DBMS LANGUAGES

- Data Definition Language (DDL)

- Data Manipulation Language (DML)

- High-Level or Non-procedural Languages: These include the relational language SQL

- May be used in a standalone way or may be embedded in a programming language

- Low Level or Procedural Languages:

These must be embedded in a programming language

Data Definition Language (DDL)

Used by the DBA and database designers to specify the conceptual schema of a database.

- 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.
- SDL is typically realized via DBMS commands provided to the DBA and database designers

Data Manipulation Language (DML)

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, C++, or Java.

- A library of functions can also be provided to access the DBMS from a programming language
- Alternatively, stand-alone DML commands can be applied directly (called a *query language).*

Types of DML

- **High Level or Non-procedural Language:**

   For example, the SQL relational language are "set"-oriented and specify what data to retrieve rather than how to retrieve it.
   Also called **declarative languages.**

- **Low Level or Procedural Language:**
   Retrieve data one record-at-a-time;
   Constructs such as looping are needed to retrieve multiple records, along with positioning pointers.

DBMS Interfaces

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

- Programmer interfaces for embedding DML in programming languages
- User-friendly interfaces
- Menu-based, forms-based, graphics-based, etc.

DBMS Programming Language Interfaces

- Programmer interfaces for embedding DML in a programming languages:
- **Embedded Approach: e.g embedded SQL (for C,**C++, etc.), SQLJ (for Java)
- **Procedure 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/

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 usedextensively 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