DBMS: Types, Advantages, Disadvantages

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Introduction

- It is a collection of interrelated data and a set of programs to access those data.
- The collection of data if files, usually referred to as the database, it contains information relevant to an enterprise.
- A management system is then implemented on this database to retrieve, insert and delete the data efficiently

Cont..

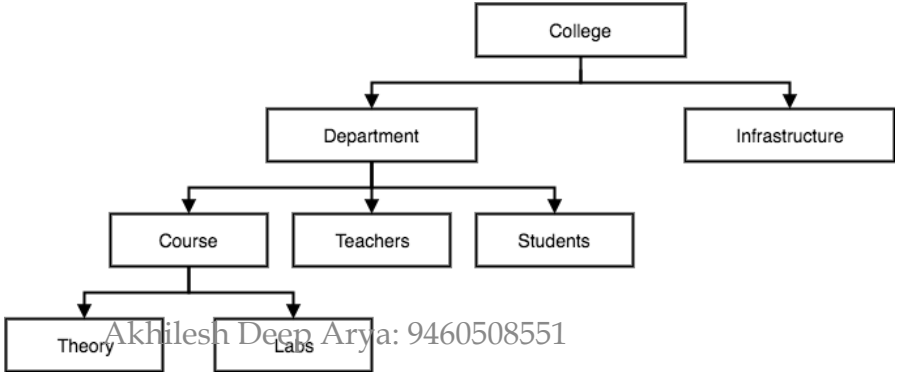
- Examples: MySQL, Sybase, Oracle, MongoDB, Informix, PostgreSQL, SQL Server, etc
- DBMS provides an interface to perform various operations like database creation, storing data in it, updating data, creating a table in the database and a lot more.
- It provides protection and security to the database. In the case of multiple users, it also maintains data consistency

Cont..

- **SQL** or Structured Query Language is used to operate on the data stored in a database.
- SQL depends on
  - Relational algebra and
  - Tuple relational calculus.

History

- 1968 was the year when File-Based database were introduced. It requires extensive programming in a third-generation language such as COBOL, BASIC
- 1968-1980 was the era of the Hierarchical Database. Prominent hierarchical database model was IBM's first DBMS. It was called IMS (Information Management System).



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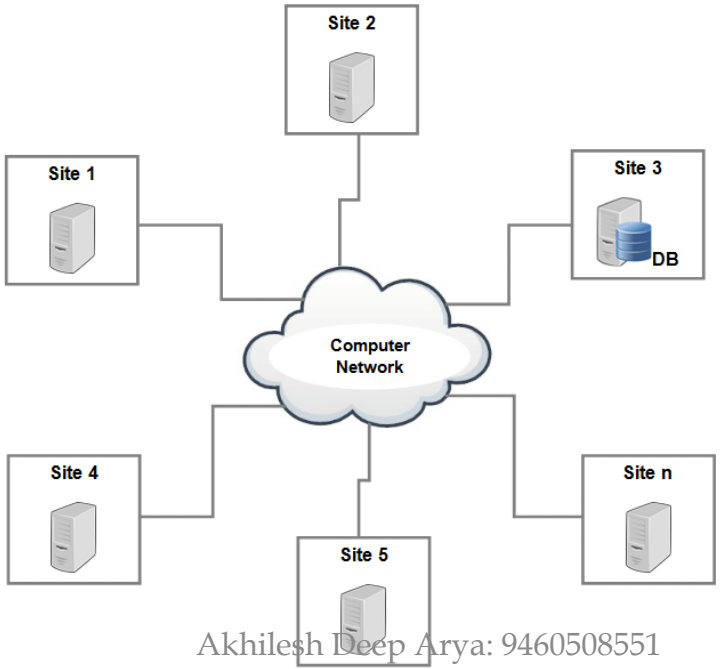
- **Charles Bachman** developed the first DBMS at Honeywell called Integrated Data Store (IDS). It was developed in the early 1960s, but it was standardized in 1971 by the CODASYL group (Conference on Data Systems Languages).
- **Network data model identified the following components:**
  - Network schema (Database organization)
  - Sub-schema (views of database per user)
  - Data management language (procedural)

Cont..

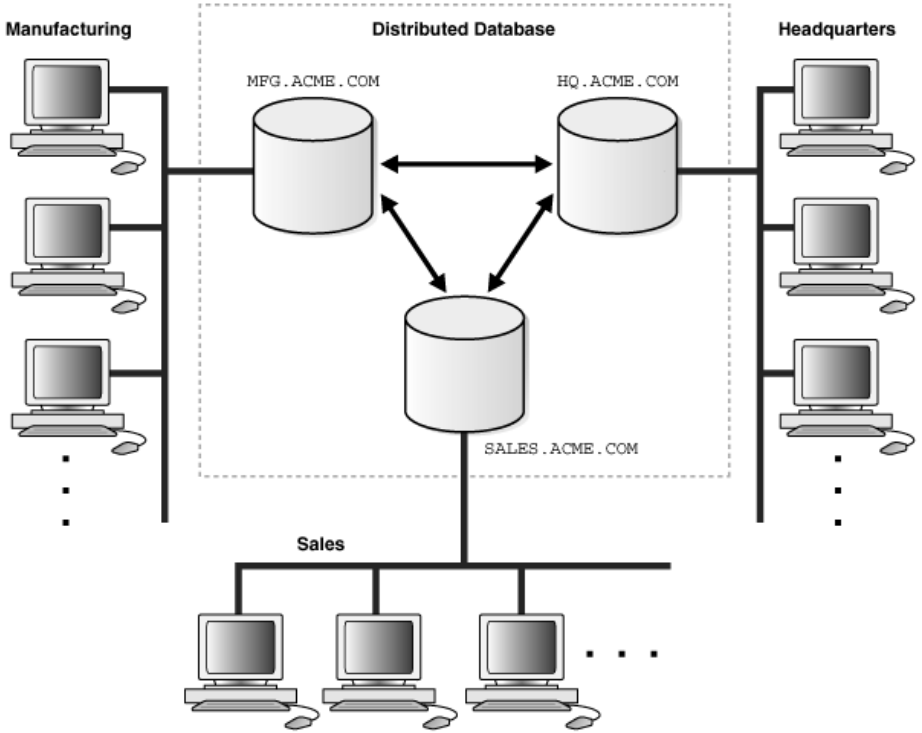
- **1970 - Present:** It is the era of Relational Database and Database Management. In 1970, the relational model was proposed by E.F. Codd.
- Relational database model has two main terminologies called
  - instance
  - schema.
- The instance is a table with rows or columns
- Schema specifies the structure like name of the relation, type of each column and name.

Types of Database

- Centralized Database

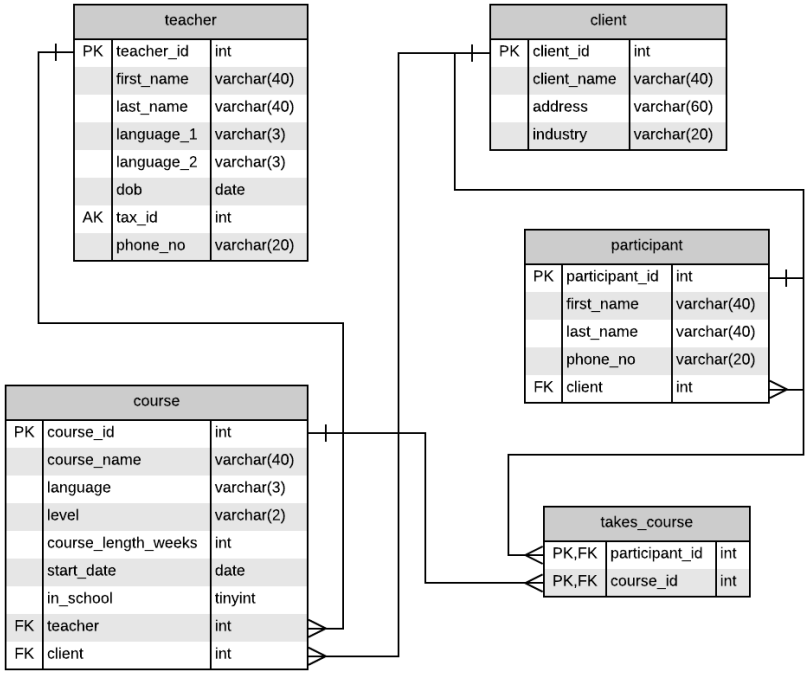


Distributed Database



Examples of the Distributed database are Apache Cassandra, HBase, Ignite, etc.

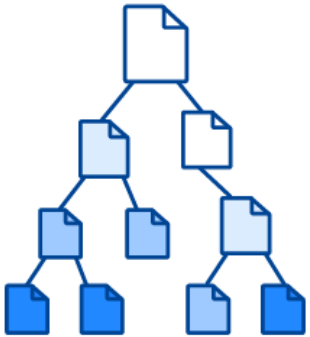
Relational Database



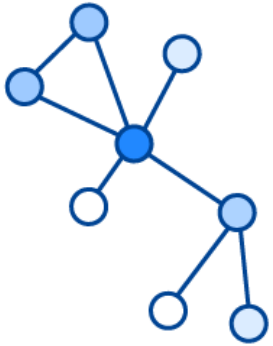
Examples of Relational databases are MySQL, Microsoft SQL Server, Oracle, etc.

NoSQL Database

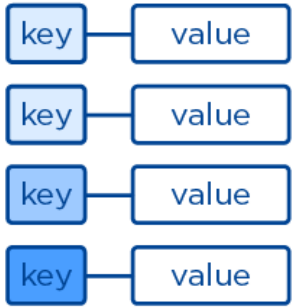
Document



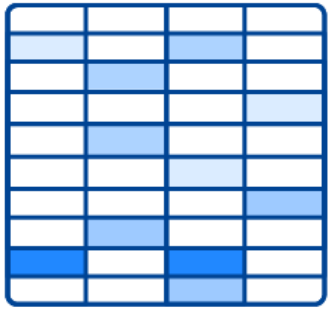
Graph



Key-Value



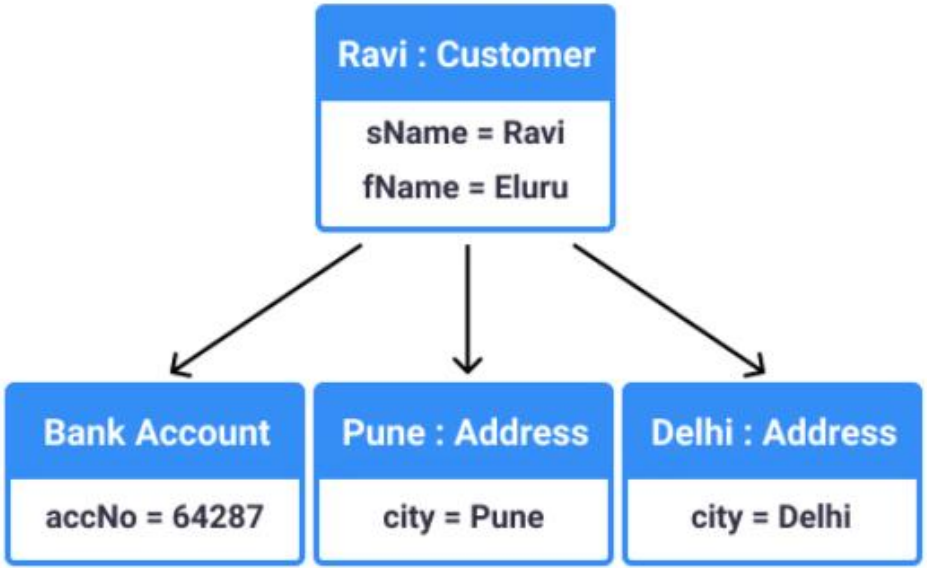
Wide-column



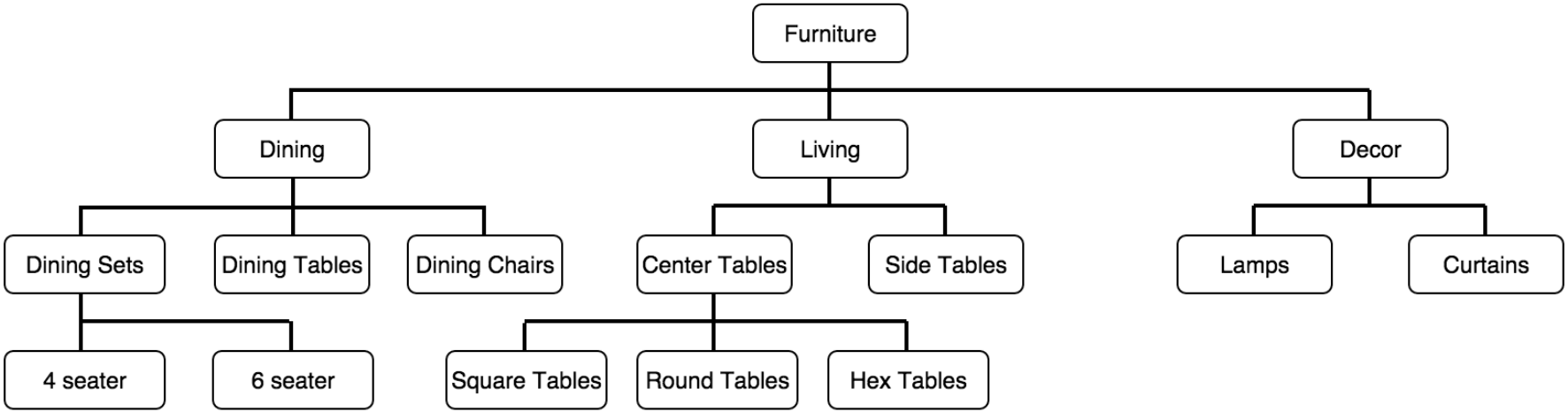
Cloud Database

- Amazon Web Services(AWS)
- Microsoft Azure
- Kamatera
- PhonixNAP
- ScienceSoft
- Google Cloud SQL, etc.

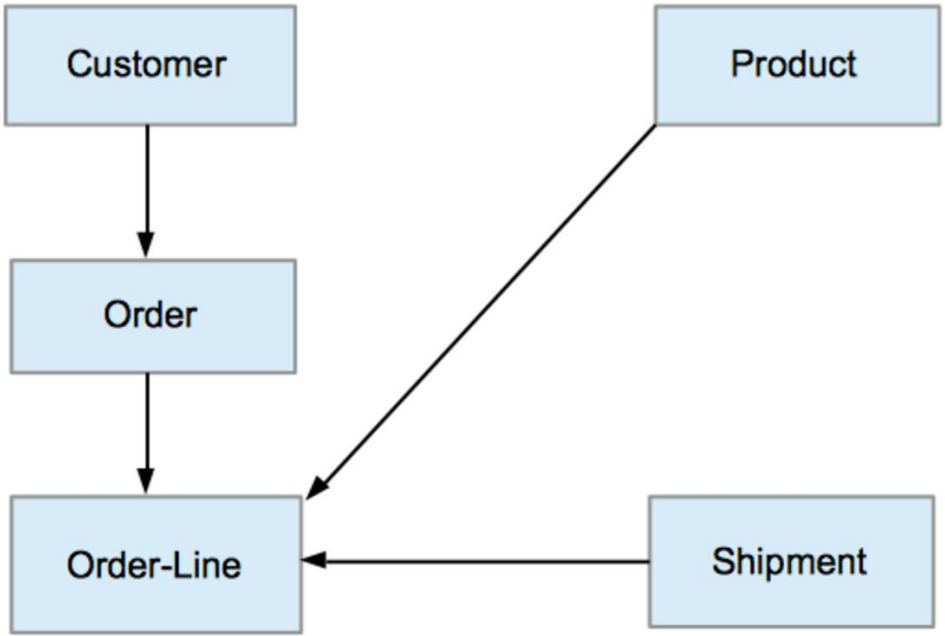
Object-oriented Databases



Hierarchical Databases



Network Databases



Advantages of DBMS over FILE

- Reduce Redundancy
  - Due to the centralized approach applications are not required to maintain their own copy
- Ensure Consistency
  - Changes made at one place will automatically applied to other entries unlike file system, this ensures that ever copy has same information
- Data Manipulation Capabilities
  - When a user requirement is changed in file system, there is a requirement of new program. In DBMS quires can be modified according to the user requirements

Cont..

- Atomicity and Transaction Management
  - During any process the DBMS ensures the completion of the whole transaction which combines more than one operation or no operation, this ensures the consistency.
- Security
  - The DABM system provides security checks which allows only authorize persons to access the database
- Integrity
  - We can apply the constraints in DBMS if required, file system does not provide any procedure to check these constraints automatically

Disadvantages

- **Cost of Hardware and Software:** It requires a high speed of data processor and large memory size to run DBMS software.
- **Size:** It occupies a large space of disks and large memory to run them efficiently.
- **Complexity:** Database system creates additional complexity and requirements.
- **Higher impact of failure:** Failure is highly impacted the database because in most of the organization, all the data stored in a single database and if the database is damaged due to electric failure or database corruption then the data may be lost forever.

Applications

- **Banking:** all transactions
- **Airlines:** reservations, schedules
- **Universities:** registration, grades
- **Sales:** customers, products, purchases
- **Online retailers:** order tracking, customized recommendations
- **Manufacturing:** production, inventory, orders, supply chain
- **Human resources:** employee records, salaries, tax deductions