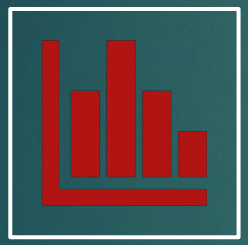
Data Information Systems Management

Database Systems

LECTURE 1 – DATABASES

CHAPTER OUTLINE



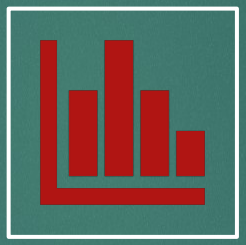
Managing Data

The Database Approach

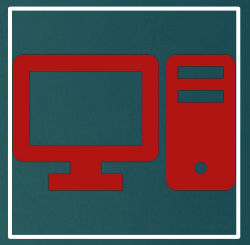
Database Management Systems

What’s the big deal about databases?

Who has used a database today?



What data are they recording



What data is stored in these databases

Annual Flood of Data from.....

Credit/Debit card swipes

E-mails

Digital video

CCTV

RFID tags

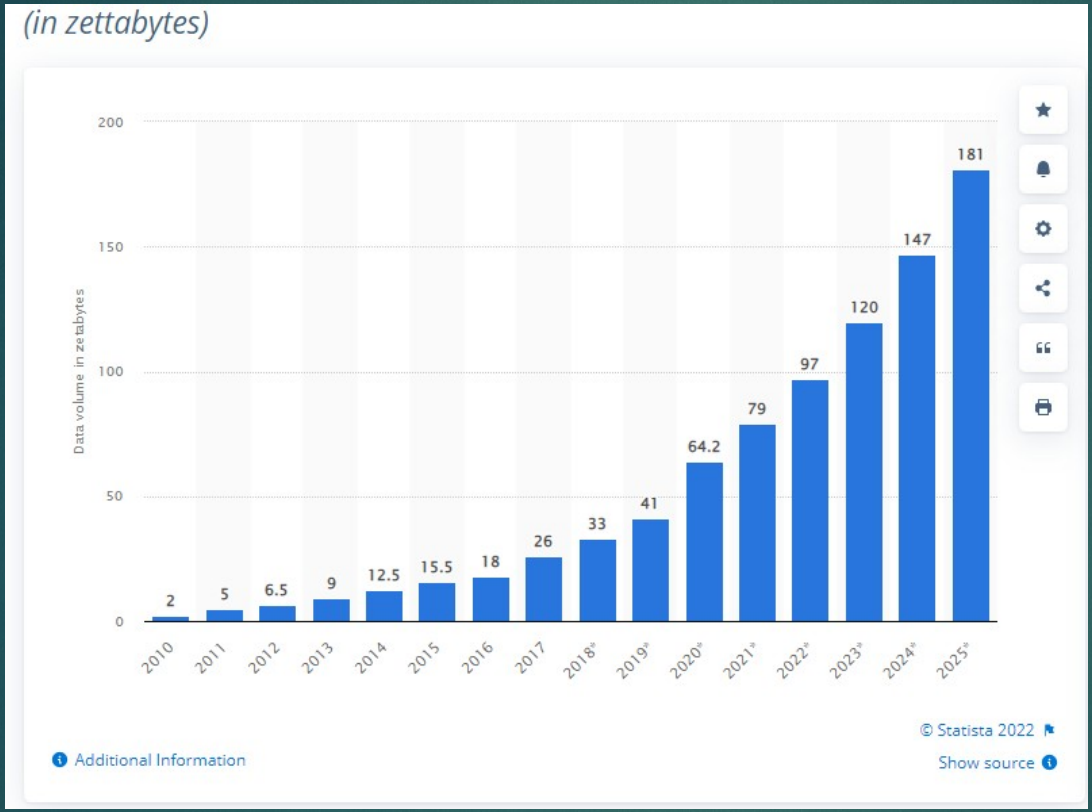
Social Media

Telemetry

Radiology scans

Source: Media Bakery

Annual Flood of New Data!



In the zettabyte range

A zettabyte is 1000 exabytes

The Difficulties of Managing Data

- Amount of data increasing exponentially
- Data are scattered throughout organizations and collected by many individuals using various methods and devices.
- Data come from many sources.
- Data security, quality, and integrity are critical.

There is a need for Data Governance

Data Governance

- **Data Governance:** is an approach to managing information across an entire organization

- **Master Data Management :**is a process that spans all of an organization's business processes

- **Master Data:** are a set of core data that span all of an enterprise's information systems.

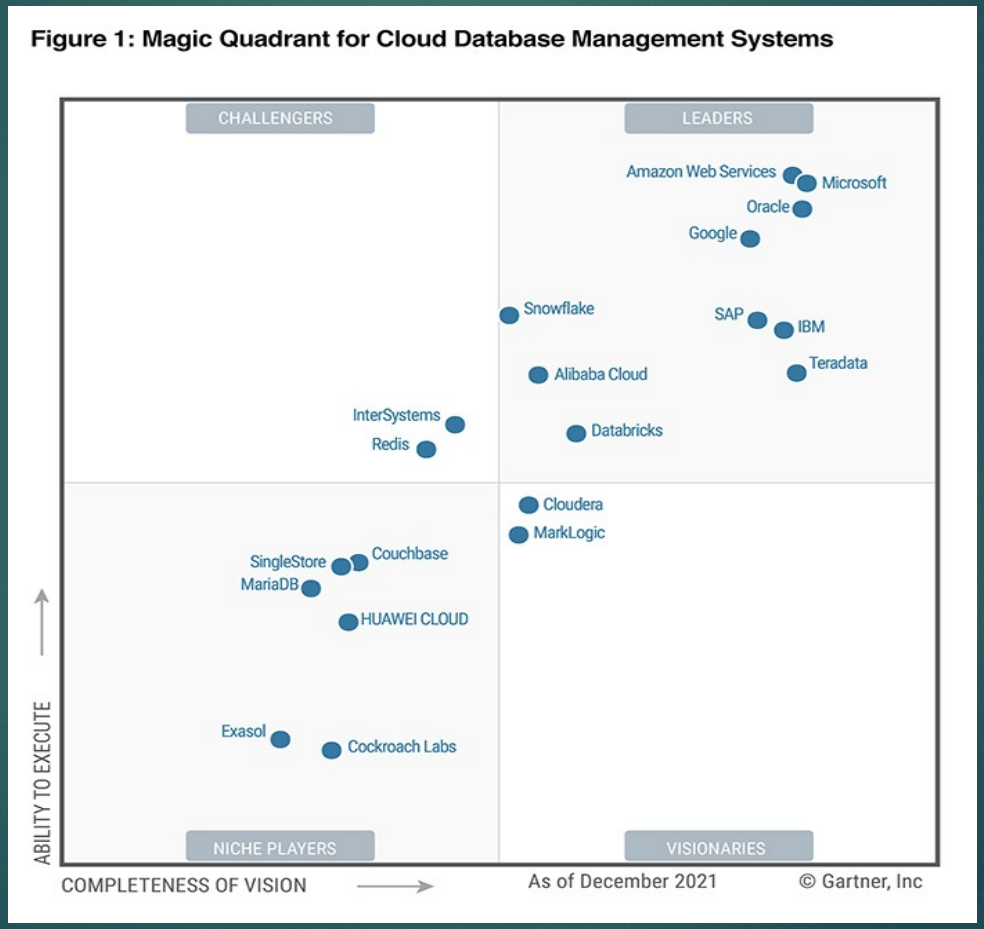
See video The benefits of a Master Data Management system

Master Data Management

- Top 10 Enterprise Database Systems to consider in 2023

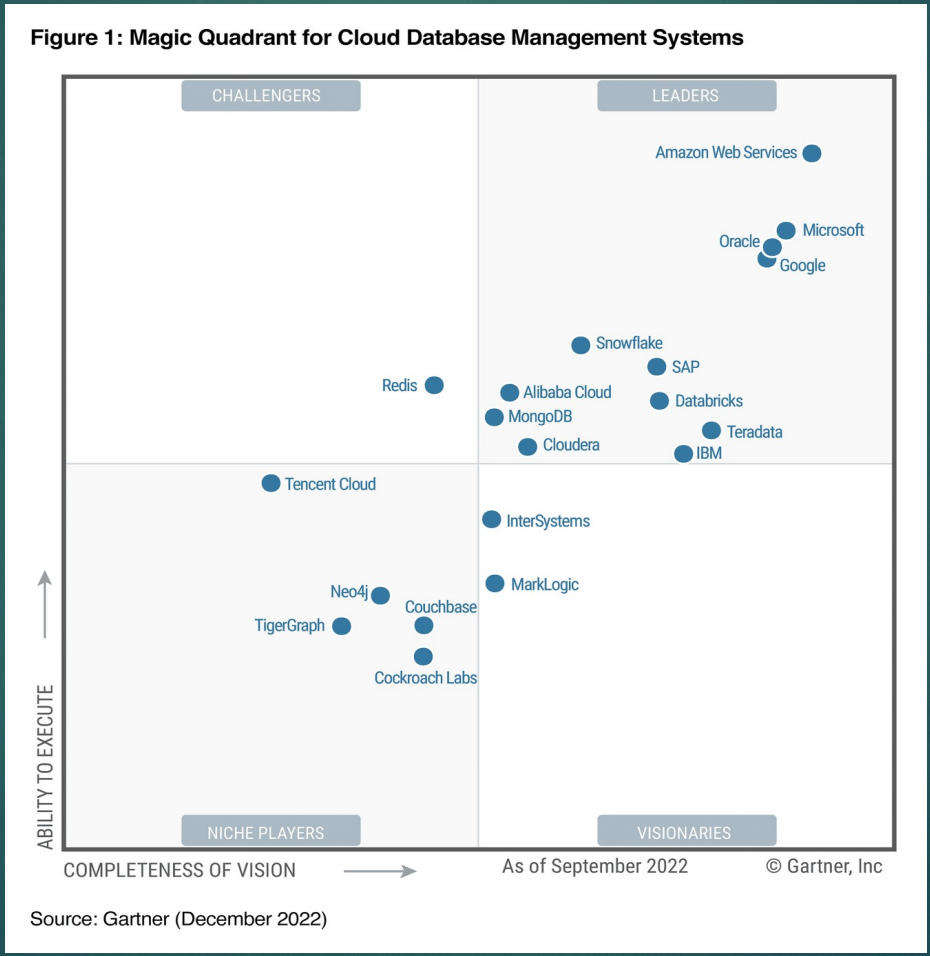
* Note of caution depending on who is producing these stats we must just accept these are indicative in nature

Data Management systems 2021



Source: Gartner Magic Quadrant 2021

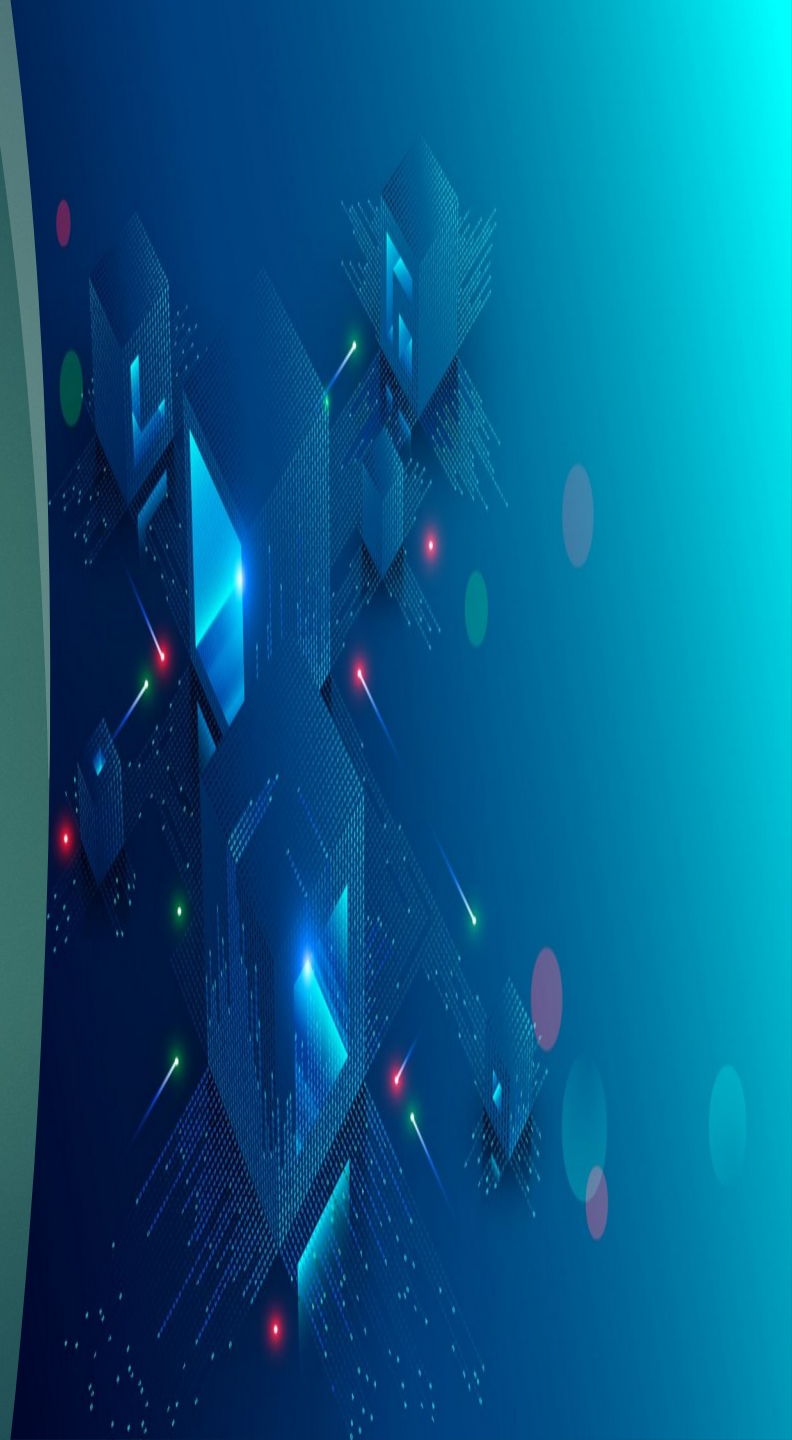
Data Management systems 2022 (December)



Source: Gartner Magic Quadrant 2022

The Database Approach

- Oracle Database concepts
  - Oracle database concepts
  - Top differences between Oracle and Microsoft SQL server
  - MySQL versus Oracle Featues/Functionality



The Database Approach

Database management system (DBMS) minimize the following problems:

Data redundancy: The same data are stored in many places.

Data isolation: Applications cannot access data associated with other applications.

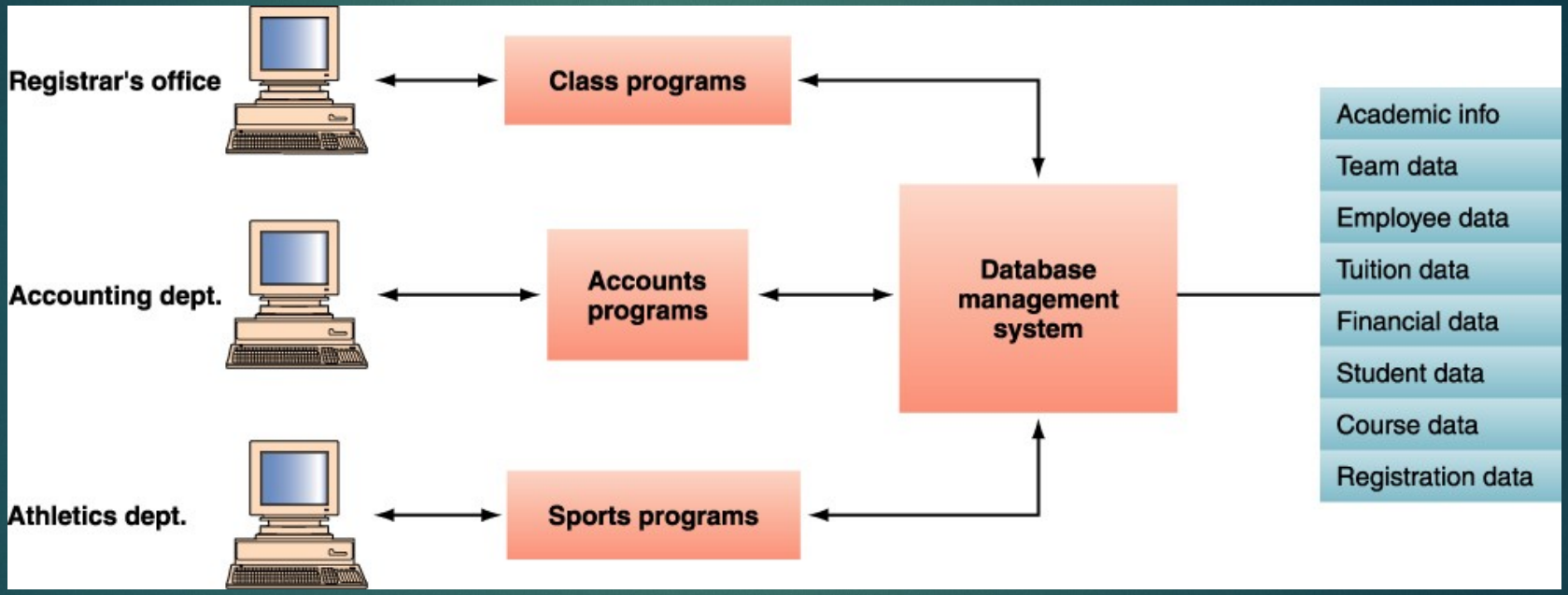
Data inconsistency: Various copies of the data do not agree.

Database Approach (continued)

DBMSs maximize the following issues:

- **Data security:** Keeping the organization's data safe from theft, modification, and/or destruction.
- **Data integrity:** Data must meet constraints (e.g., student grade point averages cannot be negative).
- **Data independence:** Applications and data are independent of one another. Applications and data are not linked to each other, meaning that applications are able to access the same data.

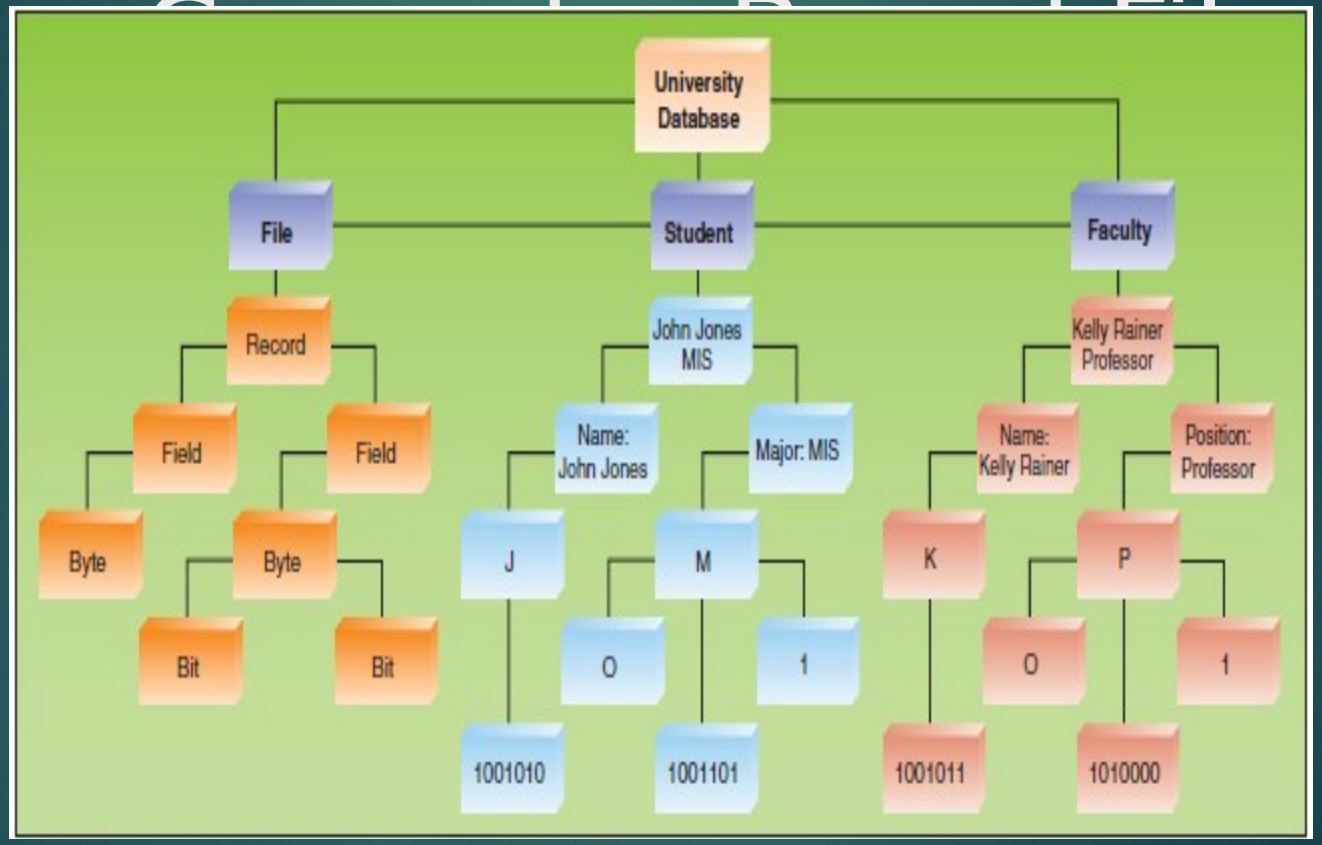
Database Management Systems



Data Hierarchy

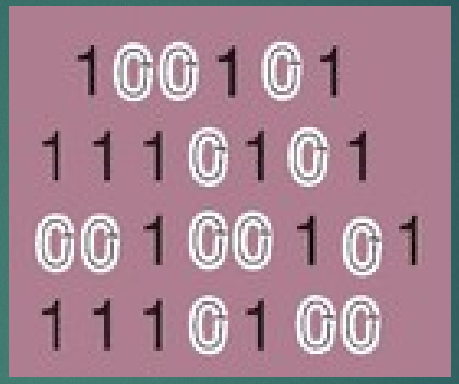
- A **bit** is a binary digit, or a “0” or a “1”.
- A **byte** is eight bits and represents a single character (e.g., a letter, number or symbol).
- A **field** is a group of logically related characters (e.g., a word, small group of words, or identification number).
- A **record** is a group of logically related fields (e.g., student in a university database).
- A **file** is a group of logically related records.
- A **database** is a group of logically related files.

Hierarchy of Data for a

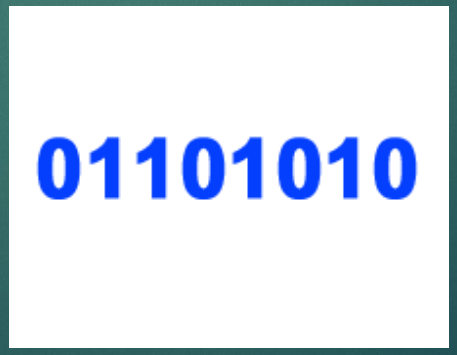


Data Hierarchy (continued)

Bit (binary digit)

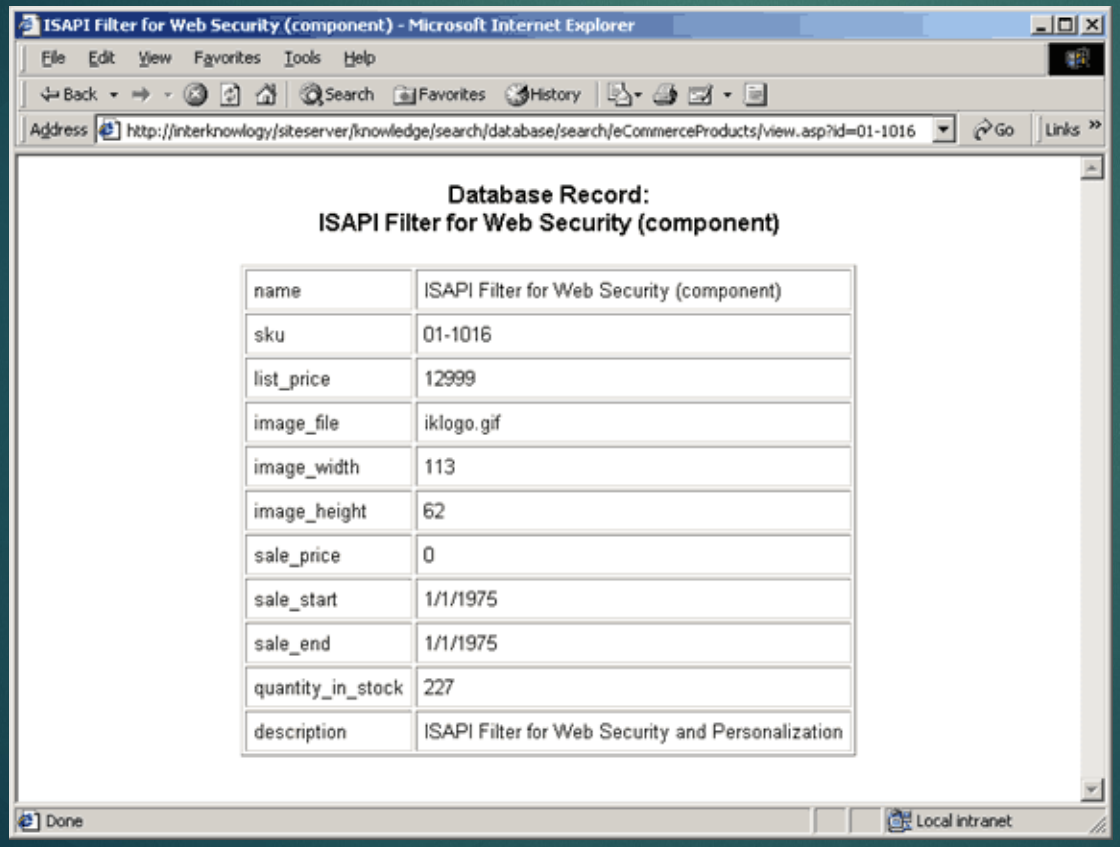


Byte (eight bits)



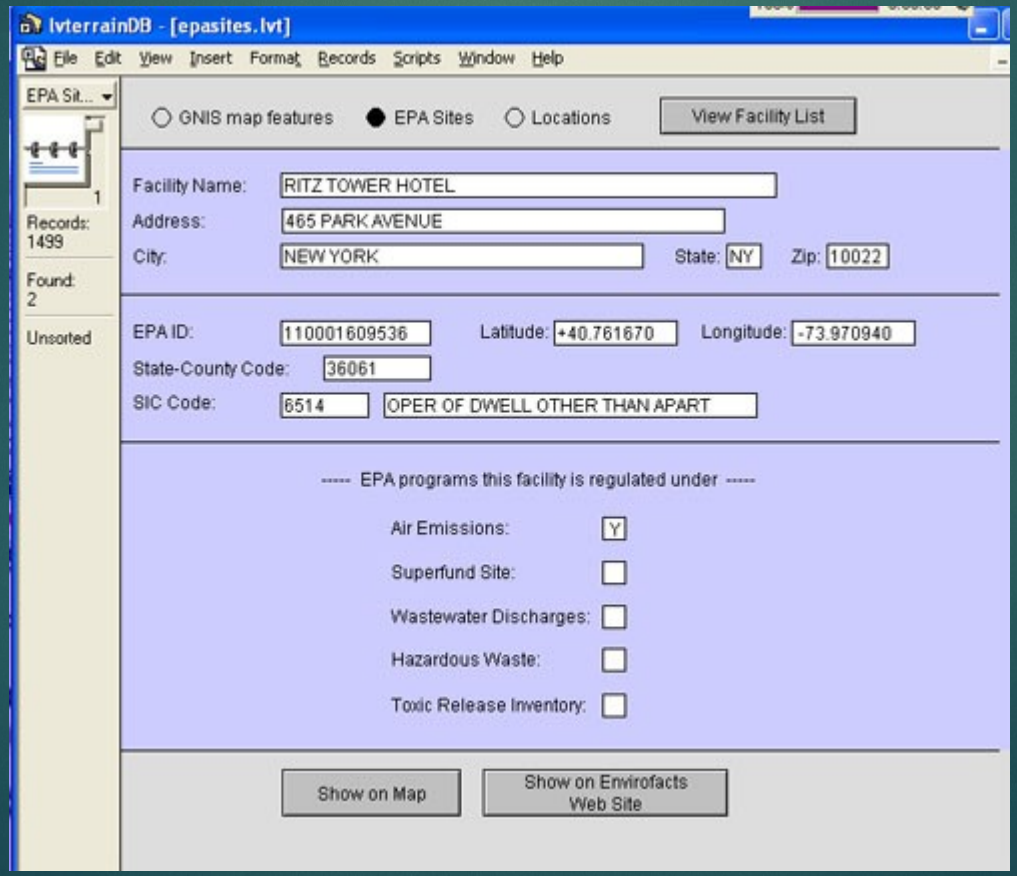
Data Hierarchy (continued)

Example of Field and Record



Data Hierarchy (continued)

Example of Field and Record



Designing the Database

Data model

- The **data model** is a diagram that represents the entities in the database and their relationships.
- An **entity** is a person, place, thing, or event about which information is maintained. A record generally describes an entity.
- An **attribute** is a particular characteristic or quality of a particular entity.
- The **primary ke**y is a field that uniquely identifies a record.
- **Secondary keys** are other field that have some identifying information but typically do not identify the file with complete accuracy.

Entity-Relationship Modeling

Database designers plan the database design in a process called **entity-relationship (ER) modeling.**

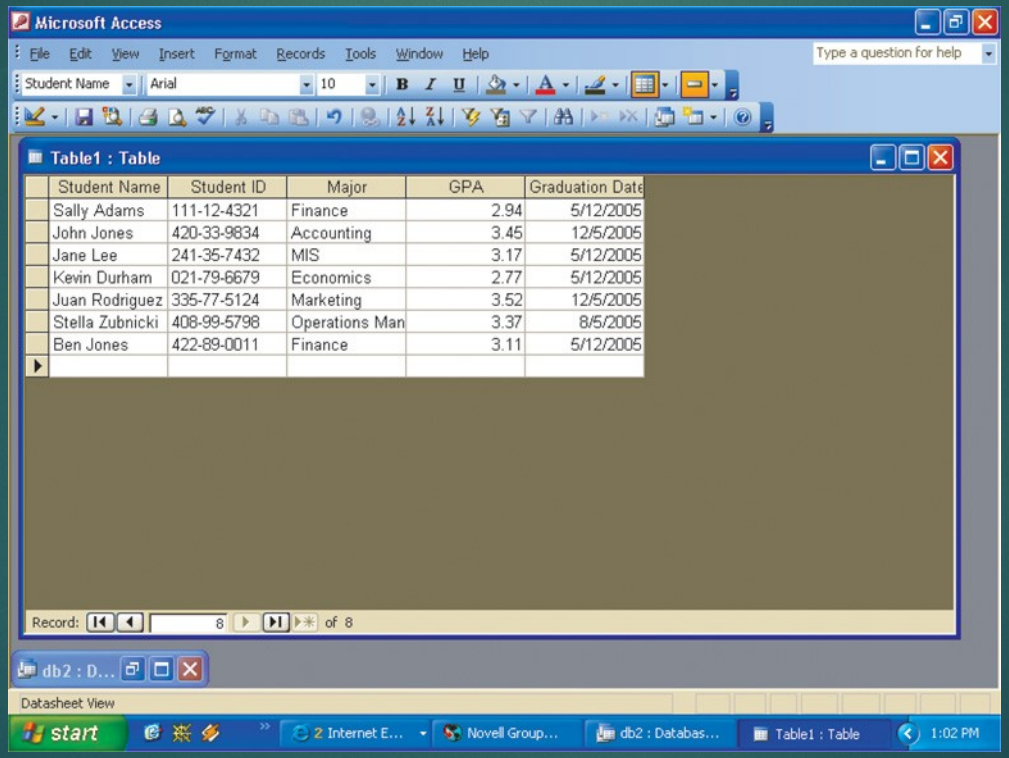
ER diagrams consists of entities, attributes and relationships.

- **Entity classes** are groups of entities of a certain type.
- An **instance** of an entity class is the representation of a particular entity.
- Entity instances have **identifiers**, which are attributes that are unique to that entity instance.

Database Management Systems

- A **database management system** is a set of programs that provide users with tools to add, delete, access, and analyze data stored in one location.
- The **relational database model** is based on the concept of two-dimensional tables.
- **Structured query language** allows users to perform complicated searches by using relatively simple statements or keywords.
- **Query by example** allows users to fill out a grid or template to construct a sample or description of the data he or she wants.

Student Database Example



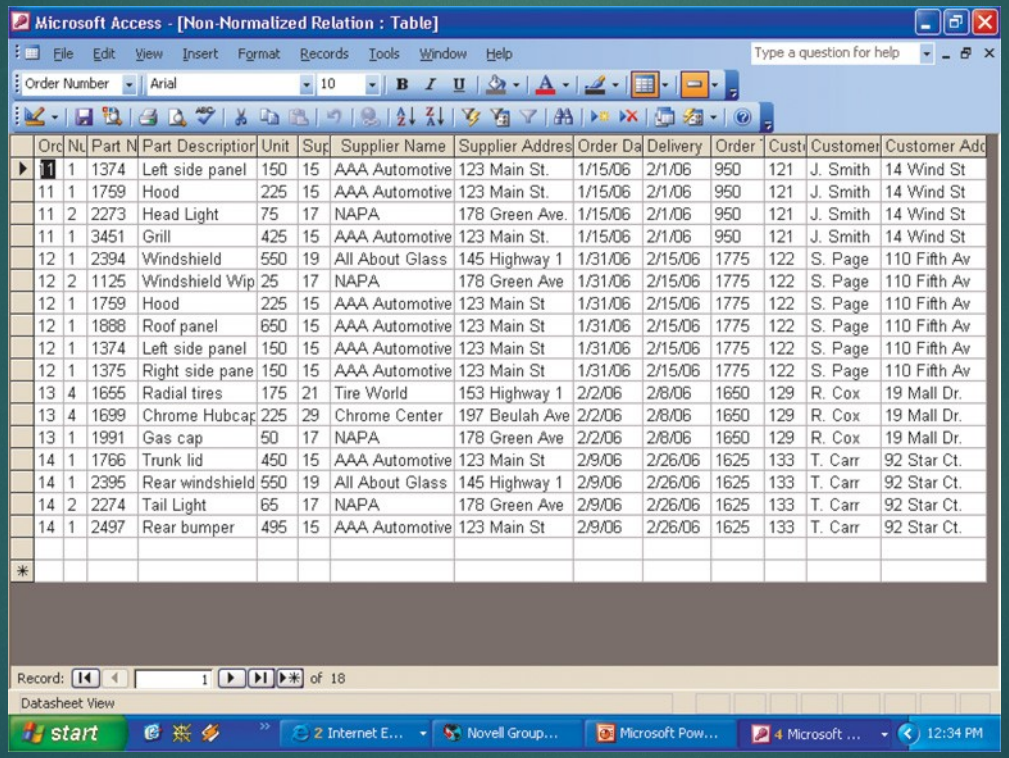
Normalization

- **Minimum redundancy**
- **Maximum data integrity**
- **Best processing performance**

Normalized data occurs when attributes in the table depend only on the primary key.

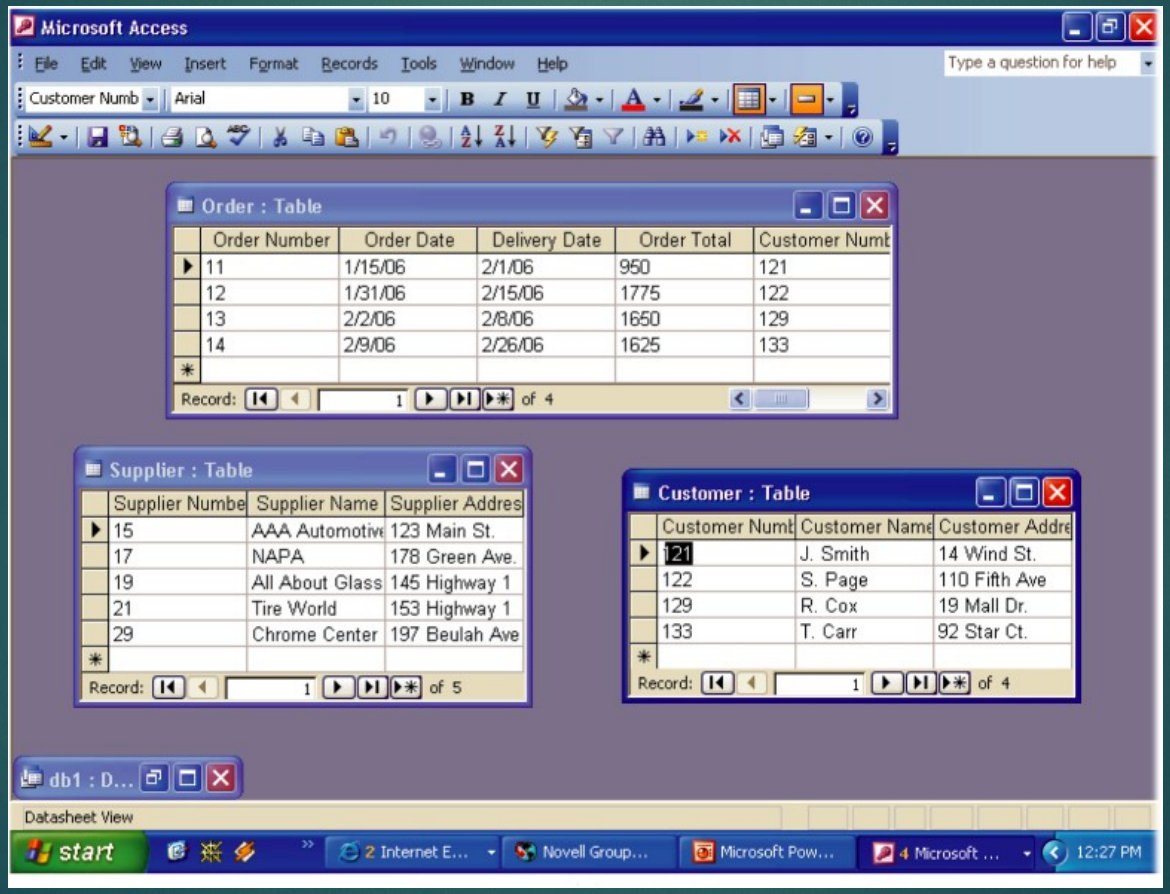
Normalization is a method for analyzing and reducing a relational database to its most streamlined form for minimum redundancy, maximum data integrity, and best processing performance.

Non-Normalized Relation



Orc	Nu	Part N	Part Description	Unit	Sup	Supplier Name	Supplier Addres	Order Da	Delivery	Order	Cust	Customer	Customer Add
11	1	1374	Left side panel	150	15	AAA Automotive	123 Main St.	1/15/06	2/1/06	950	121	J. Smith	14 Wind St
11	1	1759	Hood	225	15	AAA Automotive	123 Main St.	1/15/06	2/1/06	950	121	J. Smith	14 Wind St
11	2	2273	Head Light	75	17	NAPA	178 Green Ave.	1/15/06	2/1/06	950	121	J. Smith	14 Wind St
11	1	3451	Grill	425	15	AAA Automotive	123 Main St.	1/15/06	2/1/06	950	121	J. Smith	14 Wind St
12	1	2394	Windshield	550	19	All About Glass	145 Highway 1	1/31/06	2/15/06	1775	122	S. Page	110 Fifth Av
12	2	1125	Windshield Wip	25	17	NAPA	178 Green Ave	1/31/06	2/15/06	1775	122	S. Page	110 Fifth Av
12	1	1759	Hood	225	15	AAA Automotive	123 Main St	1/31/06	2/15/06	1775	122	S. Page	110 Fifth Av
12	1	1888	Roof panel	650	15	AAA Automotive	123 Main St	1/31/06	2/15/06	1775	122	S. Page	110 Fifth Av
12	1	1374	Left side panel	150	15	AAA Automotive	123 Main St	1/31/06	2/15/06	1775	122	S. Page	110 Fifth Av
12	1	1375	Right side pane	150	15	AAA Automotive	123 Main St	1/31/06	2/15/06	1775	122	S. Page	110 Fifth Av
13	4	1655	Radial tires	175	21	Tire World	153 Highway 1	2/2/06	2/8/06	1650	129	R. Cox	19 Mall Dr.
13	4	1699	Chrome Hubcap	225	29	Chrome Center	197 Beulah Ave	2/2/06	2/8/06	1650	129	R. Cox	19 Mall Dr.
13	1	1991	Gas cap	50	17	NAPA	178 Green Ave	2/2/06	2/8/06	1650	129	R. Cox	19 Mall Dr.
14	1	1766	Trunk lid	450	15	AAA Automotive	123 Main St	2/9/06	2/26/06	1625	133	T. Carr	92 Star Ct.
14	1	2395	Rear windshield	550	19	All About Glass	145 Highway 1	2/9/06	2/26/06	1625	133	T. Carr	92 Star Ct.
14	2	2274	Tail Light	65	17	NAPA	178 Green Ave	2/9/06	2/26/06	1625	133	T. Carr	92 Star Ct.
14	1	2497	Rear bumper	495	15	AAA Automotive	123 Main St	2/9/06	2/26/06	1625	133	T. Carr	92 Star Ct.

Normalizing the Database (part A)



Normalizing the Database (part B)