**Introduction to Databases**

* A database (DB) is any collection of related information. Examples: shopping list, text file, excel file, amazon db.
* A database management system (DBMS) is a special software program that helps users create and maintain a database. A DBMS isn’t the actual DB, but rather, it is the software application that creating/maintaining/deleting/updating information from the actual database.
* Graphical user interface, text, application

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* CRUD represents the main operations we will do with information in a database.
* A picture containing text, clipart

  Description automatically generated

Types of Databases

Graphical user interface

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SQL

* A relational database is very much like an excel spreadsheet.
* Graphical user interface, application

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* SQL is a programming language. MySQL is RDBMS.Text

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No SQL

Diagram

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Graphical user interface, text, application, email

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Summary

Text

Description automatically generated

**Tables and Keys**

Table

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Columns define a single attribute such as the name column. Inside the name column, we have the names of all the students. A row is an individual entry in the table which represents a single student.

Primary Key

We always want to have a special column called the primary key. The primary key is an attribute that uniquely defines a row in the DB. The primary key can be anything, it can be a number, a string of text, whatever. Just make sure the primary key is unique. The student id attribute is the primary key. Notice that even the two jacks have the same name and major, they have different primary keys.

There are two kinds of primary keys, surrogate keys and natural keys.

A surrogate key is just a key that has no context in the real world, it is just used for DB purposes. In the example below, the number 100 is just some random number we chose. 100 is used to represent the entry in the DB but it has no meaning outside of the DB.

Table

Description automatically generated

A natural key is a key that has context in the real world. For instance, below, the primary key is the social security number. While the SSN plays a role in the database for uniquely defining each entry, it also has context in the real world since that SSN belongs to that person.

Table

Description automatically generated

Foreign Key

* A foreign key is an attribute we can store in a DB table that will link us to another DB table.
* A foreign key allows us to define relationships between tables.
* A foreign key is the primary key of another table

Table

Description automatically generated Table

Description automatically generated

Notice we have two DB tables. In the Employee table, there is a branch\_id attribute which is a foregin key. The foreign key stores the primary key of a row in another table. For example, we can say that employees belong to a specific branch in the company. We can define which branch a specifc employee belongs to by referring to the primary key of the branch table. Ex: Jan Levinson has a branch id of 1. So when we go to the branch table, we look for the entry with a primary key of 1. This entry has a branch name of corporate. So Jan is in the corporate branch.

In this example, the branch table has a foreighn key which is the manager\_id attribute which points to the employee id of the manager. So for example, if we look at the branch with id of 2, the manager of the branch has an id of 101. Thus, we can go to the employee table and find the entry where the employee id is 102, which corresponds to the person of michael scott.

Notice that the employee table has a foreign key(branch id) that links it with the branch table. As well the branch table has a foreign key(manager id) that links it with the employee table.

Note that a table can have more than 1 foreign key as shown below. In the tabe below each employee not only has a branch they belong to but they also have a supervisor. We can find out more information about that supervisor by going to the employee with id of whatever our current employee’s super\_id is. For example, Michael Scott’s supervisor has an id of 100. When looking at the employee with id of 100, we get Jan. So Jan is Michael’s supervisor.

Table

Description automatically generated

Composite Key

* A primary key that needs two attributes

Table

Description automatically generated

Branch supplier tells us who the supplier for the different branches is. For instance looking at the first entry we can see that Hammer Mill supplies paper for the branch with id of 2 which is Scranton. Notice that the composite key consists of two attributes, the branch id and the supplier name. We need both these attributes since the branch id by itself does not uniquely define each row and the supplier name by itself does not uniquely define each row. Only together can they uniquely define each row. For instance, the supplier name of Hammer Mill appears twice. But the combination of Hammer Mill supplying to branch 2 only appears once.

It is possible that the attributes to create a composite key can actually be foreign keys as well as shown below. Below we introduce the client and works\_with branch. The client branch is the customer and the works\_with table tells us which employee works with which client.

Table

Description automatically generated

Consider the works\_with table. Again, notice that the emp id and the client id by themselves cannot uniquely define a row. However, together the two attributes uniquely define a row. As well, notice that these two attributes are foreign keys. The employee id is going to refer to an employee in the employee table and the client id is going to refer to an employee in the employee table. For example, employee 101 has sold client 401 267000 sales of something. Looking at where the foreign keys point to, this says Michael Scott (employee 101) has solid Lackawanna country (client 401) 267000 sales of something.

**SQL Basics**

* + A picture containing text, person

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  + SQL is a programming language as it provides instructions to a RDBMS
  + In order to update/delete/etc information in a RDBMS, we need to use SQL.
  + Text

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  + SQL has formal specifications which defines how SQL needs to be used
  + There are a bunch of RDBMs such as postgres, mysql which implement SQL, but each slightly differently.
  + SQL is used on all the RDBMs, just differently
  + Text

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  + Note: Schemas is the layout/design of the DB

Queries

Queries is just asking the database for some information.

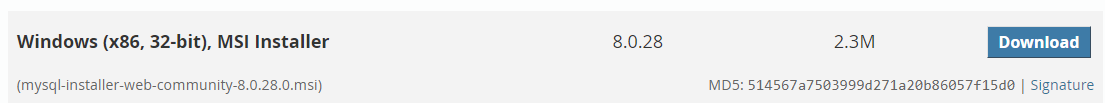
Graphical user interface, text, application

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Graphical user interface, text, application

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**MySQL Windows Installation**

* MySQL is a RDBMS
* When we have MySQL on our computer, we set up a MySQL DB server.
* We will also install PopSQL which is a program to write out all the queries. It is basically a text editor that can hook up to the MySQL DB.
* Installing MySQL
  + Search ‘mysql community server’
  + Click on the first link <https://dev.mysql.com/downloads/mysql/>
  + Click on 
  + Then click download 
  + Ignore the sign up by clicking no thanks just start my download
  + Click the download thing
  + Click next