

PATUAKHALI SCIENCE AND TECHNOLOGY UNIVERSITY

COURSE CODE CCE-224

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Assignment 02

Assignment title: Chapter 01 (silberchatz)

Chapter 1 | Exercises

1. This chapter has described several major advantages of a database system. What are two disadvantages?

Some disadvantages,

1. Increased complexity
2. Poor performance

2. List five ways in which the type declaration system of a language such as “Java” or “C++” differs from the data definition language used in a database.

DDL	Programming language
Creates new object	Doesn't create new object, rather it creates an abstraction
It can contain consistency constraints to check a value before assigning	No constraint is used, so any values within the same type can be applied
Authorization → everyone can't access everything	No authorization exists
Only basic data types	Can contain advanced data types like array
Can contain relation between data	Doesn't contain relation between

3. List six major steps that you would take in setting up a database for a particular enterprise.

1. System requirement specification
2. Data model (data type)
3. Define integrity constraints
4. Define physical layer
5. Write application programs (user interface)
6. Create/ initialize the database

4. Suppose you want to build a video site similar to YouTube. Consider each of the points listed in Section 1.2 as disadvantages of keeping data in a file-processing system. Discuss the relevance of each of these points to the storage of actual video data, and to metadata about the video, such as title, the user who uploaded it, tags, and which users viewed it.

Disadvantage	Video	metadata
Data redundancy and inconsistency	No effect	It can be issue, if multiple metadata is stored per one video
Difficulty in accessing data	Less relevant	It can be issue, if search filter is used
Data isolation	Not much affect	Can be in separate files

		leading to isolation
Integrity problems	Not much problem	Constraints can be difficult to implement like unique ID
Atomicity problems	If a video is uploaded and it's metadata isn't added then it may cause atomicity	If a video is uploaded and it's metadata isn't added then it may cause atomicity
Concurrent-access anomalies	Won't affect because video is not updated often	Won't affect because video is not updated often
Security problems	May cause problem if system has authorization	May cause problem if system has authorization

5. Keyword queries used in web search are quite different from database queries. List key differences between the two, in terms of the way the queries are specified and in terms of what is the result of a query.

Keyword query	Database query
No specific syntax	Has a specific syntax
Result is an unordered list of URL	Result is a table

6. List four applications you have used that most likely employed a database system to store persistent data.

Some apps that I used might have used databases are below,

1. **Facebook:** Facebook stores metadata about videos in it's database which is persistent and doesn't change frequently.
2. **Bangla Dictionary:** Dictionary apps uses database for storing words which are pretty much persistent and doesn't get updated frequently.
3. **Gboard:** Gboard, a keyboard type application stores keyboard layouts, and other attributes like preferences are saved in persistent database.
4. **Daraz:** Daraz stores product information in persistent database. Because product information is not pretty much updated or rarely updated.

7. List four significant differences between a file-processing system and a DBMS.

File processing	DBMS
No centralized control of data	Data is controlled in one or multiple instance by one system
Data redundancy can be occurred by different files are used	Data redundancy is used to link multiple occurrence of same database
Change in one table doesn't change other same fields	Change in one occurrence applies in all other occurrences

Doesn't provide security, because authentication can't be applied	Provide authentication, so everyone can't access everything
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8. Explain the concept of physical data independence and its importance in database systems.

Physical data independence is the case when it is separated from the logical view to ensure logical view is not affected whenever a change is made to physical data.

9. List five responsibilities of a database-management system. For each responsibility, explain the problems that would arise if the responsibility were not discharged.

Some responsibility contains,

1. Redundancy minimize – without it, our database will use much more storage volume
2. Integrity maintain – without integrity, when one occurrence of data will be updated, it won't update other occurrences automatically
3. Concurrency support – without concurrency if multiple users try to do same operation, system may not work in the expected way
4. Authentication – without it anyone can access or edit data which is out of the scope of his
5. Backup and restore – without it, we may lose data permanently

10. List at least two reasons why database systems support data manipulation using a declarative query language such as SQL, instead of just providing a library of C or C++ functions to carry out data manipulation.

Firstly to make DBMS more easy and simple, SQL is used. C or C++ is much harder to write manually, and different people can use different types of code for doing the same thing, but their complexity will differ which will make it difficult to work on the same codebase.

Secondly, SQL can provide a standardization, where all of its code is highly optimized. Otherwise, programming languages could be implemented in different ways which will lack a default standard and optimization.

11. Assume that two students are trying to register for a course in which there is only one open seat. What component of a database system prevents both students from being given that last seat?

Transaction management is responsible for handling this case. This part of the database deals with consistency.

12. Explain the difference between two-tier and three-tier application architectures. Which is better suited for web applications? Why?

Currently, **three-tier is better suited for web applications.**

In two tier applications, user can directly interact with the database through front end which can cause many issues like performance. Every calculation is done

in the frontend part. And the users can also database through frontend which can also cause security concerns.

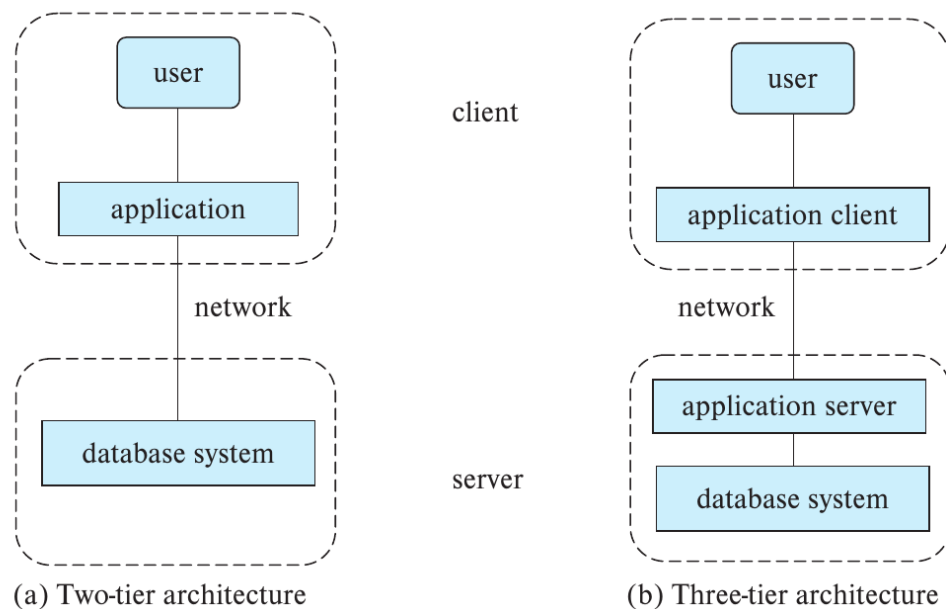


Figure 1.4 Two-tier and three-tier architectures.

On the other hand, in the three tier application, we have a backend server in between the database and the frontend. The frontend or application server directly communicates with the database, and provide services for the frontend which can gives its users more performance alongside security and authentication support.

13. List two features developed in the 2000s and that help database systems handle data-analytics workloads.

Firstly, graph databases were introduced, mainly used for social networks. Because social networks can't be described in tables efficiently. It made the social networking more practical.

Secondly, NoSQL were also created to facilitate lightweight form of data management. It was also needed for data-intensive applications. At that time data mining became ubiquitous and new frameworks were being developed.

14. Explain why NoSQL systems emerged in the 2000s, and briefly contrast their features with traditional database systems.

NoSQL systems were mainly emerged to solve some shortcomings of RDBMS systems. Some of the problems contain solving big data, scalability, real-time processing issues. Some of the features are,

1. **Scalability:** Traditional databases couldn't scale horizontally because it has a fixed data type. On the other hand in NoSQL data type is quite flexible.
2. **Performance:** Modern applications may need intensive use of data. For example data mining applications.

3. **Big data:** Social networks doesn't have a fixed pattern so it's hard to implement in the relation table structure.

15. Describe at least three tables that might be used to store information in a socialnetworking system such as Facebook.

For facebook, we may use three tables, 'user' table, 'friend' table and 'posts' table. Here's a short description,

1. **User table:**

In user table we can put,

1. unique id
2. user name
3. email
4. password (encrypted)
5. data of birth
6. profile picture
7. gender

2. **Friend table:**

In friend table, we can link to another user table,

1. unique id
2. first friend's unique id
3. second friend's unique id
4. status

3. **posts table:**

this table may contain posts of a user,

1. unique id
2. user id of the post creator
3. content
4. date