UNIT 2. INTRODUCTION TO DB2

Overview

- **Introduction to DB2**

- **Operating Environments**

- **Major Components of DB2**

Figure 2.1 Introduction

Notes:

INTRODUCTION TO DB2

- DB2 is a Relational Database Management System (RDBMS); it is an abbreviation for IBM Database 2. DB2 is a subsystem of the MVS operating system. It is a system that allows the MVS users to build, access and maintain Relational databases using a well known language known as SQL (Structured Query Language).

- Relational Database Management System is a
  'Table Database Management System'. SQL is used to define and manipulate data in relational form.

Figure 2.2 Introduction to DB2
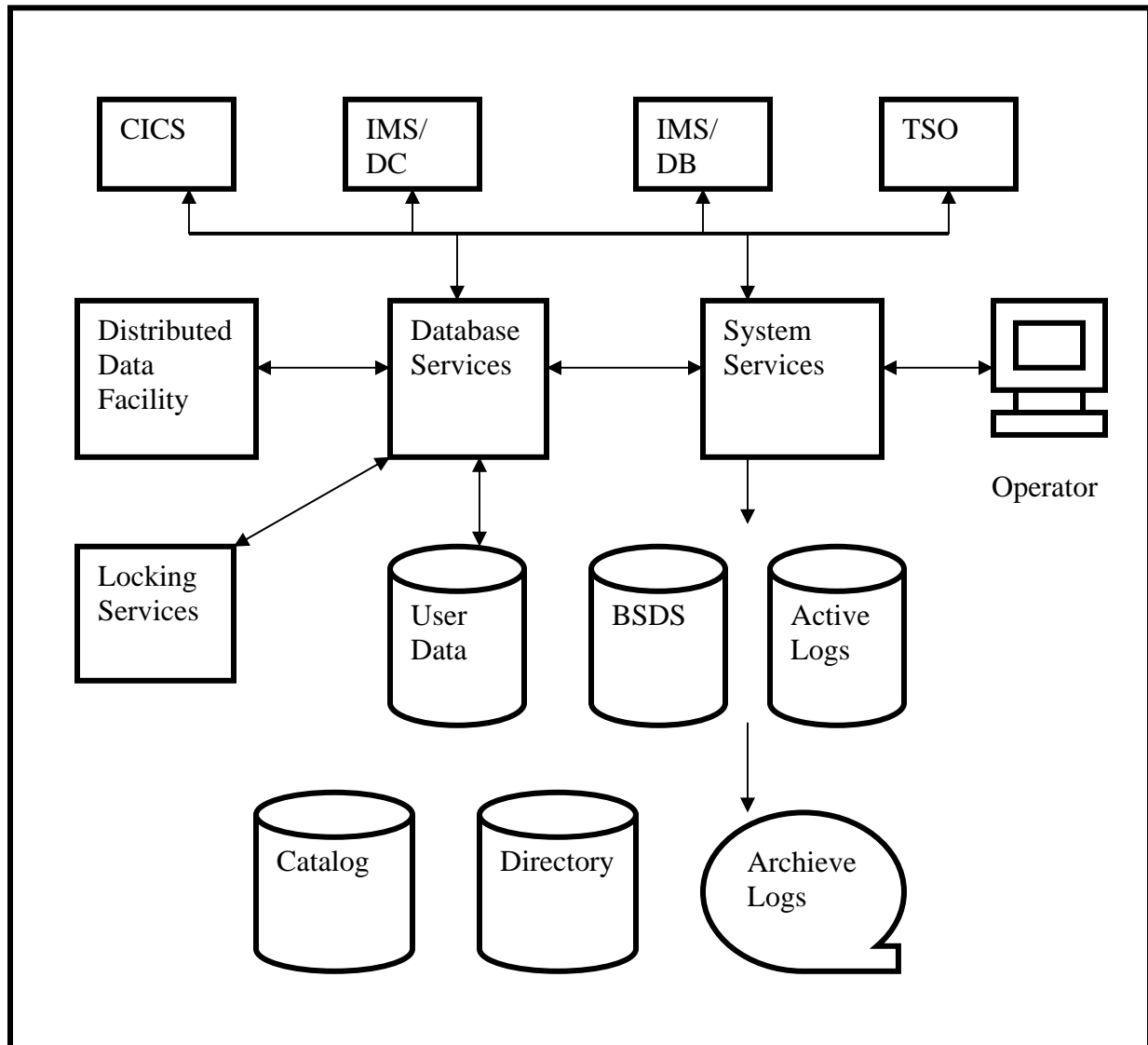
Notes:

OPERATING ENVIRONMENTS

DB2 Structure

Figure 2.3 Operating Environment

MAJOR COMPONENTS OF DB2

The four major components of DB2 are

1. **System Services Component**

2. **Locking Services Component**

3. **Database Services Component**

4. **Distributed Data Facility Component**

Figure 2.4 Major components of DB2

Notes:

1. System Services Component, which supports System operation, Operator communication, Logging and similar functions.

2. Locking Services Component, which provides the necessary controls for managing concurrent access to data.

3. Database Services Component, which supports the definition, retrieval and update of user and system data.

4. Distributed Data Facility Component, which provides DB2 database support.
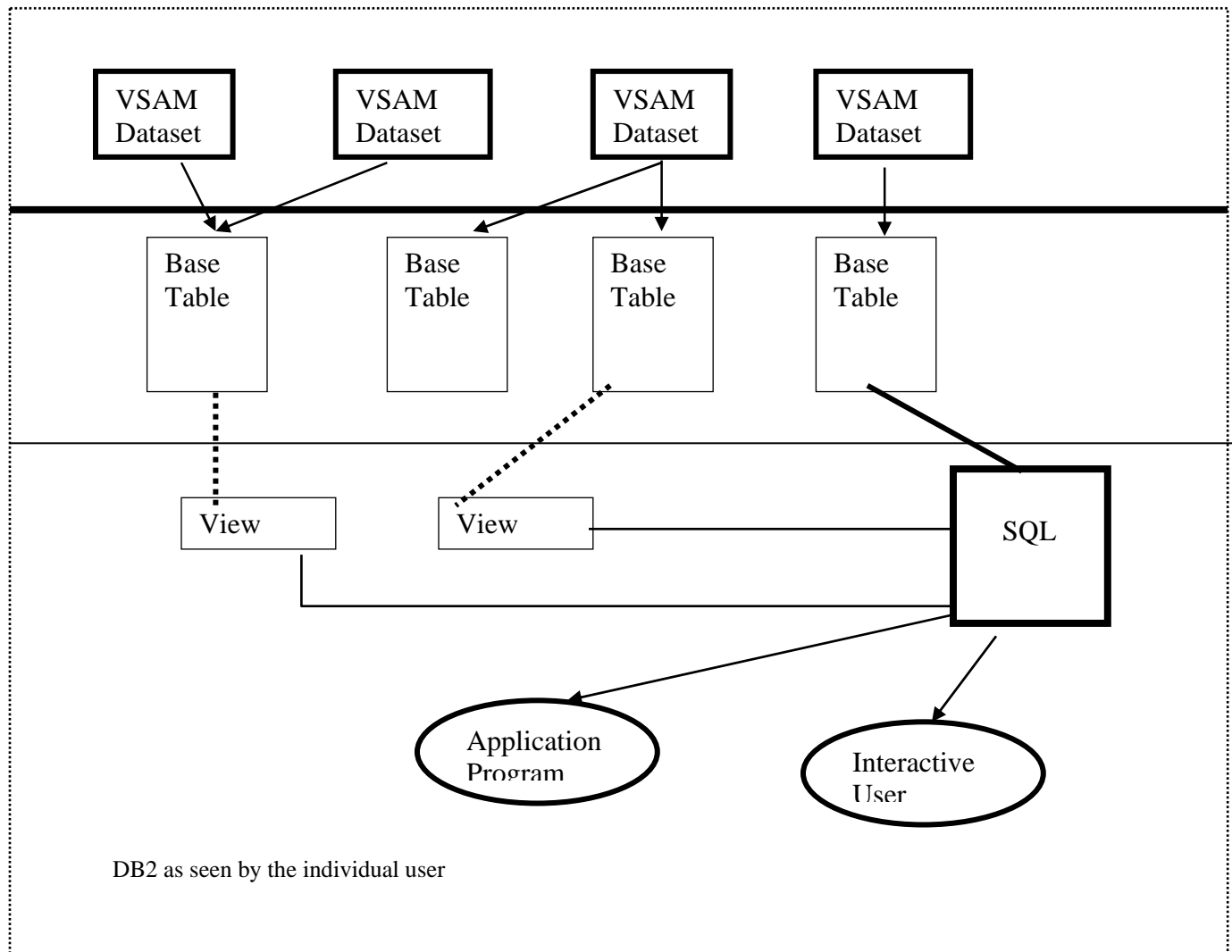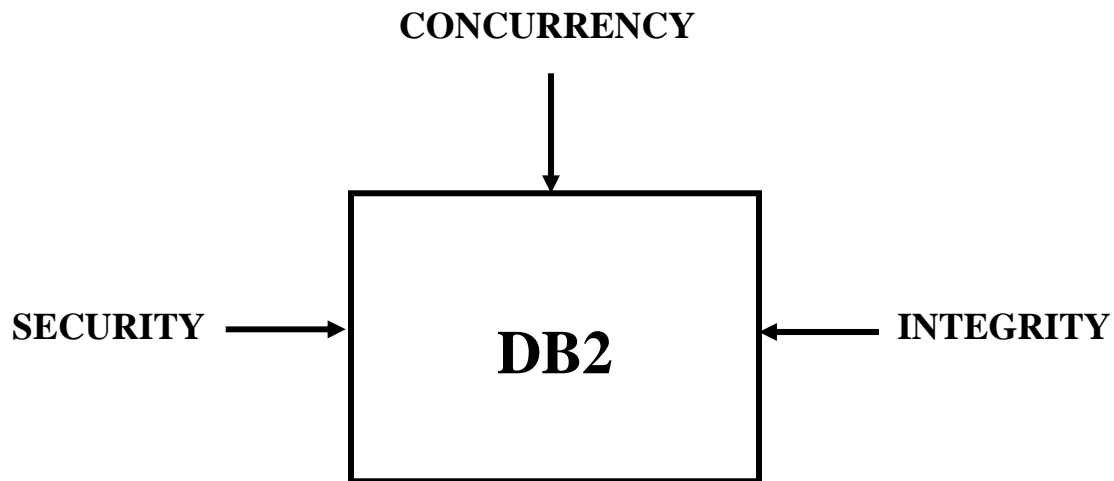
MAJOR COMPONENTS OF DB2 (Cont…)

Figure 2.5 Major components of DB2 (Cont…)

CONCURRENCY, INTEGRITY, SECURITY

CONCURRENCY

SECURITY ⟶ | **DB2** | ⟵ **INTEGRITY**

Figure 2.6 Concurrency, Integrity, security

Notes:

Concurrency is what allows more that one DB2 application process to access the same data at essentially the same time. Problem may occur, such as lost updates, access to uncommitted data, and unrepeatable reads.

Integrity is the assurance that the work one application is doing will not interfere with work being done by other applications.

Security. DB2 will check the authorization each time an attempt to access the database by the user.

SYSTEM SERVICES

This system services component handles all system wide tasks.

- Controlling Connections to other MVS Subsystems (CICS, IMS & TSO)
- Handling system startup and shut down and operator communication.
- Managing the System log
- Gathering system wide statistics performance, auditing and accounting information.

Figure 2.7 System Services

LOCKING SERVICES

- These are provided by an MVS subsystem called the IMS Resource Lock Manager (IRLM).

- This IRLM is used to control concurrent access to DB2 data, regardless of whether IMS is present in the system or not.
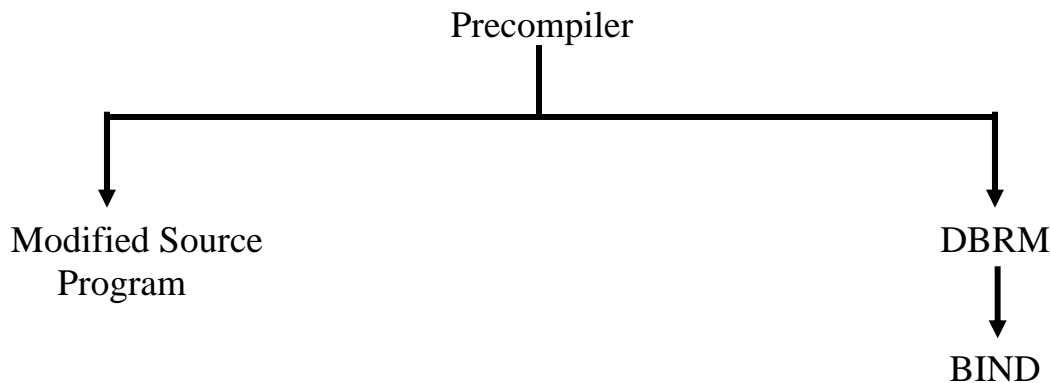
Figure 2.8 Locking Services

DATABASE SERVICES

The primary purpose of this is to support the definition, retrieval and update of database data, in other words, to implement the functions of the SQL. The necessary support is provided by a series as follows.

Precompiler

Modified Source
Program   DBRM

BIND

Figure 2.9 Database services

- **Precompiler**

    - The precompiler is a preprocessor for the host programming languages (PL/I, COBOL). The basic function of precompiler is to analyze a host language source module; stripping out all the SQL statements it finds and replaces them by host language CALL statements. (At runtime those CALLS will pass control indirectly to the Runtime Supervisor).

    - The precomiler constructs a Database Request Module (DBRM), which becomes input to the BIND component

- **BIND**

    - The function of BIND component is to bind a given DBRM to produce the Package, and this package is used to bind together a list of packages to produce an Application Plan or simply plan.

DATABASE SERVICES (Cont...)

- **Runtime Supervisor**

  Runtime Supervisor is resident in main memory when the application program is executed. Its job is to oversee that execution. When the application programs requests some database operation to be performed, control goes first to Runtime Supervisor, which uses control information in the application plan to request the appropriate operations on the part of Data Manager.

- **Data Manager**

  It performs all the normal access method functions like Search, Retrieval, Update and Index Maintenance. It is the component that manages the physical databases. It invokes other system components to perform functions like locking, logging and I/O operations.

- **Buffer Manager**

  This component is responsible for physically transferring data to external storage and virtual memory. It employs techniques like read-ahead buffering and look-aside buffering to get the best performance.
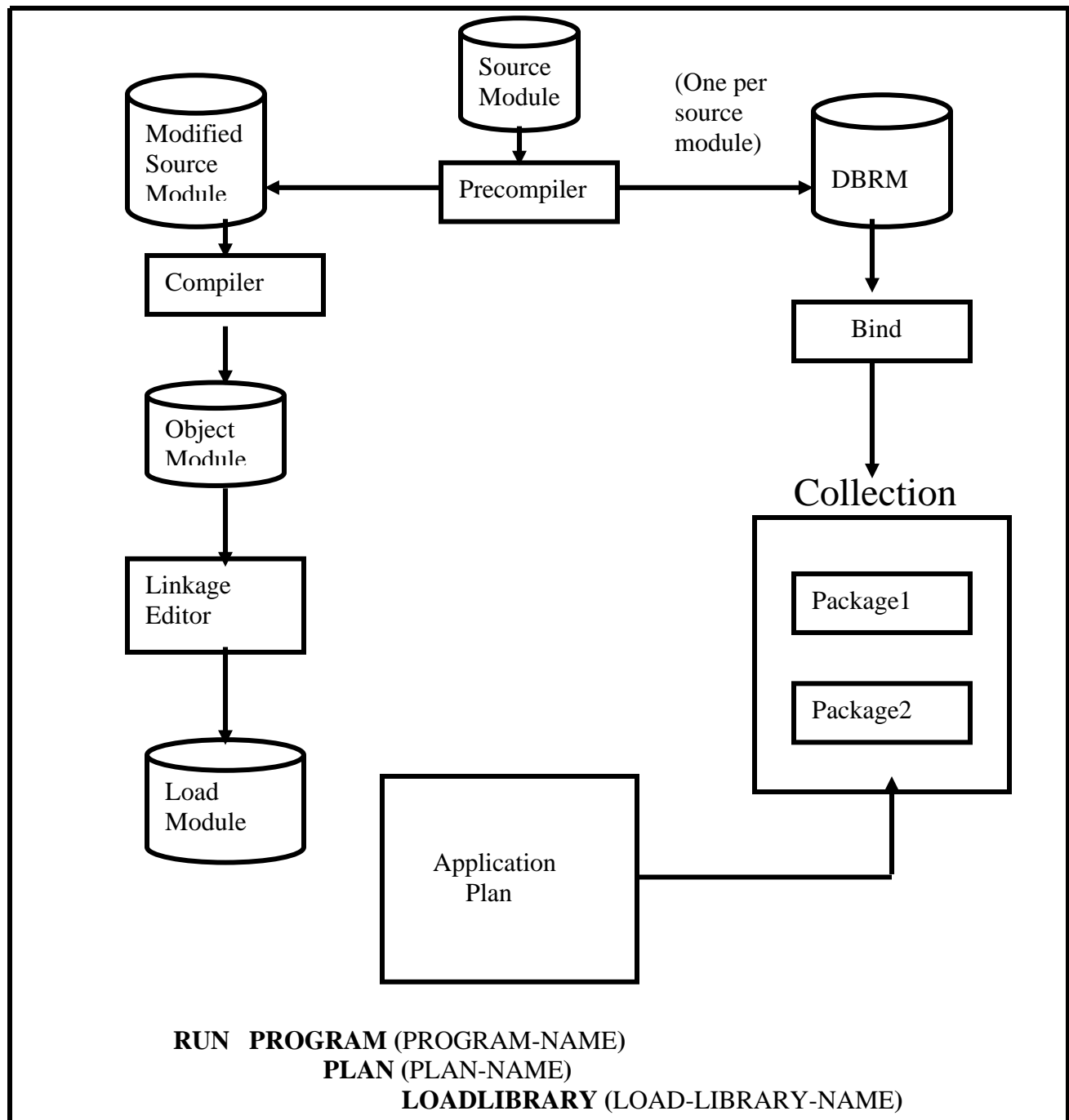
Figure 2.10 Database services (Cont…)

DB2 APPLICATION PROGRAM PREPARATION AND EXECUTION

Figure 2.11 DB2 application program preparation and execution

OPERATING ENVIRONMENTS OF DB2

There are various environments in which DB2 operates as follows.

- TSO (online)
- TSO (batch)
- CICS
- IMS (online)
- IMS (batch)
- CAF

TSO online

- TSO is an MVS component and product that enables programs to be invoked and executed interactively from TSO terminal. In particular, it allows DB2 to be invoked from such a terminal. If DB2 is invoked in this manner, and if DB2 in turn invokes a user application program, then that application is said to be a "TSO online " DB2 application.

TSO batch

- TSO batch can also execute as a batch job, and if it then invokes DB2, and if DB2 in turn then invokes a user application, then that application is said to be a "TSO batch" DB2 application.

Figure 2.12 Operating Environments of DB2

OPERATING ENVIRONMENTS OF DB2 (Cont…)

CICS

- A CICS DB2 application is an online application that is invoked from a CICS terminal and uses the facilities of CICS to exchange messages with that terminal. Like an IMS batch or DB2 application, a CICS DB2 application can access both DB2 data and IMS data (also VSAM data). The combination of DB2 with CICS also acts as full function a DB/DC system.

IMS (Online)

- An IMS online DB2 application is an outline application that is invoked from an IMS terminal and uses the data communications (DC) facilities of IMS. This can access both DB2 data and IMS data. The combination of DB2 with IMS/DC acts as a full-function Database/ Datacomunication (DB/DC) system.

Figure 2.13 Operating Environments of DB2 (Cont…)

OPERATING ENVIRONMENTS OF DB2 (Cont...)

IMS (Batch)

- An IMS batch DB2 application is a conventional IMS batch application that access DB2 (via SQL statements) as well as IMS data (via DL/I database calls.)

CAF

- It is also possible for a "pure" MVS application (i.e. an application running directly under MVS instead of under IMS, CICS, or TSO) to operate on DB2 data, thanks to a feature known as the DB2 Call Attach Facility. Finally, all DB2 application types –IMS batch, IMS online, CICS, TSO Batch and CAF can execute concurrently. They can even share the same DB2 databases.

Figure 2.14 Operating Environments of DB2 (Cont….)

SYSADM RESPONSIBILITIES

- Install new releases
- Grant privileges
- Creating system level objects
- Monitoring System performance

Figure: 2-15 SYSADM Responsibilities

Note:

SYSADM may install or assist in the install of DB2 and fixes.
SYSADM grants privileges (DBADM, CREATETAB, CONNECT).
SYSADM creates the system level objects like Databases, Tablespaces
SYSADM monitors DB2's performance using tools like DB2 PM.

SOME OF THE DB2 OBJECTS

Following are the DB2 objects:

1) DATABASE
2) TABLE SPACE
3) TABLE
4) INDEX
5) SYNONYM
6) VIEW

Figure: 2-16 Some of the DB2 Objects

DATABASE and TABLESPACE

A **DATABASE** is a way of grouping data together for management purposes. It is not a physical object and does not occupy storage. Normally data for a specific application is contained within one database. However tables from different databases can be joined and there is no restriction on accessing data from two or more databases.

A **TABLESPACE** is a physical object. It occupies one or more VSAM linear datasets, which can store one or more DB2 tables. The maximum size of a Tablespace is 64 GB. Each tablespace is divided into units of 4 KB called pages.

Figure: 2-17 DATABASE and TABLESPACE

Notes:

While creating a table we have to specify the DATABASE and TABLESPACE it will occupy.

TABLE and VIEW

The DB2 data structures that a user will access are called 'Tables'. They consist of a number of rows, all rows having the same structure. Each row consists of a number of columns.

A View is a virtual table, deriving its data from the base tables.

Figure: 2-18 TABLE and VIEW

INDEX and SYNONYM

A set of keys and corresponding pointers to the rows is called an 'Index'. It improves the performance of accessing data from the Database.

A Synonym is an alternate name for a table. A synonym cannot refer to a table created by another user.

Figure: 2-19 INDEX and SYNONYM

DBADM RESPONSIBILITIES

- **Build and maintain objects within the database.**
- **Grants to other users the privilege to access or change objects within the database.**
- **Perform the binds (prepare application programs to work with DB2).**
- **DBADM is responsible for the running of most DB2 utilities**

Figure: 2-20 DBADM Responsibilities

PROGRAMMER RESPONSIBILITIES

- **Create the test environments for new applications.**
- **Prototypes (write and test the SQL before it is used in production).**
- **Check that SQL statements access the data most efficiently.**
- **Physically embedded SQL in host language programs.**
- **Prepare (precompile and bind) programs for execution.**

Figure: 2-21 Programmer responsibilities

END-USER RESPONSIBILITIES

Anyone who executes an SQL statement is an end-user.

- **SQL can be in the applications the end-users run.**
- **The SQL within the applications may read, add, change or remove data.**
- **Produce reports after giving necessary input data.**
- **Write their own SQL to change data or produce reports.**

Figure: 2-22 END-USER responsibilities

OPERATOR'S RESPONSIBILITIES

Run the utilities for maintaining the data like:

- **Loading data**
- **Backing up the data**
- **Restoring the database**
- **Importing data into DB2**

Figure: 2-23 Operator responsibilities