Ievads datu bāzēs

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IEGULDĪJUMS TAVĀ NĀKOTNĒ

VUMC

Ievads datu bāzēs
2021

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Par datu tipiem

- Datu tips ir piemēram integer, floating-point, Boolean utt.
- Datu tips apzīmē iespējamās vērtības, operācijas kuras var veikt ar šo tipu un veidu kā ši tipa vērtības tiek glabātas.

Galvenās tipu kategorijas

- Numeric tipi
- DATE un TIME tipi
- String

Kas ir datu tips

MySQL uztur visus SQL standarta skaitliskos datu tipus:

- INTEGER
- SMALLINT
- DECIMAL
- NUMERIC

MySql uztur arī peldošā punkta skaitliskos tipus

- FLOAT
- REAL
- DOUBLE PRECISION

Skaitliskie datu tipi

MySQL uztur visus SQL standarta skaitliskos datu tipus:

SQL standarta integer tipi

- INTEGER(vai INT) un
- SMALLINT

Uztur arī integer tipus;

- TINYINT
- MEDIUMINT
- BIGINT

Group	Types
Integer Types	`INTEGER`, `INT`, `SMALLINT`, `TINYINT`, `MEDIUMINT`, `BIGINT`
Fixed Point Types	`DECIMAL`, `NUMERIC`
Floating Point Types	`FLOAT`, `DOUBLE`
Bit Value Type	`BIT`

Skaitliskie datu tipi

Type	Length in bytes	Minimum Value (Signed)	Max Val (Signed)	Min Val (Unsigned)	Max Val (Unsigned)
TINYINT	1	-128	127	0	255
SMALLINT	2	-32768	32767	0	65535
MEDIUMINT	3	-8388608	8388607	0	16777215
INT	4	-2147483648	2147483648	0	429497295
BIGINT	8	-9223372036854775808	9223372036854775808	0	18446744073709551615

Skaitlisko tipu precizitāte


```
mysql> CREATE TABLE Ages(Id SMALLINT, Age TINYINT) ENGINE=Memory;
Query OK, 0 rows affected (0.06 sec)

mysql> INSERT INTO Ages VALUES(1, 43);
Query OK, 1 row affected (0.05 sec)

mysql> INSERT INTO Ages VALUES (2, 128);
ERROR 1264 (22003): Out of range value for column 'Age' at row 1
mysql> ALTER TABLE Ages MODIFY Age TINYINT UNSIGNED;
Query OK, 1 row affected (0.06 sec)
Records: 1 Duplicates: 0 Warnings: 0

mysql> INSERT INTO Ages VALUES(2, 128);
Query OK, 1 row affected (0.05 sec)

mysql> SELECT * FROM Ages;
+------+------+
| Id   | Age |
+------+------+
|  1 |  43 |
|  2 | 128 |
+------+------+
2 rows in set (0.05 sec)
```

Peldošā punkta tipi

The FLOAT and DOUBLE tipi attēlo aproksimētas skaitliskās datu vērtības.

MySQL atļauj nestandarta sintaksi

- FLOAT(M,D)
- REAL(M,D)

Apzīmē vētības līdz M cipariem, D decimālo zīmju skaitu

`FLOAT` and `DOUBLE` represent *approximate* data types.

Type	Storage	Precision	Range
FLOAT	4 bytes	23 significant bits / ~7 decimal digits	10^+/-38
DOUBLE	8 bytes	53 significant bits / ~16 decimal digits	10^+/-308

`REAL` is a synonym for `FLOAT`. `DOUBLE PRECISION` is a synonym for `DOUBLE`.

Peldošā punkta problēmas


```
mysql> CREATE TABLE Numbers (Id TINYINT, Floats FLOAT, Decimals DECIMAL(3, 2));
Query OK, 0 rows affected (0.08 sec)

mysql> INSERT INTO Numbers VALUES (1, 1.1, 1.1), (2, 1.1, 1.1), (3, 1.1, 1.1);
Query OK, 3 rows affected (0.05 sec)
Records: 3 Duplicates: 0 Warnings: 0

mysql> SELECT * FROM Numbers;
+------+--------+----------+
| Id   | Floats | Decimals |
+------+--------+----------+
|  1 |  1.1 |    1.10 |
|  2 |  1.1 |    1.10 |
|  3 |  1.1 |    1.10 |
+------+--------+----------+
3 rows in set (0.05 sec)

mysql> SELECT SUM(Floats), SUM(Decimals) FROM Numbers;
+-------------------+--------------+
| SUM(Floats)     | SUM(Decimals) |
+-------------------+--------------+
| 3.3000000715255737 |     3.30 |
+-------------------+--------------+
1 row in set (0.05 sec)
```

Fiksētais tips

- DECIMAL(m,n) m - zīmju skaits, n - decimālo ciparu skaits
- DECIMAL(5,2) var saglabāt vērtību līdz 5 cipariem un 2 decimālajām zīmēm
- Vērtību intervāls -999.99 to 999.99
- DECIMAL(M) ir sinonīms DECIMAL(M,0)
- DECIMAL ir sinonīms to DECIMAL(M,0)

Piemērs (decimal)


```
mysql> CREATE TABLE materials (
  ->   id INT AUTO_INCREMENT PRIMARY KEY,
  ->   description VARCHAR(255),
  ->   cost DECIMAL(19 , 4 ) NOT NULL
  -> );
Query OK, 0 rows affected (0.06 sec)

mysql> INSERT INTO materials(description,cost)
  -> VALUES('Bicycle', 500.34),('Seat',10.23),('Break',5.21);
Query OK, 3 rows affected (0.05 sec)
Records: 3 Duplicates: 0 Warnings: 0

mysql> select * from materials;
+----+-------------+----------+
| id | description | cost     |
+----+-------------+----------+
| 1 | Bicycle    | 500.3400 |
| 2 | Seat     | 10.2300 |
| 3 | Break     |  5.2100 |
+----+-------------+----------+
3 rows in set (0.05 sec)
```

Date un Time tips

- Tipi DATE, TIME, DATETIME, TIMESTAMP and YEAR
- Katram tipam ir vērtību intervāls kā arī nulles vērtība.

Tips	Apraksts	Displeja Formāts	Intervāls
DATETIME	satur abus datums un laiks .	YYYY-MM-DD HH:MM:SS	'1000-01-01 00:00:00' līdz '9999-12-31 23:59:59'.
DATE	Tikai datums.	YYYY-MM-DD	'1000-01-01' līdz '9999-12-31'.
TIMESTAMP	pārveido tekošo laika zonu uz UTC saglabājot, un konvertē atpakaļ no UTC uz tekošo laika zonu kad nolasa	YYYY-MM-DD HH:MM:SS	'1970-01-01 00:00:01' UTC līdz '2038-01-19 03:14:07' UTC

Date tips


```
mysql> SELECT CURDATE();
+------------+
| CURDATE() |
+------------+
| 2021-08-15 |
+------------+
1 row in set (0.05 sec)

mysql> SELECT DATE('2017-01-31 12:01:00');
+-----------------------------+
| DATE('2017-01-31 12:01:00') |
+-----------------------------+
| 2017-01-31          |
+-----------------------------+
1 row in set (0.05 sec)

mysql> SELECT ADDDATE('2017-01-20', 8);
+--------------------------+
| ADDDATE('2017-01-20', 8) |
+--------------------------+
| 2017-01-28         |
+--------------------------+
1 row in set (0.05 sec)
```

Date formāti


```
mysql> CREATE TABLE Dates(Id TINYINT, Dates DATE);
Query OK, 0 rows affected (0.07 sec)

mysql> INSERT INTO Dates VALUES(1, '2017-01-24');
Query OK, 1 row affected (0.06 sec)

mysql> INSERT INTO Dates VALUES(2, '2017/01/25');
Query OK, 1 row affected (0.05 sec)

mysql> INSERT INTO Dates VALUES(3, '20170126');
Query OK, 1 row affected (0.05 sec)

mysql> INSERT INTO Dates VALUES(4, '170127');
Query OK, 1 row affected (0.05 sec)

mysql> INSERT INTO Dates VALUES(5, '2017+01+28');
Query OK, 1 row affected (0.05 sec)

mysql> SELECT * FROM Dates;
+------+------------+
| Id | Dates |
+------+------------+
| 1 | 2017-01-24 |
| 2 | 2017-01-25 |
| 3 | 2017-01-26 |
| 4 | 2017-01-27 |
| 5 | 2017-01-28 |
+------+------------+
5 rows in set (0.05 sec)
```

Time


```
mysql> SELECT CURTIME();
+-----------+
| CURTIME() |
+-----------+
| 10:42:23 |
+-----------+
1 row in set (0.04 sec)

mysql> SELECT TIMEDIFF('23:34:32', '22:00:00');
+----------------------------------+
| TIMEDIFF('23:34:32', '22:00:00') |
+----------------------------------+
| 01:34:32                         |
+----------------------------------+
1 row in set (0.04 sec)

mysql> SELECT TIME('2017-01-31 11:06:43');
+-----------------------------+
| TIME('2017-01-31 11:06:43') |
+-----------------------------+
| 11:06:43                    |
+-----------------------------+
1 row in set (0.05 sec)

mysql> SELECT TIMEDIFF('211344', 201123);
+----------------------------+
| TIMEDIFF('211344', 201123) |
+----------------------------+
| 01:02:21                   |
+----------------------------+
1 row in set (0.05 sec)
```

Datetime


```
mysql> SELECT NOW();
+---------------------+
| NOW()               |
+---------------------+
| 2021-08-15 11:17:04 |
+---------------------+
1 row in set (0.05 sec)

mysql> SELECT DAYNAME('2017@01@31 11@12@12');
+--------------------------------+
| DAYNAME('2017@01@31 11@12@12') |
+--------------------------------+
| Tuesday                        |
+--------------------------------+
1 row in set (0.05 sec)
Add a little bit of body text
```

Year


```
mysql> SELECT YEAR(CURDATE()) AS 'Current year';
+--------------+
| Current year |
+--------------+
|         2021 |
+--------------+
1 row in set (0.05 sec)
```

Year


```
mysql> SELECT YEAR(CURDATE()) AS 'Current year';
+--------------+
| Current year |
+--------------+
|         2021 |
+--------------+
1 row in set (0.05 sec)
```

Timestamp

- Timestamp ir tips ar kuru var saglabāt kāda notikuma datumu/laiku.
- Timestamp tipiski izmanto notikumu reģistrēšanai (logging).
- TIMESTAMP kolonu izmanto INSERT vai UPDATE operācijas datuma/laika reģistrēšanai .

Data type	Format
TIMESTAMP(14)	YYYYMMDDHHMMSS
TIMESTAMP(12)	YYMMDDHHMMSS
TIMESTAMP(10)	YYMMDDHHMM
TIMESTAMP(8)	YYYYMMDD
TIMESTAMP(6)	YYMMDD
TIMESTAMP(4)	YYMM
TIMESTAMP(2)	YY

Timestamp


```
mysql> CREATE TABLE Prices(Id TINYINT PRIMARY KEY,
Price DECIMAL(8, 2), Stamp TIMESTAMP);
Query OK, 0 rows affected (0.06 sec)

mysql> INSERT INTO Prices(Id, Price) VALUES(1, 234.34);
Query OK, 1 row affected (0.05 sec)

mysql> INSERT INTO Prices(Id, Price) VALUES(2, 344.12);
Query OK, 1 row affected (0.06 sec)

mysql> SELECT * FROM Prices;
+----+--------+---------------------+
| Id | Price | Stamp               |
+----+--------+---------------------+
| 1 | 234.34 | 2021-08-15 11:25:19 |
| 2 | 344.12 | 2021-08-15 11:25:28 |
+----+--------+---------------------+
2 rows in set (0.04 sec)

mysql> UPDATE Prices SET Price=250.50 WHERE Id=1;
Query OK, 1 row affected (0.05 sec)
Rows matched: 1 Changed: 1 Warnings: 0

mysql> SELECT * FROM Prices;
+----+--------+---------------------+
| Id | Price | Stamp               |
+----+--------+---------------------+
| 1 | 250.50 | 2021-08-15 11:25:49 |
| 2 | 344.12 | 2021-08-15 11:25:28 |
+----+--------+---------------------+
2 rows in set (0.05 sec)
```

Teksta tips

- CHAR
- VARCHAR
- BINARY
- VARBINARY
- BLOB
- TEXT
- ENUM
- SET

Teksta tips

- CHAR
- VARCHAR
- BINARY
- VARBINARY
- BLOB
- TEXT
- ENUM
- SET

Char


```
mysql> CREATE TABLE Chars(Id TINYINT PRIMARY KEY, Chars CHAR(3));
Query OK, 0 rows affected (0.06 sec)

mysql> INSERT INTO Chars VALUES (1, 'a'), (2, 'ab'), (3, 'abc');
Query OK, 3 rows affected (0.05 sec)

mysql> INSERT INTO Chars VALUES (1, 'abcd');
ERROR 1406 (22001): Data too long for column 'Chars' at row 1
```

Varchar

- VARCHAR datu tips glabā mainīga garuma teksta rindu.
- Rindas sgarums var būt 0 līdz 65535.
- VARCHAR netiek uzpildītas sno labāss puses

```
mysql> CREATE TABLE FirstNames(Id TINYINT, Firstname VARCHAR(20));
Query OK, 0 rows affected (0.08 sec)

mysql> INSERT INTO FirstNames VALUES (1, 'Tom'), (2, 'Lucy'), (3, 'Alice'),
  -> (4, 'Robert'), (5, 'Timothy'), (6, 'Alexander');
Query OK, 6 rows affected (0.05 sec)
Records: 6 Duplicates: 0 Warnings: 0

mysql> SELECT Id, Firstname, LENGTH(FirstName) AS Length FROM FirstNames;
+------+-----------+--------+
| Id   | Firstname | Length |
+------+-----------+--------+
|  1 | Tom     |    3 |
|  2 | Lucy    |    4 |
|  3 | Alice    |    5 |
|  4 | Robert   |    6 |
|  5 | Timothy   |    7 |
|  6 | Alexander |    9 |
+------+-----------+--------+
6 rows in set (0.09 sec)
```

BLOB

- A BLOB ir binary large objekta datu tips.
- Var saturēt mainīga garuma binārus datus.
- izmanto laai glabātu datus kā bildes vai dokumentus.

Blog type	Range in bytes
TINYBLOB	0 - 255
BLOB	0 - 65535
MEDIUMBLOB	0 - 16777215
LONGBLOB	0 - 4294967295

```
mysql> CREATE TABLE Images(Id INT PRIMARY KEY, Img LONGBLOB);
Query OK, 0 rows affected (0.06 sec)
mysql> SHOW VARIABLES LIKE "secure_file_priv";
+------------------+-----------------------+
| Variable_name   | Value                 |
+------------------+-----------------------+
| secure_file_priv | /secure_file_priv_dir/ |
+------------------+-----------------------+
1 row in set (0.04 sec)

mysql> INSERT INTO Images VALUES (1, LOAD_FILE('/Users/robertspolis/Pictures/snapcode-How Old You Look.png'));
Query OK, 1 row affected (0.05 sec)
```

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