
Chapter: 2

Architecture of Database Management System

By

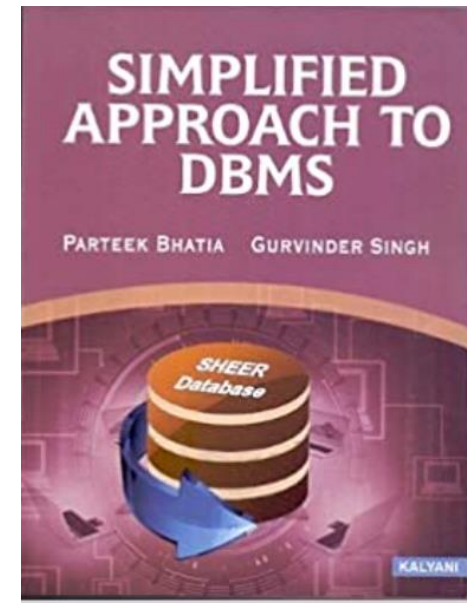
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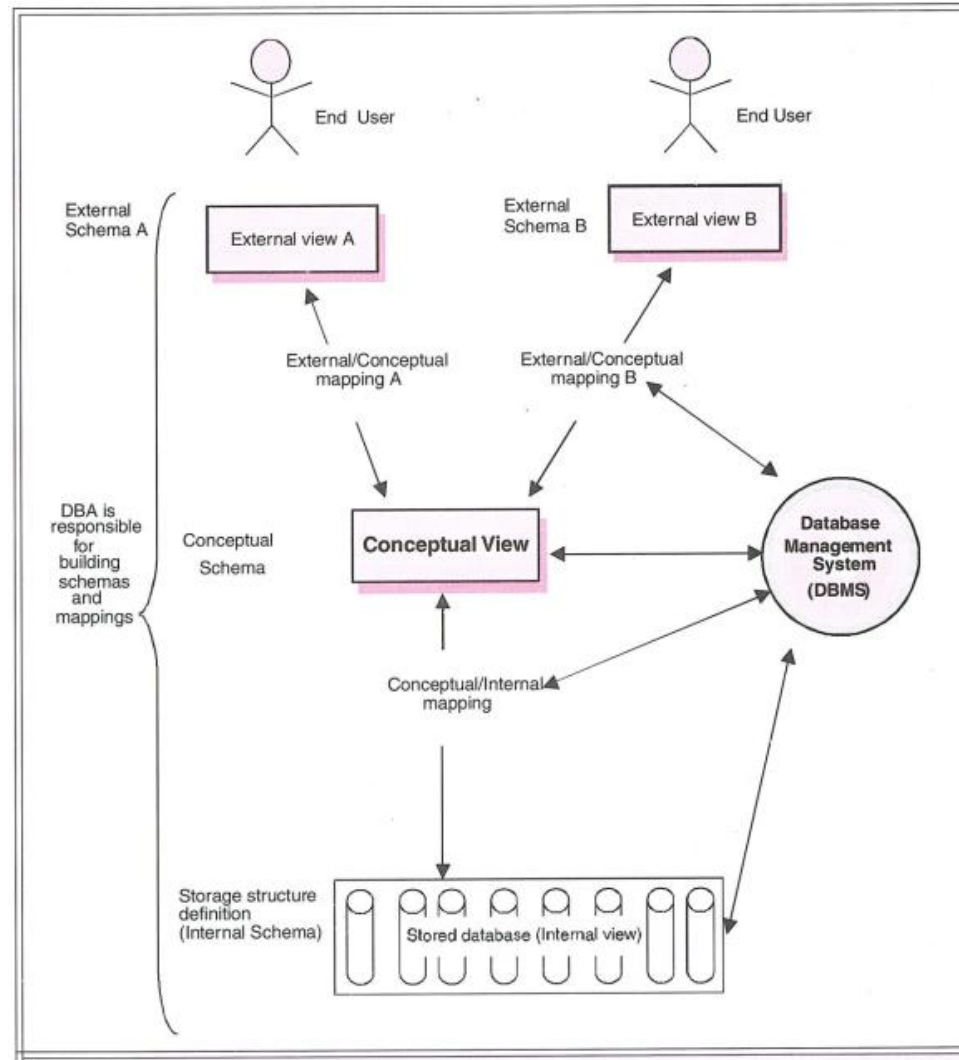
Early Two Level Architecture

- Given by Data Base Task Group (DBTG) in 1971.
- Early attempt to standardize database development.
- Recommend two level approach.
 - Schema
 - Subschema

Objective of the Three Level Architecture

- Each user should be able to access the same data, but have a different customized view of the data.
- User's interaction with the database should be independent of storage considerations.
- The Database Administrator (DBA) should be able to change the database storage structures without affecting the user's views.
- The internal structure of the database should be unaffected by changes to the physical aspects of storage, such as the changeover to a new storage device.
- The DBA should be able to change the conceptual structure of the database without affecting all users.

Three Level Architecture of DBMS

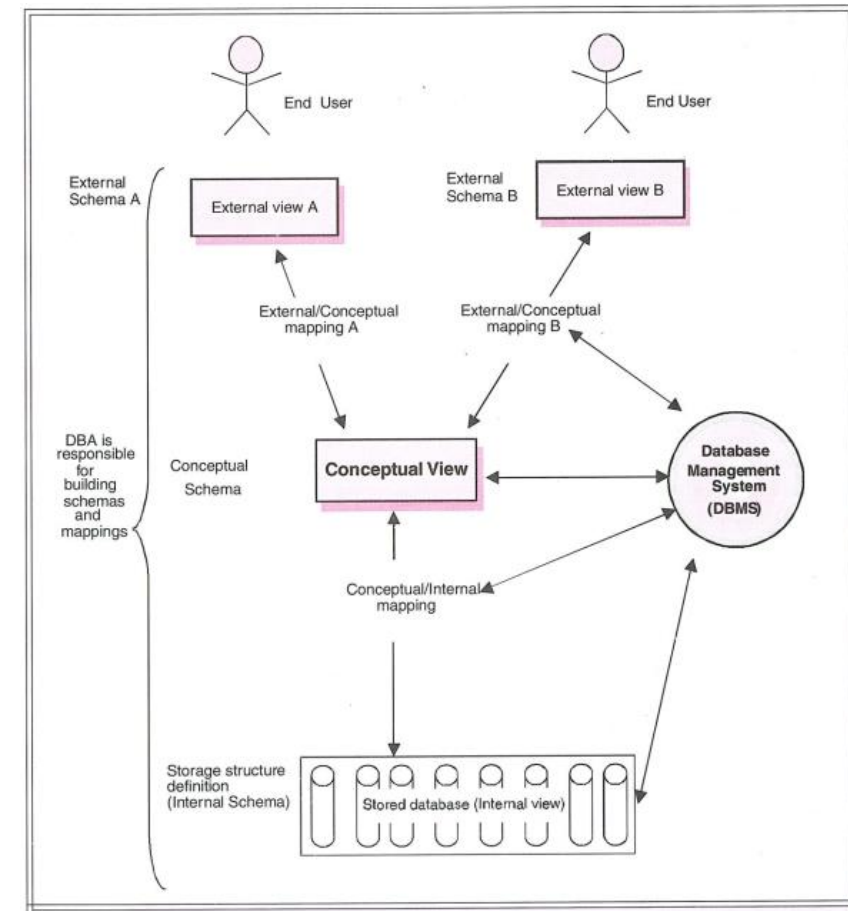


Three Level Architecture of DBMS

- External Level
- Conceptual Level
- Internal Level

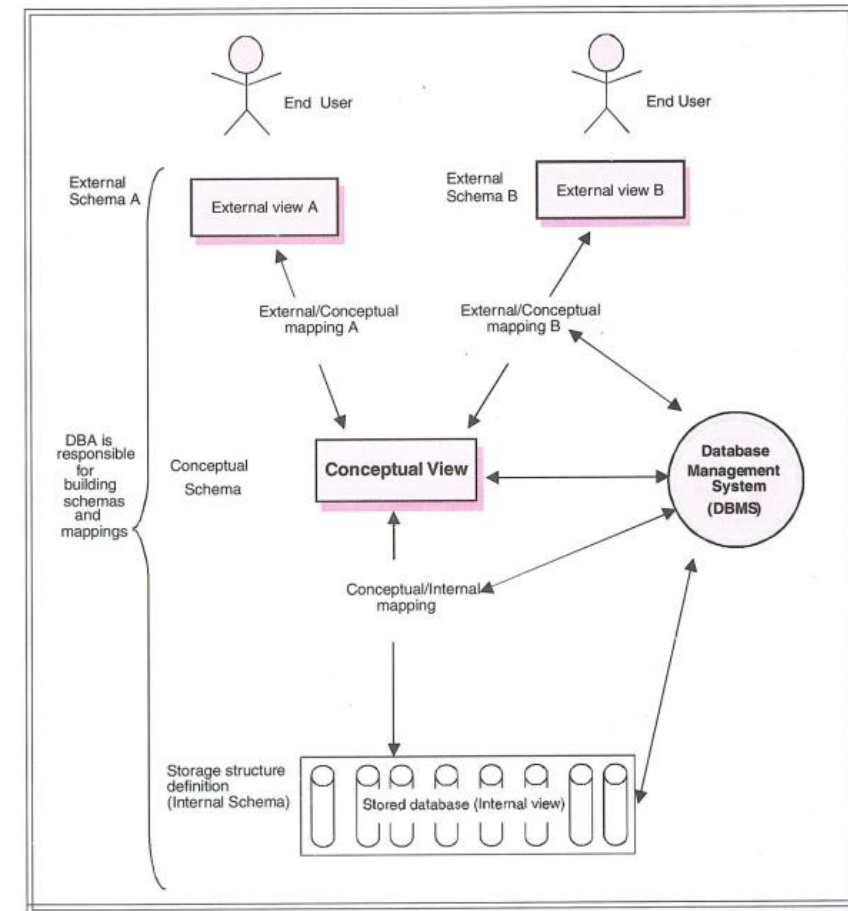
External Level or View level

- It is the users' view of the database.
- It describes that part of the database that is relevant to each user.
- It is closest to the end users.
- External level is also known as the view level.



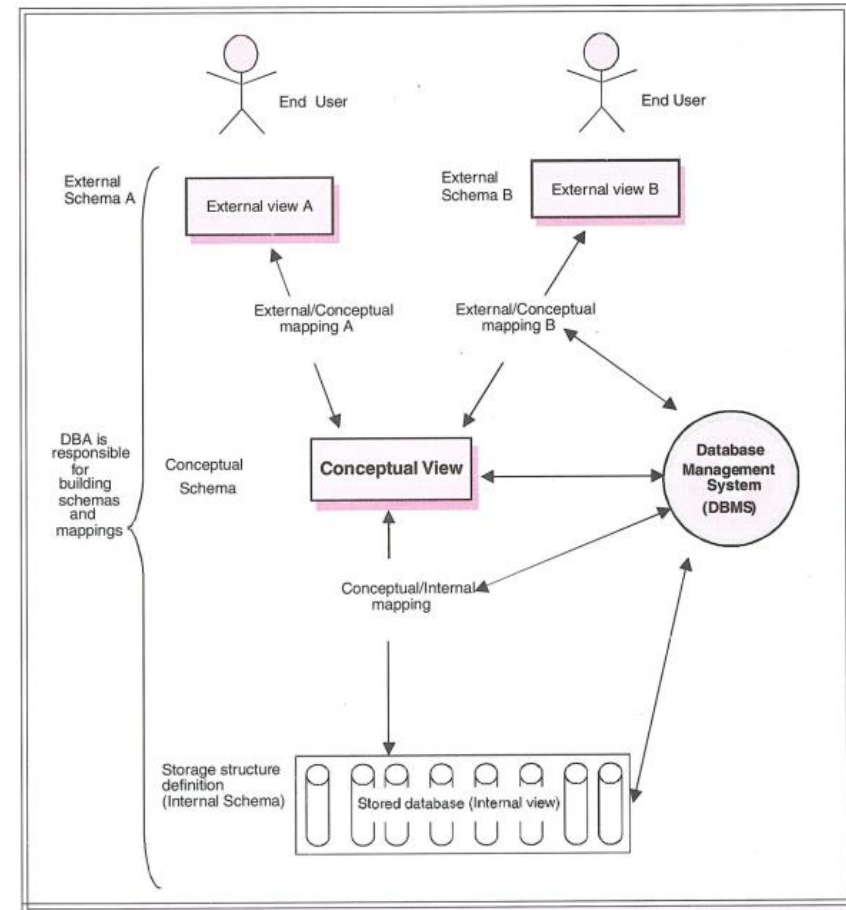
External Level or View level

- It deals with the way in which individual users view data.
- Individual users are given different views according to their requirements.
- Example: one user may view dates in the form (day, month, year), while another may view dates as (year, month, day).
- One may be interested in First Name other may be in First Name and Last Name.



Conceptual Level or Logical Level

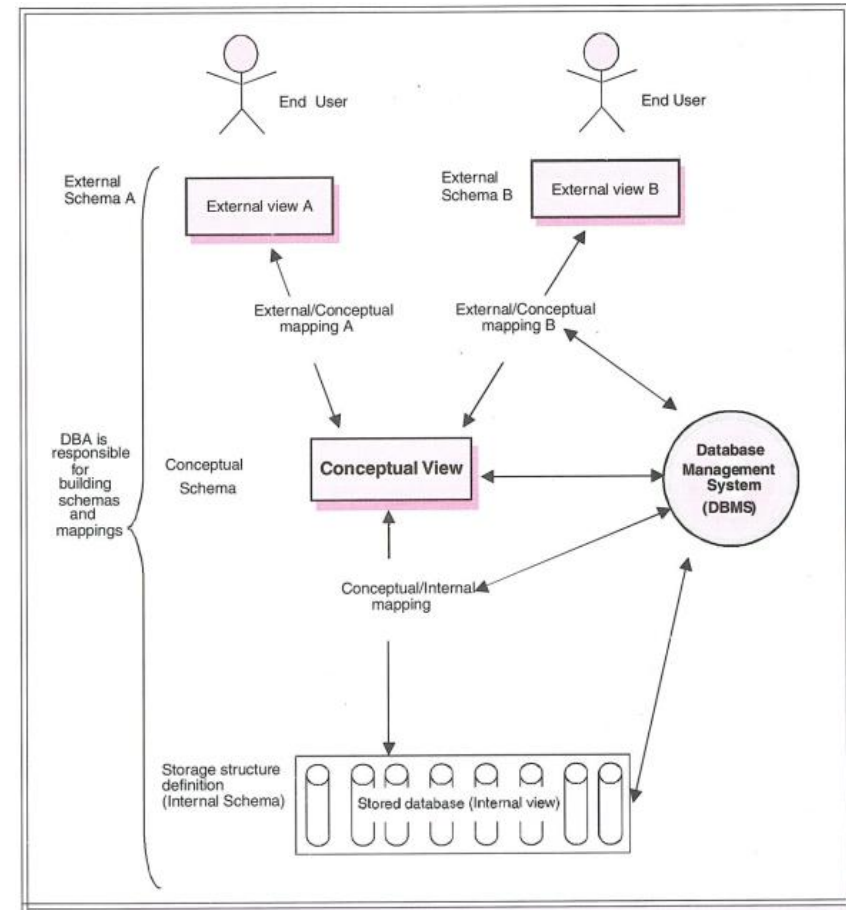
- This level must not contain any storage dependent details.
- For example it contains only information about data type and its size but not any storage considerations, such as the number of bytes occupied.
- Conceptual level is also known as the logical level.



Conceptual Level or Logical Level

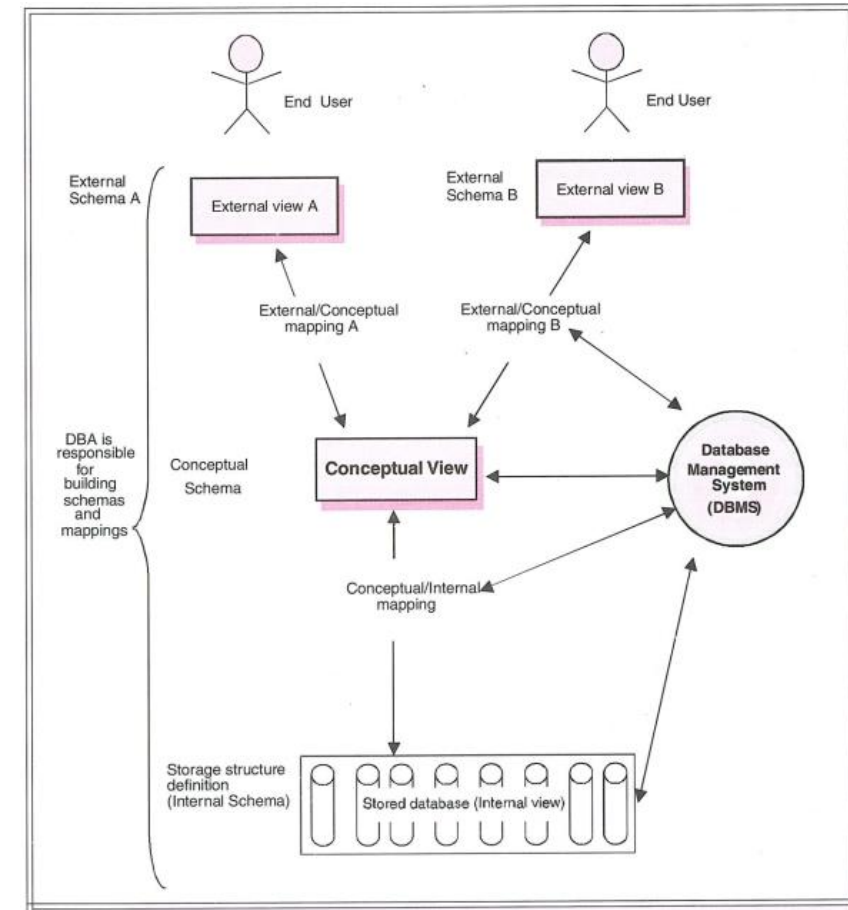
This level deals with

- All entities, their attributes, and their relationships
- The constraints on the data
- Security and integrity information



Internal Level or Storage level

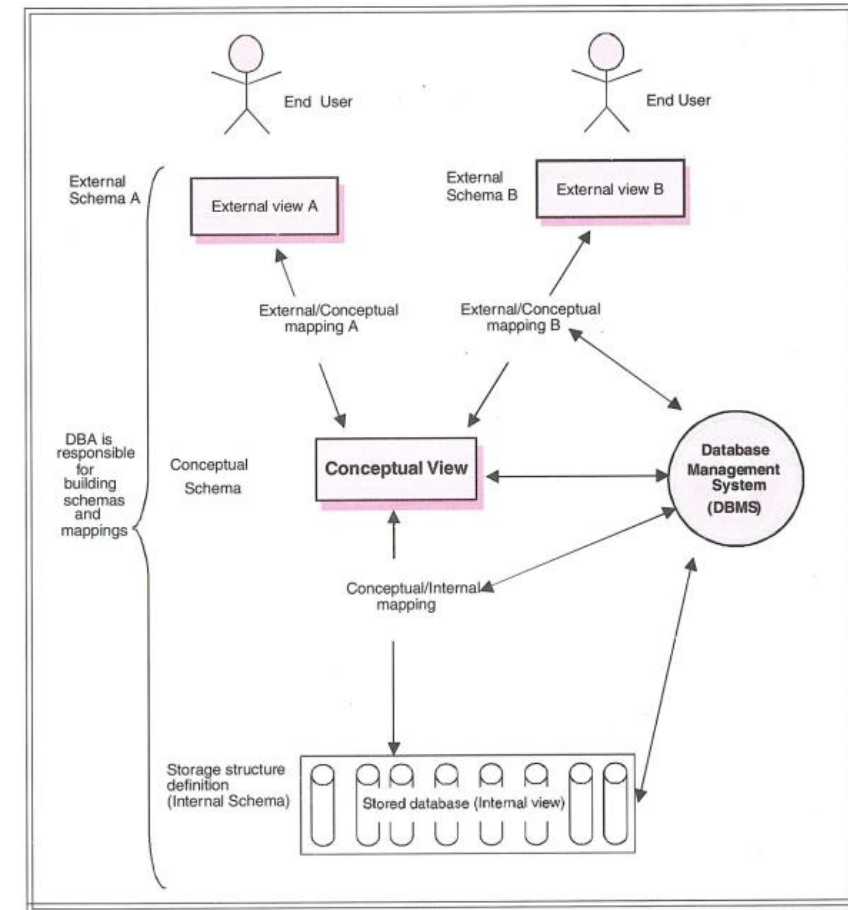
- It is the physical representation of the database on the computer.
- This level describes how the data is stored in the database.
- It concerns the way the data are physically stored on the hardware.



Internal Level or Storage level

The internal level is concerned with

- Storage space allocation for data and indexes;
- Record descriptions for storage (with stored sizes for data items);
- Record placement;
- Data compression and data encryption techniques.



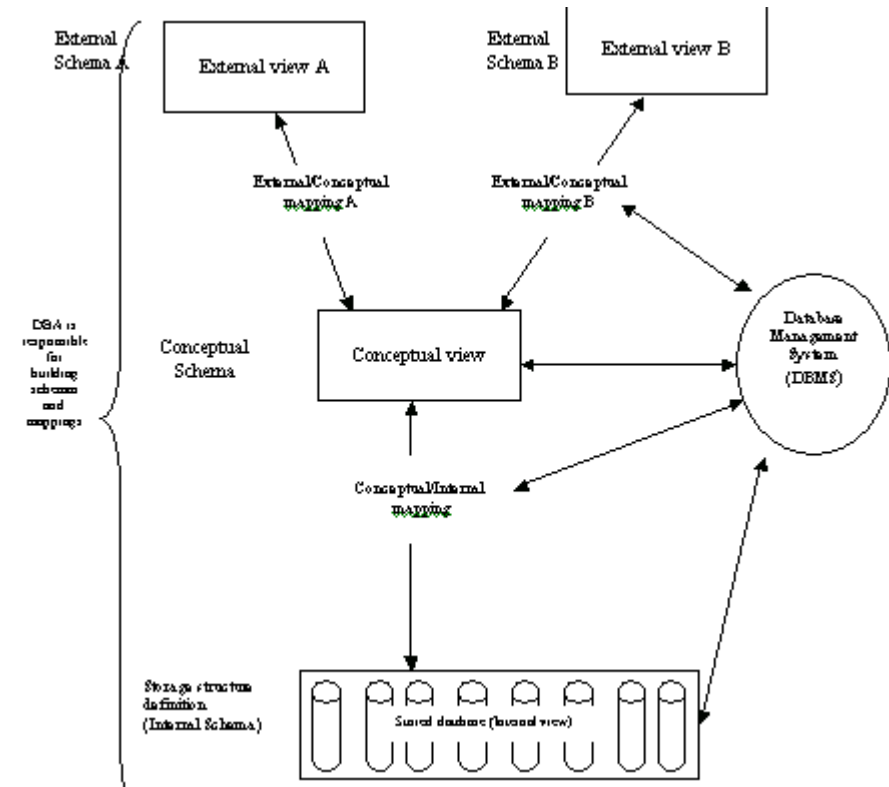
Three Level Architecture

Mapping between the Views

Mapping between Views

External/Conceptual Mapping:

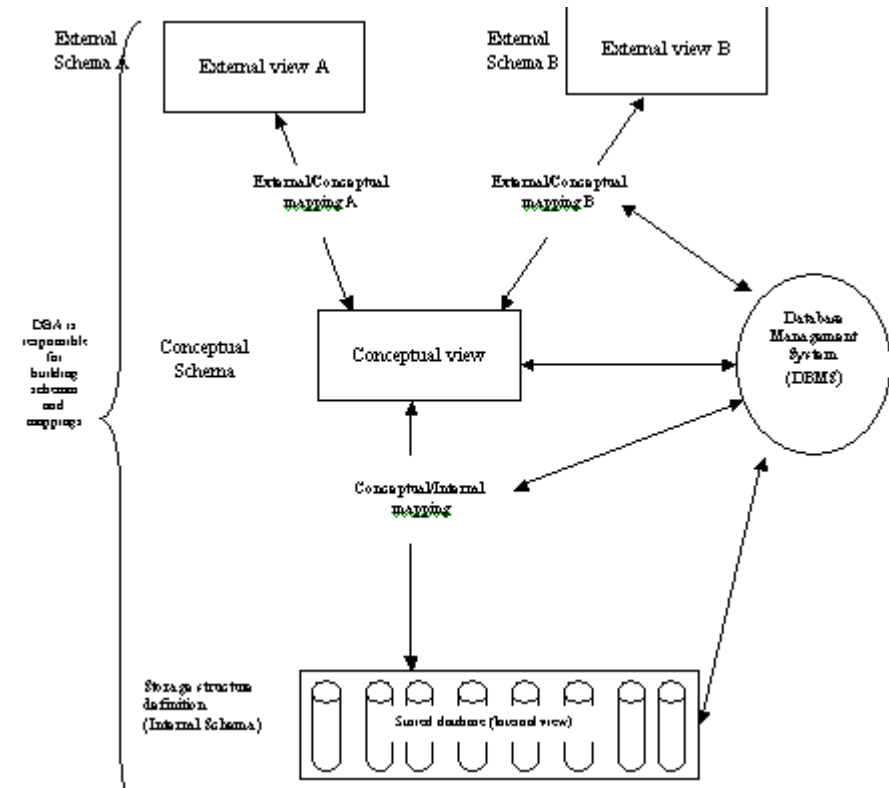
- Each external schema is related to the conceptual schema by the external/conceptual mapping.
- It maps logical record in the external view to one (or more) conceptual record(s) in the conceptual view.



Mapping between Views

Conceptual/Internal Mapping:

- Conceptual schema is related to the internal schema by the conceptual/internal mapping.
- This enables the DBMS to find the actual record or combination of records in physical storage that constitute a logical record in conceptual schema.



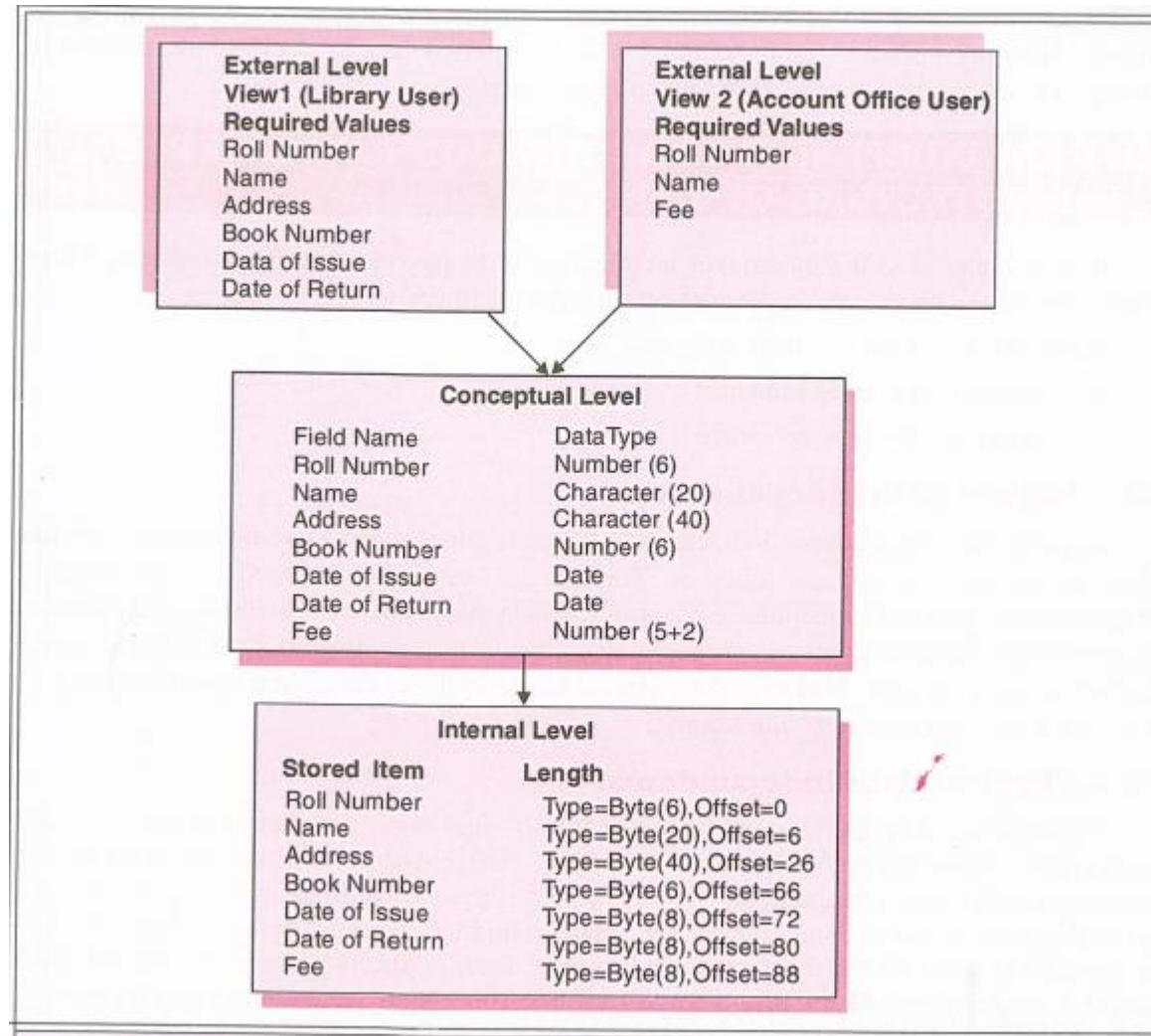
Schema

- **The overall description of the database is called the Database Schema.**
- There are three different types of schema in the database corresponding to each data view of database. In other words, the data views at each of three levels are described by schema.

Schema

- The External view is described by means of a schema called **external schema** that correspond to different views of the data.
- Similarly the Conceptual view is defined by **conceptual schema**, which describes all the entities, attributes, and relationship together with integrity constraints.
- Internal View is defined by **internal schema**, which is a complete description of the internal model, containing definition of stored records, the methods of representation, the data fields, and the indexes used.

Example: University Management System

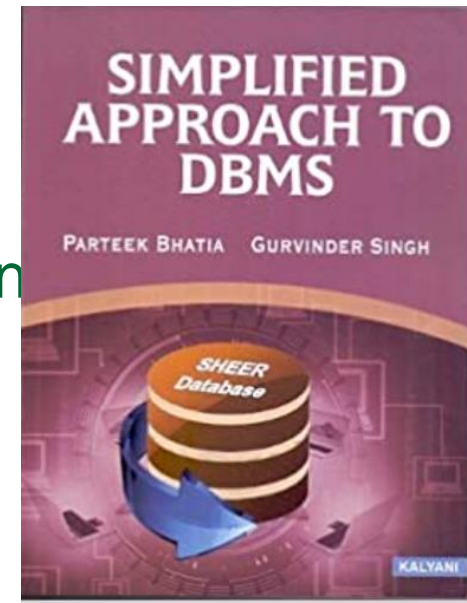


Data Independence

Achievement of Three Level Architecture



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Data Independence

- Application Programs should be independent from the way the data is stored and accessed.

Data Independence-Achievement of Layered Architecture of DBMS

There are two kinds of data independence:

- Logical data independence
- Physical data independence

Logical data independence

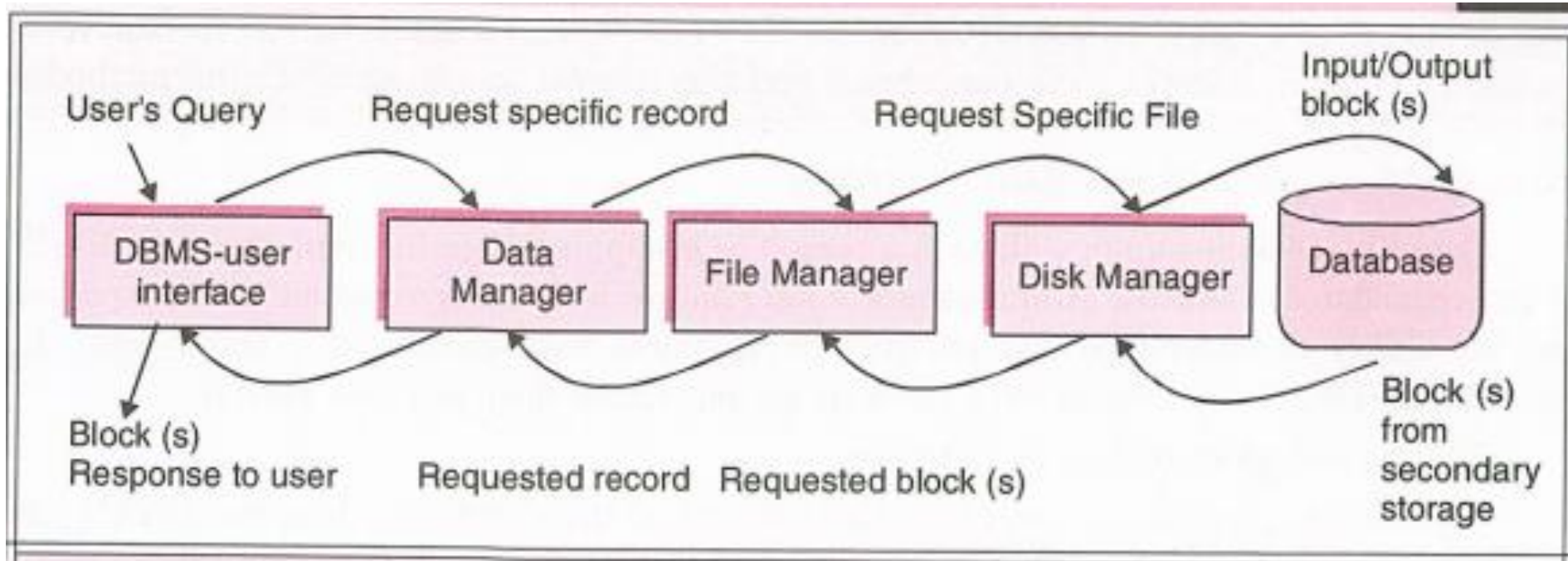
Logical data independence indicates that the conceptual schema can be changed without affecting the existing external schemas. The change would be absorbed by the mapping between the external and conceptual levels.

Physical data independence

Physical data independence indicates that the physical storage structures or devices could be changed without affecting conceptual schema. The change would be absorbed by the mapping between the conceptual and internal levels.

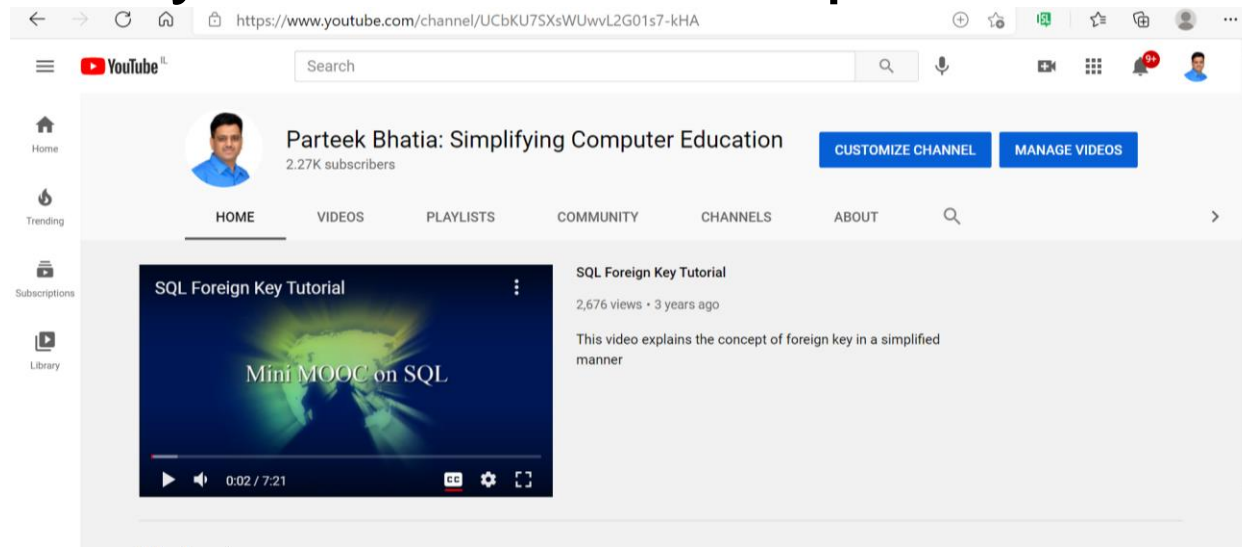
Procedure for Data Access by DBMS

Procedure for Data Access by DBMS



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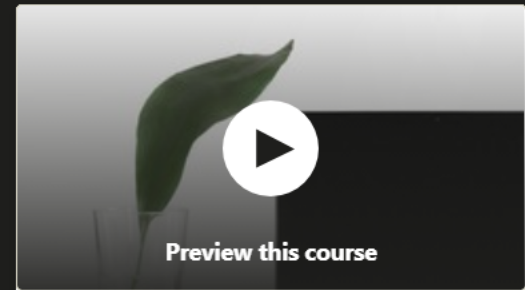
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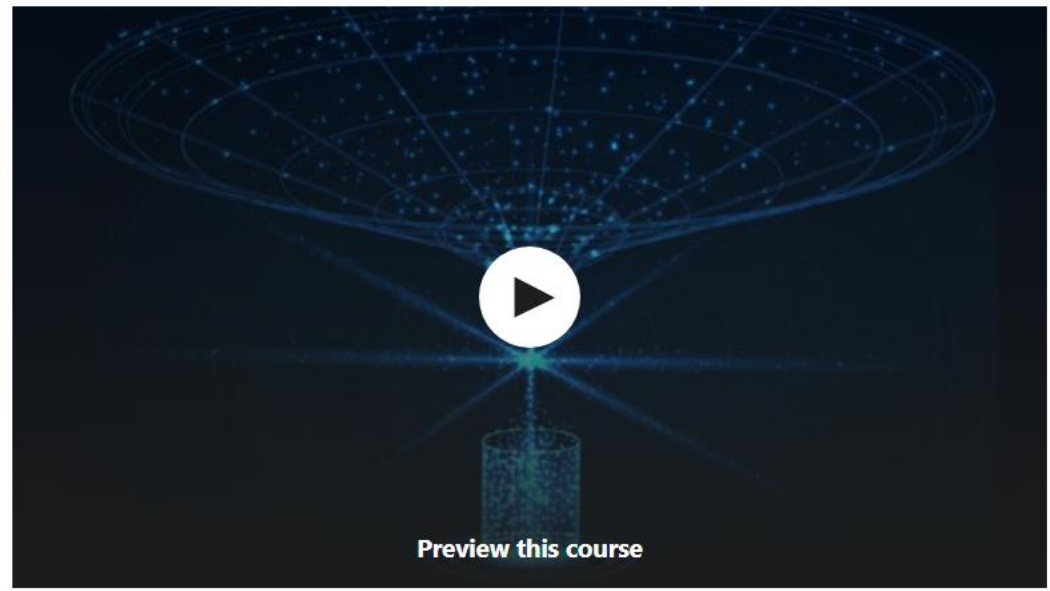
Dr. Parteek Bhatia is Associate Professor in the Department of Computer Science and Engineering at Thapar Institute of Engineering and Technology, Patiala. He has more than 18 years of academic experience. He has authored several books in various areas of computer science. His book - Simplified approach to DBMS is one of the bestseller. Currently, he is working on plethora of Projects which are funded by Department of Science and Technology, CSIR and other funding agencies of India.

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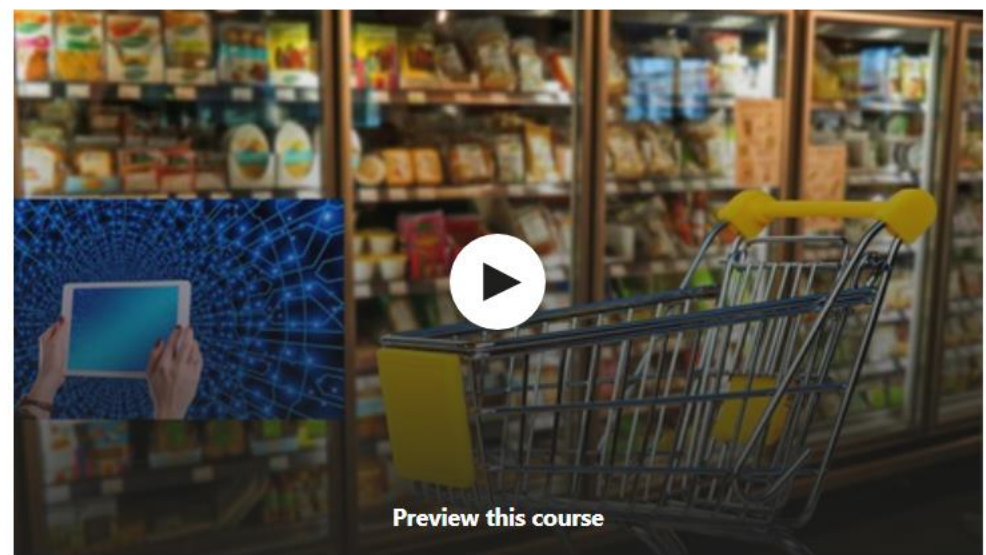
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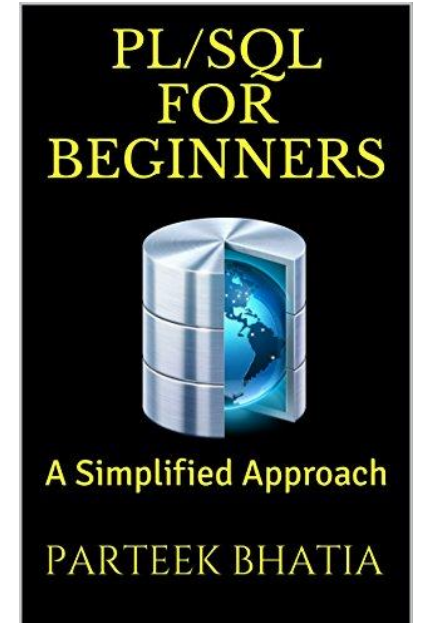
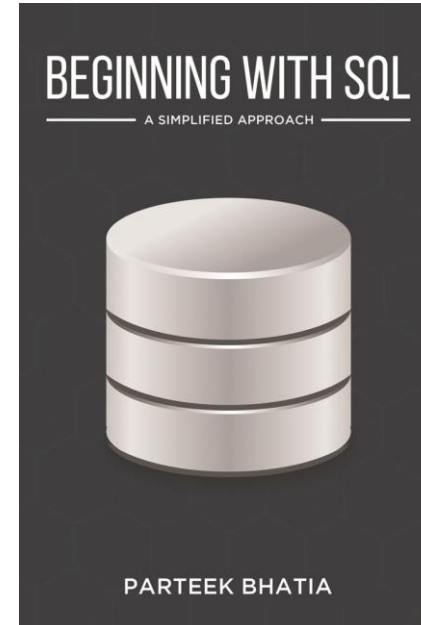
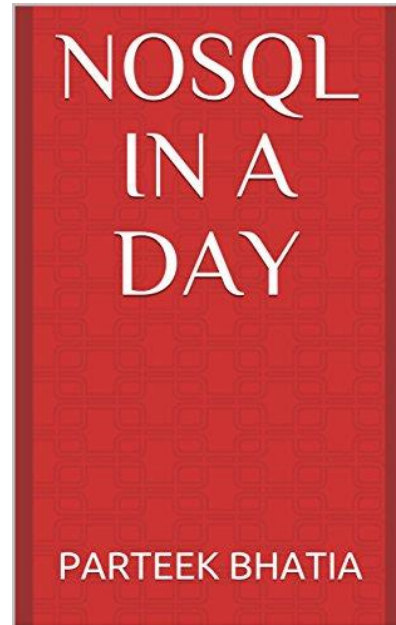
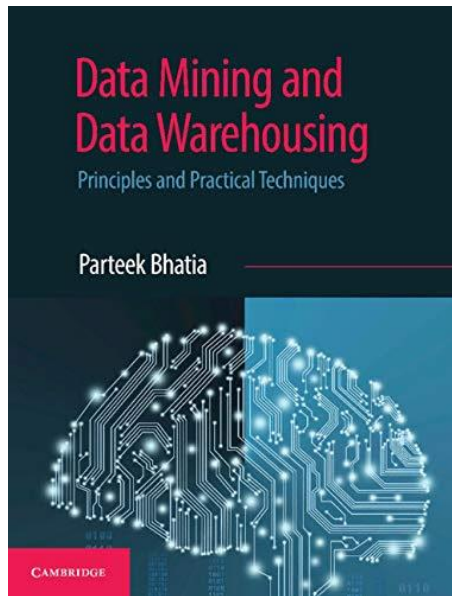
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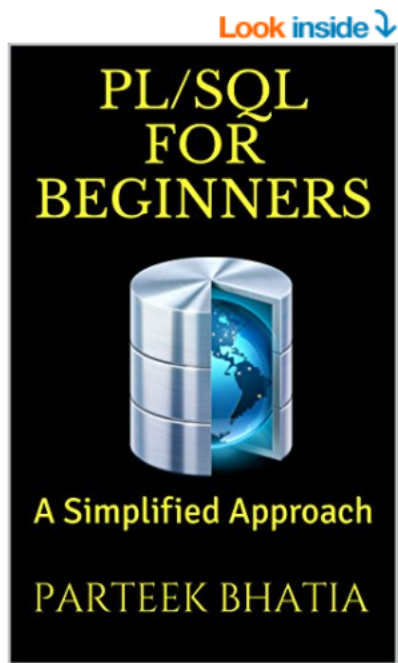
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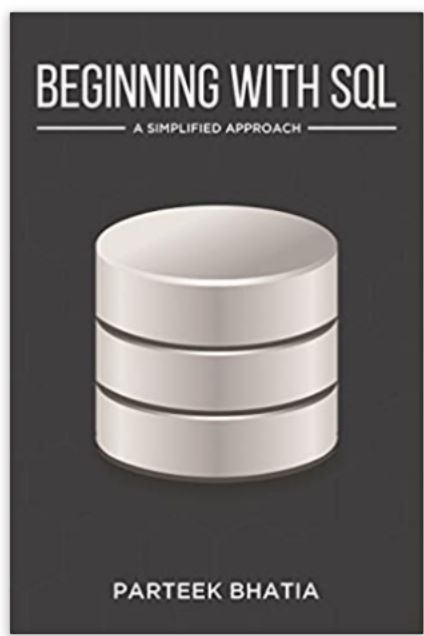
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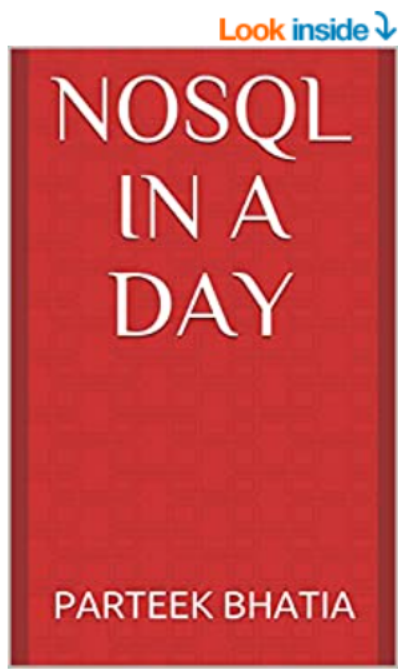
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