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THREE-TIER ARCHITECTURE DESIGN AND CONCEPTS

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ABSTRACT

In this paper we will discuss the concept of 2 tier and 3 tier architecture, and the concept related to the architecture. That means concept of schema, instance and data independence.

DATABASE ARCHITECTURE

1. Logical two-tier Client / Server architecture
2. Logical three-tier Client / Server architecture

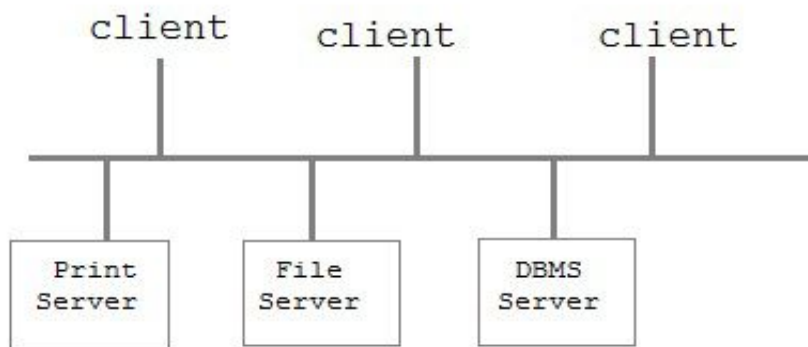**Two-tier Client / Server Architecture**

Fig. View of 2-tier architecture

Two-tier Client / Server architecture is used for User Interface program and Application Programs that runs on client side. An interface called ODBC(Open Database Connectivity) provides an API that allow client side program to call the dbms. Most DBMS vendors provide ODBC drivers. A client program may connect to several DBMS's. In this architecture some variation of client is also possible for example in some DBMS's more functionality is transferred to the client including data dictionary, optimization etc. Such clients are called Data server. [1]

Three-tier Client / Server Architecture

1. Physical Data Level

The physical schema describes details of how data is stored: files, indices, etc. on the random access disk system. It also typically describes the record layout of files and type of files (hash, b-tree, flat). [1]

2. Conceptual Data Level

Also referred to as the Logical level. Middle layer acts like medium for sending partially processed data between the database server and the client. [1]

3. External Data Level

The external level also presents data as a set of relations. An external level specifies a view of the data in terms of the conceptual level. Students should not see faculty salaries. [2]
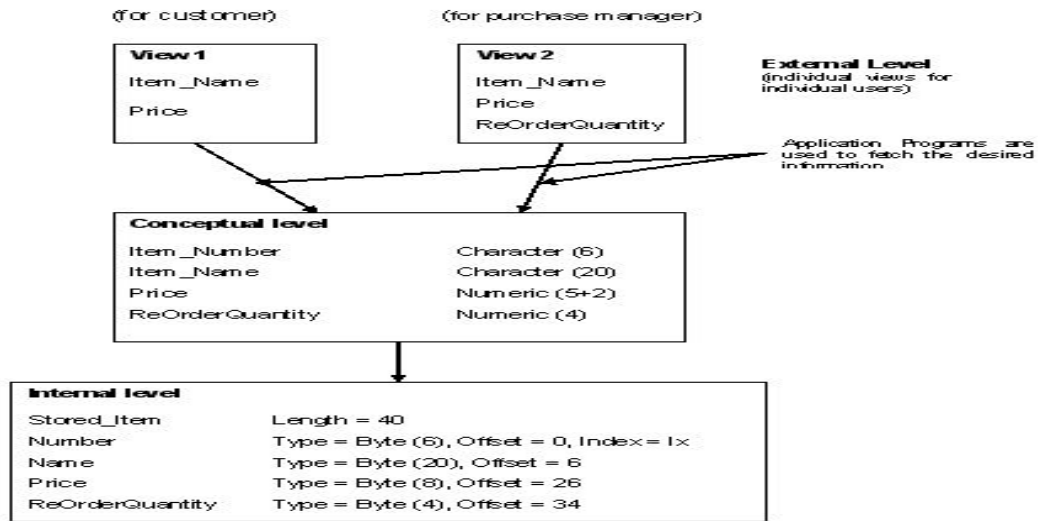
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Fig. View of data at three-tier database architecture

DATA INDEPENDENCE

A database system normally contains a lot of data in addition to users' data. For example, it stores data about data, known as metadata, to locate and retrieve data easily. It is rather difficult to modify or update a set of metadata once it is stored in the database. But as a DBMS expands, it needs to change over time to satisfy the requirements of the users. If the entire data is dependent, it would become a tedious and highly complex job. Metadata itself follows a layered architecture, so that when we change data at one layer, it does not affect the data at another level. This data is independent but mapped to each other. [3]

Fig. Data Independence
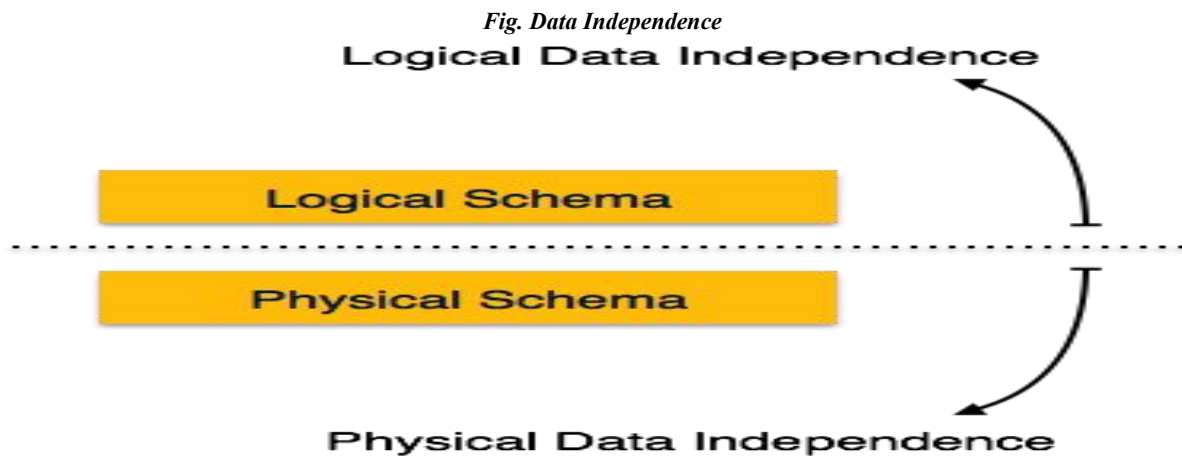
1. Logical Data Independence

Logical data is data about database, that is, it stores information about how data is managed inside. For example, a table (relation) stored in the database and all its constraints, applied on that relation. Logical data independence is a kind of mechanism, which liberalizes itself from actual data stored on the disk. If we do some changes on table format, it should not change the data residing on the disk. [3]

2. Physical Data Independence

All the schema are logical, and the actual data is stored in bit format on the disk. Physical data independence is the power to change the physical data without impacting the schema or logical data. [3]

DATABASE SCHEMA

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Description of data at some level. Each level has its own schema.

We will be concerned with three forms of schemas:
* physical,
* conceptual, and
* External. [1]

A database schema is the skeleton structure that represents the logical view of the entire database. It defines how the data is organized and how the relations among them are associated. It formulates all the constraints that are to be applied on the data. [4]

A database schema defines its entities and the relationship among them. It contains a descriptive detail of the database, which can be depicted by means of schema diagrams. It's the database designers who design the schema to help programmers understand the database and make it useful. [4]
* Each external schema describe what information ONE particular type of users require
* The conceptual schema list (describe) the fields in each data file
* The internal schema describe the structure of each data file and how BEST to access each data file. [5]
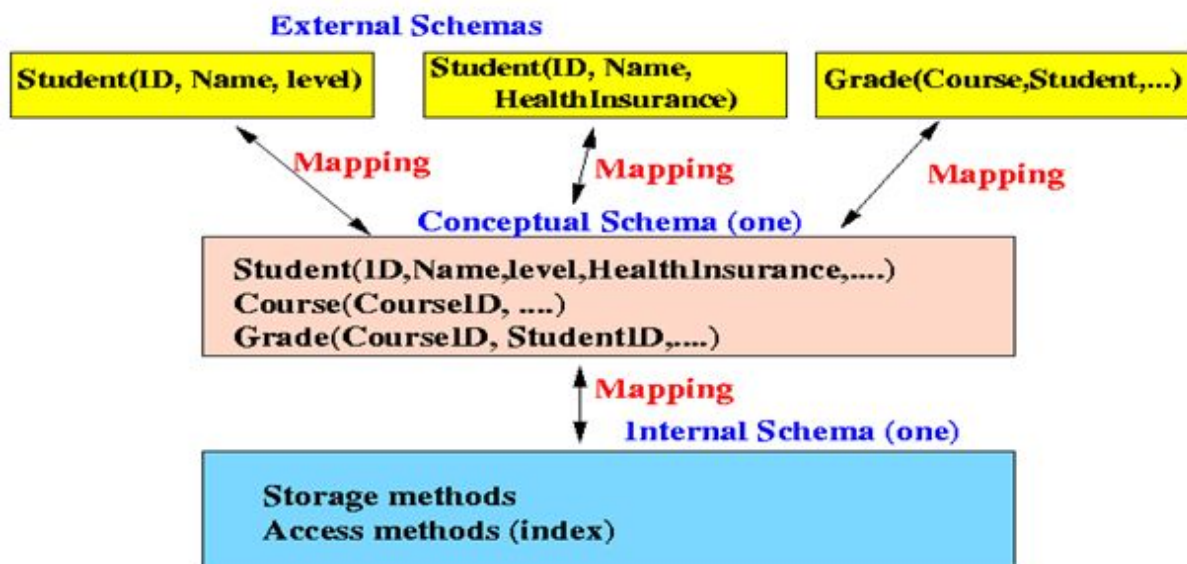

Fig. Database Schema

DATABASE INSTANCE
It is important that we distinguish these two terms individually. Database schema is the skeleton of database. It is designed when the database doesn't exist at all. Once the database is operational, it is very difficult to make any changes to it. A database schema does not contain any data or information. A database instance is a state of operational database with data at any given time. It contains a snapshot of the database. Database instances tend to change with time. A DBMS ensures that its every instance (state) is in a valid state, by diligently following all the validations, constraints, and conditions that the database designers have imposed. [4]

CONCLUSION
By this paper we can easily understand the concept of 3 level architecture, database schema, database independence and database instance. Hence we can conclude that this paper is able to clarify the concept of 3 level architecture.

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