



Assignment Project Exam Help

Introduction to Database Systems – Part 1

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What is a Database?

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- Have you worked with a database?

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Definition of Databases

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- A database is a collection of related data

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- designed and built for a **specific pur**

Examples (Huge):

Amazon: – It has 244 million active customers occupying many terabytes of data (clothing, sports, videos, office products).

YouTube: – Over 1.3 billion users, 300 hours of videos added every minute, average of one billion mobile YouTube views per day



What is a Database Management System?

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- A **database management system (DBMS)** is a collection of programs that enable users to create and maintain a database.

- It is

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- **constructing:** storing data on some stor
- **manipulating:** retrieving and manipulat
- **sharing:** using data by multiple users/pr

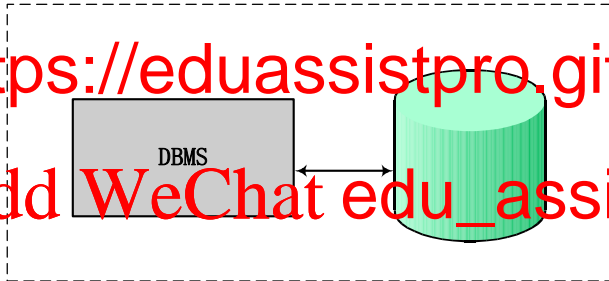
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- Well-known relational DBMSs include Oracle, IBM DB2, Microsoft's Access, Microsoft's SQL Server, MySQL, postgresQL, etc.



What is a Database System?

- A **database system** is part of information systems dealing with data retrieval and manipulation
- It often refers to a DBMS plus a database.



- Main services a database system provides:
 - answer queries efficiently;
 - execute updates efficiently.



Why is a Database System Needed?

- Database system: an integrated collection of logically related data
- File system: many separate and unrelated files

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Why is a Database System Needed?

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- Advantages of using a database system
 - **Data redundancy:** Data redundancy is controlled to ensure

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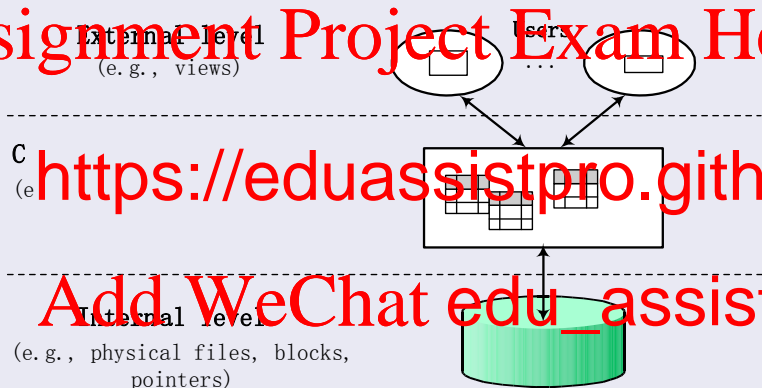
- **Data security:** Since the data is managed, it ensures that the database access is through

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In addition to the above, the database system provides the following:

Concurrent transactions; backup and recovery services; data independence; etc.

Three-level ANSI/SPARC Architecture



- **Note:** schemas at the three levels are *descriptions* of data; the stored data *actually* exists at the internal level (i.e., physical level) only.



Three-level ANSI/SPARC Architecture

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- **External Schema**

- perspective of the user / application



- **Conceptual Schema**



- describes what data is stored in the database
data (independent from their physical storage)

- **Internal Schema**

- perspective of the implementation / system realization
- describes how data is stored in the database (e.g., physical storage structures).



Derived Principles – Data Independence

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- **Logical data independence:** change the conceptual/logical schemas
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- **Physical data independence:** change the in
to change the conceptual/logical schemas

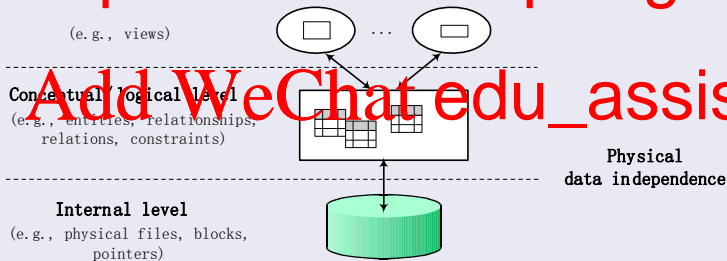
Example: If physical files were reorganised, we should not have to change the conceptual/logical schemas.

Derived Principles – Data Independence

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- **Key idea:** When the schema is changed at some level,
 - the schema at the next higher level remains unchanged;
 -

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Historical Remarks I/II

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• Hierarchical Databases

- Oldest data model (1960s);

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- Extension of hierarchical databases, fro

• Relational Databases

- Edgar F. Codd,
A Relational Model of Data for Large Shared Data Banks
- System R and SQL



Historical Remarks II/II

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Object-Oriented Databases

- Driven by object-oriented programming languages (1980s);



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- XML is emerged as the standard for Web dat

- Suitable to sparse data, deeply nested data

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• NoSQL Databases

- Recent development in industry (since 2009);
- We will discuss NoSQL databases at the end of this course.