SQL and MySQL Data Types

Databases have tables. Tables have columns. Columns have types and other properties. From those types and properties flow crucial characteristics of your database.

SQL data types and MySQL

Look in any computer language manual and you will find a list of data types like this:

- *Character stream, or string*: one or more alphanumeric characters likely to be meaningful or printable in text, e.g., a company name or.
- *Binary stream*: a sequence of characters that may be printable or may encode other information for example a digital photograph, an engineering drawing, or a document formatted by a word processor.
- *Number*: a negative or positive numeric value, small or large, rational or irrational, for example 27, -1, 3.14159, 6.28 + 3i. A numeric subtype of special interest is the two-valued numeric called boolean (True/False, Yes/No, Living/Dead, or whatever is appropriate to the problem domain).
- *Datetime*: dates, times, timestamps.

Databases are concerned at the most fundamental level with data types, because every column of every table must be of a defined base type, or of a user-defined type (UDT) derived from a base type. As of version 5, UDTs are not yet available in MySQL.

SQL92 defines a set of base types. Every SQL92 implementation delivers a slightly different subset of these types. In designing your tables, choose types that best fit your requirements in the interests of efficiency and performance. MySQL offers these:

- *Character string*, or string for short: a sequence of characters, as short as someone's initial 'A', or as long as a huge sequence of four billion characters; MySQL has eight string column types including CHAR, VARCHAR, four TEXT types, ENUM and SET.
- *Binary stream* or object: a character stream without optimisation for rendering as text. MySQL has two BINARY and four Binary Large Object (BLOB) types, and since version 5.7.8 the structured JSON type.
- *Numeric*: representation of a number as an integer, a floating point value, or a value to a fixed decimal precision; MySQL has 11 numeric data types: BIT, TINYINT, SMALLINT, MEDIUMINT, INT, BIGINT, three FLOATs, DOUBLE, DECIMAL.

- *Datetime*: a value representing the time in milliseconds since a reference date. MySQL has five datetime types: DATE, TIME, DATETIME, TIMESTAMP, and YEAR.
- *OpenGIS*: types for representing spherical geometric values.

Column type modifiers in MySQL

When you *CREATE* or ALTER a column, you may also specify properties the MySQL manual calls *field attributes*, for example UNSIGNED for only positive values, or NULL to accept null values. But *attribute* is a formal SQL synonym for *column*, so using it also for column properties like NULL makes them attributes of attributes. Confusing at best. We refer to these properties as *type modifiers*, because that's exactly what they do.

The general column type modifiers are

- NOT NULL: the column does not accept NULL values, for example `lastname` CHAR(20) NOT NULL,
- NULL: the column accepts NULL values, for example `middlename` CHAR(2) NULL,
- DEFAULT `x`: the default value of the column is `x`, for example `country_code CHAR(2) DEFAULT 'US'`.
- UNSIGNED: numeric type accepts values >= 0 only.
- AUTO_INCREMENT: in numeric columns only, automatically assign the next available value to a column in a new row
- *Maximum display width*: specify this by adding a number in parentheses right after the type name, for example `qty INT(4)`. See *Chapter 6* (CREATE TABLE) for display width modifier syntax.

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