Database System Environment

The term database system refers to an organization of components that define and regulate the collection, storage, management, and use of data within a database environment. These are:

- Hardware
- Software
- People
- Procedures
- Data

Hardware

It identifies all the system's physical devices. The database system's main and most easily identified hardware component is the computer, which might be a microprocessor, a minicomputer, or a mainframe computer. It also include peripherals like keyboard, mice, modems, printers, etc.

Software

Software refers to the collection of programs used by the computers within the database system.

- ✓ **Operating system Software-** manages all hardware components and makes it possible for all other software to run on the computers. DOS,OS/2, and Windows used by micro computers. UNIX and VMS used by mini computers, and MVS used by IBM mainframe computers.

✓**DBMS Software-** manages the database within the database system. MS-Access, MS-SQL Server, Oracle, DB2 etc. are some famous DBMS software.

✓**Application Programs & Utilities Software-** are used to access and manipulate the data in the DBMS to manage the computer environment in which data access and manipulation take place.

People

- ✓**System Administrator:** oversee the database system's general operations.
- ✓**Database Administrator:** manage the DBMS's use and ensure that the database is functioning properly.
- ✓**Database Designers:** design the database structure. They are in effect the database architects. If the database design is poor, even the best application programmers and the most dedicated DBAs will fail to produce a useful database environment.

✓**System Analysts and Programmers:** design and implement the application programs. They design and create the data entry screens, reports, and procedures through which end user access and manipulate the database's data.

✓ **End Users:** are the people who use the application programs to run the organization's daily operations. E.g. sales clerks, supervisors, managers, and directors are all classified as end users. High-level end users employ the information obtained from the database to make tactical and strategic business decisions.

Procedures

Procedures are the instructions and rules that govern the design and use of the database system. Procedure are a critical, although occasionally forgotten, component of the system. Procedures play a very important role in a company, because they enforce the standards by which business is conducted within the organization and with customers. These also are used to ensure that there is an organized way to monitor and audit both the data and information.

Data

The word “data” covers the collection of facts stored in the database. Because data are the raw material from which information is generated, the determination of which data are to be entered into the database and how such data are to be organized is a vital part of the database designer’s job.

DBMS Functions

A DBMS performs several important functions that guarantee the integrity and consistency of the data in the database. Most of these functions are transparent to end users, and most can be achieved only through the use of a DBMS.

- **Data dictionary management:** The DBMS requires that definitions of the data elements and their relationships(metadata) be stored in a data dictionary. In turn, all programs that access the data in the database work through the DBMS. The DBMS uses the data dictionary to look up the required data component structures and relationships, thus relieving us from having to code such complex relationships in each program.

- **Data Storage Management:** The DBMS creates the complex structures required for data storage, thus relieving us from the difficult task of defining and programming the physical data characteristics. A modern DBMS system provides storage not only for the data, but also for the related data entry forms or screen definitions, report definitions, data validation rules, procedural code, structures to handle video and picture formats, and so on.

- **Data transformation and presentation:** the DBMS transforms entered data to conform to the data structures that are required to store data. Therefore, the DBMS relieves us of the chore of making a distinction between the data logical format and the data physical format. By maintaining the **data independence,** the DBMS translates logical requests into commands that physically locate and retrieve the requested data. That is, the DBMS formats the physically retrieved data to make it confirm to the user's logical expectations.

- **Security Management:** The DBMS creates a security system that enforces user security and data privacy within the database. Security rules determines which user can access the database, which data items each user may access, and which data operations the user may perform. This is especially important in multi user database systems where many users can access the database simultaneously.

- **Multi user access control:** The DBMS creates the complex structures that allow multi user access to the data. In order to provide data integrity and data consistency, the DBMS uses sophisticated algorithms to ensure that multiple users can access the database concurrently without compromising the integrity of the database.

- **Backup and recovery management:** The DBMS provides backup and data recovery procedures to ensure data safety and integrity. Current DBMS system provide special utilities that allow the DBA to perform routine and special backup and restore procedures. Recovery management deals with the recovery of the database after a failure, such as a bad sector in the disk or a power failure. Such capability is critical to the preservation of the database's integrity.

- **Data Integrity Management:** The DBMS promotes and enforces integrity rules to eliminate data integrity problems, thus minimizing the data duplicity and maximizing data consistency. The data relationships stored in the data dictionary are used to enforce data integrity. Ensuring data integrity is especially important in transaction-oriented database systems.

- **Database access languages and application programming interface:** The DBMS provides data access via a query language. A query language is a nonprocedural language – that is, one that lets the user specify what must be done without having to specify how it is to be done. The DBMS query language contains two components: a DDL and DML. The DBMS also provides data access to programmers via procedural languages.It also provides administrative utilities used by the DBA and the database designer to create, implement, monitor, and maintain the database.

- **Database communication interfaces:** Current-generation DBMSs provide special communications routines designed to allow the database to accept end user requests within a computer network environment. In fact, database communications capabilities are an essential feature of the modern DBMS. E.g. the DBMS might provide communications functions to access the database through the Internet, using Internet browsers such as Netscape or Explorer as the front end.