Classification of DBMS:

1. Hierarchical databases
2. Network databases
3. Relational databases
4. Object Oriented databases.

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File Based System:

- File system is a method for storing & organizing computer files & the data they contain to make it easy to find & access them.

Drawbacks of file based system:

- Data Redundancy
- Data Inconsistency
- Data Isolation
- Data Atomicity
- Data Dependence
- Program maintenance
- Data sharing
- Data Security
- Incompatible File Format

Database System Approach:

- It emphasizes the integration & sharing of data throughout the organization.
- The current generation of DBMS s/w stores not only the data structures but also the relationship b/w those structures.

Advantages of DBMS:

- Controlling Data Redundancy
- Data Sharing
- Enforcing Data Integrity
- Data Security
- Ease of application development
- Multiple User Interfaces
- Backup & Recovery
- Data Independence
- Reduced Maintenance

Data Models: Data model is a collection of conceptual tool for describing data, relationships, semantics and consistency constraints.

- Data models represent the structure of a database
  - Hierarchial Model
  - Network Model
  - Relational Model
  - Object Oriented Model

Components of Database System: The major components of DBMS are:- Software
Hardware
Data
Procedures
Database Access Language

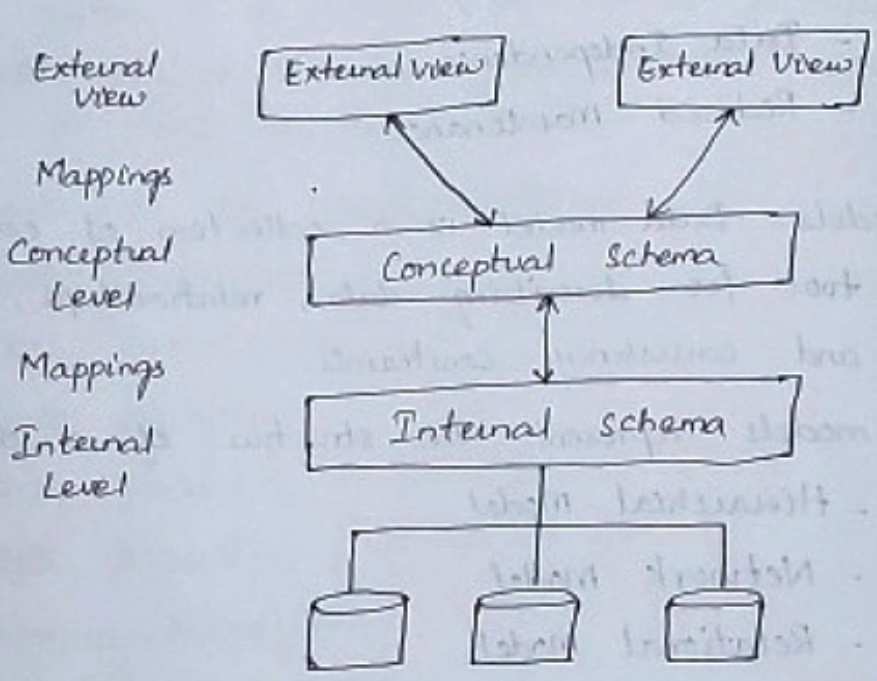
Users: The users are the people who manage the databases & perform different operations on the databases in the database system.

1. Application Programmers
2. Database Administrators
3. End Users

Architecture of Database : A database architect develops & implements s/w to meet the needs of users.

- There are three levels in DBMS architecture :

1. External Level
2. Conceptual level
3. Internal Level



DBMS Vendors :

Oracle Database

Microsoft SQL Server

IBM DB2

SAP Sybase ASE

Postgre SQL

MySQL

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Building Blocks of Entity Relationship : The basic building blocks of all data models are entities, attributes & relationships

Entities : These may be physical objects such as customers or products about which data are to be collected & stored.

Attributes : Each entity is described by a set of attributes.

Relationships : A relationship describes an association among two or more entities.

- Data models use three types of relationships.
  1. One - to - many (1 : M) relationship
  2. Many - to - many (M : N or M : M) relationship
  3. One - to - One (1 : 1) relationship.

Classification of Entity sets : An entity set is the collection of entities of the same type

- An entity is an object that is represented in the database.
- An entity is represented or defined by set of attributes.
- Attributes are the properties used to describe an entity.

Types of Entity : Strong Entity
Recursive Entity
Weak Entity
Composite or Associative Entity
Super & Sub Type Entities

Attribute : It is a property or characteristic of a entity type

Classification of Attributes :

- Required attributes
- Optional attributes
- Identifier
- Composite attribute
- Simple attribute
- Single valued attribute
- Multi valued attribute
- Stored attribute
- Derived attribute

Relationship Degree : The degree of a relationship indicates that the no. of entities that participate in that relationship.

- Unary relationship
- Binary relationship
- Ternary relationship

Relationship Classification : Relationship is a meaningful association b/w entities.

- The entities that participate in a relationship are called as participants.
- Among entities four types of relationships exist. These are
  - One - to - One
  - One - to - Many
  - Many - to - One
  - Many - to - Many

Generalization & Specialization :

- Abstraction mechanisms are used to model information in DBMS.
- The abstraction is the mechanism used to hide the superfluous details of a set of objects.

Generalization : It is a process of extracting common characteristics from two or more classes & combining them into a generalized superclass.

- It is a bottom up approach.

Notation : ⇧

Specialization : It is the reverse process of generalizat

- It is the abstracting process of introducing new characteristics to an existing class of objects to create one or more new classes of objects.
- It is a top down approach.

Aggregation : It is a specialized form of association b/w two or more objects in which the objects have their own life cycle but there exists an ownership as well.

Composition : It is a specialized form of aggregation in which if the parent object is destroyed, the child objects would cease to exist.

CODD's Rules : There are 12 rules formulated b E. F. Codd for RDBMS in 1970.

1. Information Representation
2. Guaranteed Access
3. Systematic Treatment of Null Values
4. Database Description Rule

5. Comprehensive Data Sub Language
6. View Updating
7. High level Update, Insert & Delete
8. Physical Data Independence
9. Logical Data Independence
10. The Distribution Rule
11. Non-Subversion
12. Integrity Rule

Relational Data model: It is the primary data model, which is used widely around the world for data storage & processing.

Concepts are: Relation
Tables
Tuple
Relation instance
Relation schema
Relation key
Attribute domain

Constraints are: Key constraints
Domain constraints
Referential integrity constraints

Relation Data Integrity: Integrity check is to be perfo at the data entry level itself.

- The relational model includes two general integrity rules
  - Integrity Rule 1 (Entity Integrity)
  - Integrity Rule 2

Keys in ER Model:

- Candidate Key
- Composite Key
- Primary Key
- Secondary Key
- Alternate Key

Normalization: It is a process of evaluating & correcting table structures for eliminating redundancy & inconsistency of data.

First Normal Form (1NF): Any multi valued attributes have been removed, so there is a single value at the intersection of each row & column of the table

Second Normal Form (2NF): Any partial functional dependencies have been removed.

Third Normal Form (3NF): Any transitive dependencies have been removed.

Boyce Codd Normal form (BCNF): Any remaining anomalies that results from functional dependencies have been removed.

Fourth Normal Form (4NF): Any multi valued dependencies have been removed.

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History of SQL:

- SQL language was first commercially implemented by Oracle Corporation in the year 1979.
- In 1986, SQL was jointly published by ANSI & the ISO.
- SQL'86 standard was revised in 1989 to introduce features that enforce referential integrity.

The features in new SQL'92 standard

- Schema definition stmts
- Temporary tables
- Built in join operators
- Altering & dropping objects

Types of SQL commands: SQL provides a comprehensive set of commands for a variety of tasks

1. Data Definition Language (DDL)
2. Data Manipulation Language (DML)
3. Data Query Language (DQL)
4. Data Control Language (DCL)
5. Data Administration Statements (DAS)
6. Transaction Control Statements (TCS)

DDL commands are CREATE, ALTER & DROP

DML commands are INSERT, UPDATE & DELETE

DQL commands are SELECT

DCL commands are GRANT & REVOKE

DAS commands are START AUDIT & STOP AUDIT

TCS commands are COMMIT, ROLLBACK, SAVE POINT
SET TRANSACTION.

Data Types in SQL

- Char
- Varchar / Varchar2
- Long
- Date
- Time Stamp
- Number
- Raw
- Long Raw
- Blob, Clob
- Bfile

DDL Commands:

CREATE

Syntax: CREATE <object type> <object name> (object definition);

ALTER

Syn: ALTER TABLE <Table Name> ADD/MODIFY (col def, coldef ...);

DROP

Syn: DROP <object type> <object name>;

DCL Commands:

GRANT

Syn: GRANT <privilege list> PRIVILEGES TO <User Name>

DML Commands:

INSERT

Syn: INSERT INTO <table name> VALUES (list of data values in the order of structure define

UPDATE

Syn: UPDATE <table name> SET Col=Val1, Col2=val2, ... Coln=valn;

DELETE

Syn: DELETE from <table name>;

Selection Operation (σ): Used to choose a subset of the tuples from a relation

Syn: $\sigma_{<\text{Selection condition}>}(R)$

Notation: $\sigma_p(r)$

Projection Operation (π): It outputs a relation containing only the specified list of attributes with duplicate tuples removed.

Notation: $\pi_{A1, A2, An}(r)$

Aggregate functions: This fn takes an entire column of data as its argument & produces a single data item that summarizes the column.

- The aggregate fns are

COUNT() & COUNT(*)

SUM()

AVG()

MAX()

MIN()

Table Maintenance in SQL: Table contain the rows & columns of the data. We can CREATE, MODIFY & DELETE tables using the DDL commands

Table Truncation : The SQL TRUNCATE TABLE stmt is used to remove all records from a table.

- It performs the same fn as a DELETE stmt without a WHERE clause.
- It cannot be rolled back.

Syntax : TRUNCATE TABLE table_name;

- Truncate table deletes all rows from a table. The table structure & all the indexes continue to exist until you issue a drop table command.

Integrity Constraints in SQL :

- Integrity constraints are the rules that are to be imposed on the data
- It is a mechanism used by Oracle database to prevent invalid data entry into the database.

Types :

1. Domain Integrity Constraints
2. Entity Integrity Constraints
3. Referential Integrity Constraints

Domain Integrity Constraints are handled by defining certain data type & set / range of permitted valu

- There are two types
    1. NOT NULL
    2. CHECK

NOT NULL : It enforces the database system not to contain NULL values under a column.

CHECK : Used to restrict a column to have a set/ra of permitted values.

Entity Integrity Constraints are used to force the business rules on a table of the database

- There are two types
  1. UNIQUE
  2. PRIMARY KEY

UNIQUE is used to prevent the duplicates values within rows of a specified column or set of columns in table

PRIMARY KEY used for identifying an entity uniquely among several entities

- Primary Key constraint avoid duplicate rows & does not allow null values.

Referential Integrity Constraints:

- These are used to build relationship b/w different tables.
- Primary Ta or unique key called referenced key.

Parent Table: The table that contains the referenced key (primary / unique) which is used as reference key is called Parent Table of a relationship

Child Table: The table that contains a foreign key that refers a referenced key of another table is called child Table of a relationship

Set Operations:

- These are used to combine two or more sets to creat new set where each set can be understood as a relati
- SQL enables us to handle the requirements of combining two or more sets by using set operations like UNION, INTERSECT & MINUS.

UNION: It combines rows from two or more queries without including duplicate rows.

Syn: <select query> UNION <select query>;

UNION ALL: It combines rows from two or more queries by including even duplicate rows from the sets.

Syn: <select query> UNION ALL <select query>;

INTERSECT: It combines rows from two queries returning only the rows that appear in both the sets.

Syn: <select query> INTERSECT <select query>;

MINUS: It combines rows from two queries returning only the rows that appear in the first set but not in the second set.

Syn: <select query> MINUS <select query>;