Database system environment

1

Simplified database system environment
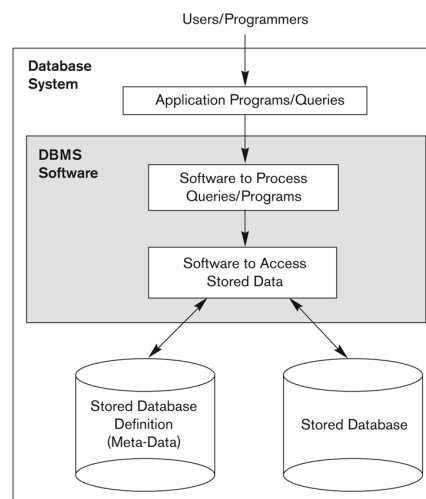

Users/Programmers

Database System

Application Programs/Queries

DBMS Software

Software to Process Queries/Programs

Software to Access Stored Data

Stored Database Definition (Meta-Data)

Stored Database

Figure 1.1
A simplified database system environment.

2

Components of a Database Management System

3

DBMS Architecture

- User/Programmers
- Database System
- DBMS Softawar
- Data
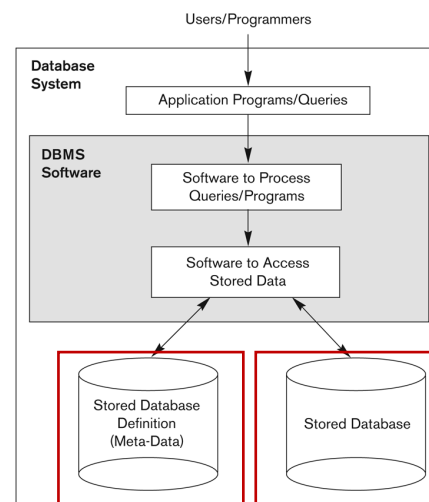 - The"cylindrical" component contains not only data, but also metadata

Users/Programmers

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Stored Database Definition (Meta-Data)

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Figure 1.1
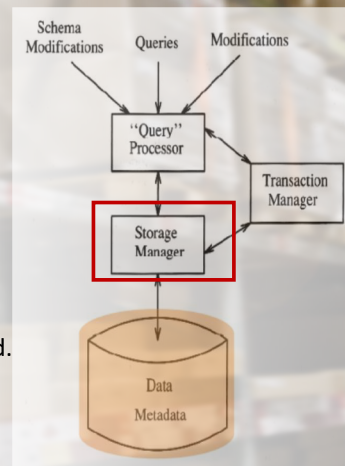A simplified database system environment.

4

Metadata

- Info about the structure of data. Data about Data

- If DBMS is relational, metadata
  Includes names of relations, name of attributes of those relations and data types for those attributes (e.g., integer or character string).
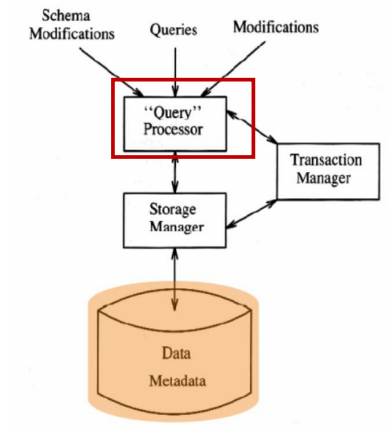

5

Storage Manager

- It is part of the DBMS Software component

- The job of the Storage Manager is to

  - Obtain data from the data storage, and
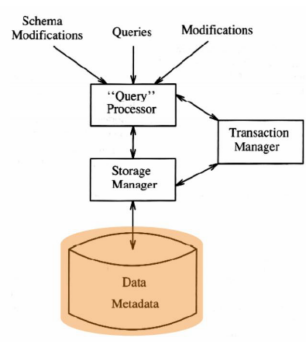 - Return new data to the data storage when updated.

6

Query Processor

- It is part of the DBMS Software component
- The job of the Query Processor is to

  - Queries and modifications to the data.
  - Finds the best way to carry out a requested operation.
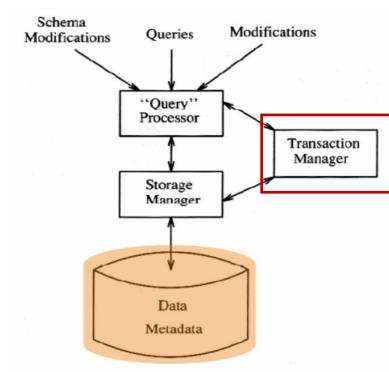

7

Example: Query optimization

- A bank has a DB with two tables: Customers (name, SIN, address), Accounts (accountNo, balance, SIN)
- Query: "Find the balances of all accounts of which Sally is the owner."
- SQL:
  ```
  SELECT  Accounts.balance FROM
    Customers, Accounts  WHERE
          Customers.SIN
        = Accounts.SIN AND
  Customers.name =  'Sally';
  ```
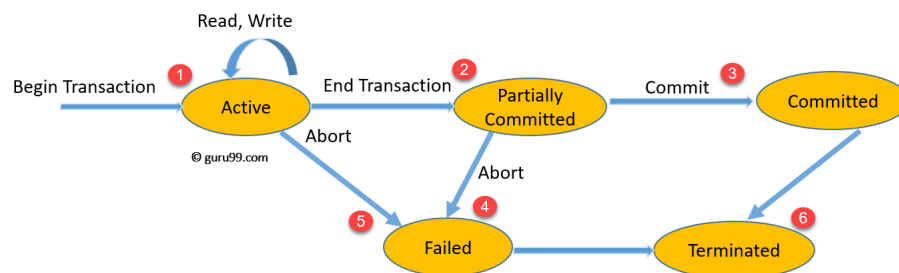
8

Transaction Manager

- Transaction Manager jobs assures that:
  - Several queries running simultaneously do not interfere with each other and that,
  - The system will not end up with corrupted data even if there is a power failure.
- Transaction Manger interacts with:
  - Query Manager Because it may need to delay certain query operations to avoid conflicts.

9

State Transition Diagram for a Database Transaction

https://www.guru99.com

10

Typical DBMS Functionality

Define a particular database in terms of its data types, structures, and constraints

Construct or Load the initial database contents on a secondary storage medium

Manipulating the database:

Retrieval: Querying, generating reports
Modification: Insertions, deletions and updates to its content
Accessing the database through Web applications

Processing and ***Sharing*** by a set of concurrent users and application programs – yet, keeping all data valid and consistent

11

Additional DBMS Functionality

Protection or Security measures to prevent unauthorized access

"Active" processing to take internal actions on data

Presentation and Visualization of data

Maintenance of the database and associated programs over the lifetime of the database application
Called database, software, and system maintenance

12

Application Activities Against a Database

🛢️	Applications interact with a database by generating	- Queries: that access different parts of data and formulate the result of a request - Transactions: that may read some data and "update" certain values or generate new data and store that in the database

🚫 Applications must not allow unauthorized users to access data

🖥️ Applications must keep up with changing user requirements against the database

13