Data types and system functions in MySQL

Kathleen Durant

CS 3200

Supported data type classes

Numeric Data Types
Date & Time
String

Numeric data types

- Bit(M)
  - Number of bits
- Integer
  - Comes in different sizes (tinyint, smallint, mediumint, int, largeint)
- Boolean = tinyint(1)
- Decimal(M,D)
  - specify ***M*** as the total number of digits (the precision) and ***D*** as the number of digits after the decimal point (the scale).
    - Example Decimal(4,2) for dollars amounts from -$99.99 to $99.99
- Float : four bytes for single-precision values
- Double: eight bytes for double-precision values
- The FLOAT and DOUBLE types represent approximate numeric data values.
- Can use unsigned with integer, float, double, decimal

Numeric Type Limitations

Data type	Limitations, Size	Examples
BIT[N]	64	BIT(5)
BOOL,BOOLEAN	Alias for TINYINT TRUE=1, FALSE = 0	
TINYINT	-127 to 127	
MEDIUMINT	signed range is -8,388,608 to 838,8607	
INTEGER, INT	-2,147,483,648 to 2,147,483,647	
BIGINT	-9,223,372,036,854,775,808 to 9,223,372,036,854,775,807	
DECIMAL(M,D)	DECIMAL(65,30)	DECIMAL(5,2)
FLOAT(M,D)	38 DECIMAL PLACES Accurate to ~7 decimal places	FLOAT(15,10)
DOUBLE(M,D)	308 DECIMAL PLACES Accurate to ~15 decimal places	DOUBLE(30,10)

String data types

- **CHAR(n)** n from 0 to 255
  - length indicates the number of characters you want to store
- **VARCHAR(n)** n from 0 to 65,535
  - length indicates the maximum number of characters you want to store
- **BINARY(b)** n from 0 to 255
  - contain binary strings rather than character strings
- **VARBINARY(n)** n from 0 to 65,535
- **BLOB**: TINYBLOB from 0 to 255 , BLOB from 0 to 65,535, MEDIUMBLOB a maximum length of 16,777,215, LONGBLOB – maximum length of 4GB
- **TEXT**: TINYTEXT from 0 to 255 , TEXT 0 to 65,535, MEDIUMTEXT maximum length of 16,777,215, LONGTEXT maximum length of 4GB
- **ENUM**
  - Value chosen from a list of permitted values that are listed in the column specification at table creation time Example: size ENUM('x-small', 'small', 'medium', 'large')
  - The index of each value is as shown:
    - **Value = Index**
    - NULL = NULL
    - ‘’ = 0
    - ‘x-small’ = 1
    - ‘small’ = 2
    - ‘medium’ = 3
    - ‘large’ = 4
- **SET**
  - string object that can have zero or more values, each of which must be chosen from a list of permitted values specified when the table is created
  - members separated by commas

Date & Time

- DATE
  - The supported range is '1000-01-01' to '9999-12-31’
- DATETIME
  - supported range is '1000-01-01 00:00:00.000000'
    to '9999-12-31 23:59:59.999999'
- TIMESTAMP
  - The range is '1970-01-01 00:00:01.000000' UTC to '2038-01-19 03:14:07.999999' UTC
  - Stored as the number of seconds since the epoch ('1970-01-01 00:00:00' UTC)
- TIME
  - displayed as [HH:MM:SS]
  - Range is from -838:59:59.000000' to '838:59:59.000000'
- YEAR
  - Range is from 1901 to 2051

System Provided Functions

Aggregate
Numeric
String
NULL
Date & Time
Casting and Conversion

Numeric functions

- Simple arithmetic operations
  - The arithmetic operators: +, -, *, /
  - DIV() return value has same data result as the input values
  - MOD for the remainder of division or use the modulo key %
  - POWER(BASE, EXPONENT), synonym POW – power function
  - ABS(N) - absolute value function
  - SIGN(N) – returns the sign of the provided number n
- Base arithmetic
  - CONV(NUMBER, BASE, NEWBASE) – convert a number from one base to another. Current My SQL limitation is BASE 36
- Rounding Functions
  - ROUND(n) – round a number to a whole number
  - ROUND(N, NUMDIGITS) – round specify number of digits
  - TRUNCATE(N,NUMDIGITS) – limit value of n to numdigits
  - CEILING(N) - round the number n up
  - FLOOR(N) – round a number n down
- Random number generator
  - RAND() – generate a random number
  - RAND(seed) – generate a random number seeded with the number seed – will generate the same collection of numbers for each run
- Trigonometric functions, log functions
- Complete list:
- http://dev.mysql.com/doc/refman/5.7/en/mathematical-functions.html

String functions

- Length – number of bytes in a string
- Char_length – number of characters in string
- Left (string,num) extract the left most num characters from string
- Right(string,num) extract the rightmost num characters from string
- Mid(string,start,num) extract num characters from string starting at position num
- Concat(string1,string2) concatentate strings together
- Concat_ws(delimited, string1, string2) concatenate string2 to string1 using the delimited string as a separator
- Locate(substring,string) – returns the character position of substring in string
- Upper(string), Lower(string) – change string to the corresponding case
- Reverse(string) – reverse the order of the characters in string
- Complete list
- http://dev.mysql.com/doc/refman/5.7/en/string-functions.html

Regular Expressions

- Specifies a pattern for a complex search.
- Clause: *expression* REGEXP *format*
  - Returns 1 if the format matches the expression else 0
- Special characters for matching
  - ^ matches the beginning of a string
  - $ matches the end of a string
  - . Match any character
  - a* match any sequence of zero of more a characters
  - a+ match any sequence of one of more a characters
  - a? match either zero or one a character
  - de|abc match either sequence de or abc
  - (abc)* match zero or more instances of the sequence abc
  - a{m,n} match m to n instances of a
  - 2 backslashes allow you to match a special character \\.

NULL related functions

- COALESCE(EXPR1, EXPR2,…,EXPRN) returns the first expression from the list that is not NULL
- IFNULL(expr1, expr2) returns expr1 if expr1 is not NULL if it is NULL returns expr2
- NULLIF(expr1, expr2) compares exp1 to exp2. If they are equal returns NULL, if they are not equal returns exp1

- NULL SAFE equality operator <=> (MYSQL specific)
  - SELECT NULL <=> NULL ; -- returns TRUE;

- A complete set of comparison and NULL related functions
- http://dev.mysql.com/doc/refman/5.7/en/comparison-operators.html

Common Date functions

- NOW() – returns the current date and time
- Dayname(date) – return the day of the provided date Sunday – Saturday
- Dayofmonth() – return the day of the month values 1 – 12
- Dayofyear() – return the day of the year where Jan 1 = 1
- Dayofweek() – returns the day name number 'Monday' = 2
- Monthname(now()) – return the month of the provided date
- Adddate('2015-12-31', INTERVAL exp unit); - add a specific interval to a date
  - Example: Adddate('2010-12-31', INTERVAL 31 day) 31 days after Dec 31, 2010
- SUBDATE('2015-01-02', INTERVAL exp unit); - subtract a specific interval to a date
- List of interval formats formats
- https://dev.mysql.com/doc/refman/5.7/en/date-and-time-functions.html#function_date-add

- DATE_FORMAT(date, "%W, %D OF %M %Y) – format a date using the provided format
- List of interval formats formats
- https://dev.mysql.com/doc/refman/5.7/en/date-and-time-functions.html#function_date-add

- Complete list of functions
- https://dev.mysql.com/doc/refman/5.7/en/date-and-time-functions.html

Time functions

- Time_to_sec('00:30:00') return the seconds portion of a time variable
- Sec_to_time() convert seconds variable to a time variable
- To_char(date, fmt_specifer) – convert a date to a character string
  - %d the day of the month, %M the long name of the month, %Y the year
- Addtime(time1,time2) – add time together
- Subtime(time1,time2) – subtract time
- Complete list of functions
- https://dev.mysql.com/doc/refman/5.7/en/date-and-time-functions.html

Conversion functions

- BINARY string – convert a string to binary
  - Short hand notation for CAST(string as binary)
- CAST(expr as type) – cast expression to type
- CONVERT(expr , type)
  - ODBC syntax
- CONVERT(expr USING type) – convert expression to type
  - Can specify a particular character set
  - Standard SQL syntax

- Full description
- http://dev.mysql.com/doc/refman/5.7/en/cast-functions.html#function_cast

AGGREGATE FUNCTIONS

- Counting functions
  - COUNT – count records , COUNT(DISTINCT) – count distinct values
- Statistical functions
  - SUM, MIN, MAX, AVG, STD, STDDEV,VARIANCE
- Sample and Population variance and standard deviation
  - STDDEV_SAMP, STDDEV_POP
  - VAR_POP, VAR_SAMP
- Bit function operations
  - BIT_AND, BIT_OR, BIT_XOR
- One text function
  - GROUP_CONCAT – Concatenate strings based on groups
  - Complete list
  - http://dev.mysql.com/doc/refman/5.7/en/group-by-functions.html