Introduction to DBMS

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ToC

Basic Terminology

- **Data** – Raw information,
  A value representing an quality or quantity
  A recorded fact.
- **Information** – Processed data
- **Record** – A collection of related data/information.
- **Data Dictionary** – Data dictionary is a detailed description of data objects exists in a system.
- **Data Warehouse** – Centralized repository of data from one or more sources and used for reporting and data analysis.

Database & DBMS

Database – A database is an organized collection of data, that can be easily accessed, managed and manipulated.

OR

A database is a collection of interrelated data stored together without harmful or unnecessary redundancy.

DBMS

A database management system(DBMS) is a software package used to store and manage data.

Problems in Manual Database

- No sharing
- Data isolation
- Diffused responsibilities
- Poor coordination
- Data redundancy
- Weak (data) integrity

Functions/Characteristics of DBMS

- Data Representation
- Data Manipulation Management
- Performance
- Transaction Management
- Data Access Management

Advantages of DBMS

- Storage and Data Redundancy Management
- Increased Security
- Faster Retrieval
- Analysis Summary Reports
- Restricted Access
- Centralized Management and Control
- Data Sharing

Applications of DBMS

- Banking
- Railway
- Airlines
- Educational Organizations / University
- Data Warehouses
- And many more…

- Enterprise Business
  - Manufacturing
  - Sales
  - Human Resource
  - Payroll
  - And many more…

Find at least 3 more applications of DBMS

DBMS Examples

Find names of at least 5 additional popular DBMS

- Oracle
- Microsoft SQL Server
- IBM DB2
- SAP Sybase ASE
- Microsoft Access
- Ingres (OS)
- PostgreSQL (OS)
- MySQL (OS)
- MariaDB (OS)
- SQLite
- Teradata
- NoSQL Databases
  - Couchbase Mobile
  - Google Firebase
  - MongoDB
  - Cassandra
  - Hbase

Find more about these listed databases – Type, Uses, Latest Versions, Underlying Data Modals, Owner Companies etc.

Database System Architecture

Database System Architecture can be defined on three levels

- **Internal Level (Physical Level)** – Defines the way data is stored on physical storage. Low level architecture.
- **Conceptual Level (Logical Level)** – Defines logical structure of the database in terms of entities, relationships, attributes, datatypes etc.
- **External Level (View Level)** – The way data will be represented to the end user. High Level Architecture

Data Models

Learn more about these listed Data Modals.

Find out few other data models with their examples

- Data models defines how data in a database system get stored and represented.
- A data model uses a set of construct or rules to provide a representation of data content, structure and constraints required by an application.

Network Model – Data is represented in collection of records and relationship among records is in form of links (similar to pointers).

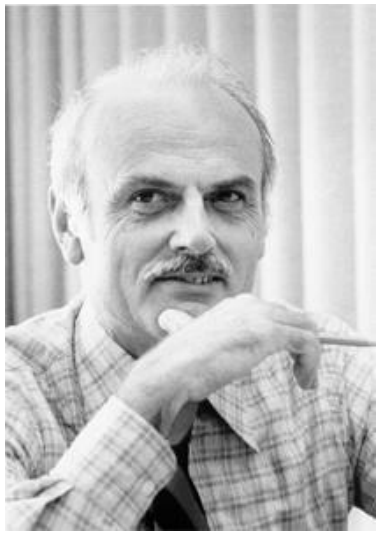
Hierarchical Model – Data is represented in collection of records, and relationship among records is represented in form of hierarchical trees.

Relational Model – Data is represented in tabular format. A table is comprises of rows and columns.

Object Oriented Model – Data is represented in form of objects and based on the concept of Object Oriented Programming (OOP) Concepts.

Hybrid Models – Ex. Object Relational Database Management Systems

Relational [Database] Model



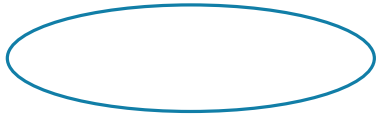
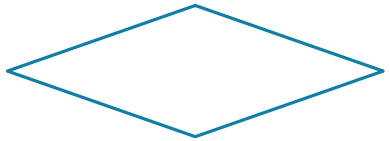
- First defined by Computer Scientist **Edgar Frank Codd** in 1969.
- Mathematical model, based on Relational Algebra and Predicate Logic.
- Very well defined and extremely mature model in terms of data storage and representation.
- All RDBMS (Relational Database Management Systems) derived from Relational model.

Entity Relationship (ER) Model

- A high level data model.
- Proposed by Peter Chen in 1970s.
- Graphical representation of the logical relationship among entities (or objects).
- Describes data aspects of a system under implementation on abstract level.
- Represents conceptual/logical design of a database.
- Notations
  - Chen Notation
  - Crow-Foot Notation
  - Bachman Notation
  - Martin Notation
  - IDEF1X Notation

Entity Relationship (ER) Model

Learn about various symbols available in different ER notations.

Component	Symbol	Example
Entity	Rectangle	
Attribute	Ellipse	
Link between Entity and Attribute	Line	
Relationship Among Entities	Diamond	

Cardinality Ratio of Relationship

Relationship among entities can be represented in following three ways –

- One-to-one
- One-to-many or Many-to-one
- Many-to-many

Find out at least 3 examples of each type of Relationship in real world

Simple ER Depiction

Identify Entities, Relation among entities and Attributes in a System/Business and create an ER Diagram.