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Data Abstraction and Data Independence in DBMS

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***Abstract*: A Method to hide irrelevant data from user and provide the required data is presented in this paper. The method is known as the abstraction which allows the DBA or user to ignore the complexity of database. There are three level of abstraction physical, logical and view. Each level has different way to hide the complexity of data, and each is very important for their tasks. The main purpose of data abstraction is to achieve data independence property. This paper presents all types of abstraction.**

***Keywords*: Data Independence, DBA, DBMS, Distributed DBMS.**

1. Introduction

Data is raw facts of information that ought to be translated into a kind that's additional convenient method. data is that the assortment of connected data, that is organized in such the way that it may be simply managed. A database management System(DBMS) may be a package that manages the data, it will perform operations like creation, insertion, modification, and deletion of data to manage it during a systematic manner. data system area unit designed to manage great deal of data by providing security from accidental crash of system and unauthorized access.

The data is usually hold on during a elaborated and sophisticated manner. it's necessary to supply associate degree abstract read of data to the user. to grasp the read of data there's conception of abstraction.

Abstraction is a very important feature of database System. Extracting the necessary data by ignoring the remaining irrelevant details is understood as abstraction. data system area unit typically made-up of advanced data structure as per their necessities. to create the user interaction simple with data the inner irrelevant details may be hidden from users. This method of concealment such a details from user is named data abstraction. The complexness of data will be concealment from user by totally different level of abstraction, referred to as physical level, logical level and consider level.

The main purpose of data abstraction is achieving data independence so as to save lots of time and price needed once the data is changed or altered. One will use this hold on data for computing and presentation. In several systems, data independence is a necessary operate for elements of the system.

2. Level of abstraction

A. Physical level

Physical level defines the physical storage structure of data in database. It is additionally referred to as Internal Level; this level is incredibly near to physical storage of data. At lowest level, it's hold on within the sort of bits with the physical addresses on the external storage device. The physical defines the assorted hold on data sorts, it uses a physical data model. This level describes however the info is really hold on within the physical memory. The physical memory are disc, magnetic tapes etc.

Magnetic tape contains skinny plastic ribbon is employed for storing data. it's a sequent access memory. Therefore, the data read/write speed is slower. it's in the main used for data backups.

Hard Disk contains circular disk fabricated from metal or plastic. each aspect of disk is typically used for storing data. The disk is coated by magnetic compound. The disk is split into multiple concentric circles referred to as track and tracks area unit divided into sectors during which data area unit hold on.

At Physical level the strategy like hashing area unit used for organization purpose. In package, hashing may be a technique to directly search the placement of desired data on the disk while not using index number. Hashing methodology is employed to index and retrieve things in a database because it is quicker to go looking that specific item index number the shorter hashed key rather than index number its original worth.

Developer would recognize the necessity, size and accessing frequency of the records clearly during this level that makes straightforward to style this level.

B. Logical level

This is subsequent level of abstraction that is employed to explain what data the database stores, and what relationships exist in between the data. The logical level additionally called conceptual level because it defines the logical relations between the data. The logical level therefore describes a whole data in terms of tiny variety of comparatively straightforward structure.

Although implementation of the straightforward structure at the logical level might involve advanced physical level structures, the user of the logical level doesn't ought to bear in mind of this quality. this can be thought-about as physical data independence database administrator (DBA) use the logical level of abstraction to determine what data to stay in an exceedingly database. Logical level is additionally referred to as conceptual model. These level contains all the data to builds relevant external records. It additionally hides the interior details of physical storage.

C. *View level*

It is highest level of data abstraction. This level describes the user interaction with database management system. within the logical level, easy structure is used however still complexness remains as a result of within the giant database varied kind of data is hold on. several users don't seem to be attentive to technical details of the system, and additionally they have to access whole data from the database. thence it's necessary to produce a straightforward and short interface for such user as their necessities. Multiple views will be created for same database for multiple users. user interacts with system the assistance of user interface and enters the small print on the screen at read level. User in not attentive to however data is hold on and what data is hold on, such details are hidden from them. This level is additionally best-known as External Level, this level is near to the user. External read describes the phase of the database that's needed for a selected use cluster and hides the remainder of the database from that user cluster.

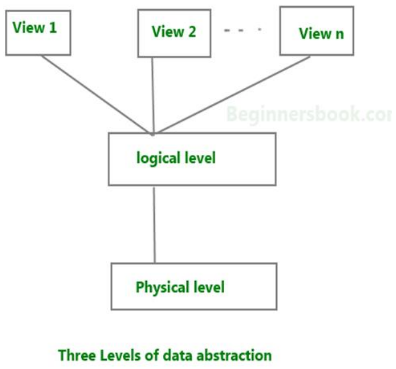

Fig. 1. Level of abstraction

Example:

Let’s say we have a tendency to storing client data in an exceedingly client table.

At physical level these records are represented as blocks of storage (bytes, gigabytes, terabytes etc.) in memory. These details are typically hidden from the programmers.

At the logical level these records are represented as fields and attributes at the side of their knowledge sorts, their relationship among one another is logically enforced. The programmers typically work on this level as a result of they're awake to such things regarding info systems.

At view level, user simply move with system with the assistance of user interface and enter the main points on the screen, not awake to however the data is hold on and what data is stored; such details are hidden from them.

3. Data independence

The main purpose data abstraction is to achieving data independence so as to save lots of time and price needed once the information is changed or altered. One will use this hold on data for computing and presentation. In several systems, data independence is a vital perform for parts of the system.

Data Independence is outlined as a property of package that helps you to alter the database schema at one level of database management system while not requiring to alter the schema at future higher level. data independence helps you to stay data separated from all programs that create use of it.

We have specifically 2 levels of data independence arising from these levels of abstraction

1. Physical level data independence
2. Logical level data independence

A. *Physical Level data independence*

Physical data independence helps to separate abstract levels from the internal/physical levels. It permits you to supply a logical description of the database while not the requirement to specify physical structures. Compared to Logical Independence, it's simple to attain physical data independence.

With Physical independence, you'll be able to simply amendment the physical storage structures or devices with an impression on the abstract schema. Any amendment done would be absorbed by the mapping between the abstract and internal levels. Physical data independence is achieved by the presence of the inner level of the database and so the transformation from the abstract level of the database to the inner level.

Due to Physical independence, any of the below amendment won't have an effect on the abstract layer.

- Using a replacement device like disk drive or Magnetic Tapes
- Modifying the file organization technique within the info
- Switching to completely different knowledge structures.
- Changing the access technique.
- Modifying indexes.
- Changes to compression techniques or hashing algorithms.

B. *Logical level data independence*

Logical data Independence is that the ability to alter the abstract theme while ever-changing

1. External views
2. External API or programs

Any amendment created are going to be absorbed by the mapping between external and abstract levels.

When compared to Physical data independence, it's difficult to realize logical data independence.

Due to Logical independence, any of the below amendment won't have an effect on the external layer.

1. Add/Modify/Delete a brand new attribute, entity or relationship is feasible while not a rewrite of

existing application programs
2. Merging 2 records into one
3. Breaking associate existing record into 2 or additional records

4. Importance of data independence

Helps to boost the standard of the database

- Database system maintenance becomes reasonable
- Enforcement of standards and improvement in info security
- Don't ought to alter system in application programs
- Permit developers to specialize in the final structure of the info instead of worrying concerning the interior implementation
- It permits to boost state that is uninjured or undivided
- Database incongruousness is immensely reduced.
- Easily create modifications within the physical level is required to boost the performance of the system.

5. Advantages of data abstraction

The main purpose data abstraction is to achieving data independence so as to avoid wasting time and price needed once the data is changed or altered. One will use this keep information for computing and presentation. In several systems, information independence is a necessary perform for parts of the system.

Data abstraction hides the complexness of database by material possession you outline a brand new, higher organized structure that exists solely within the middleware. The result's that Associate in Nursing application (or another service) will request the data in an exceedingly well-organized, logical format, while not having to stress regarding its actual physical layout. As Associate in Nursing example, Associate in Nursing application might request a client record from the information abstraction layer. information is fetched from doubtless several information sources, reworked into the in agreement logical structure, and came back to the job application.

Various styles of information abstraction layers area unit doable, every appropriate for a selected purpose. Examples embody a virtual information that presents a relative model of information that's victimisation SQL, and virtual programmes that gift back-end information for simple manipulation in an exceedingly spreadsheet kind. broadly, a virtual computer database maximizes the flexibleness within the styles of queries that may be issued, thanks to its made search language. to supply information to services, however, the natural implementation of a knowledge abstraction layer is to model the information in XML, that makes it a perfect acceptable modern SOA implementations as a result of the richness of information outlined via XML Schema absolutely supports the creation of coarse-grained and loosely coupled services, outlined in business terms.

The potential value savings for building a knowledge abstraction layer for your SOA comprise variety of classes. First, if {you are} convinced that SOA normally provides the advantages that you just are trying to find, it solely is smart that you're going to wish "SOA done right.". A properly outlined logical layer leads on to multiplied reusability opportunities, maybe the foremost basic of all SOA-related advantages. ROI analysis has convincingly shown that employing a information abstraction layer dramatically reduces the price of systems within the end of the day.

The best advantages accrue thanks to the loose coupling achieved through a well-designed information abstraction layer

6. Drawbacks of data abstraction and data independence

DBMS needs high initial investment for hardware, software system and trained employees. a big investment based mostly upon size and practicality of organization if needed. additionally, organization needs to pay simultaneous annual maintenance value.

A database management system needs disk storage for data and typically you wish to get additional area to store your data. additionally, typically you wish to an infatuated machine for higher performance of info. These machines and space for storing increase additional prices of hardware.

7. Conclusion

Data abstraction is well required for any DBMS, without any abstraction handling database will be huge task. If we use data abstraction, it provides data independence and hide unwanted data. Suppose such a data are not hide than it will be same as handling normal word file, and there will be no use of DBMS. There are some drawbacks like system will responses slowly still it will provide great reliability and take less time.

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