
Lecture 9

— databases and sql —

What is database?

- A database is a tool for collecting and organizing information.
- A database is an organized collection of data. It is the collection of schemes, tables, queries, reports, views and other objects. The data is typically organized to model aspects of reality in a way that supports processes requiring information, such as modelling the availability of rooms in hotels in a way that supports finding a hotel with vacancies.

What information to store in database?

- Databases can store information about people, products, orders, or anything else.

Where it is used?

- any company has huge amounts of data, so they need to manipulate them easily

What we can use instead of database?

- Many databases start as a list in a word-processing program or spreadsheet. As the list grows bigger, redundancies and inconsistencies begin to appear in the data. The data becomes hard to understand in list form, and there are limited ways of searching or pulling subsets of data out for review.

Types of database

There are two types of database storage:

- via file database
- via application database

File database

All data is saved in file and can be accessed through special libraries

As example:

- SQLite3 (connection library is already in python)
- the most used type of database, since it is stored in every iPhone and Android
- if you want to use sqlite3. check tutorial

<http://www.blog.pythonlibrary.org/2012/07/18/python-a-simple-step-by-step-sqlite-tutorial/>

Advantages: easily can be moved from one computer to another

Application databases

Server database is a program that manages data

And all queries, requests are performed by that program

Advantages: can be more faster than file database for big data

Server database, examples

- Oracle. Mostly used commercial database
- MySQL (open-source) 2nd mostly used database
- MSSQL - developed by Microsoft
- PostgreSQL (open-source database, 5th by popularity)

Database structure

Databases are designed to offer an organized mechanism for storing, managing and retrieving information.

Server stores many **databases**

Database stores **tables**

Tables are constructed by **fields**

Table saves each data in a **row**

Fields have type. e.g. integer, string, date, datetime, boolean

Tables: example

Database is **MySDU**

Tables are **students, course, teachers**

Fields are **name** (string/varchar), **surname** (string/varchar), **age** (integer)

SQL

SQL - structured query language

SQL is special language to retrieve, update, delete data from database

How does it work:

we write SQL request in code that sends it to SQL server and then retrieve response

SQL data retrieving: example

```
SELECT name,surname  
FROM contacts  
WHERE name='John'  
ORDER BY surname
```

*fields to output, put *
to output all fields*

table that is retrieved

*Filtering results by
setting conditions*

*Output result sorted
by specified field*

SQL insert, delete, update

```
INSERT INTO students (name,surname) values ('Berik','Sakenov')
```

```
DELETE FROM students WHERE name = 'Berik'
```

```
UPDATE students SET name='Serik' WHERE name='Berik'
```

SQL aggregate functions

```
SELECT COUNT(*) FROM users
```

```
SELECT MIN(age) FROM users
```

```
SELECT AVG(age) FROM users
```

```
SELECT DISTINCT(surname) FROM users
```

To use MySQL

- Install XAMPP (you will be using it in next semester for Foundations of web) <http://www.apachefriends.org/en/xampp.html>
- enter in browser localhost/phpmyadmin

phone/poor connection:

https://www.w3schools.com/sql/trysql.asp?filename=trysql_select_columns

id	name	surname	group	faculty
1	Bill	Gates	EN1A03	Engineering
2	Jeff	Bezos	EN1A03	Engineering
3	Tim	Cook	EN1B03	Engineering
4	Steve	Jobs	MAN1A	Economy
5	Mike	Wazovski	LAW1B	Law

Saving all information in one table

Relational database

- System of related tables
- Minimum redundancy
- Referential integrity
- Database keys

Relational databases store information in atomic tables

			Customer ID	CustomerName	Country
OrderID	CustomerID	OrderDate	1	Samat Sarsembayev	Germany
			2	Zhanat Davletov	Mexico
			3	Ayan Ibrahimov	Mexico
10308	2	1996-09-18			
10309	1	1996-09-19			
10310	77	1996-09-20			