Ievads datu bāzēs

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ESF projekts Nr. 8.4.1.0/16/I/001
"Nodarbināto personu profesionālās kompetences pilnveide"

NACIONĀLAIS ATTĪSTĪBAS PLĀNS 2020
EIROPAS SAVIENĪBA
Eiropas Sociālais fonds
IEGULDĪJUMS TAVĀ NĀKOTNĒ

Datubāzes un tabulu veidošana

4. lekcija

Šodienas lekcijā

Kas ir datu tips
Skaitliskie datu tipi
Precizitāte
Peldošā punkta tipi un problēmas
Fiksētais tips
Datuma un laika tipi
Teksta tips

Datubāzes būvēšana

- MySQL Datubāze ir ekvivalenta Shēmai. Tass nav tipiski Relāciju datubāzēm
- Shēma ir nosaukta objektu kopa. Citās RDBMS sshēma ir lietotājam piederošu objektu kopa .
- Lai varētu izveidot datubāzi jābūt pieejamai MySQL instancei un nepieciešams pieslēgums pie šis instances

Datubāzes būvēšana


```
mysql> create database green_db;
Query OK, 1 row affected (0.96 sec)
mysql> use green_db;
Database changed
mysql> show databases;
+----------------------+
| Database             |
+----------------------+
| green_db             |
| information_schema   |
| innodb               |
| mysql                |
| performance_schema   |
| sakila               |
+----------------------+
11 rows in set (0.05 sec)

mysql> drop database green_db;
Query OK, 0 rows affected (0.05 sec)
```

Izveidojam datubāzi

CREATE DATABASE [IF NOT EXISTS] nosaukums;

Dzēšam datubāzi

DROP DATABASE [IF EXISTS] nosaukums;

Pārslēdzam datubāzi

USE nosaukums;

Pārslēgties uz datubāzi


```
mysql> SELECT database();
+------------+
| database() |
+------------+
| NULL       |
+------------+
1 row in set (0.05 sec)

mysql> use sakila;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> SELECT database();
+------------+
| database() |
+------------+
| sakila     |
+------------+
1 row in set (0.05 sec)
```

uzzināt tekošo daatubāzi

- Izmantojam database() funkciju

Tabulu izveidošana

Tabulas veidojam ar **CREATE TABLE** komandu

- Norādam tabulas nosaukumu
- Uzskaitam kolonas ar to datu tipiem
- Norādam arī citus atribūtus piemēram Primāro atslēgu

```
CREATE TABLE IF NOT EXISTS `world_x`.`city` (
  `ID` INT(11) NOT NULL AUTO_INCREMENT,
  `Name` CHAR(35) NOT NULL DEFAULT '',
  `CountryCode` CHAR(3) NOT NULL DEFAULT '',
  `District` CHAR(20) NOT NULL DEFAULT '',
  `Info` LONGTEXT CHARACTER SET 'utf8mb4' COLLATE 'utf8mb4_bin' NULL DEFAULT NULL,
  PRIMARY KEY (`ID`))
ENGINE = InnoDB
AUTO_INCREMENT = 4080
DEFAULT CHARACTER SET = utf8mb4;
```

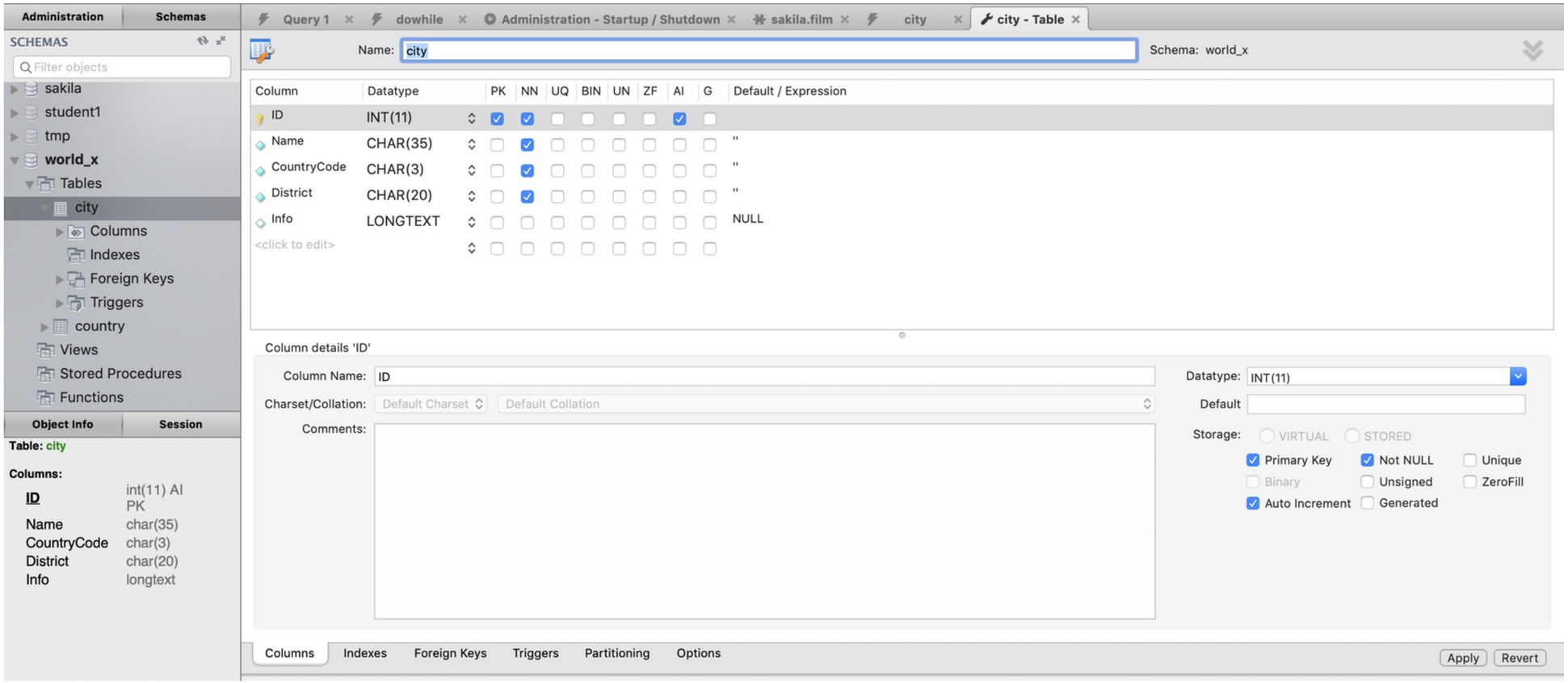
Apskatīt tabulu struktūru


```
mysql> describe world_x.city;
+-------------+---------+------+-----+---------+----------------+
| Field       | Type    | Null | Key | Default | Extra          |
+-------------+---------+------+-----+---------+----------------+
| ID          | int(11) | NO   | PRI | NULL    | auto_increment |
| Name        | char(35) | NO  |     |         |                |
| CountryCode | char(3) | NO   |     |         |                |
| District    | char(20) | NO  |     |         |                |
| Info        | longtext | YES |     | NULL    |                |
+-------------+---------+------+-----+---------+----------------+
5 rows in set (0.06 sec)

mysql> use world_x;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> describe city;
+-------------+---------+------+-----+---------+----------------+
| Field       | Type    | Null | Key | Default | Extra          |
+-------------+---------+------+-----+---------+----------------+
| ID          | int(11) | NO   | PRI | NULL    | auto_increment |
| Name        | char(35) | NO  |     |         |                |
| CountryCode | char(3) | NO   |     |         |                |
| District    | char(20) | NO  |     |         |                |
| Info        | longtext | YES |     | NULL    |                |
+-------------+---------+------+-----+---------+----------------+
5 rows in set (0.05 sec)
```

Tabulu var norādīt prefiksējot ar datubāzes vārdu

Tabulas struktūra ar MysqlWorkbench

- Navigātorā atrodam tabulu
- nospiežam uz configure pogu.
- Apakšā ir tabs: Kolonas, indekssi, atsslēgas ...



Tabulas kolonu nosaukumu nomaiņa

MySQL 5.7
ALTER TABLE nosaukums CHANGE COLUMN old_col_name new_col_name datu_tips;
MySQL 8.0
ALTER TABLE table_name RENAME COLUMN old_col_name TO new_col_name;

```
mysql> ALTER TABLE city CHANGE COLUMN Name city_name char(40);
Query OK, 4079 rows affected (0.17 sec)
Records: 4079 Duplicates: 0 Warnings: 0

mysql> ALTER TABLE city CHANGE COLUMN Name city_name;
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MariaDB
server version for the right syntax to use near '' at line 1

mysql> SELECT VERSION();
+---------------------+
| VERSION()           |
+---------------------+
| 10.4.13-MariaDB-log |
+---------------------+
1 row in set (0.05 sec)

mysql> ALTER TABLE city RENAME COLUMN Name TO city_name;
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MariaDB
server version for the right syntax to use near 'COLUMN Name TO city_name' at line 1
```

Tabulas kolonas pievienošana

ALTER TABLE table_name ADD COLUMN (new_column data_type);

```
mysql> ALTER TABLE city ADD COLUMN (country_name varchar(45));
Query OK, 0 rows affected (0.05 sec)
Records: 0 Duplicates: 0 Warnings: 0

mysql> describe city;
+-------------+------------+------+-----+---------+----------------+
| Field       | Type       | Null | Key | Default | Extra          |
+-------------+------------+------+-----+---------+----------------+
| ID          | int(11)    | NO   | PRI | NULL    | auto_increment |
| city_name   | char(40)   | YES  |     | NULL    |                |
| CountryCode | char(3)    | NO   |     |         |                |
| District    | char(20)   | NO   |     |         |                |
| Info        | longtext   | YES  |     | NULL    |                |
| country_name | varchar(45) | YES |     | NULL    |                |
+-------------+------------+------+-----+---------+----------------+
6 rows in set (0.05 sec)
```

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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