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**DATABASE MANAGEMENT SYSTEM**

**LAB ASSIGNMENT#2**

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# Simplified Database System Organization

# Approaches to Management of Data

## Database Approach

It is a single repository of data which is accessed by various users. Database system contains the database and a complete description of the database called meta-data. In order to remove all limitations of the File Based Approach, a new approach was required that must be more effective known as Database approach. The database is no longer owned by one department but is a shared corporate resource. The database holds not only the organization's operational data but also a description of this data. For this reason, a database is also defined as a self-describing collection of integrated records. The description of the data is known as the Meta Data (the 'data about data').

It is the self-describing nature of a database that provides program-data independence.

Database Approach

## File system Approach

File-based systems were an early attempt to computerize the manual filing system. File-based system is a collection of application programs that perform services for the end-users, such as updating, insertion, deletion adding new files to database etc. Each program defines and manages its data.

When a computer user wants to store data electronically they must do so by placing data in files. Files are stored in specific locations on the hard disk (directories). The user can create new files to place data in, delete a file that contains data, rename the file, etc which is known as file management; a function provided by the Operating System (OS).

File System approach

# Database vs file system approaches

Data base use miniworld(some part of the real world about which data is stored in a database eg. student grades and transcripts at a university) as data source. It has logically integrated files for intended users and application. The data in data base approach is self describing and shared.

In comparison File based approach has program data independence and allows for multiple people to view data at the same time.

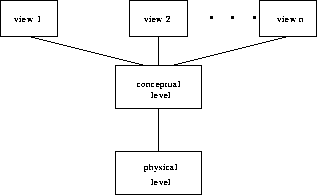
## Data abstraction

The major purpose of a database system is to provide users with an abstract view of the system.

The system hides certain details of how data is stored and created and maintained

Complexity should be hidden from database users.

* There are several levels of abstraction:
  + Physical Level:
    - How the data are stored.
    - E.g. index, B-tree, hashing.
    - Lowest level of abstraction.
    - Complex low-level structures described in detail.
  + Conceptual Level:
    - Next highest level of abstraction.
    - Describes *what* data are stored.
    - Describes the relationships among data.
    - Database administrator level.
  + View Level:
    - Highest level.
    - Describes *part* of the database for a particular group of users.
    - Can be many different views of a database.
    - E.g. tellers in a bank get a view of customer accounts, but not of payroll data.



The three levels of data abstraction

# Third layer architecture (ANSI/APARC)

A 3-tier architecture separates its tiers from each other based on the complexity of the users and how they use the data present in the database. It is the most widely used architecture to design a DBMS.



* **Database (Data) Tier** − At this tier, the database resides along with its query processing languages. We also have the relations that define the data and their constraints at this level.
* **Application (Middle) Tier** − At this tier reside the application server and the programs that access the database. For a user, this application tier presents an abstracted view of the database. End-users are unaware of any existence of the database beyond the application. At the other end, the database tier is not aware of any other user beyond the application tier. Hence, the application layer sits in the middle and acts as a mediator between the end-user and the database.
* **User (Presentation) Tier** − End-users operate on this tier and they know nothing about any existence of the database beyond this layer. At this layer, multiple views of the database can be provided by the application. All views are generated by applications that reside in the application tier.

Multiple-tier database architecture is highly modifiable, as almost all its components are independent and can be changed independently.

# Advantages of DBMS

The database management system has promising potential advantages, which are explained below:

1. **Controlling Redundancy:** In file system, each application has its own private files, which cannot be shared between multiple applications. 1:his can often lead to considerable redundancy in the stored data, which results in wastage of storage space. By having centralized database most of this can be avoided. It is not possible that all redundancy should be eliminated. Sometimes there are sound business and technical reasons for· maintaining multiple copies of the same data. In a database system, however this redundancy can be controlled.
2. **Integrity can be enforced:** Integrity of data means that data in database is always accurate, such that incorrect information cannot be stored in database. In order to maintain the integrity of data, some integrity constraints are enforced on the database. A DBMS should provide capabilities for defining and enforcing the constraints.

For Example: Let us consider the case of college database and suppose that college having only BTech, MTech, MSc, BCA, BBA and BCOM classes. But if a \.,ser enters the class MCA, then this incorrect information must not be stored in database and must be prompted that this is an invalid data entry. In order to enforce this, the integrity constraint must be applied to the class attribute of the student entity. But, in case of file system tins constraint must be enforced on all the application separately (because all applications have a class field).

1. **Inconsistency can be avoided**: When the same data is duplicated and changes are made at one site, which is not propagated to the other site, it gives rise to inconsistency and the two entries regarding the same data will not agree. At such times the data is said to be inconsistent. So, if the redundancy is removed chances of having inconsistent data is also removed.
2. **Data can be shared:** As explained earlier, the data about Name, Class, Father \_\_name etc. of General\_Office is shared by multiple applications in centralized DBMS as compared to file system so now applications can be developed to operate against the same stored data. The applications may be developed without having to create any new stored files.
3. **Standards can be enforced** : Since DBMS is a central system, so standard can be enforced easily may be at Company level, Department level, National level or International level. The standardized data is very helpful during migration or interchanging of data. The file system is an independent system so standard cannot be easily enforced on multiple independent applications.
4. **Restricting unauthorized access:** When multiple users share a database, it is likely that some users will not be authorized to access all information in the database. For example, account office data is often considered confidential, and hence only authorized persons are allowed to access such data. In addition, some users may be permitted only to retrieve data, whereas other are allowed both to retrieve and to update. Hence, the type of access operation retrieval or update must also be controlled. Typically, users or user groups are given account numbers protected by passwords, which they can use to gain access to the database. A DBMS should provide a security and authorization subsystem, which the DBA uses to create accounts and to specify account restrictions. The DBMS should then enforce these restrictions automatically.
5. **Solving Enterprise Requirement than Individual Requirement:** Since many types of users with varying level of technical knowledge use a database, a DBMS should provide a variety of user interface. The overall requirements of the enterprise are more important than the individual user requirements. So, the DBA can structure the database system to provide an overall service that is "best for the enterprise".

For example: A representation can be chosen for the data in storage that gives fast access for the most important application at the cost of poor performance in some other application. But, the file system favors the individual requirements than the enterprise requirements

1. **Providing Backup and Recovery:**A DBMS must provide facilities for recovering from hardware or software failures. The backup and recovery subsystem of the DBMS is responsible for recovery. For example, if the computer system fails in the middle of a complex update program, the recovery subsystem is responsible for making sure that the .database is restored to the state it was in before the program started executing.
2. **Cost of developing and maintaining system is lower:**It is much easier to respond to unanticipated requests when data is centralized in a database than when it is stored in a conventional file system. Although the initial cost of setting up of a database can be large, but the cost of developing and maintaining application programs to be far lower than for similar service using conventional systems. The productivity of programmers can be higher in using non-procedural languages that have been developed with DBMS than using procedural languages.
3. **Data** **Model can be developed :**The centralized system is able to represent the complex data and interfile relationships, which results better data modeling properties. The data madding properties of relational model is based on Entity and their Relationship, which is discussed in detail in chapter 4 of the book.
4. **Concurrency Control :**DBMS systems provide mechanisms to provide concurrent access of data to multiple users.

# Disadvantages of DBMS

The disadvantages of the database approach are summarized as follows:

**1.** **Complexity :**The provision of the functionality that is expected of a good DBMS makes the DBMS an extremely complex piece of software. Database designers, developers, database administrators and end-users must understand this functionality to take full advantage of it. Failure to understand the system can lead to bad design decisions, which can have serious consequences for an organization.

**2.** **Size :**The complexity and breadth of functionality makes the DBMS an extremely large piece of software, occupying many megabytes of disk space and requiring substantial amounts of [memory](http://ecomputernotes.com/fundamental/input-output-and-memory/what-are-the-different-types-of-ram-explain-in-detail) to run efficiently.

**3.** **Performance:**Typically, a File Based system is written for a specific application, such as invoicing. As result, performance is generally very good. However, the DBMS is written to be more general, to cater for many applications rather than just one. The effect is that some applications may not run as fast as they used to.

**4.** **Higher impact of a failure:**The centralization of resources increases the vulnerability of the system. Since all users and applications rely on the ~vailabi1ity of the DBMS, the failure of any component can bring operations to a halt.

**5.** **Cost of DBMS:**The cost of DBMS varies significantly, depending on the environment and functionality provided. There is also the recurrent annual maintenance cost.

**6. Additional Hardware costs:** The disk storage requirements for the DBMS and the database may necessitate the purchase of additional storage space. Furthermore, to achieve the required performance it may be necessary to purchase a larger machine, perhaps even a machine dedicated to running the DBMS. The procurement of additional hardware results in further expenditure.

**7. Cost of Conversion:** In some situations, the cost oftlle DBMS and extra hardware may be insignificant compared with the cost of converting existing applications to run on the new DBMS and hardware. This cost also includes the cost of training staff to use these new systems and possibly the employment of specialist staff to help with conversion and running of the system. This cost is one of the main reasons why some organizations feel tied to their current systems and cannot switch to modern database technology.

# Drawbacks of using file system to stored data

* Data redundancy and inconsistency.
* Data isolation
* Problem in atomicity of data
* Difficulty to access data.
* Security Problems
* <http://www.ukessays.com/essays/information-technology/traditional-file-systems-and-database-management-information-technology-essay.php#ixzz3h3S4rywg>
* <http://gpdb.docs.pivotal.io/4340/admin_guide/perf_intro.html>