MySQL

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DataBase

- It's an organized collection of data, generally stored and accessed electronically from a computer system.

- DataBase Management System (DBMS) = software that interacts with end users, applications, and the database itself to capture and analyze the data.

DataBase Uses...

Some uses of DataBases are:

-To support internal operations of organizations and to underpin online interactions with customers and suppliers.

-Databases are used to hold administrative information and more specialized data, such as engineering data or economic models.

Relational and Non-relational

- Relational Databases:
- ❖ Represent and store data in tables and rows.
- ❖ They're based on a branch of algebraic set theory known as relational algebra.
- ❖ Use Structured Querying Language (SQL), making them a good choice for applications that involve the management of several transactions.

- Non-Relational Databases:
- ❖ Represent data in collections of JSON documents.
- ❖ A non-relational database just stores data without explicit and structured mechanisms to link data from different tables (or buckets) to one another.
- ❖ If your data model turns out to be very complex, or if you find yourself having to de-normalize your database schema, non-relational databases like Mongo may be the best way to go

Cases of relational and non relational

- Relational Databases:
- ❖ They are also called SQL Databases.
- ❖ The most popular of these are Microsoft SQL Server, Oracle DataBase, MYSQL and IBM DB2.

- Non-Relational DataBase:
- ❖ Also called NoSQL Databases.
- ❖ The most popular are MONGODB, DocumentDB, Cassandra, CoachBase, HBase, Redis and Neo4j.

Local Database Advantages

- Advantages:
- ❖ You do not need to use concurrent access controls, data transmission, etc.
- ❖ it's cheaper.
- ❖ it requires the use of interconnected systems between several devices, since the central unit unifies everything.

Relational Databases Design phases

- Phase 1: Collect user requirements.
- ❖ identify needs.
- Phase 2: Conceptual design.
  - ❖ we will shape our entities and the relationships that will exist between them.
- Phase 3: Logical design.
- ❖ In this phase, we must think about how to normalize our tables to avoid duplication of information and to save storage space.
- Phase 4: Physical design.
- ❖ we will shape our entities and the relationships that will exist between them.

SGBD

❖ Oracle database. Object-relational database management system developed by Oracle Corporation. It is considered one of the most complete database systems and until recently it had a great market dominance.

❖ Microsoft SQL Server Database management system of the relational model developed by Microsoft. It is only available for the Windows operating system.

❖ PostgreSQL. Object-oriented database management system. It is open source and is published under a BSD license.

❖ MariaDB. A derivation of MySQL.

❖ MongoDB. We are facing the Non-relational Database Management System (DBMS NoSQL)

Database inconsistency

This occurs when data is unnecessarily repeated in the files or tables that make up the database. We say that there is data redundancy when the same information is stored several times in the same system or tables.

Master Table

The master tables in all relational databases are those that contain information that does not change over time.

Static and Dynamic DataBase Differences

- Static DataBases:
  - ❖ Static or Embedded SQL are SQL statements in an application that do not change at runtime.
  - ❖ For example, the application may allow users to enter their own queries.

- Dynamic DataBases:
  - ❖ It's a programming technique that allows you to build SQL Statements dynamically at runtime.
  - ❖ You can create more general purpose, flexible applications by using dynamic SQL because the full text of a SQL statement may be unknown at compilation.

What is the SQL Language?

- It's a domain-specific language designed for managing data.

- SQL Data can be held in:

  -A relational database management system (RDBMS).

  -Stream processing in a relational data stream management system (RDSMS).

- Useful in handling structured data (data incorporating relations among entities and variables).

Database queries

- SELECT query :- Selection of the data from database is based on select query

- ACTION query :- Append, Delete , Create and Update

- PARAMETER query :- Able to pass parameters to select and action

- AGGREGATE query :- Instead of parameters it totals up the query results
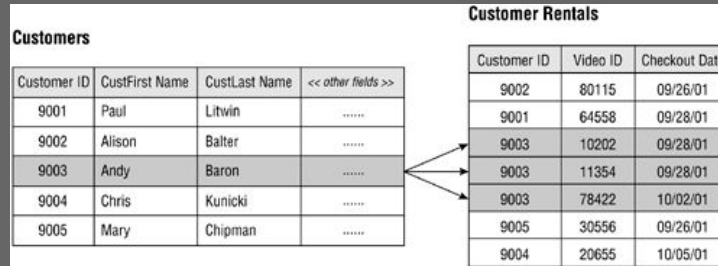
Physical data model

- Defines all the logical components and services required for DBMS

- Primarily defines all relational data models and objects of databases

- Created using native database language

- Used by database administrators to calculate the size of database and perform capacity planning
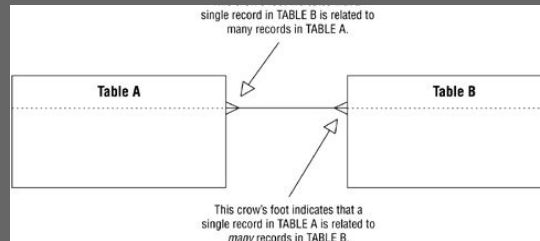
Types of relationships

- One to one :-
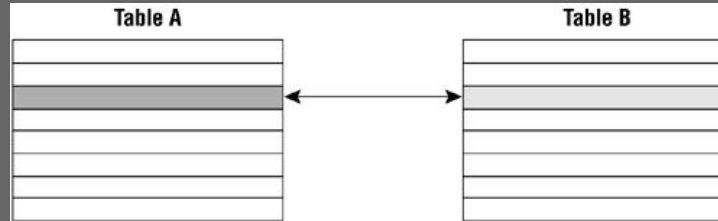
- One to many :-

- Many to one:- courses (Table B)

Students(TableA) attending various

What types of security exist in the DataBases?

Many layers and types of information security control are appropriate to databases, including:

- Access control.
- Auditing.
- Authentication.
- Encryption.
- Integrity controls.
- Backups.
- Application security.
- Database Security applying Statistical Method.

Data stored in main engines

- Oracle:- Relational, Document store, Graph DBMS, RDF store

- MySQL:- Relational and Document store

- Microsoft SQL server:- Relational, Document store, Graph DBMS

- PostgreSQL:- Relational and Document store

- MongoDB:- Document store and search engine

Primary key

- A special relational database column or columns to uniquely identify all table records.
- Important characteristics:-
  - Cannot be null
  - Must be unique value for each row
- A good primary key must have the following attributes:
  - Keep it short
  - Use a number
  - Keep it simple
  - Never change

Auto-increment

- Auto increment allows for generation of a unique key once a new row is inserted

```sql
CREATE TABLE Persons (

    Personid int NOT NULL AUTO_INCREMENT,

    LastName varchar(255) NOT NULL,

    FirstName varchar(255),

    Age int,

    PRIMARY KEY (Personid)

);
```

NOT_NULL, UNIQUE, INDEX

- The not_null constraints the column not to accept NULL values

```
CREATE TABLE Persons (
    ID int NOT NULL,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255) NOT NULL,
    Age int
);
```

- Unique constraints all values in the column to be different

```
CREATE TABLE Persons (
    ID int NOT NULL,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255),
    Age int,
    UNIQUE (ID)
);
```

- Index is used to create index in tables

```
CREATE INDEX index_name

ON table_name (column1, column2, ...);
```

Graphical tools

- RazorSQL
- Microsoft SQL Server Management Studio
- MySQL Workbench
- TeamDesk
- TablePlus
- Sequel Pro
- phpMyAdmin
- Navicat for MySQL
- SQLyog
- Knack