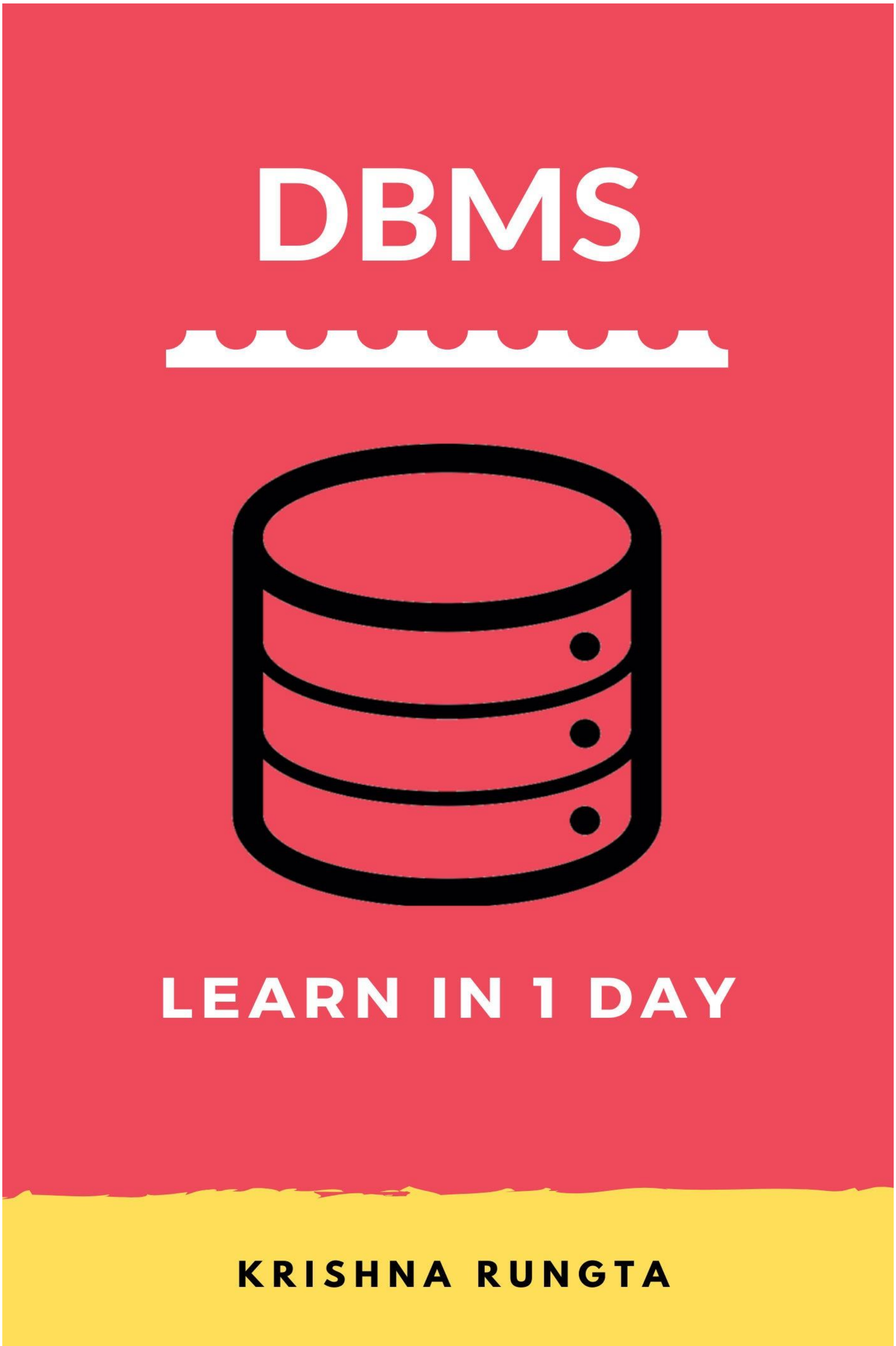

DBMS

LEARN IN 1 DAY

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Learn DBMS in 1 Day

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Chapter 1: What is DBMS (Database Management System)? Application, Types & Example

Before the introduction to Database Management System (DBMS), let's understand-

What is a Database?

A database is a collection of related data which represents some aspect of the real world. A database system is designed to be built and populated with data for a certain task.

What is DBMS?

Database Management System (DBMS) is a software for storing and retrieving users' data while considering appropriate security measures. It consists of a group of programs which manipulate the database. The DBMS accepts the request for data from an application and instructs the operating system to provide the specific data. In large systems, a DBMS helps users and other third-party software to store and retrieve data.

DBMS allows users to create their own databases as per their requirement. The term "DBMS" includes the user of the database and other application programs. It provides an interface between the data and the software application. In this Database Management System tutorial tutorial, you will learn DBMS concepts like-

Example of a DBMS

Let us see a simple example of a university database. This database is maintaining information concerning students, courses, and grades in a university environment. The database is organized as five files:

- The STUDENT file stores data of each student
- The COURSE file stores contain data on each course.
- The SECTION stores the information about sections in a particular course.
- The GRADE file stores the grades which students receive in the various sections
- The TUTOR file contains information about each professor.

To define DBMS:

- We need to specify the structure of the records of each file by defining the different types of data elements to be stored in each record.

- We can also use a coding scheme to represent the values of a data item.
- Basically, your Database will have 5 tables with a foreign key defined amongst the various tables.

History of DBMS

Here, are the important landmarks from the history:

- 1960 - Charles Bachman designed first DBMS system
- 1970 - Codd introduced IBM'S Information Management System (IMS)
- 1976- Peter Chen coined and defined the Entity-relationship model also know as the ER model
- 1980 - Relational Model becomes a widely accepted database component
- 1985- Object-oriented DBMS develops.
- 1990s- Incorporation of object-orientation in relational DBMS.
- 1991- Microsoft ships MS access, a personal DBMS and that displaces all other personal DBMS products.
- 1995: First Internet database applications
- 1997: XML applied to database processing. Many vendors begin to integrate XML into DBMS products.

Characteristics of Database Management System

Here are the characteristics and properties of Database Management System:

- Provides security and removes redundancy
- Self-describing nature of a database system
- Insulation between programs and data abstraction

- Support of multiple views of the data
- Sharing of data and multiuser transaction processing
- Database Management Software allows entities and relations among them to form tables.
- It follows the ACID concept (Atomicity, Consistency, Isolation, and Durability).
- DBMS supports multi-user environment that allows users to access and manipulate data in parallel.

DBMS vs. Flat File

DBMS	Flat File Management System
Multi-user access	It does not support multi-user access
Design to fulfill the need for small and large businesses	It is only limited to smaller DBMS system.
Remove redundancy and Integrity	Redundancy and Integrity issues
Expensive. But in the long term Total Cost of Ownership is cheap	It's cheaper
Easy to implement complicated transactions	No support for complicated transactions

Users in a DBMS environment

Following, are the various category of users of a DBMS system

Component Name	Task
Application Programmers	The Application programmers write programs in various programming languages to interact with databases.
Database Administrators	Database Admin is responsible for managing the entire DBMS system. He/She is called Database admin or DBA.
End-Users	The end users are the people who interact with the database management system. They conduct various operations on database like retrieving, updating, deleting, etc.

Popular DBMS Software

Here, is the list of some popular DBMS system:

- MySQL
- Microsoft Access
- Oracle
- PostgreSQL
- dBASE
- FoxPro
- SQLite
- IBM DB2
- LibreOffice Base
- MariaDB
- Microsoft SQL Server etc.

Application of DBMS

Below are the popular database system applications:

Sector	**Use of DBMS**
Banking	For customer information, account activities, payments, deposits, loans, etc.
Airlines	For reservations and schedule information.
Universities	For student information, course registrations, colleges and grades.
Telecommunication	It helps to keep call records, monthly bills, maintaining balances, etc.
Finance	For storing information about stock, sales, and purchases of financial instruments like stocks and bonds.
Sales	Use for storing customer, product & sales information.
Manufacturing	It is used for the management of supply chain and for tracking production of items. Inventories status in warehouses.
HR Management	For information about employees, salaries, payroll, deduction, generation of paychecks, etc.

Types of DBMS

Types of DBMS

Tha main Four Types of Database Management System are:

- Hierarchical database
- Network database
- Relational database
- Object-Oriented database

Hierarchical DBMS

In a Hierarchical database, model data is organized in a tree-like structure. Data is Stored Hierarchically (top down or bottom up) format. Data is represented using a parent-child relationship. In Hierarchical DBMS parent may have many children, but children have only one parent.

Network Model

The network database model allows each child to have multiple parents. It helps you to address the need to model more complex relationships like as the orders/parts many-to-many relationship. In this model, entities are organized in a graph which can be accessed through several paths.

Relational Model

Relational DBMS is the most widely used DBMS model because it is one of the easiest. This model is based on normalizing data in the rows and columns of the tables. Relational model stored in fixed structures and manipulated using SQL.

Object-Oriented Model

In Object-oriented Model data stored in the form of objects. The structure which is called classes which display data within it. It is one of the components of DBMS that defines a database as a collection of objects which stores both data members values and operations. [adinserter block="4"]

Advantages of DBMS

- DBMS offers a variety of techniques to store & retrieve data
- DBMS serves as an efficient handler to balance the needs of multiple applications using the same data
- Uniform administration procedures for data
- Application programmers never exposed to details of data representation and storage.
- A DBMS uses various powerful functions to store and retrieve data efficiently.
- Offers Data Integrity and Security
- The DBMS implies integrity constraints to get a high level of protection against prohibited access to data.
- A DBMS schedules concurrent access to the data in such a manner that only one user can access the same data at a time
- Reduced Application Development Time

Disadvantage of DBMS

DBMS may offer plenty of advantages but, it has certain flaws-

- Cost of Hardware and Software of a DBMS is quite high which increases the budget of your organization.
- Most database management systems are often complex systems, so the training for users to use the DBMS is required.
- In some organizations, all data is integrated into a single database which can be damaged because of electric failure or database is corrupted on the storage media
- Use of the same program at a time by many users sometimes lead to the loss of some data.
- DBMS can't perform sophisticated calculations

When not to use a DBMS system?

Although, DBMS system is useful. It is still not suited for specific task mentioned below: Not recommended when you do not have the budget or the expertise to operate a DBMS. In such cases, Excel/CSV/Flat Files could do just fine.

Summary

- DBMS definition: A database is a collection of related data which represents some aspect of the real world
- The full form of DBMS is Database Management System. DBMS stands for Database Management System is a software for storing and retrieving users' data by considering appropriate security measures.
- DBMS Provides security and removes redundancy
- DBMS has many advantages over tradition Flat File management system

- Some Characteristics of DBMS are Security, Self-describing nature, Insulation between programs and data abstraction, Support of multiple views of the data, etc.
- End-Users, Application Programmers, and Database Administrators are they type of users who access a DBMS
- DBMS is widely used in Banking, Airlines, Telecommunication, Finance and other industries
- The main Four DBMS types are 1) Hierarchical 2) Network 3) Relational 4) Object-Oriented DBMS
- DBMS serves as an efficient handler to balance the needs of multiple applications using the same data
- Cost of Hardware and Software of a DBMS is quite high which increases the budget of your organization

Chapter 2: Database Architecture in DBMS: 1-Tier, 2-Tier and 3-Tier

What is Database Architecture?

A **Database Architecture** is a representation of DBMS design. It helps to design, develop, implement, and maintain the database management system. A DBMS architecture allows dividing the database system into individual components that can be independently modified, changed, replaced, and altered. It also helps to understand the components of a database.

A Database stores critical information and helps access data quickly and securely. Therefore, selecting the correct Architecture of DBMS helps in easy and efficient data management.

- Types of DBMS Architecture
- 1-Tier Architecture
- 2-Tier Architecture
- 3-Tier Architecture

Types of DBMS Architecture

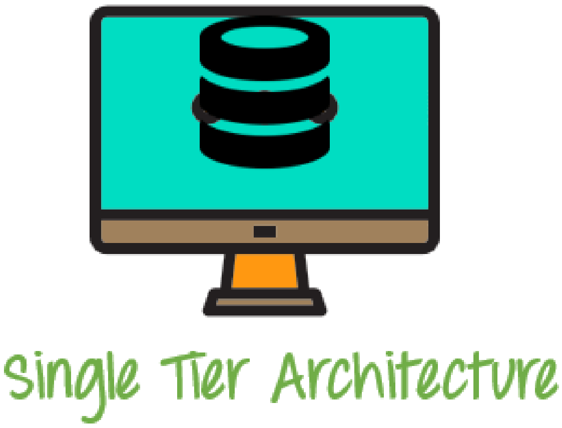
There are mainly three types of DBMS architecture:

- One Tier Architecture (Single Tier Architecture)
- Two Tier Architecture
- Three Tier Architecture

Now, we will learn about different architecture of DBMS with diagram.

1-Tier Architecture

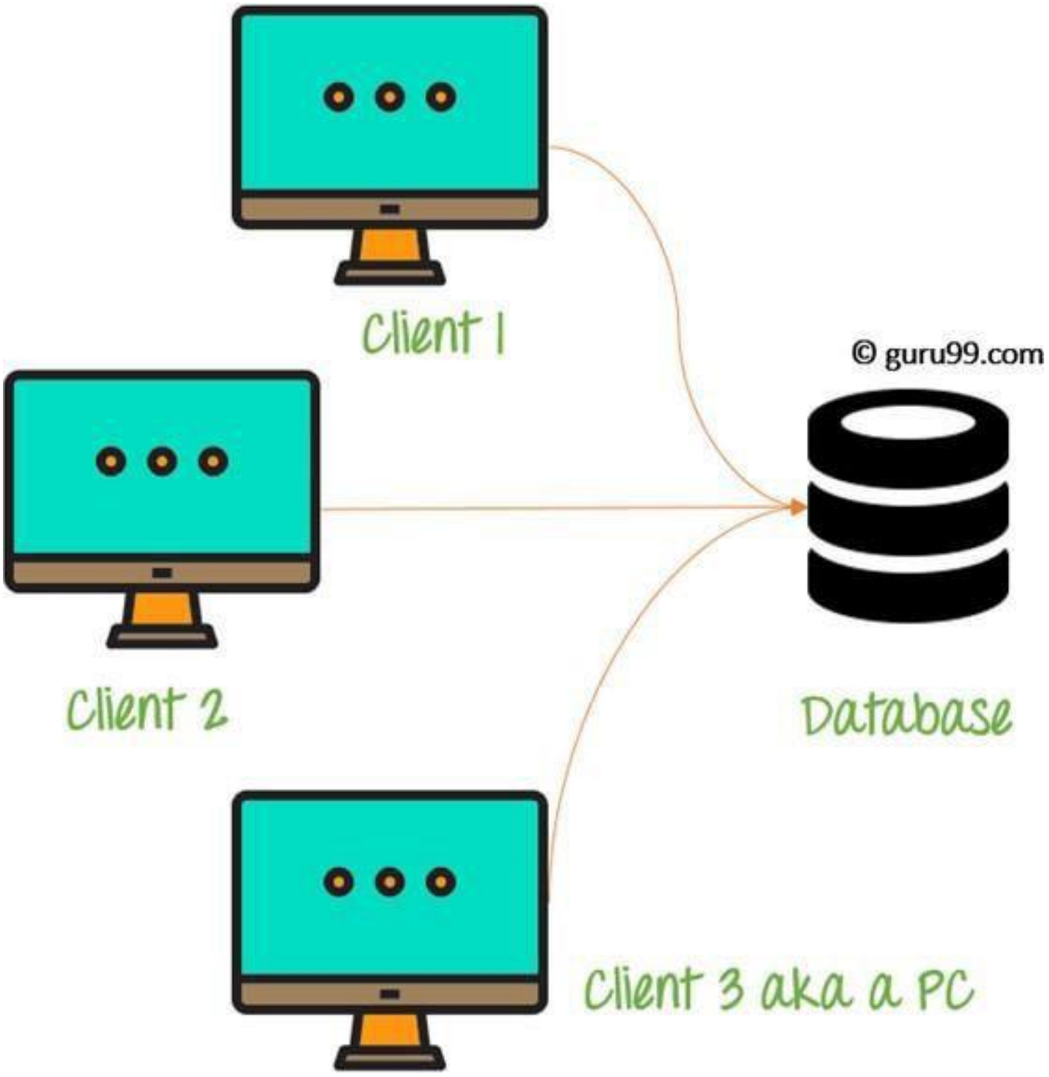
1 Tier Architecture in DBMS is the simplest architecture of Database in which the client, server, and Database all reside on the same machine. A simple one tier architecture example would be anytime you install a Database in your system and access it to practice SQL queries. But such architecture is rarely used in production.



Tier Architecture Diagram

2-Tier Architecture

A **2 Tier Architecture** in DBMS is a Database architecture where the presentation layer runs on a client (PC, Mobile, Tablet, etc.), and data is stored on a server called the second tier. Two tier architecture provides added security to the DBMS as it is not exposed to the end-user directly. It also provides direct and faster communication.



Tier Architecture Diagram

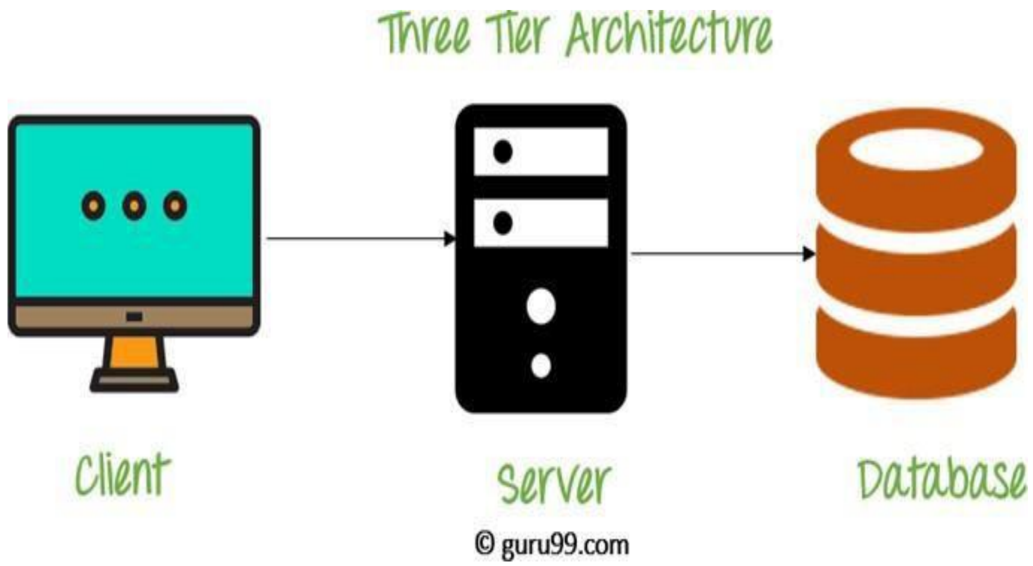
In the above 2 Tier client-server architecture of database management system, we can see that one server is connected with clients 1, 2, and 3.

Two Tier Architecture Example: A Contact Management System created using MS- Access.

3-Tier Architecture

A **3 Tier Architecture** in DBMS is the most popular client server architecture in DBMS in which the development and maintenance of functional processes, logic, data access, data storage, and user interface is done independently as separate modules. Three Tier architecture contains a presentation layer, an application layer, and a database server. 3-Tier database Architecture design is an extension of the 2-tier client-server architecture. A 3-tier architecture has the following layers:

1. Presentation layer (your PC, Tablet, Mobile, etc.)
2. Application layer (server)
3. Database Server



Tier Architecture Diagram

The Application layer resides between the user and the DBMS, which is responsible for communicating the user's request to the DBMS system and send the response from the DBMS to the user. The application layer(business logic layer) also processes functional logic, constraint, and rules before passing data to the user or down to the DBMS.

The goal of Three Tier client-server architecture is:

- To separate the user applications and physical database

- To support DBMS characteristics
- Program-data independence
- Supporting multiple views of the data

Three Tier Architecture Example: Any large website on the internet, including **guru99.com**.

Summary

- An Architecture of DBMS helps in design, development, implementation, and maintenance of a database
- The simplest database system architecture is 1 tier where the Client, Server, and Database all reside on the same machine
- A two-tier architecture is a database architecture in DBMS where presentation layer runs on a client and data is stored on a server
- Three-tier client-server architecture consists of the Presentation layer (PC, Tablet, Mobile, etc.), Application layer (server) and Database Server