

# Structure Relational Database



10301223

ฐานข้อมูลโครงสร้างเชิงสัมพันธ์

# คำอธิบายรายวิชา (Course Description)

(บรรยาย 2 ชั่วโมง ปฏิบัติ 3 ชั่วโมง ศึกษาด้วยตนเอง 5 ชั่วโมง/สัปดาห์)

การออกแบบและประยุกต์ใช้งาน  
ด้านระบบฐานข้อมูล พีชคณิตเชิง  
สัมพันธ์ แบบจำลองข้อมูล  
กระบวนการนอร์มัลไลเซชัน ภาษา  
สำหรับการสืบค้น (เอสคิวแอล การ  
รวบรวมชุดคำสั่ง) การประมวลผล  
การสืบค้น (การเชื่อมโยง, การ  
เรียงลำดับ, การรวม, การเพิ่ม  
ประสิทธิภาพ)

design and implementation  
of database management  
systems. relational algebra.  
data models, normalization;  
query languages (SQL, stored  
procedures), query  
processing (joins, sorting,  
aggregation, optimization)

# Course Outline

Database Fundamental

Relational Model

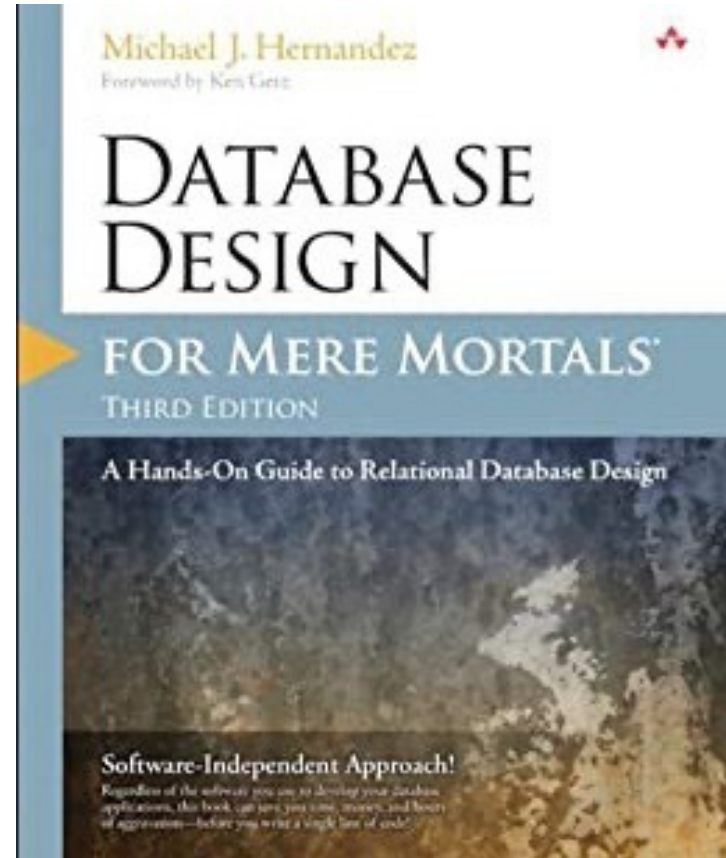
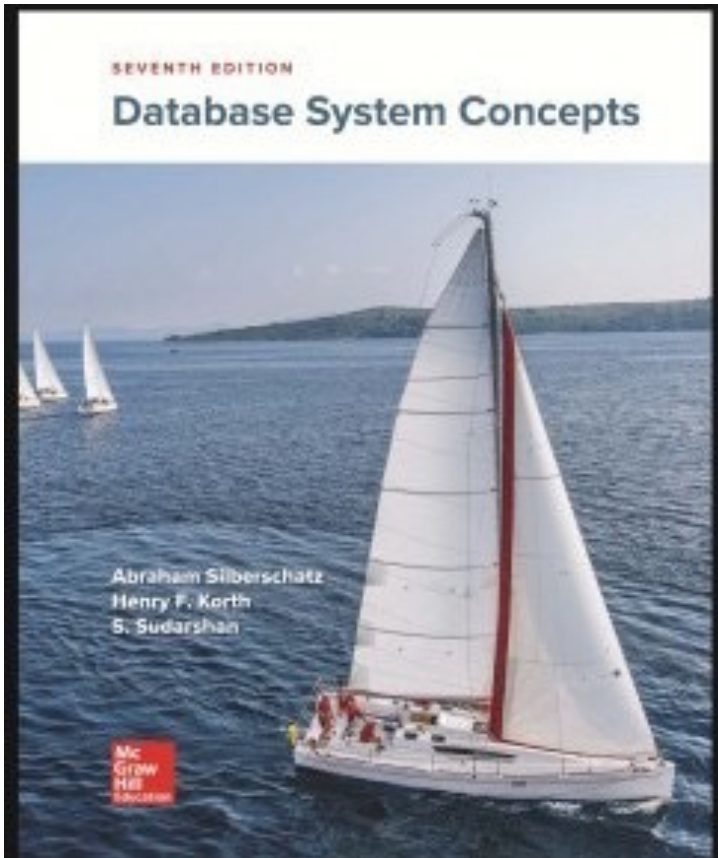
Database Design

SQL

Query Process

Transaction Management

# Resource



- **Database System Concepts.** 7th Edition. Avi Silberschatz, Henry F. Korth & S. Sudarshan. McGraw-Hill. ISBN 9780078022159
- **Database Design for Mere Mortals.** 4th Edition. Michael J. Hernandez. Addison-Wesley Professional. ISBN 9780136788041

# Course Rubric



Assignment

60%



Midterm Exam

20%



Final Exam

20%

# Data ?

1. **Data** constitute the building blocks of information
2. **Information** is produced by processing data
3. Information is used to reveal the meaning of data
4. Good relevant and timely information are the key to good decision making
5. Good decision making is the key to organization survival in global environment

# Data vs Information



คะแนนสอบของ  
นักศึกษา

คะแนน  
เฉลี่ยของ  
นักศึกษา

**Processes**

**Data**

**Information**



# Data Processing

- Calculating : คำนวณ mean, median, mode,...
- Summarizing : สรุปผลรวม, ค่าเฉลี่ย
- Updating : ปรับแก้ไข
- Sorting : เรียงลำดับข้อมูล
- Reporting : รายงานข้อมูลในมิติต่าง ๆ
- Searching : ผลการค้นหาข้อมูล
- Classifying : แยกข้อมูลตามประเภท





# Data ?

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# History of Database Systems

## 1960s:

- Data processing using magnetic tapes for storage : **Tapes** provided only sequential access
- Punched cards for input

## 1970s:

- **Hard disks** allowed direct access to data
- **Network** and hierarchical data models in widespread use
- **Ted Codd** defines the **relational data model** : **Oracle** releases first commercial relational database
- High-performance (for the era) transaction processing

## 1980s:

- Research relational prototypes evolve into **commercial systems** : **SQL** becomes industrial standard
- **Parallel and distributed** database systems : Wisconsin, IBM, Teradata
- **Object-oriented** database systems

## 1990s:

- Large **decision** support and **data-mining** applications
- Large multi-terabyte data **warehouses**
- Emergence of **Web commerce**

## 2000s

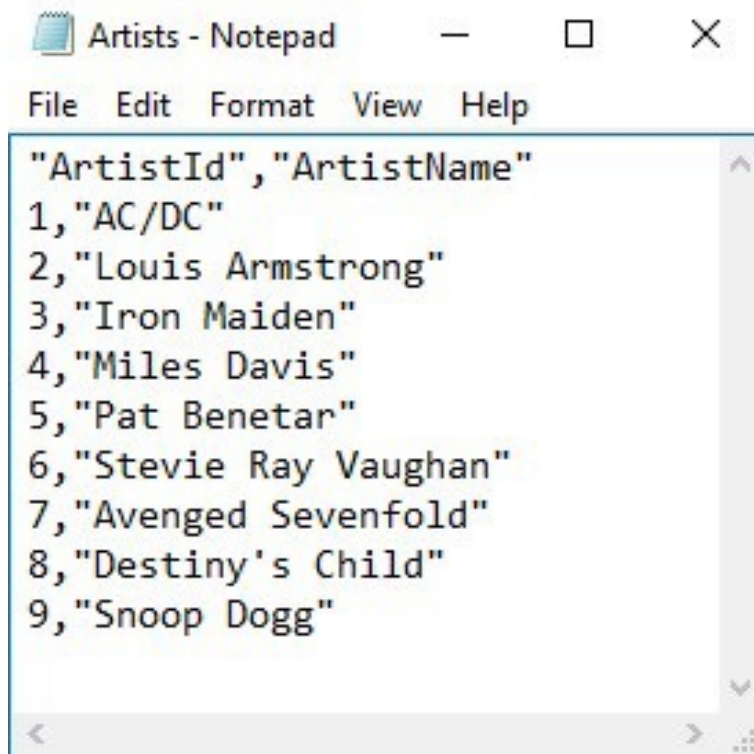
- **Big data** storage systems
  - Google BigTable, Yahoo PNuts, Amazon,
- “NoSQL” systems.
- Big data analysis: beyond SQL
  - **Map reduce** and friends

## 2010s

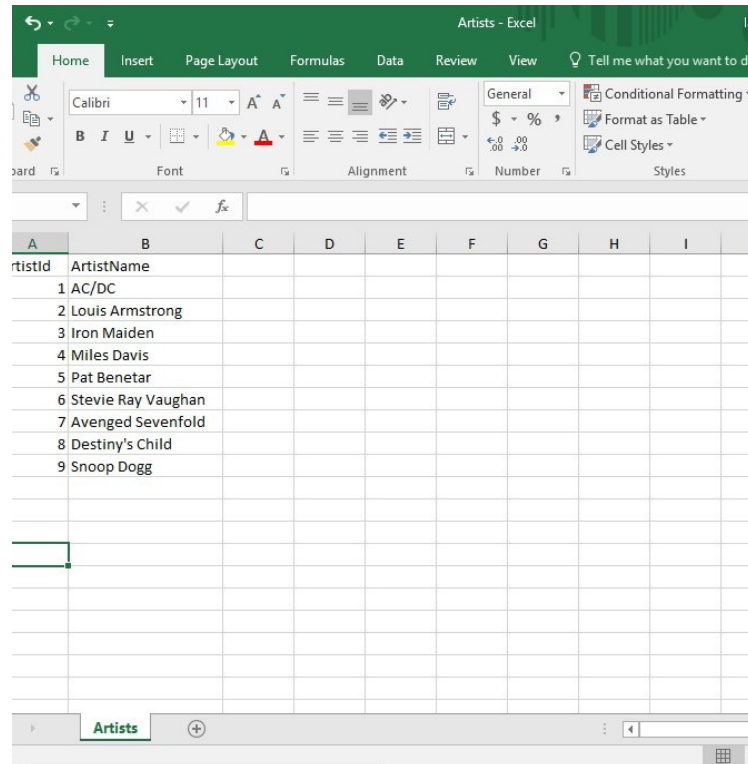
- **SQL reloaded**
  - SQL front end to Map Reduce systems
- Massively parallel database systems
- Multi-core main-memory databases

# Database ?

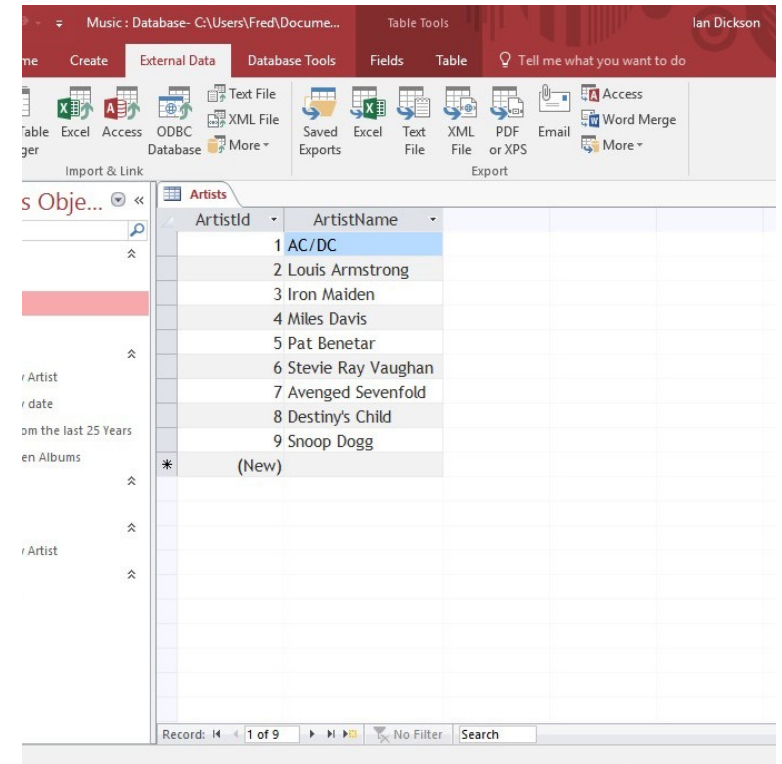
- Database is a **collection of data**.
- Database is a collection of **related** data and data is a collection of facts and figures that can be **processed** to produce information



```
"ArtistId","ArtistName"  
1,"AC/DC"  
2,"Louis Armstrong"  
3,"Iron Maiden"  
4,"Miles Davis"  
5,"Pat Benetar"  
6,"Stevie Ray Vaughan"  
7,"Averged Sevenfold"  
8,"Destiny's Child"  
9,"Snoop Dogg"
```



ArtistId	ArtistName
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*	(New)

# Database Management System?

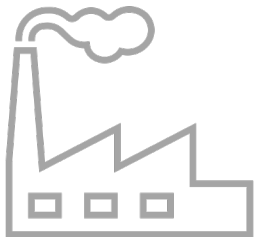
- Database Management System (DBMS) is a collection of **programs** which enables its users **to access a database**, manipulate data and reporting/representation of data.
- DBMS contains information about a particular enterprise
  - Collection of interrelated data
  - Set of programs to access the data
  - An environment that is both convenient and efficient to use
- Database systems are used **to manage collections of data** that are:
  - Highly valuable
  - Relatively large
  - Accessed by multiple users and applications, often at the same time.

# Tools



Microsoft®  
**SQL Server®**





# Database Applications Examples

- **Enterprise Information**

- Sales: customers, products, purchases
- Accounting: payments, receipts, assets
- Human Resources: Information about employees, salaries, payroll taxes.

- **Manufacturing:** management of production, inventory, orders, supply chain.

- **Banking and finance**

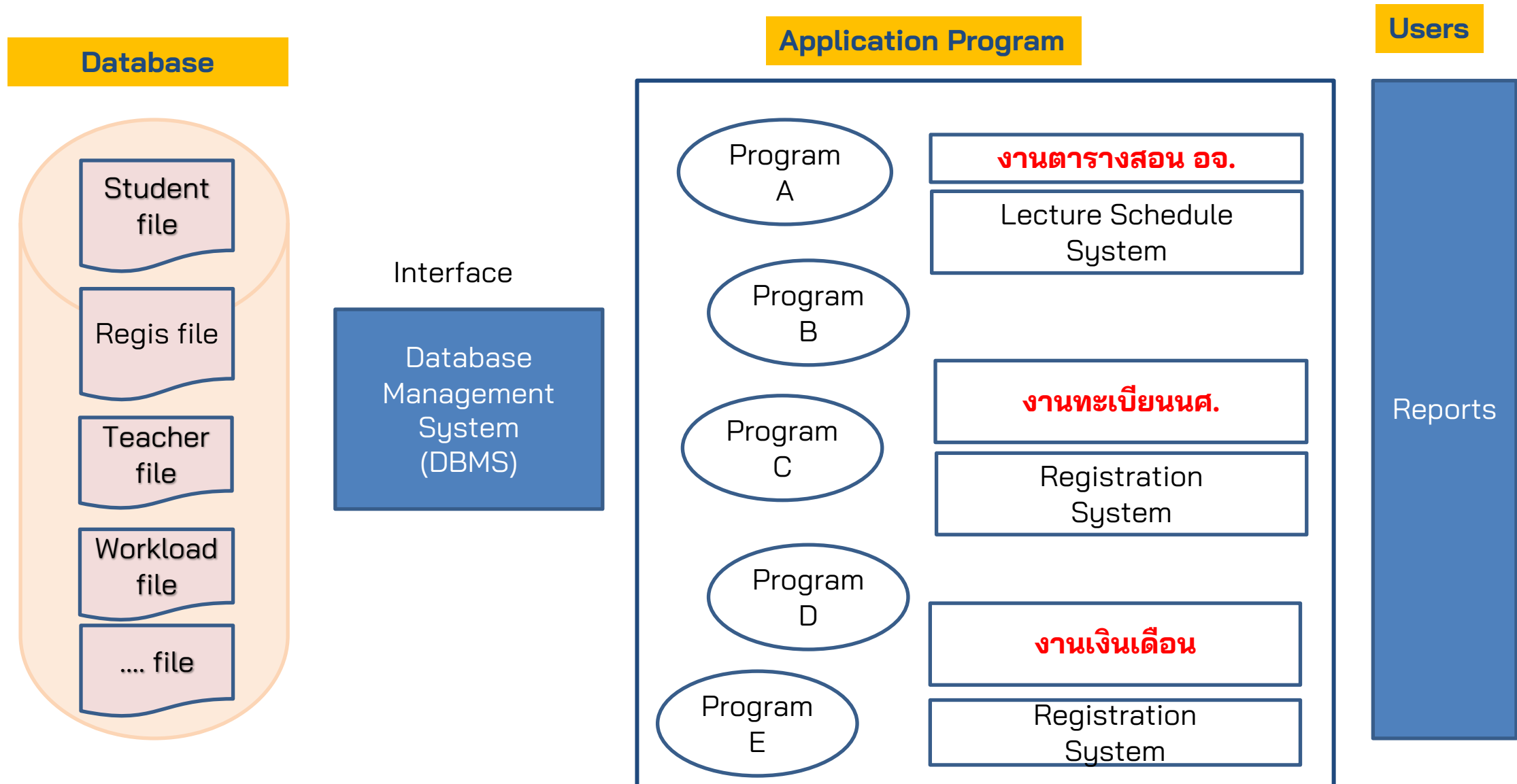
- customer information, accounts, loans, and banking transactions.
- Credit card transactions
- Finance: sales and purchases of financial instruments (e.g., stocks and bonds; storing real-time market data)

- **Universities:** registration, grades

- Etc.



# การแก้ไขปัญหาระบบไฟล์ข้อมูล ด้วย ระบบฐานข้อมูล

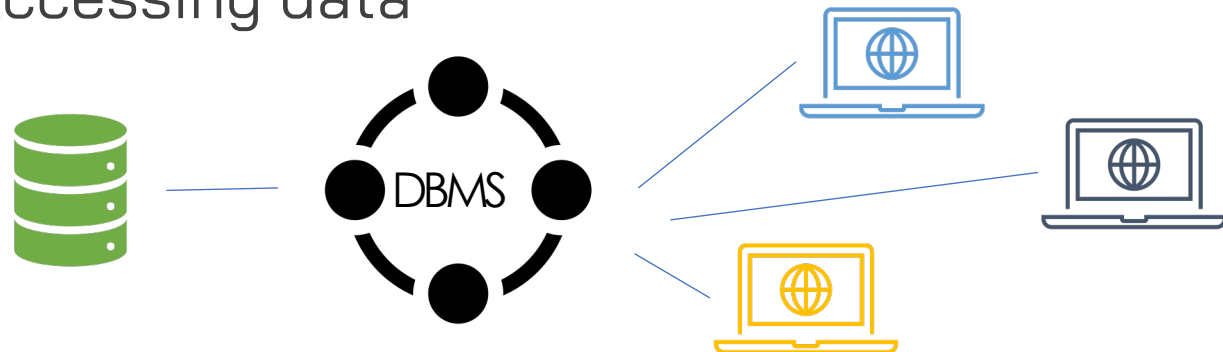


# Purpose of Database Systems

- **Data redundancy and inconsistency** : data is stored in multiple file formats resulting induplication of information in different files

Emp_code	Emp_name	Emp_experience	Dep_id	Dep_manager_name
1	Arpit	2	22	Ankit
2	Ajay	5	18	Mohit
3	Deepak	3	17	Shruti
4	Chetan	1	22	Ankit
5	Manish	4	18	Mohit
6	Abhishek	2	19	Rohit

- Accessing data





# Purpose of Database Systems

- **Data isolation** : Multiple files and formats



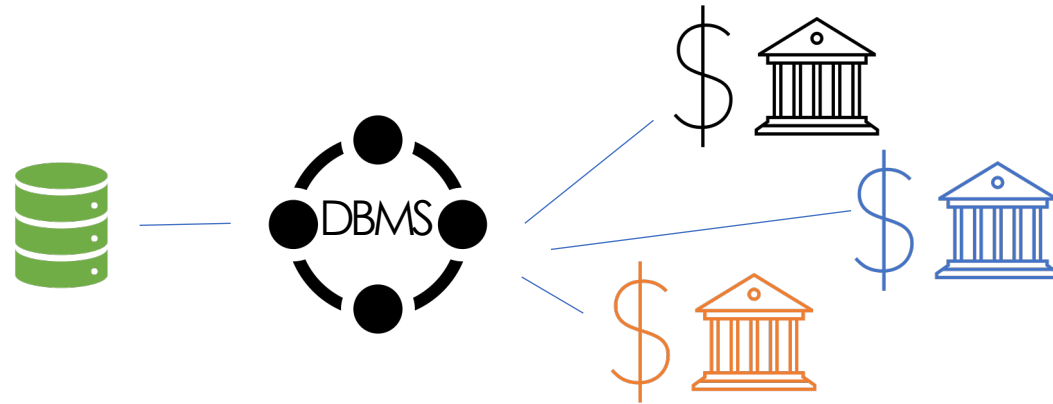
- **Integrity constraints**: The existence of such constraints allows storing of data in an organized and refined manner.



- **Security** : provide user access

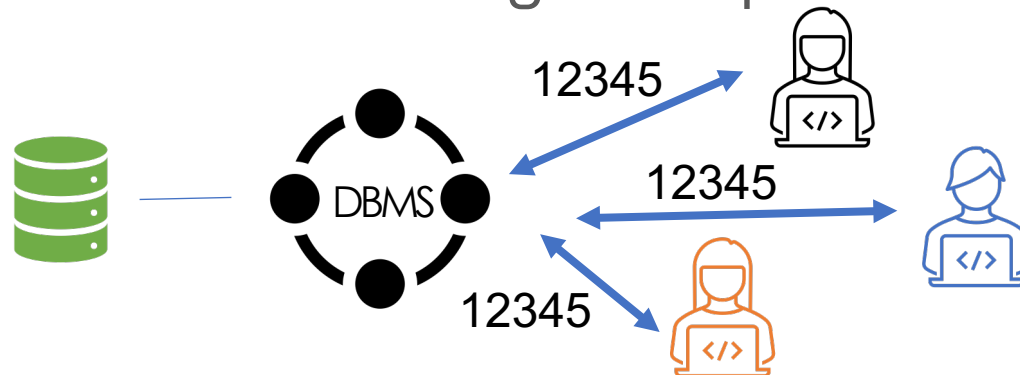
# Purpose of Database Systems

- Atomicity of updates



Transfer of funds from one account to another should either complete or not happen at all

- Concurrent access by multiple users



# Database Architecture



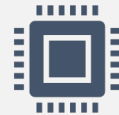
Centralized  
databases

One to a few cores, shared  
memory



Client-server,

One server machine executes  
work on behalf of multiple client  
machines.



Parallel databases

Many core shared memory  
Shared disk  
Shared nothing

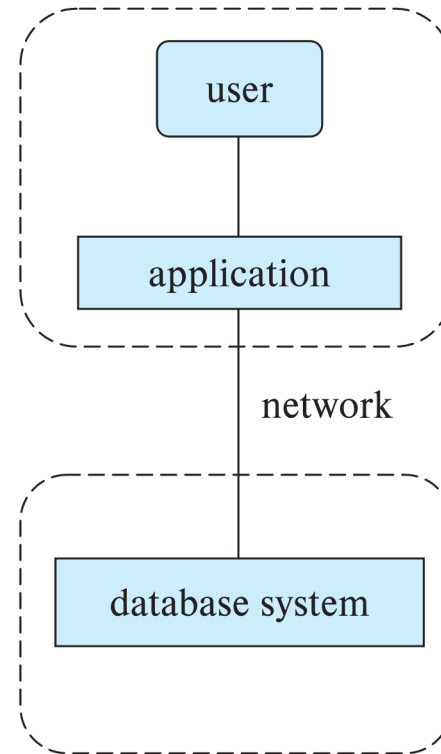


Distributed  
databases

Geographical distribution  
Schema/data  
heterogeneity

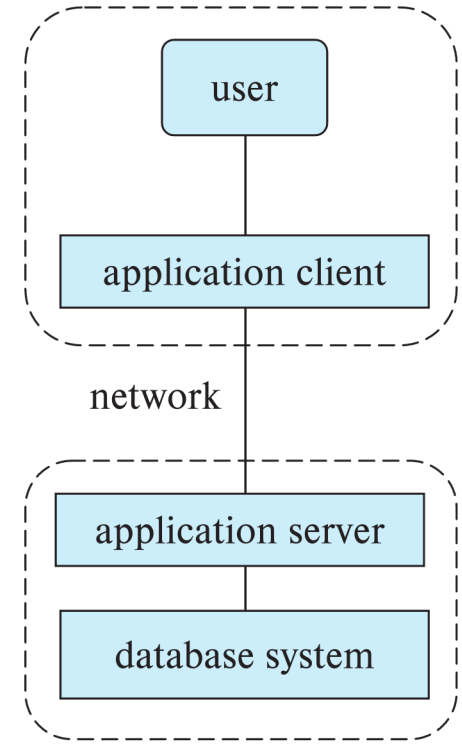
# Database Applications

- **Two-tier architecture** --the application resides at the client machine, where it invokes database system functionality at the server machine
- **Three-tier architecture** -- the client machine acts as a front end and does not contain any direct database calls.
  - The client end communicates with an application server, usually through a forms interface.
  - The application server in turn communicates with a database system to access data.



(a) Two-tier architecture

client

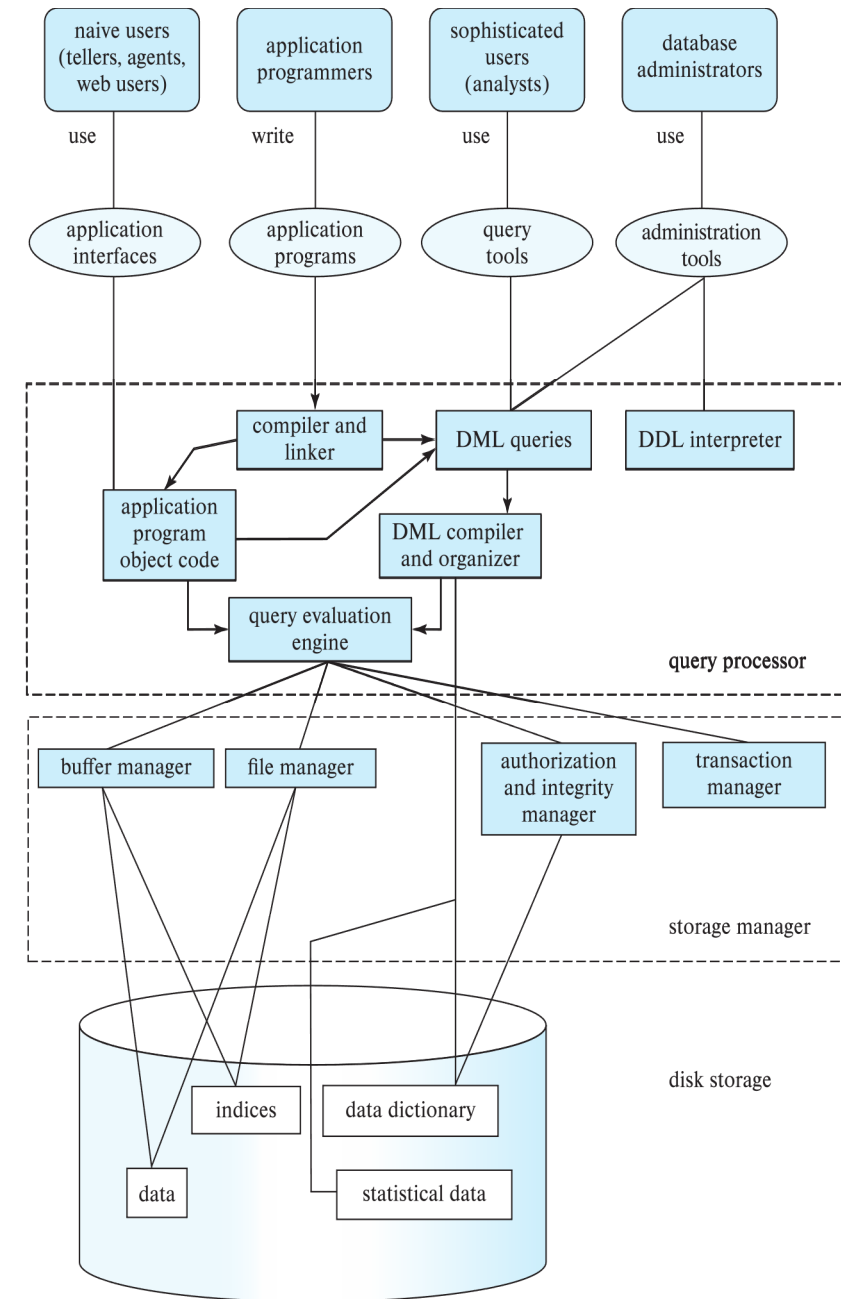


server

(b) Three-tier architecture



# Database Users



# Database Administrator

A person who has central control over the system is called a **database administrator (DBA)**. Functions of a DBA include:

Schema definition

Storage structure and access-method definition

Schema and physical-organization modification

Granting of authorization for data access

Routine maintenance

Periodically backing up the database

Ensuring that enough free disk space is available

Monitoring jobs running on the database



# Data Management System ?

# Q&A



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