

Cool SQL Server Features Every Developer Should Know About

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Sample Database and Code



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Sample database and queries for my talk about Cool SQL Server Features

📦 3 commits

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DavidCBerry13 Added SQL for MERGE statement, example window function queries

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📁 JSONFeatures	Initial revision	a day ago
📁 MergeStatement	Added SQL for MERGE statement, example window function queries	17 seconds ago
📁 TemporalTables	Initial revision	a day ago
📁 WindowFunctions	Added SQL for MERGE statement, example window function queries	17 seconds ago
📄 .gitattributes	🤖 Added .gitattributes & .gitignore files	a day ago
📄 .gitignore	🤖 Added .gitattributes & .gitignore files	a day ago

<https://github.com/DavidCBerry13/CoolSqlServerFeatures/>

We all use SQL Server every day...
...we might as well be good at it.

Agenda

MERGE Statement

Temporal Tables

JSON Support

Window (Analytic) Functions

MERGE Statement

Available in SQL Server 2008 and later, SQL Azure

Essentially provides an “UPSERT” capability

Useful when doing bulk updates to tables

Can be useful for setting reference data in DEV databases

Problem Scenario

Source Table

*May contain records
already in our data table



Target Table

Use a MERGE statement
to perform an UPSERT

MERGE Statement Syntax

```
MERGE INTO Customers AS Target
USING (
    SELECT
        CustomerId,
        FirstName,
        LastName,
        DateOfBirth,
        PhoneNumber,
        Email
FROM CustomersStaging
) AS Staging
ON (Staging.CustomerId = Target.CustomerId)
    WHEN MATCHED THEN
        UPDATE SET
            FirstName = Staging.FirstName,
            LastName = Staging.LastName,
            DateOfBirth = Staging.DateOfBirth,
            PhoneNumber = Staging.PhoneNumber,
            Email = Staging.Email
    WHEN NOT MATCHED BY Target THEN
        INSERT (CustomerId, FirstName, LastName, DateOfBirth, PhoneNumber, Email)
            VALUES (CustomerId, FirstName, LastName, DateOfBirth, PhoneNumber, Email);
--WHEN NOT MATCHED BY Staging THEN
--    DELETE;
```

Using MERGE to Set Reference Data

```
MERGE INTO ProductTypes As Target
USING (VALUES
    (1, 'Laptops',          'Computers'),
    (2, 'Desktops',        'Computers'),
    (3, 'Displays',        'Accessories'),
    (4, 'PC Accessories',   'Accessories'),
    (5, 'Tablets',          'Mobile Devices')
)
AS Source (ProductTypeId, ProductTypeName, CategoryName)
ON (Target. ProductTypeId = Source. ProductTypeId )
    WHEN MATCHED THEN
        UPDATE SET
            ProductTypeName = Source. ProductTypeName,
            CategoryName = Source.CategoryName
    WHEN NOT MATCHED BY TARGET THEN
        INSERT (ProductTypeId, ProductTypeName, CategoryName)
        VALUES (ProductTypeId, ProductTypeName, CategoryName)
    WHEN NOT MATCHED BY SOURCE THEN
        DELETE;
```


Temporal Tables

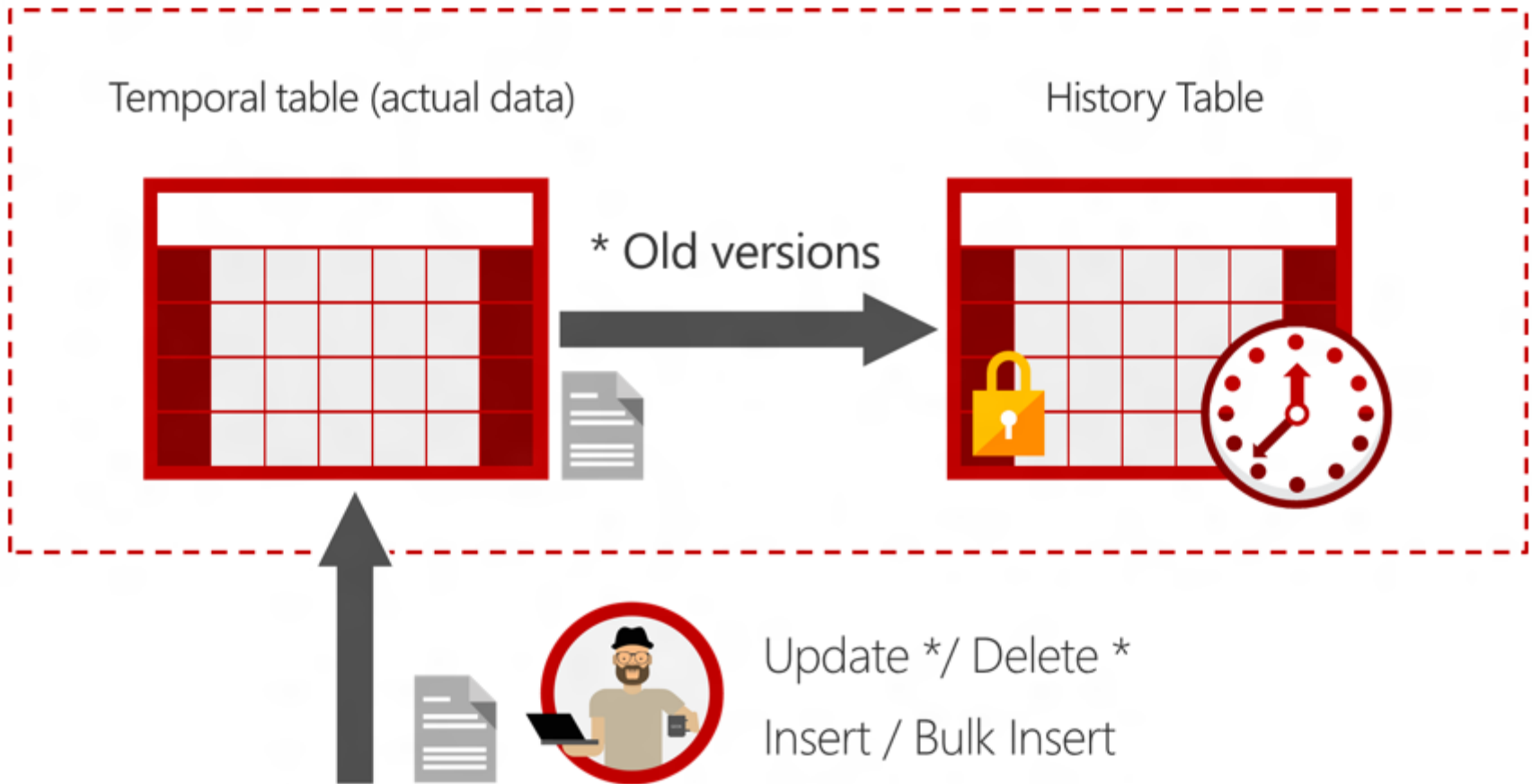
Available in SQL Server 2016, SQL Azure

Every time a row is changed, SQL Server keeps a snapshot of the old row values

SQL constructs allow us to see what the value was at any given date/time

No need to implement your own triggers, history tables and views

Temporal Table Concept



CREATE TABLE Syntax

```
CREATE TABLE Contacts
(
    ContactID          INT IDENTITY(1,1)          NOT NULL,
    FirstName          VARCHAR(30)                NOT NULL,
    LastName           VARCHAR(30)                NOT NULL,
    CompanyName        VARCHAR(30)                NULL,
    PhoneNumber        VARCHAR(20)                NULL,
    Email              VARCHAR(50)                NULL,
    ValidFrom          DATETIME2(3) GENERATED ALWAYS AS ROW START,
    ValidTo            DATETIME2(3) GENERATED ALWAYS AS ROW END,
    PERIOD FOR SYSTEM_TIME (ValidFrom, ValidTo),
    CONSTRAINT PK_Contacts PRIMARY KEY (ContactId)
)
WITH (SYSTEM_VERSIONING = ON
      (HISTORY_TABLE = dbo.ContactsHistory));
```

Hiding ValidFrom and ValidTo Columns

```
-- Hide the ValidFrom and ValidTo columns
```

```
ALTER TABLE Contacts
```

```
    ALTER COLUMN ValidFrom ADD HIDDEN;
```

```
ALTER TABLE Contacts
```

```
    ALTER COLUMN ValidTo ADD HIDDEN;
```

```
-- Show the ValidFrom and ValidTo Columns
```

```
ALTER TABLE Contacts
```

```
    ALTER COLUMN ValidFrom DROP HIDDEN;
```

```
ALTER TABLE Contacts
```

```
    ALTER COLUMN ValidTo DROP HIDDEN;
```

Temporal Table Query Qualifiers

Expression	Description
AS OF <date time>	Gets all of the rows that were active at the specified date and time
FROM <start time> TO <end time>	Gets all of the rows that were active at any point during the specified time period, excluding rows that were only active at the start time or end time
BETWEEN <start time> AND <end time>	Gets all rows active in the time period including rows that became active at the ending time of the period
CONTAINED IN (<start time>, <end time>)	Gets all rows that were opened and closed in the period specified
ALL	Get all rows in the table and the history table

JSON Support

Available in SQL Server 2016, SQL Azure

JSON data stored in a VARCHAR data type

Functions available to interact with JSON data

Allows us to mix relational and NoSQL data models in the same database

Storing JSON in Tables

```
CREATE TABLE WeatherDataJson
(
    ObservationId      INT IDENTITY(1,1)  NOT NULL,
    StationCode        VARCHAR(10)        NOT NULL,
    City               VARCHAR(30)         NOT NULL,
    State              VARCHAR(2)          NOT NULL,
    ObservationDate     DATETIME            NOT NULL,
    ObservationData     VARCHAR(4000)       NOT NULL,
    CONSTRAINT PK_WeatherDataJson
        PRIMARY KEY (ObservationId)
);
```

Exposing JSON Values With Computed Columns

```
ALTER TABLE WeatherDataJson  
  ADD Temperature AS  
    (JSON_VALUE(ObservationData, '$.dryBulbFarenheit'));
```


Getting Data From a JSON Column


JSON_VALUE	Extract a scalar value from a JSON String
JSON_QUERY	Extract an object or an array from a JSON String
OPENJSON	Table value function used for parsing JSON and returning a rowset view of the data

Resturn Results As JSON


SELECT

```
s.StationCode,  
s.City,  
s.State,  
observations.ObservationDate,  
observations.DryBulbFarenheit As Temperature,  
observations.RelativeHumidity,  
observations.WindDirection,  
observations.WindSpeed  
FROM WeatherStations s  
INNER JOIN WeatherObservations observations  
    ON s.StationCode = observations.StationCode  
WHERE  
    observations.ObservationDate > '2016-06-01'  
    AND observations.ObservationDate < '2016-06-07'  
FOR JSON AUTO;
```

**Column or alias
names used for
property names**



**Alias used
as name of
child object**



Window Functions

Available in SQL Server 2008 and later, SQL Azure

Extended functionality over traditional GROUP BY queries

Can partition and aggregate data by different criteria in the same statement

Greatly enhances reporting capabilities in SQL Server

Window Function Syntax

```
SELECT DISTINCT
    City,
    State
    CONVERT (DATE, ObservationDate) AS SummaryDate,
    RANK ()
        OVER (PARTITION BY City, State, CONVERT (DATE, ObservationDate)
            ORDER BY DailyHighTemp DESC) As HighTemp
FROM DailyWeatherSummaries o
WHERE
    State = 'WI'
    AND ObservationDate BETWEEN '2016-05-01' AND '2016-06-01';
```

- PARTITION BY** Splits the result set into different partitions or groups using these columns
- ORDER BY** Orders the rows within each partition for functions where order is important (not used in for some functions)

Window Function Grouping

RANK ()

**OVER (PARTITION BY City, State, CONVERT (DATE, ObservationDate)
ORDER BY DailyHighTemp DESC) As HighTemp**

City	State	SummaryDate	DailyHighTemp	Rank()	
Chicago	IL	2017-06-01	65	1	Partition Group
Chicago	IL	2017-06-01	63	2	
Chicago	IL	2017-06-01	62	3	
Chicago	IL	2017-06-02	67	1	Partition Group
Chicago	IL	2017-06-02	65	2	
Chicago	IL	2017-06-02	63	3	
Milwaukee	WI	2017-06-01	71	1	Partition Group
Milwaukee	WI	2017-06-01	70	2	
Milwaukee	WI	2017-06-01	68	3	

Partition Columns

Sort Column

Ranking Window Functions

ROW_NUMBER()	Creates sequential number of a row within a partition of a result set, starting at 1 for the first row in each partition
RANK()	Returns the rank of each row within the partition of a result set. If there two or more values tie for a rank, then there will be a gap to the next ranking
DENSE_RANK()	Returns the rank of each row within the partition of a result set without any gaps between rankings in event of multiple values for the same rank
NTILE(<integer>)	Distributes the rows in the partition into the specified number of buckets (groups) and shows what bucket that row falls in.

Analytic Window Functions

<code>FIRST_VALUE(<column>)</code>	Returns the first value of the partition as sorted by the <code>ORDER BY</code> clause
<code>LAST_VALUE(<column>)</code>	Returns the last value of the partition as sorted by the <code>ORDER BY</code> clause
<code>LAG(<column>, <offset>, <default>)</code>	Returns the preceding value in the partition. Offset (optional) allows you to reach back multiple rows. Default (optional) allows a default value to be specified
<code>LEAD(<column>, <offset>, <default>)</code>	Returns the next value in the partition. Offset (optional) allows you to reach forward multiple rows. Default (optional) allows a default value to be specified

Resources

MERGE Statement

<https://docs.microsoft.com/en-us/sql/t-sql/statements/merge-transact-sql>

Temporal Tables

<https://docs.microsoft.com/en-us/sql/relational-databases/temporal-tables>

JSON Functions

<https://docs.microsoft.com/en-us/sql/t-sql/functions/json-functions-transact-sql>

<https://www.simple-talk.com/sql/learn-sql-server/json-support-in-sql-server-2016/>

Window Functions

<https://docs.microsoft.com/en-us/sql/t-sql/queries/select-over-clause-transact-sql>

<https://www.simple-talk.com/sql/learn-sql-server/window-functions-in-sql-server/>