PW SKILLS

Lesson Plan

Introduction to SQL

INTRODUCTION TO DATABASE AND TYPES

What is Data?

Data might simply be facts about any thing under examination. Your name, age, height, weight, and so on are a few pieces of information about you. Data can also include an image, file, pdf, or other visual representation.

What is Database?

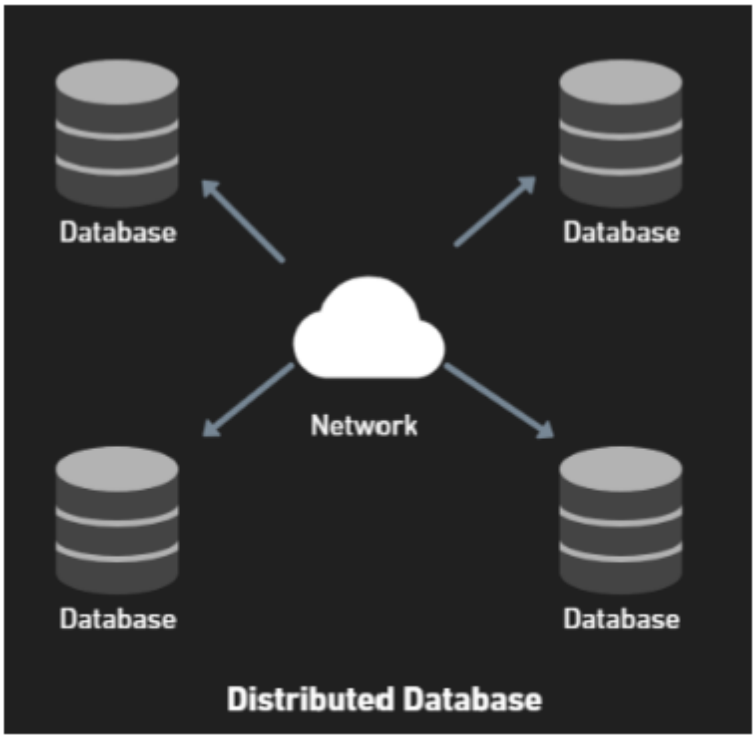
A database is a planned gathering of data. They enable the manipulation and storage of data electronically. Data administration is made simple by databases.

Let's use a database as an example. A database is used to hold information on people, their phone numbers, and other contact information in an online telephone directory. A database is used by your energy service provider to handle invoicing, client-related issues, defect data, etc.

Let's think about Facebook as well. Data on members, their friends, member activities, messages, adverts, and much more must be stored, modified, and presented. We have endless examples of how to use databases at our disposal.

Types of Databases

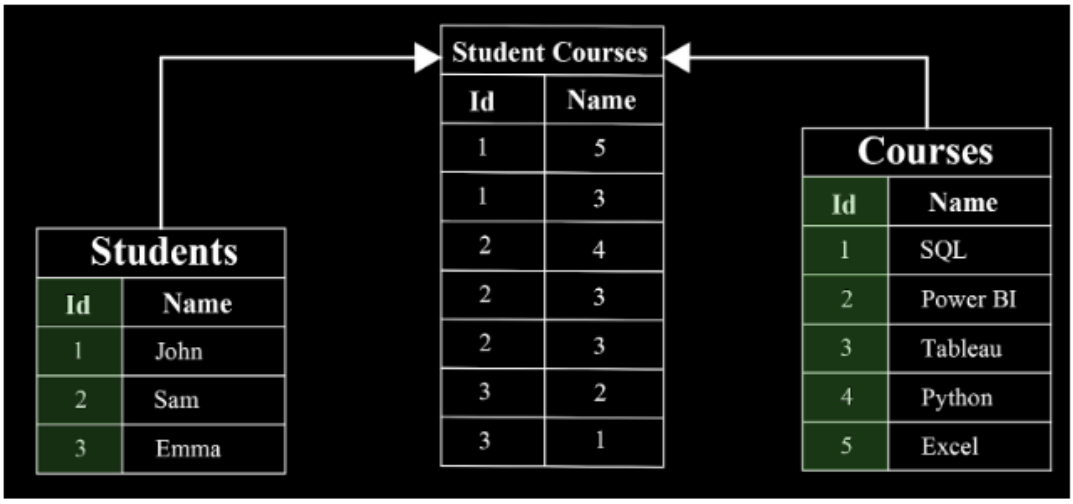
1. **Distributed Databases:** A distributed database is a special kind of database that incorporates data from local computers as well as data from the common database. The data in this kind of database system is dispersed across numerous organisations and not kept in one location.



2. **Relational Databases:** This kind of database uses tables to define database relationships. The most common DBMS type on the market is also known as Relational DBMS. MySQL, Oracle, and Microsoft SQL Server databases are a few examples of RDBMS databases.

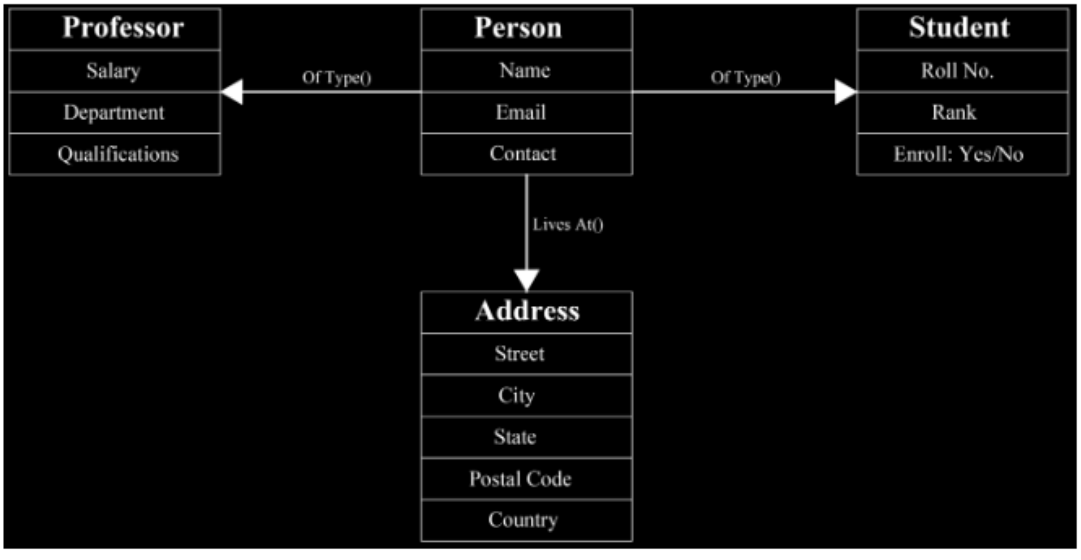
These databases, together with associated management systems, are the most developed and in the forefront of production. Every item of information in this database is related to every other piece of information. This is due to each data value having a distinct identity as a record in the database.

It should be noted that this model tabulates all data. As a result, using a primary key, every row of data in the database is connected to every other row. Similar to this, every table uses a foreign key to connect it to another table.

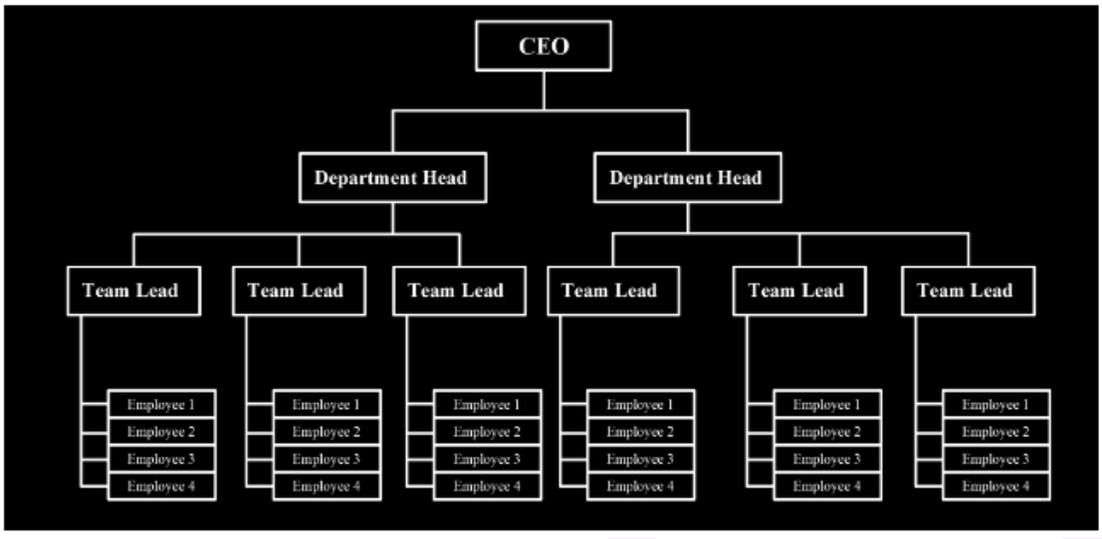


3. Object Oriented Databases: All data kinds can be stored in this kind of computer database. Objects are used to store the data. The characteristics and methods of the objects that will be stored in the database specify how the data should be used. An illustration of an object-oriented relational DBMS is PostgreSQL.

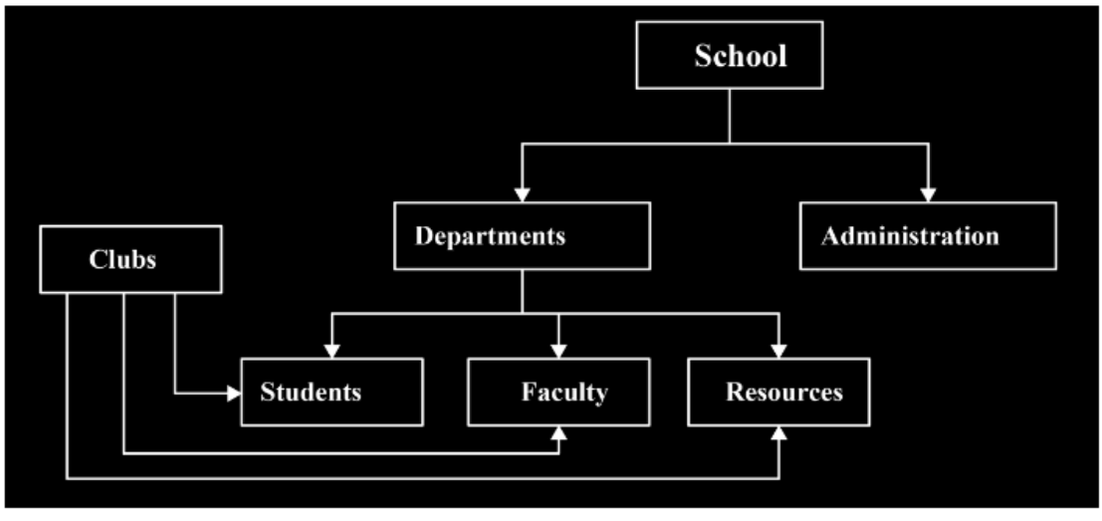
This database model will be simple for those who are accustomed to the Object-Oriented Programming Paradigm. It is possible to represent data that is saved in a database as an object that responds as an instance of the database model. As a result, calling and referencing the object are simple processes. The strain on the database is significantly decreased as a consequence.



4. **Hierarchical Databases:** This database follows the evolution of data classification in ranks or levels, where data is classified based on a common point of connection, much as in any hierarchy. As a result, the rank of the two data entities will be lower and the rank of the commonality will be greater. See the illustration below:



5. **Network Databases**: A network database differs significantly from a hierarchical database in several ways. The ability to link with various parent records is granted to the kid records. As a result, one can witness a network or net of database files connected by several threads. Take note of the fact that the Student, Faculty, and Resources components all have Departments and Clubs listed as their second parents.



6. **NoSQL Databases:** A database that offers a method for data storage and retrieval is referred to as a NoSQL. The term originally stood for non SQL or non-relational. numerous than the tabular relations seen in relational databases, this data is modelled in numerous ways.

A NoSQL database has a simpler architecture, easier horizontal scalability to machine clusters, and more precise availability control. Because NoSQL databases employ different data structures than relational databases do by default, some operations can be completed more quickly. The problem that a NoSQL database is supposed to answer determines whether it is appropriate. NoSQL databases' data structures are occasionally thought of as being more adaptable than relational databases' tables.

Mongo DB falls in this categoryNetwork Databases: A network database differs significantly from a hierarchical database in several ways. The ability to link with various parent records is granted to the kid records. As a result, one can witness a network or net of database files connected by several threads. Take note of the fact that the Student, Faculty, and Resources components all have Departments and Clubs listed as their second parents.

DBMS Vs RDBMS

DBMS – Database Management System

A group of programmes known as a database management system (DBMS) give users access to databases and the ability to alter, report, and depict data. Controlling access to the database is aided by it as well. Since database management systems are not a new idea, they were initially used in the 1960s.

The Integrated Data Store (IDS) by Charles Bachman is regarded as the first DBMS ever created. As database technology advanced throughout time, so did demand for and expectations of their features.

A software programme called a database management system (DBMS) is made to manage and arrange data in a systematic way. Users may manage the security and access settings for a database as well as create, change, and query databases.

Features of DBMS

1. **Data Modelling:** A DBMS offers tools for building and altering data models, which specify the organisation and connections of the data in a database.

2. **Data storage and retrieval:** A DBMS can offer a variety of techniques for finding and querying the data. It is responsible for storing and retrieving data from the database.

3. **Concurrency control:** A DBMS offers tools for managing simultaneous access to the database, ensuring that different users may access the information without interfering with one another.

4. **Data security and integrity:** A database management system (DBMS) offers tools for implementing security and integrity restrictions, such as limitations on the data's values and access controls that limit who may access the data.

5. **Backup and recovery:** A DBMS provides mechanisms for backing up and recovering the data in the event of a system failure.

6. Relational Database Management Systems (RDBMS) and Non-Relational Database Management Systems (NoSQL or Non-SQL) are the two categories into which DBMS may be divided.

7. **RDBMS:** Data is arranged into tables, each of which has a specific number of rows and columns. Through main and foreign keys, the data are connected to one another.

8. **NoSQL:** Data is arranged as columns, documents, graphs, or key-value pairs. These are made to handle high-performance, large-scale situations.

A database is a group of connected data that facilitates effective data retrieval, insertion, and deletion. The data is organised in the database using tables, views, schemas, reports, etc. For instance, a university database organises information on students, professors, administrative staff, etc., enabling effective data retrieval, insertion, and deletion.

Advantages of DBMS

1. A range of methods for storing and retrieving data are provided by DBMS.
2. The demands of several applications using the same data are efficiently handled by DBMS.
3. Uniform data administration practises.
4. Application programmers are never exposed to the specifics of data storage and representation.
5. A DBMS makes effective use of a number of strong functions to store and retrieve data.
6. Provides security and data integrity.
7. Integrity restrictions are implied by the DBMS to get a high level of security against unauthorised access to the data.
8. Only one user can access the same data at once due to the way a DBMS schedules concurrent access to the data.
9. Shortened time for application development

Disadvantages

1. Because DBMS hardware and software are relatively expensive, your organization's budget grows.
2. Since most database management systems are sophisticated, users must get training before using them.
3. In certain businesses, all data is combined into a single database that can be harmed by an electrical failure or a corrupted database on the storage medium.
4. Multiple people using the same programme simultaneously might occasionally result in data loss.
5. DBMS is not capable of complex computations.

RDBMS

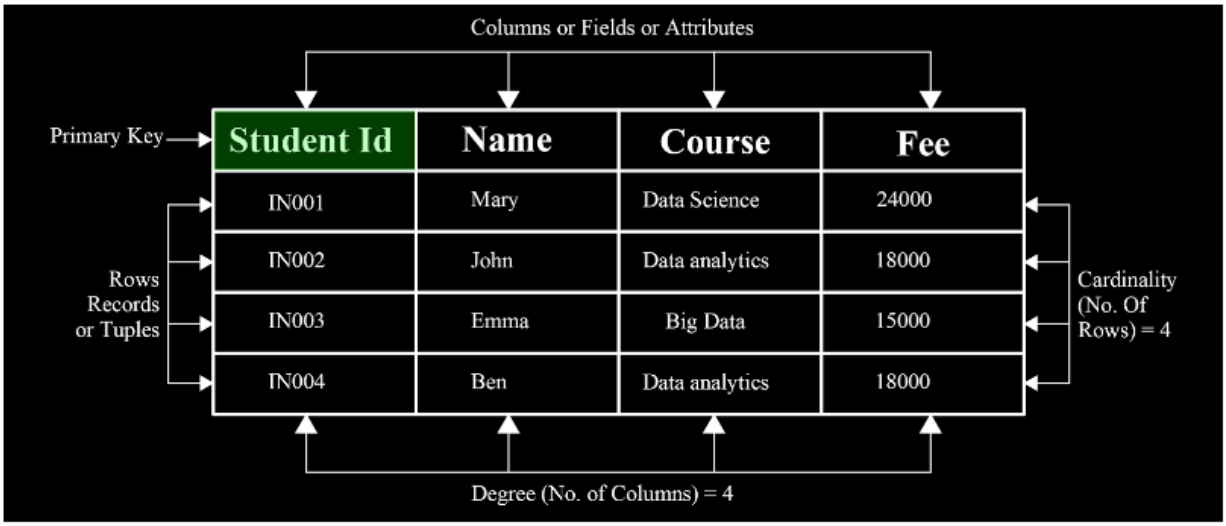
In a relational database, data is kept in one or more tables (or "relations") of columns and rows, making it simple to see and comprehend how various data structures connect to one another. Data is organised in relational databases according to predetermined relationships. Relationships are logical connections that have been made between several tables as a result of their interaction.

Relational Database Model

The relational database paradigm, created by E.F. Codd at IBM in the 1970s, enables any table to be associated to another table using a common attribute. Codd suggested switching to a data model, where data is stored, retrieved, and connected in tables without reorganising the tables that hold them, as opposed to utilising hierarchical structures to organise data.

A data type is specified by attributes (columns), and the value for that particular data type is contained in each record (or row). Each row may be used to establish a relationship between multiple tables using a foreign key, which is a reference to a primary key of an existing table. All tables in a relational database have an attribute known as the primary key, which is a unique identifier of a row.

The relational model represents the database as a collection of relations. In relational model terminology, a row is called a tuple, a column header is called an attribute and the table is called a relation. The data type describing the type of values that can appear in each column is called a domain.



In the given table the SID, SNAME, CLASS, AGE are attributes.

What is Table/Relation?

A relational database stores data in the form of relations for everything. Tables are used in the RDBMS database to hold data. A table is a collection of connected data elements that stores data in rows and columns. Each table represents a specific real-world item, such as a person, location, or event, about which data is being gathered. The logical view of the database is the organised collection of data included in a relational table.

Properties of a Relation

1. Each relation has a distinct name that may be used to locate it in the database.
2. There are no duplicate tuples in the relationship.
3. A relation's tuples are not in any particular sequence.
4. Each cell of a connection holds precisely one value since all characteristics in a relation are atomic.

What is a Row or Record or Tuple?

A record or tuple is another name for a database row. It includes all of the precise details for each table entry. In the table, it is a horizontal element. For instance, the table above has 5 records.

Properties of a Row

1. In all of their entries, no two tuples are identical to one another.
2. The format and amount of items are the same for all tuples in the relation.
3. The tuple's order is not important. They are recognised by their ideas, not by where they are located.

What is Column/Attribute?

In a table, a column is a vertical object that holds all the data pertaining to a single field. For instance, the column "name" in the table above provides all the details on a student's name.

Properties of a Column

1. A relation's attributes must all have names.
2. The attributes are allowed to have null values.
3. If no additional value is supplied for an attribute, default values can be specified and added automatically.
4. The primary key refers to the characteristics that specifically identify each tuple in a relation.

What is Data Items/Cells?

The individual data item is the smallest type of data in the table. It is kept at the point where tuples and attributes overlap.

Properties of a Cells

1. Items in data are atomic.
2. An attribute's data elements ought to come from the same domain.

What is Degree?

The degree of the table refers to the total number of characteristics in a relation.

What is Cardinality?

The cardinality of a table is the total number of tuples present in a relation at any one time. An empty table is a relation whose cardinality is 0.

What is a NULL Value?

The table's NULL value indicates that the field was left empty when the record was created. It differs from a value that is blank or a field with white space.