Answers

David Morán Gorgojo

Miguel Sánchez Rodríguez

Pablo Ruiz Morán

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2.1.Data Types

1.1 Explain when and how are used the data types in SQL Server

Data types are used to define the type of information that a column in a table can store. In addition, each type of data has storage restrictions, which affect its handling, therefore, it is necessary to ensure that it is correctly chosen to guarantee its integrity, consistency and optimize storage space.

1.2 Explain what a data type is.

A data type is a classification that defines the characteristics of data that can be stored in a column, parameter, variable, or result of a function in SQL Server. This determines:

- The format of the data (text, numeric, date, etc.).
- The range of values allowed.
- The space it will occupy in memory
- The space it will occupy in memory.

1.3 Explain what the “Data Type Synonyms” are.

These are the equivalent names for certain types of data in SQL Server, which are used to maintain compatibility with other systems or to provide simpler names for users. E.g.) integer is synonymous with int.

1.4 Copy or make a table with the Transact-SQL Data Type Synonyms

SINONYM	TIYPE OF DATABASE
CHARACTER	CHAR
DEC	DECIMAL
NUMERIC	DECIMAL
FLOAT	REAL
INTEGER	INT
SMALLINT	TINYINT
NATIONAL CHAR	NCHAR
NATIONAL CHARACTER	NCHAR
NATIONAL CHARACTER VARYING	NVARCHAR

2.2. Data Type Categories

1) Exact numerics

They are used to represent integers and decimals that have exact precision. Here are the types that are included in this category:

- tinyint: Small and positive numbers.
- smallint: Small integers.
- int: More common and allows handling moderately sized integers
- bigint: Large numbers.
- bit: Logical data type that stores binary values.
- decimal: Exact decimal numbers of precision p (total number of digits) and scale (number of digits to the right of the decimal point).
- numeric: Equivalent to the decimal.
- money: Designed to specifically represent large monetary amounts.
- Smallmoney: Designed to specifically represent smaller monetary amounts.

2) Approximate numerics

They are used to store numbers where the accuracy is not exact, such as scientific calculations or statistics.

- float: A type of floating-point data of variable precision and useful for handling very large or very small values with a wide range.
- real: It has a fixed size and less precision than the float, so it takes up less space.

3) Date and time

Designed to store date, time, or both information, with varying degrees of accuracy.

- date: Stores the year, month and day, not including the time, with the following format "YYYY-MM-DD".
- time: Stores the hour, minute, second, and fraction of a second, in the following format "hh:mm:ss[.nnnnnnn]".
- datetime: It is widely used because it combines date and time in a single field, although it has a more limited range. It has the following format: "YYYY-MM-DD hh:mm:ss[.nnn]".
- smalldatetime: More compact version of datetime, with a lower range and accuracy. Its format is the same as datetime, but without the seconds and fractions of seconds.
- datetime2: Improved version of datetime, with greater range and accuracy and features the following format "YYYY-MM-DD hh:mm:ss[.nnnnnnn]".
- datetimeoffset: Similar to datetime2, but including time zone information. Its format is "YYYY-MM-DD hh:mm:ss[.nnnnnnn] [+|-hh:mm]".

4) Character strings

They store text or strings of characters with fixed or variable length.

- char: It stores text strings of fixed length and in case it has a shorter length, it is filled with spaces at the end.
- varchar: Stores text strings of variable length, making it more flexible than char because it only takes up the space needed for the stored characters.
- text: Used to store long strings of text larger than 8000 characters. It is currently in disuse and has been replaced by varchar(max).

5) Unicode characters strings

They allow you to store text in multiple languages using the Unicode standard.

- nchar: Stores fixed-length Unicode text. It exhibits similar behavior to char, but is designed for data in multiple languages.
- nvarchar: Stores Unicode text of variable length. It is most efficient for multilingual text with a variable length.
- ntext: Occurs the same as text. It was used to store large volumes of Unicode text, but was replaced by nvarchar (max).

6) Binary strings

They store binary data such as images, files, or other non-text formats.

- binary: Stores binary data of fixed length.
- varbinary: It stores binary data of variable length, so it is more flexible than binary.
- image: Used for large binary data such as images, but has been replaced by varbinary(max).

7) Ohter data types

This category includes special types for storing unique identifiers, spatial data, hierarchical data, and more.

-cursor
- geography
- Geometry
- hierarchyd
- JSON
- vector
- rowversion
- sql_variant
- table
- uniqueidentifier
- XML

2.3. Data Type Groups

a. The two main groups and the reasons for their classification.

In SQL Server, data types are divided into two groups based on their storage characteristics:

1. Fixed-Length Data Types (Tipos de Datos de Longitud Fija):
    - **Definition:** These data types always take up the same storage space, regardless of the amount of actual data stored.
    - **Reason:** They were designed to ensure faster access to data, as start and end positions are consistent across rows.
    - **Advantage:** Useful when the data is of constant length, such as identifiers.
2. Variable-Length Data Types (Tipos de Datos de Longitud Variable):
    - **Definition:** These types occupy a space that depends on the actual amount of data stored, up to a defined maximum.
    - **Reason:** They reduce disk space waste when storing data of varying lengths.
    - **Advantage:** Ideal for data such as descriptions or names, where the length varies considerably.

b. Datatypes for each group

1. Fixed-Length Data Types (Longitud fija):

• Character Types:

- **CHAR(n)** - Fixed-length text string with n characters.
- **NCHAR(n)** - Fixed-length Unicode text string with n characters.

• Numeric Types:

- **INT** - Integer number (4 bytes).
- **SMALLINT** - Small integer number (2 bytes).
- **BIGINT** - Large integer number (8 bytes).
- **DECIMAL(p,s) or NUMERIC(p,s)** - Exact number with fixed precision and scale.

- **BIT** - Stores boolean values (0 or 1).

• **Date/Time Types:**

- **DATE** - Date (3 bytes).
- **TIME** - Time (3-5 bytes depending on precision).

2. Variable-Length Data Types (Longitud variable):

• **Character Types:**

- **VARCHAR(n)** - Variable-length text string, up to a maximum of n characters.
- **NVARCHAR(n)** - Variable-length Unicode text string, up to a maximum of n characters.
- **TEXT** - Variable-length text (deprecated, replaced by VARCHAR(MAX)).

• **Binary Types:**

- **VARBINARY(n)** - Variable-length binary data, up to a maximum of n.
- **IMAGE** - Stores large binary data (deprecated, replaced by VARBINARY(MAX)).

• **Other Types:**

- **XML** - Data in XML format with variable size.
- **SQL_VARIANT** - Data of variable type.
- **GEOMETRY and GEOGRAPHY** - Spatial data.