Logical Database Architecture

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The data in a Microsoft SQL Server database is organized into several different objects.

The following components are defined as objects:

- Constraints
- Tables
- Defaults
- Triggers
- Indexes
- User-defined data types
- Keys
- Views
- Stored procedures

All the data in Microsoft SQL Server databases is contained in objects called tables.

Tables have two main components:

- ***Columns***

  Each column represents some attribute of the object modelled by the table.

- ***Rows***

  Each row represents an individual occurrence of the object modeled by the table.

Data type

A property of column which defines the type of data the column can hold.

- **Binary**
- **bit**
- **char**
- **datetime**
- **decimal**
- **float**
- **image**
- **int**
- **money**
- **nchar**
- **ntext**
- **nvarchar**
- **numeric**
- **real**
- **smalldatetime**
- **smallint**
- **smallmoney**
- **sysname**
- **text**
- **timestamp**
- **tinyint**
- **varbinary**
- **varchar**
- **uniqueidentifier**

Character and Binary Datatypes

- **Character Datatypes are**
  - **char , nchar , varchar , nvarchar , text , ntext**

- **Binary Datatypes store binary string**
  - **binary,varbinary,image ,timestamp**

Unique Identifier

•Datatype added to version 7.0 to generate values that are unique.

•It is a 16 byte binary datatype.

•Uniqueness is achieved through the newid( ) function.

•The ROWGUIDCOL property can be defined only for one column in a table.

One main use is for MERGE REPLICATION so that SQL Server can idetify rows when it synchronizes updates performed at several sites.

Timestamp

- This is a binary datatype.
- Used to uniquely identify versions of each row in a table.
- Only one timestamp column per table is allowed.
- SQL Server uses the function TSEQUAL to compare timestamp values.
- To use the TSEQUAL function ,the rest of the WHERE clause must uniquely identify a row.

DATETIME Datatype

Used to store date and time information -datetime & smalldatetime.

Smalldatetime is less precise ,covers smaller range of dates and occupies half the space

	datetime	**smalldatetime**
Storage size	8 bytes	4 bytes
Precision	3/100 second	1 minute
Min . Value	Jan1,1753	Jan 1,1900
Max value	Dec 31,9999	June 6,2079

Three types of datetime formats:

Alphabetic date format

Insert format	datetime value
‘Dec 05 2000’	2000-12-05 00:00:00.000

Numeric date format

Insert format	datetime value
‘12/05/2000’	2000-12-05 00:00:00.000

Unseparated String format

Insert format	datetime value
‘20001205’	2000-12-05 00:00:00.000

Logical Datatype : bit

- Used to store ON/OFF , True/False .
- Can hold 0,1,NULL

Numeric Datatypes

Four basic categories

Integers -int,smallint,tinyint

Approximate numeric datatypes-float,real

Exact numeric datatype - numeric,decimal

Money datatypes -money,smallmoney

Integer Data Types

int (4 bytes storage size)

Integer (whole number) data from -2^31 (-2,147,483,648) through 2^31 - 1 (2,147,483,647).

smallint(2 bytes storage size)

Integer data from 2^15 (-32,768) through 2^15 - 1 (32,767).

tinyint(1 byte storage size)

Integer data from 0 through 255.

Approximate Numeric Datatypes

- ***float (4-8 bytes storage size & precision upto 15 digits)***

  Floating precision number data from -1.79E + 308 through 1.79E + 308.

- ***Real(4 bytes storage size & precision upto 7 digits)***

  Floating precision number data from -3.40E + 38 through 3.40E + 38.

Exact Numeric Datatypes

Decimal

Fixed precision and scale numeric data from -10^38 -1 through 10^38 -1. ‘

Numeric

A synonym for **decimal**.

User defined data type

Create a date_join data type that allows nulls.

```
EXEC sp_addtype  date_join, datetime,
'NULL'
 GO
```

Tables

System tables

- Data defining the configuration of the server and all its tables are stored in a special set of tables known as system tables.
- Users should not query or update the system tables directly.
- Only SQL Server should reference the system tables in response to administration commands issued by users.

Temporary tables.

- These are tables whose names start with a number sign (#).
- If a temporary table is not dropped when the user disconnects, it is dropped automatically by SQL Server.
- Temporary tables are not stored in the current database, they are instead stored in the system database tempdb.

Two types of temporary tables

Local temporary tables

- **Have only one number sign (#) at the start of their name.**
- **They are visible only to the connection that created them.**

Global temporary tables

- **Have a double number sign (##) at the start of their name.**
- **They are visible to all connections.**
- **If they are not dropped explicitly before the connection that created them disconnects, they are dropped as soon as all other tasks stop referencing them.**
- **No new tasks can reference a global temporary table after the connection that created it disconnects.**

Views

A view can be thought of as either a virtual table or a stored query.

- **The data accessible through a view is not stored in the database as a distinct object.**
- **The SELECT statement is stored in the database and the result set of the SELECT statement forms the virtual table returned by the view.**
- **A view is used to do any or all of these functions:**

✍ **Restrict a user to specific rows in a table.**

✍ **Restrict a user to specific columns.**

•A view can reference another view.

•Views in Microsoft SQL Server are updatable.

•The following statements can be used so long as the modification only affects one of the base table referenced by the view.

- UPDATE
- DELETE
- INSERT

Stored Procedures

A stored procedure is a group of Transact-SQL statements compiled into a single execution plan.

- Stored procedures assist in achieving a consistent implementation of logic across applications.
- Stored procedures can also improve performance.
- Stored procedures can also shield users from needing to know the details of the tables in the database

Integrity

- Data integrity refers to each occurrence of a column having a correct data value. The data values must be of the right data type and in the correct domain.

- Referential integrity indicates that the relationships between tables have been properly maintained. Data in one table should only point to existing rows in another table; it should not point to rows that do not exist.

Objects used to maintain both types of integrity include:

- Constraints
- Rules
- Defaults
- Triggers

CONSTRAINTS

- **Constraints offer a way to have Microsoft SQL Server enforce the integrity of a database automatically.**
- **Constraints define rules regarding the values allowed in columns**

Classes of constraints.

•NOT NULL specifies that the column does not accept NULL values.

•CHECK constraints enforce domain integrity by limiting the values that can be placed in a column.

•UNIQUE constraints enforce the uniqueness of the values in a set of columns.

•A COLUMN constraint is specified as part of a column definition and applies only to that column .

•A TABLE constraint is declared independently from a column definition and can apply to more than one column in a table.

Rules

Rules are a backward compatibility feature that perform some of the same functions as CHECK constraints.

CHECK constraints are the preferred, standard way to restrict the values in a column and are also more concise than rules;

There can only be one rule applied to a column, but multiple CHECK constraints can be applied.

CHECK constraints are specified as part of the CREATE TABLE statement, while rules are created as separate objects and then bound to the column.

Defaults

- Defaults specify what values are used in a column if you do not specify a value for the column when inserting a row.
- Defaults can be anything that evaluates to a constant:

  Constant

  Built-in function

  Mathematical expression

There are two ways to apply defaults:

- **Create a default definition using the DEFAULT keyword in CREATE TABLE to assign a constant expression as a default on a column. This is the preferred, standard method and also the more concise way to specify a default.**

- **Create a default object using the CREATE DEFAULT statement and bind it to columns using the sp_bindefault system stored procedure. This is a backward compatibility feature.**

Triggers

- **Triggers are a special class of stored procedure defined to execute automatically when an UPDATE, INSERT, or DELETE statement is issued against a table.**

- **Triggers are a powerful tool that allows each site to enforce their business rules automatically when data is modified.**

- **Triggers can extend the integrity checking logic of Microsoft SQL Server constraints, defaults, and rules, although constraints and defaults should be used instead whenever they provide all the needed functionality.**