UNIT 1.0

Introduction to DBMS

A Database Management System (DBMS) is software that manages, stores, and retrieves data efficiently. It solves issues of redundancy, security, and access found in traditional file systems.

1. Data Models

Blueprints that define the logical structure of a database.

Model	Best For	Mechanism	Examples
RDBMS (Relational)	Complex querying & Integrity	Primary & Foreign Keys	MySQL, Oracle, SQL Server
HDBMS (Hierarchical)	Fixed "Tree" Data	Parent-Child (1:M)	Windows Registry, XML
NDBMS (Network)	Complex Relationships	Pointers (Graph)	RaimaDB, Legacy IDMS

2. Levels of Abstraction

1. Physical Level (Internal)

Deals with how data is physically stored on the disk (indexing, blocks). Used primarily by DBAs.

2. Logical Level (Conceptual)

Describes the entire database structure (tables, relationships). Hides storage details. Used by Designers.

3. View Level (External)

The highest level. Provides customized views to end-users, hiding irrelevant data.

3. Data Independence

Physical Independence

Changing storage hardware (e.g., HDD to SSD) or indexing strategies without affecting the logical structure.

Logical Independence

Modifying the table structure (e.g., adding columns) without breaking the application code or user views.

4. DBMS Languages

DDL (Definition)

Defines structure.

`CREATE` `ALTER` `DROP` `TRUNCATE`

DML (Manipulation)

Accesses and modifies data.

`SELECT` `INSERT` `UPDATE` `DELETE`

DCL (Control)

Manages permissions.

`GRANT` `REVOKE`

TCL (Transaction)

Ensures consistency.

`COMMIT` `ROLLBACK`

5. System Structure

- **Query Processor:** Translates user requests (SQL) into low-level instructions. Includes the Query Optimizer.
- **Storage Manager:** Interface between queries and stored data. Ensures ACID properties via Transaction Manager.
- **Disk Storage:** The physical layer containing Data Files, Indices, and the Data Dictionary (Metadata).

6. Advantages vs Disadvantages

Pros

- Reduced Data Redundancy
- Enhanced Security & Integrity
- Concurrent Access
- Efficient Retrieval

Cons

- High Cost (Setup & Personnel)
- Complexity of Management
- Performance Overhead
- Single Point of Failure
