

Introduction to Databases

What Are Key Questions?

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- What is a database?
- What is a database management system (DBMS)?
- Why and when do we need a DBMS?

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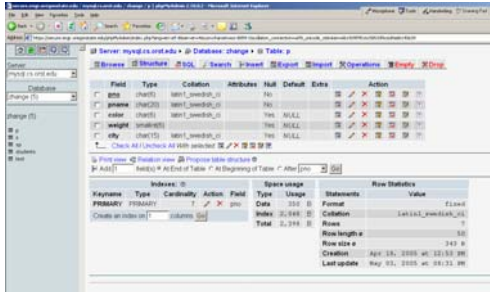
- How is data represented in DBMS?
- How is data retrieved and manipulated?
- How does DBMS support concurrent access?

What Are Key Questions?

- How does DBMS protect data during crash?
- What are the main components of a DBMS?
- Who is involved with databases in real life?

What is Database?

What is Database Management System?



What is Database Management System?

	pno	pname	color	weight	city
<input type="checkbox"/>	p1	nut	red	12	London
<input type="checkbox"/>	p2	bolt	green	17	Paris
<input type="checkbox"/>	p3	screw	blue	17	Rome
<input type="checkbox"/>	p4	screw	red	14	London
<input type="checkbox"/>	p5	cam	blue	12	Paris
<input type="checkbox"/>	p8	cog	red	19	London
<input type="checkbox"/>	P7	TEST	NULL	NULL	NULL

Check All / Uncheck All With selected

Show: row(s) starting from record #

in mode and repeat headers after cells

Why and When Do We Need DBMS?

Why and When Do We Need DBMS?

- A large amount of data,
- Concurrent access by many users,
- Fast access,
- Consistent data update,
- Role-based security,
- Robust against hardware failures and OS crashes.

Why and When Do We Need DBMS?

- Advantages of DBMS
 - Data independence (you can still access the data using Windows 95).

Why and When Do We Need DBMS?

- Advantages of DBMS
 - Efficient data access
 - High-quality data compression schemes,
 - Fast data retrieval and search algorithms.

Why and When Do We Need DBMS?

- Advantages of DBMS
 - Data integrity and security
 - Programs can prevent invalid queries from being executed,
 - Access control can be enforced.

Why and When Do We Need DBMS?

- Advantages of DBMS
 - Centralized data administration
 - The DBA can optimize the organization of the data to facilitate its uses.

Why and When Do We Need DBMS?

- Advantages of DBMS
 - Concurrent access

Why and When Do We Need DBMS?

- Advantages of DBMS
 - Crash recovery

Why and When Do We Need DBMS?

- Advantages of DBMS
 - Reduced application development time

Why and When Do We Need DBMS?

- Disadvantages of DBMS
 - High startup cost (time and effort)
 - Relatively high maintenance

When Not to Use DBMS?



When Not to Use DBMS?



How Is Data Represented?

How Is Data Represented?

- A data model
 - A collection of high-level data descriptions,
 - Hides low-level storage details.
- A semantic data model
 - More abstract,
 - Serves as an startup point for the design,
 - Farther away from the physical storage than a data model.

How Is Data Represented?

- The relational model
 - Relation (records)
 - Schema
 - Data descriptions, such as name of the relation and individual field.

Field	Type	Collation	Attributes	Null	Default	Extra	Action
id	char(8)	latin1_swedish_ci		No			
name	char(20)	latin1_swedish_ci		No			
color	char(8)	latin1_swedish_ci	Yes	NULL			
weight	smallint(6)		Yes	NULL			
city	char(15)	latin1_swedish_ci		Yes	NULL		

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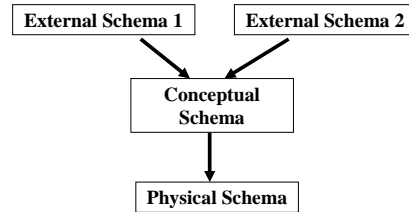
How Is Data Represented?

- The relational model
 - Relation (records)
 - Schema
 - Integrity constraints

Field	Type	Collation	Attributes	PK	Defini	Extra	Action
id	char(5)	latin1_swedish_ci		No			
name	char(20)	latin1_swedish_ci		No			
color	char(5)	latin1_swedish_ci		Yes	AI,LL		
weight	smallint(5)			Yes	AI,LL		
city	char(15)	latin1_swedish_ci		Yes	AI,LL		

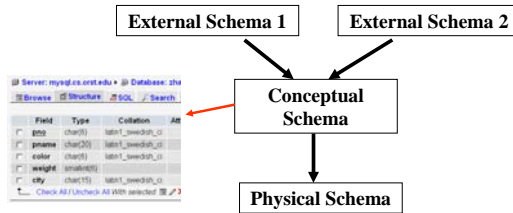
How Is Data Represented?

- Three-level of abstraction



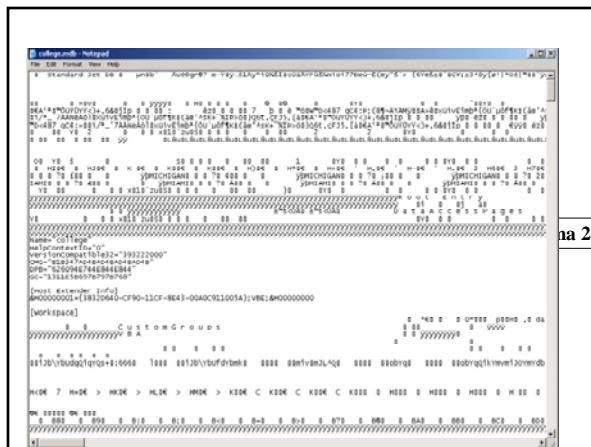
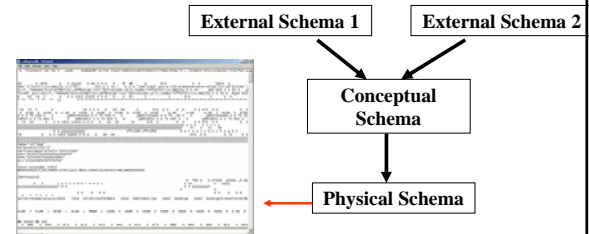
How Is Data Represented?

- Conceptual schema (logical schema)
 - Data model



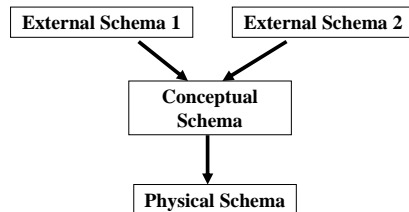
How Is Data Represented?

- Physical schema
 - Data storage



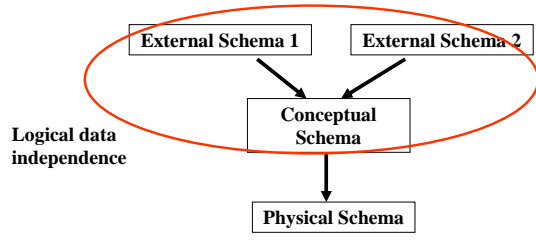
How Is Data Represented?

- External schema
 - Different views



How Is Data Represented?

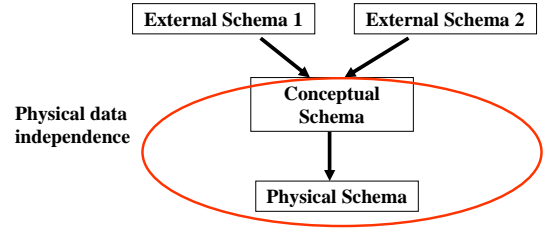
- Data independence



Logical data independence

How Is Data Represented?

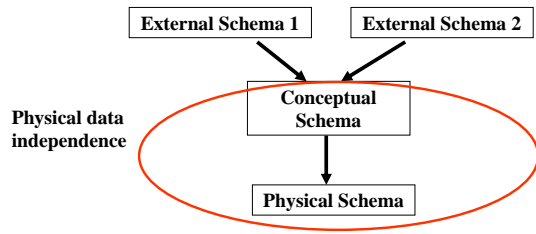
- Data independence



Physical data independence

How Is Data Represented?

- Data independence



Physical data independence

How Is Data Retrieved and Manipulated?

- Queries
 - Data manipulation language (DML)
 - Retrieval
 - Add
 - Delete
 - Update

How Does DBMS Support Concurrent Access?

- Transaction
 - Any one execution of a user program in DBMS.
 - Locking protocol
 - Shared
 - Exclusive

How Does DBMS Protect Data During Crash?

- Transaction
 - Incomplete
 - Log
 - Must be done before the transaction is finalized

Who is Involved With Databases in Real Life?

- Database application programmers
- Database administrators
 - Conceptual and physical schemas
 - Security and authorization
 - Data availabilities and recoveries
 - Database tuning

Questions?