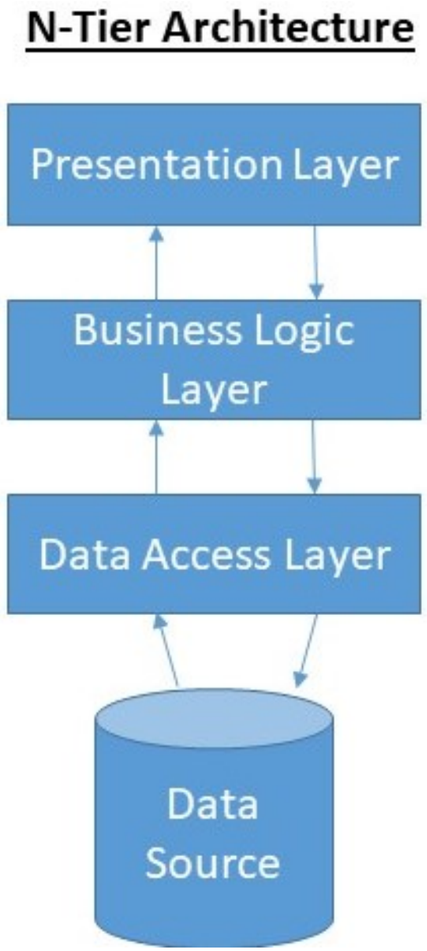
Oh CRUD!

WRITING FUNCTIONS AND STORED PROCEDURES IN SQL SERVER

Meghan Kwartler
IT Consultant

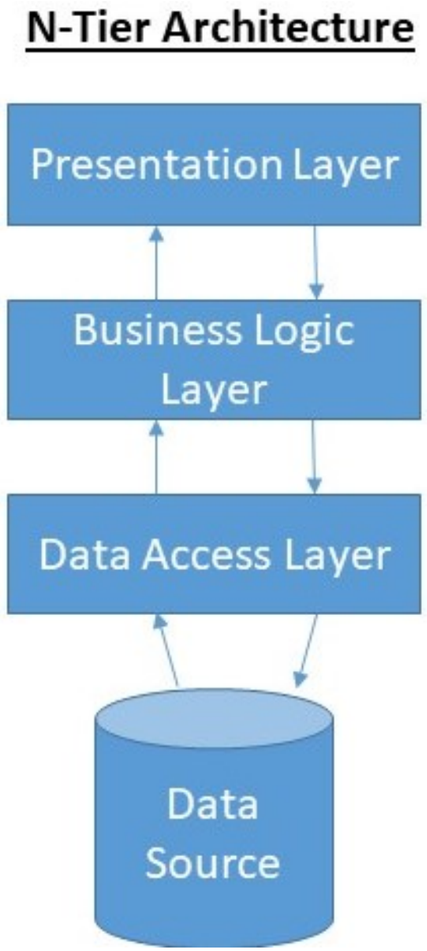
Why stored procedures for CRUD?

- Decouples SQL code from other application layers



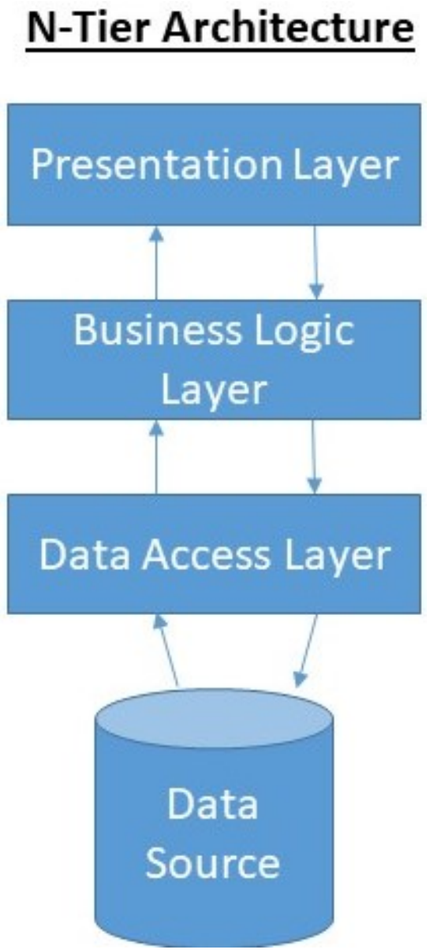
Why stored procedures for CRUD?

- Decouples SQL code from other application layers
- **Improved security**



Why stored procedures for CRUD?

- Decouples SQL code from other application layers
- Improved security
- **Performance**



C for CREATE

```
CREATE PROCEDURE dbo.cusp_TripSummaryCreate (
  @TripDate as date,
  @TripHours as numeric(18, 0)
) AS BEGIN INSERT INTO dbo.TripSummary(Date, TripHours)
VALUES
  (@TripDate, @TripHours)
SELECT Date, TripHours
FROM dbo.TripSummary
WHERE Date = @TripDate END
```

R for READ

```
CREATE PROCEDURE cusp_TripSummaryRead
    (@TripDate as date)
AS
BEGIN
SELECT Date, TripHours
FROM TripSummary
WHERE Date = @TripDate
END;
```

U for UPDATE

```
CREATE PROCEDURE dbo.cusp_TripSummaryUpdate
    (@TripDate as date,
    @TripHours as numeric(18,0))
AS
BEGIN
UPDATE dbo.TripSummary
SET Date = @TripDate,
    TripHours = @TripHours
WHERE Date = @TripDate
END;
```

D for DELETE

```
CREATE PROCEDURE cusp_TripSummaryDelete
    (@TripDate as date,
     @RowCountOut int OUTPUT)
AS
BEGIN
DELETE
FROM TripSummary
WHERE Date = @TripDate

SET @RowCountOut = @@ROWCOUNT
END;
```

Your turn for CRUD!

WRITING FUNCTIONS AND STORED PROCEDURES IN SQL SERVER

Let's EXEC!

WRITING FUNCTIONS AND STORED PROCEDURES IN SQL SERVER

Meghan Kwartler
IT Consultant

Ways to EXECute

- No output parameter or return value
- Store return value
- With output parameter
- With output parameter & store return value
- Store result set

No output parameter or return value

```
EXEC dbo.cusp_TripSummaryUpdate
     @TripDate = '1/5/2017'
     @TripHours = '300'
```

With output parameter

```
DECLARE @RideHrs as numeric(18,0)

EXEC dbo.cuspSumRideHrsOneDay
     @DateParm = '1/5/2017',
     @RideHrsOut = @RideHrs OUTPUT
```

```
SELECT @RideHrs as TotalRideHrs
```

```
+--------------+
| TotalRideHrs |
|--------------+
| 77733        |
+--------------+
```

With return value

```
Declare @ReturnValue as int

EXEC @ReturnValue =
     dbo.cusp_TripSummaryUpdate
     @TripDate = '1/5/2017',
     @TripHours = 300

Select @ReturnValue as ReturnValue
```

```
+--------------+
| ReturnValue |
|--------------+
| 0           |
+--------------+
```

With return value & output parameter

```
Declare @ReturnValue as int
Declare @RowCount as int

EXEC @ReturnValue =
     dbo.cusp_TripSummaryDelete
     @TripDate = '1/5/2017',
     @RowCountOut = @RowCount OUTPUT

Select @ReturnValue as ReturnValue,
     @RowCount as RowCount
```

```
+--------------+-----------+
| ReturnValue | RowCount |
|--------------+-----------|
| 0           | 1         |
+--------------+-----------|
```

EXEC & store result set

```
DECLARE @TripSummaryResultSet as TABLE(
        TripDate date,
        TripHours numeric(18,0))

INSERT INTO @TripSummaryResultSet
EXEC cusp_TripSummaryRead @TripDate = '1/5/2017'

SELECT * FROM @TripSummaryResultSet
```

```
+------------+-----------+
| TripDate   | TripHours |
|------------+-----------|
| 2017-01-05 | 200       |
+------------+-----------|
```

Time to EXEC your SPs!

WRITING FUNCTIONS AND STORED PROCEDURES IN SQL SERVER

TRY & CATCH those errors!

WRITING FUNCTIONS AND STORED PROCEDURES IN SQL SERVER

Meghan Kwartler
IT Consultant

To handle errors or not

What is error handling?

- Anticipation, detection and resolution of errors
- Maintains normal flow of execution
- Integrated into initial design

What happens without error handling?

- Sudden shut down or halts execution
- Generic error messages without helpful context are provided

Let's TRY

```
ALTER PROCEDURE dbo.cusp_TripSummaryCreate
  @TripDate nvarchar(30),
  @RideHrs numeric,
  @ErrorMsg nvarchar(max) = null OUTPUT
AS
BEGIN
  BEGIN TRY
      INSERT INTO TripSummary (Date, TripHours)
      VALUES (@TripDate, @RideHrs)
  END TRY
.........
```

Time to CATCH

```
ALTER PROCEDURE dbo.cusp_TripSummaryCreate
  @TripDate nvarchar(30),
  @RideHrs numeric,
  @ErrorMsg nvarchar(max) = null OUTPUT
AS
BEGIN
  BEGIN TRY
      INSERT INTO TripSummary (Date, TripHours)
      VALUES (@TripDate, @RideHrs)
  END TRY
  BEGIN CATCH
      SET @ErrorMsg = 'Error_Num: ' +
      CAST (ERROR_NUMBER() AS varchar) +
      ' Error_Sev: ' +
      CAST(ERROR_SEVERITY() AS varchar) +
      ' Error_Msg: ' + ERROR_MESSAGE()
  END CATCH
END
```

Show me the ERROR...

```
DECLARE @ErrorMsgOut as nvarchar(max)

EXECUTE dbo.cusp_TripSummaryCreate
        @TripDate = '1/32/2018',
        @RideHrs = 100,
        @ErrorMsg = @ErrorMsgOUT OUTPUT

SELECT @ErrorMsgOut as ErrorMessag
```

```
ErrorMessage
-------------------------------------------------
Error_Num: 241 Error_Sev: 16
Error_Msg: Conversion failed when converting date and/or time from
           character string
```

THROW vs RAISERROR

THROW

- Introduced in SQL Server 2012
- Simple & easy to use
- Statements following will **NOT** be executed

RAISERROR

- Introduced in SQL Server 7.0
- Generates new error and cannot access details of original error (e.g. line number where error originally occurred)
- Statements following can be executed

Your turn to CATCH!

WRITING FUNCTIONS AND STORED PROCEDURES IN SQL SERVER