CSC101
Introduction to ICT

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Lecture - 11

Database Management Systems

Databases

- **Database**, often abbreviated **DB**, is a collection of data organized so that you can access, retrieve, and use it
- Databases are designed to offer an organized mechanism for storing, managing, and retrieving information

- **Database Management System** (or **DBMS**) is a software (application program) that facilitate users in creating, organizing, deleting, updating, and manipulating data in a database
- DBMS stores large collections of data, organize the data, and becomes a data storage system

- DBMS allows you to;
  - create database
  - add, change, and delete data
  - sort and retrieve data
  - create forms and reports

Databases

- Individuals involved with a DBMS:
  - **Database designers**: They design the database
  - **Database developers**: They create the database
  - **Database programmers**: They write programs needed to access the database or tie the database to other programs
  - **Database administrators**: They are responsible for managing the databases within an organization
  - **End users**: Individuals who enter data, update data, and retrieve information out of the database

Database Models

- Database model defines how data in a database is organized and linked together
- More precisely, it is a structure or a format of a database

- Four commonly used database models are:
  - Hierarchical database model
  - Network database model
  - **Relational database model**
  - Object-oriented database model

Relational Database Model

- Relational database model is the most popular and widely used
- In the relational database model, all data is represented in terms of tuples, grouped into relations
- It consists of a collection of tables that store sets of data
- The standard fields and records are represented as columns (fields) and rows (records) in a table
- Data from several tables is tied together (related) using a field that the tables have in common

- Database Management System that supports relational database model is called '**Relational Database Management System**' or **RDBMS**
  - RDBMS organizes and describes the data
  - It normally contains two or more tables
  - Using RDBMS, maintaining data is easier

Relational Database Model

- Relational database model example

An attribute, field, or column

A record, tuple, or row

sid	name	login	dob	gpa
512412	Khaled	khaled@qatar.cmu.edu	18-9-1995	3.5
512311	Jones	jones@qatar.cmu.edu	1-12-1994	3.2
512111	Maria	maria@qatar.cmu.edu	3-8-1995	3.85

An instance of a student's relation or table

Relational Database Model

- Relational database model example

sid	name	email	dob
512412	Khaled	khaled@qatar.cmu.edu	18-9-1995
512311	Jones	jones@qatar.cmu.edu	1-12-1994
512111	Maria	maria@qatar.cmu.edu	3-8-1995

iid	Name
90012	Usman Akram
38995	Muhammad Tariq
13910	Rabia Khan

sid	cid
512412	CSC101
512311	CSC101
512311	HUM103
512311	MTH102
512111	CSC101

cid	course	iid
CSC101	Introduction to ICT	90012
MTH102	Mathematics	13910
HUM103	English	38995

Components of Relational Database Model

- Field
  - Often called a column
  - Hold an individual piece of data
  - Is named descriptively
  - Name, address, e-mail, phone number are examples
  - Field(s) may contain no data

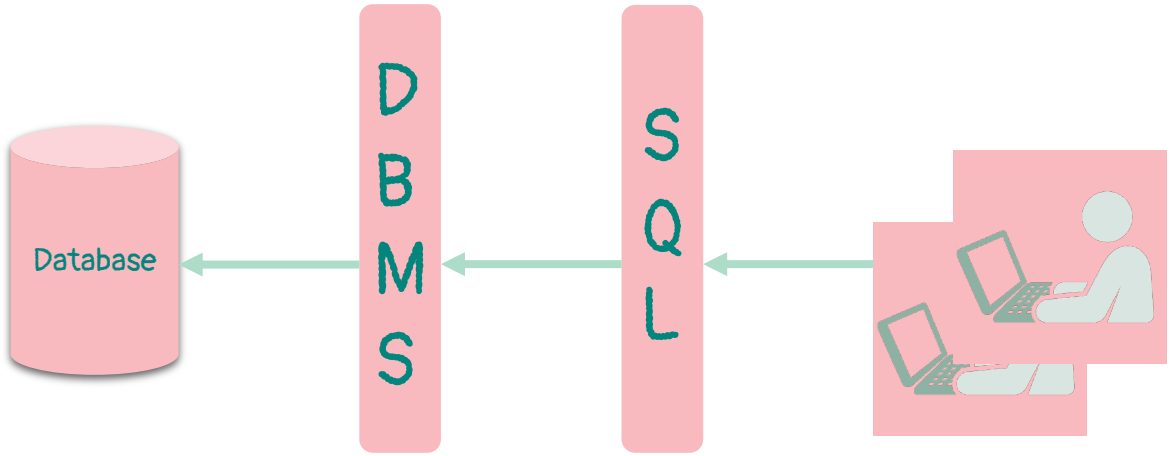
- Record
  - Often called a row
  - One full set of fields
  - Smith, Joe, 123 Some Street, 412-555-7777 is an example record
  - Tables may have unlimited rows

Components of Relational Database Model

- Table
  - One complete collection of records
  - Databases may have thousands of tables
- Form
  - Present one record to the user
  - Often used to add, change, or view data
- Report
  - Produce printed results (summaries) from the database

Structured Query Language

- Another commonly supported feature of a database is enabling a user to search for desired information in the database
- Structured Query Language (or SQL) is used to query information from a database
- It is the most popular language used to create, modify, retrieve, and manipulate information from relational database management systems



Survey of DBMSs

- Oracle
  - Most popular enterprise-level DBMS
  - Very flexible storage system
  - Can be very complex
  - Platform independent
  - Offers a wide range of solutions
  - Supports both Relational and Object Oriented models

- MySQL
  - Leading DBMS for Linux
  - Very inexpensive
  - Often faster than other DBMS
  - Platform independent
  - Supports Relational model

Survey of DBMSs

- Microsoft Access
  - DBMS from Microsoft
  - It is a member of the Microsoft Office suite
  - Runs on Microsoft platforms and a separate version for Mac
  - Popular among small to medium size organizations
  - Supports Relational model

- Microsoft SQL Server
  - Fastest growing DBMS
  - Only runs on Microsoft platforms
  - Eight different versions exist
  - Extremely scalable architecture
  - It can grow with the data
  - Based on Relational model

THANK YOU