

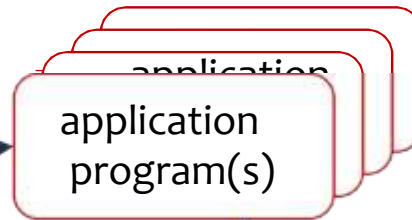
DATABASE MANAGEMENT SYSTEM (DBMS)

CONTENT

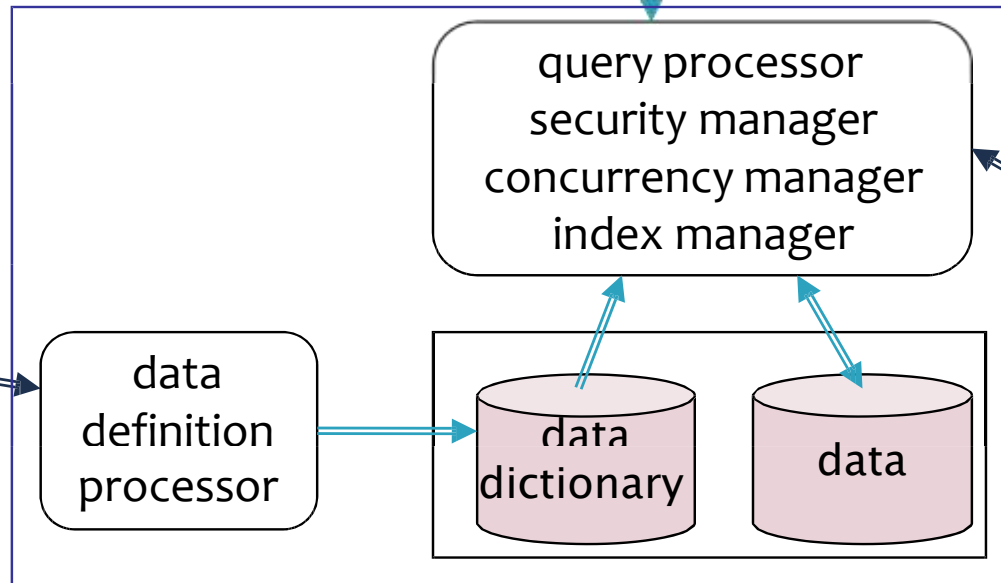
- **DBMS Language**
- **DDL**
- **DML**
- **Database Interfaces**

DBMS Languages

DML: data manipulation language
QL: query language
GPL: general purpose languages



users of the data



DDL:
data
definition
language

system
configuration
languages

DBMS Languages

1. **Data Definition Language (DDL):** used (by the DBA and/or database designers) to specify the conceptual schema.
2. **Data Manipulation Language (DML):** used for performing operations such as retrieval and update upon the populated database.
3. **Storage Definition Language (SDL):** It is used to specify the internal or physical schema.
 - In it, the storage structure and access methods used by the DB system, is specified by a set of statements.
 - These statements define the implementation details of the database schema.

DBMS Languages

- **High Level or Non-procedural Languages:**
 - e.g., SQL, are *set-oriented* and specify **what data to retrieve** than how to retrieve. Also called ***declarative languages***.
- **Low Level or Procedural Languages:**
 - they specify ***how to retrieve data*** and include constructs such as looping.

1. Data Definition Language (DDL)

- It is a set of SQL commands used to create, modify & delete database structure but not data. These commands are used by DBA.
- DDL also updates data dictionary or data directory. A data dictionary contains metadata i.e. data about data. The schema of a table is an example of metadata.
- A database system consults the data dictionary before reading or modifying actual data.
- The DBMS will have DDL compiler whose function is to process DDL statement in order to identify description of the schema constructs and to store the schema description in the DBMS catalogue.
- A language is needed to describe the database to the DBMS as well as provide facilities for changing the database and for defining and changing physical data structure.

1. Data Definition Language (DDL)

DDL specifies how the data is related.

E.g. schema

In terms of architecture the DDL involves following component:-

1. **System catalogue:-** Schema is stored here.
2. **DDL compiler:-** It translate the DDL into action.
3. **Privileged commands:-** An Action that only DBA can do.

Functionality of DDL:-

1. Creation of data structure supported by data model.

Eg. Create table for the relational model.

2. Modification of data structure. Eg. ALTER TABLE
3. Deletion of data structure. eg. DROP TABLE
4. Creating index. E.g. CREATE INDEX

1. Data Definition Language (DDL)

- In many DBMSs, the DDL is also used to define internal and external schemas (views).
- In some DBMSs, separate **storage definition language (SDL)** and **view definition language (VDL)** are used to define internal and external schemas.

1. Data Definition Language (DDL)

- Specification notation for defining the database schema

Example: **create table** *instructor* (
 ID **char**(5),
 name **varchar**(20),
 dept_name **varchar**(20),
 salary **numeric**(8,2));

- DDL compiler generates a set of table templates stored in a ***data dictionary***
- Data dictionary contains metadata (i.e., data about data)
 - Database schema
 - Integrity constraints
 - Primary key (ID uniquely identifies instructors)
 - Authorization
 - Who can access what
 - ***Data storage and definition*** language
 - language in which the storage structure and access methods used by the database system are specified
 - Usually an extension of the data definition language

2. Data Manipulation Language

- Data manipulation involves retrieval of data from the database, Insertion of new data and Deletion on modification of existing data.
- Data manipulation operation is called a query.
- A query is a statement in the DML that requests the retrieval of data from the database.
- The subset of the DML used to pose a query is known as query language.
- DML and query language are approximately synonyms.
- **There are basically two types of DML**
 1. **Procedural:-** which requires a user to specify what data is needed and how to get it. The algorithm is written in query language. eg. SQL, Quel.
 2. **Non-Procedural:-** specify what data is needed without specifying how to get it. E.g. Datalog, QBE.

2. Data Manipulation Language

Functionality:-

1. Retrieval of data.

eg. Select operator for the relational model.

2. Modification of data.

eg. Update operator

3. Creation OR Insertion of data.

eg. INSERT operator

4. Deletion of data.

eg. Deletion operator

5. Most DML's have built in fn.

e.g. SUM, COUNT, AVG etc.

2. Data Manipulation Language

- Language for accessing and manipulating the data organized by the appropriate data model
 - DML also known as query language
- Two classes of languages
 - Procedural – user specifies what data is required and how to get those data
 - Nonprocedural – user specifies what data is required without specifying how to get those data
- Two classes of languages
 - **Pure** – used for proving properties about computational power and for optimization
 - Relational Algebra
 - Tuple relational calculus
 - Domain relational calculus
 - **Commercial** – used in commercial systems
 - SQL is the most widely used commercial language

2. Data Manipulation Language

- Used to specify database retrievals and updates.
 - DML commands (**data sublanguage**) can be *embedded* in a general-purpose programming language (**host language**), such as COBOL, C or an Assembly Language.
 - Alternatively, *stand-alone* DML commands can be applied directly (**query language**).

DBMS Interfaces

1. **Stand-alone query language interfaces**
 - Example: Entering SQL queries at the DBMS interactive SQL interface.
(e.g. SQL*Plus in ORACLE)

2. DBMS Programming Language Interfaces

- Programmer interfaces for embedding DML in programming languages:
 - **Embedded Approach:** e.g. embedded SQL (for C, C++, etc.), SQLJ (for Java).
 - **Procedure (Subroutine) Call Approach:**
e.g. JDBC for Java, ODBC for other programming languages.
 - **Database Programming Language Approach:** e.g. ORACLE has PL/SQL, a programming language based on SQL; language incorporates SQL and its data types as integral components.

3. User-Friendly DBMS Interfaces

- Menu-based, popular for browsing on the web
- Forms-based, designed for naïve users
- Graphics-based
 - (Point and Click, Drag and Drop, etc.)
- Natural language: requests in written English
- Combinations of the above:
 - For example, both menus and forms used extensively in Web database interfaces

Other DBMS Interfaces

- Speech as Input and Output
- Web Browser as an interface
- Parametric interfaces, e.g., bank tellers using function keys.
- Interfaces for the DBA:
 - Creating user accounts, granting authorizations
 - Setting system parameters
 - Changing schemas or access paths