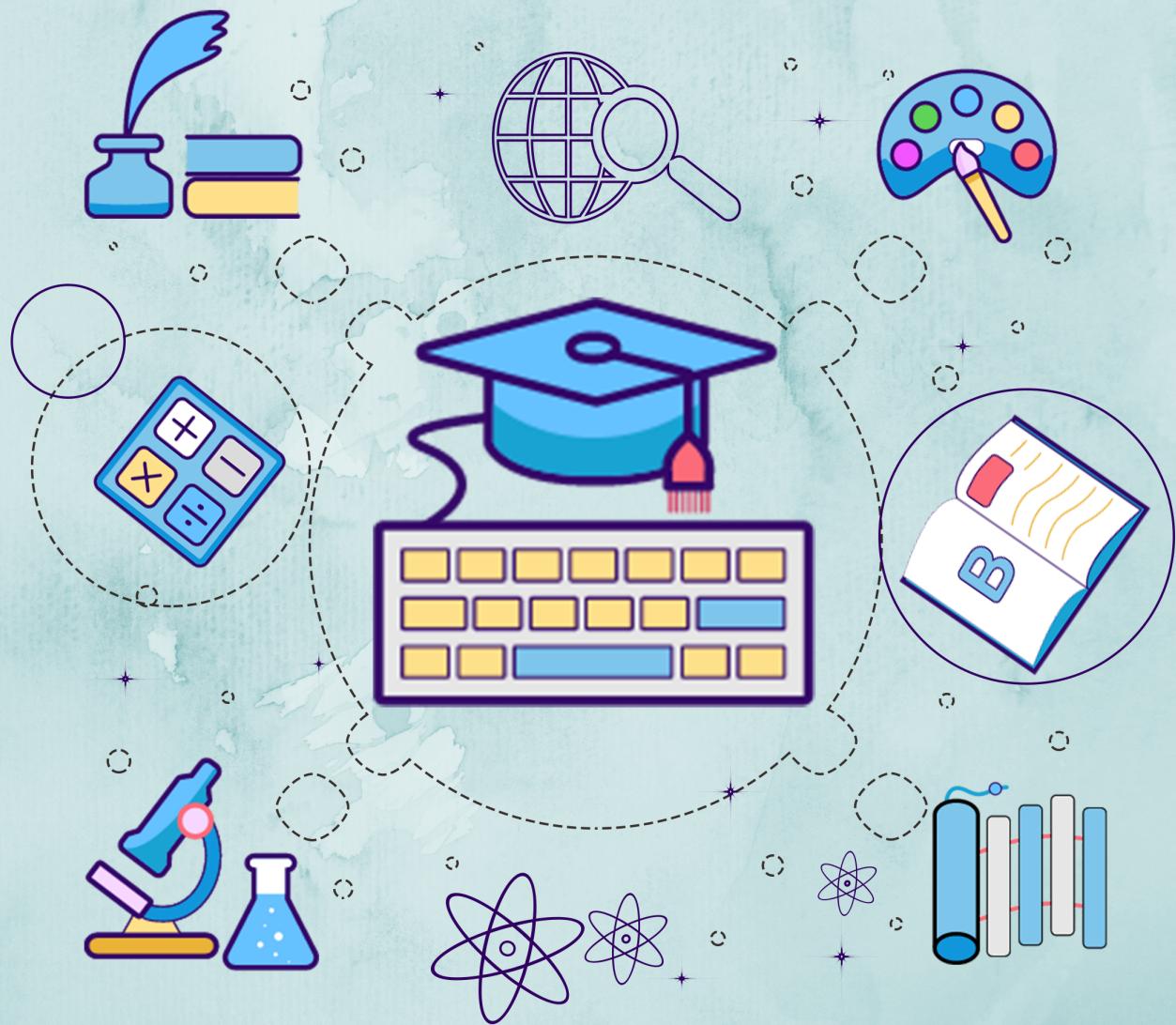


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KTU S4 CSE SHORT NOTES

DATABASE MANAGEMENT SYSTEMS (CST 204)

Module 1

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index

- ❑ DBMS
- ❑ Characteristics of DB system
- ❑ DB users
- ❑ structured, semi-structured and unstructured data
- ❑ Data models
- ❑ Schema
- ❑ Three schema architecture

DBMS

- A database-management system (**DBMS**) is a collection of interrelated data and a set of programs to access those data
- The collection of data, usually referred to as the **database**, contains information relevant to an enterprise.
- The primary goal of a DBMS is to provide a way to store and retrieve database information that is both **convenient** and **efficient**

Characteristics of Database system

DBMS Vs FILE SYSTEM

- 1.Data redundancy and inconsistency
- 2.Difficulty in accessing data
- 3.Data isolation
- 4.Integrity problems
- 5.Atomicity problems
- 6.Security problems

Database Users

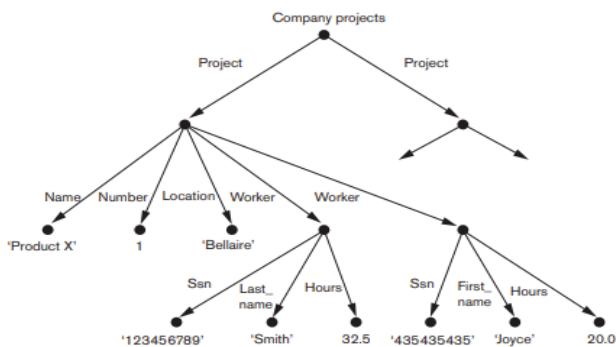
- **Sophisticated users:** They Interact with the system without writing programs
- **Naive users:** They are unsophisticated users who interact with the system by invoking one of the application programs that have been written previously
- **Application programmers:** They are computer professionals who write application programs
- **Specialized users:** They are sophisticated users who write specialized database applications that do not fit into the traditional data-processing framework.

structured, semi-structured and unstructured data

- Structured data:** The information stored in relational databases is known as structured data because it is represented in a strict format.

EMPLOYEE										
Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno	
John	B	Smith	123456789	1965-01-09	731 Fondren, Houston, TX	M	30000	333445555	5	
Franklin	T	Wong	333445555	1955-12-08	638 Voss, Houston, TX	M	40000	888665555	5	
Alicia	J	Zelaya	999887777	1968-01-19	3321 Castle, Spring, TX	F	25000	987654321	4	
Jennifer	S	Wallace	987654321	1941-06-20	291 Berry, Bellaire, TX	F	43000	888665555	4	
Ramesh	K	Narayan	666884444	1962-09-15	975 Fire Oak, Humble, TX	M	38000	333445555	5	
Joyce	A	English	453453453	1972-07-31	5631 Rice, Houston, TX	F	25000	333445555	5	
Ahmad	V	Jabbar	987987987	1969-03-29	980 Dallas, Houston, TX	M	25000	987654321	4	
James	E	Borg	888665555	1937-11-10	450 Stone, Houston, TX	M	55000	NULL	1	

- Semistructured data:** It is information that does not reside in a relational database but that has some organizational properties that make it easier to analyze.



3. Unstructured data: It is a data which is not organized in a predefined manner

```

<HTML>
  <HEAD>
    ...
  </HEAD>
  <BODY>
    <H1>List of company projects and the employees in each project</H1>
    <H2>The ProductX project:</H2>
    <TABLE width="100%" border=0 cellpadding=0 cellspacing=0>
      <TR>
        <TD width="50%"><FONT size="2" face="Arial">John Smith:</FONT></TD>
        <TD>32.5 hours per week</TD>
      </TR>
      <TR>
        <TD width="50%"><FONT size="2" face="Arial">Joyce English:</FONT></TD>
        <TD>20.0 hours per week</TD>
      </TR>
    </TABLE>
    <H2>The ProductY project:</H2>
    <TABLE width="100%" border=0 cellpadding=0 cellspacing=0>
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        <TD>7.5 hours per week</TD>
      </TR>
      <TR>
        <TD width="50%"><FONT size="2" face="Arial">Joyce English:</FONT></TD>
        <TD>20.0 hours per week</TD>
      </TR>
      <TR>
        <TD width="50%"><FONT size="2" face="Arial">Franklin Wong:</FONT></TD>
        <TD>10.0 hours per week</TD>
      </TR>
    </TABLE>
    ...
  </BODY>
</HTML>

```

Figure 13.2
Part of an HTML document
representing unstructured data.

Data Models

- A collection of conceptual diagrams that can be used to describe the structure of a database
- **Categories of Data Models**
 - ❑ **High-level or conceptual data model** provide concepts that are close to the way many users perceive data
Eg:entity–relationship model
 - ❑ **Low-level or physical data models** provide concepts that describe the details of how data is stored on the computer storage media
 - ❑ **Representational or implementation data models** which provide concepts that may be easily understood by end users but that are not too far removed from the way data is organized in computer storage
Eg:network and hierarchical models

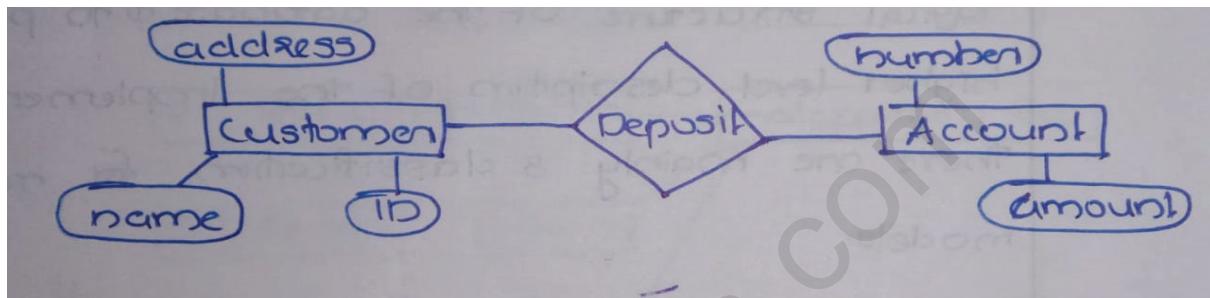
entity–relationship model

- A popular high-level conceptual data model.
- Conceptual data models use concepts such as **entities**, **attributes**, and **relationships**.

Entity: An entity represents a real-world object

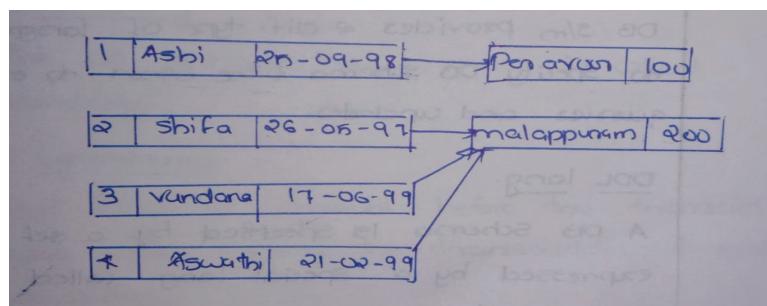
Relationship: Relationship among those objects

Attributes: Set of properties for describing the entities



Network model

- It is representational model
- **Data** in the network model are represented by **collection of records** and the **relationship** among the data are represented by **link**



schema

- The **overall design of database system** is called the database schema
- Layout or **blueprint of a database**
- The diagrammatic representation of schema is called **schema diagram**

STUDENT			
Name	Student_number	Class	Major
Smith	17	1	CS
Brown	8	2	CS

COURSE			
Course_name	Course_number	Credit_hours	Department
Intro to Computer Science	CS1310	4	CS
Data Structures	CS3320	4	CS
Discrete Mathematics	MATH2410	3	MATH
Database	CS3380	3	CS

database

STUDENT			
Name	Student_number	Class	Major

COURSE			
Course_name	Course_number	Credit_hours	Department

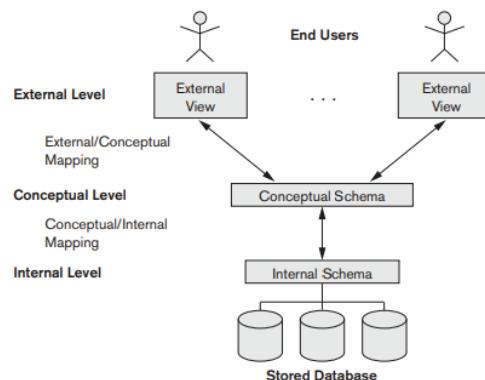
Schema diagram

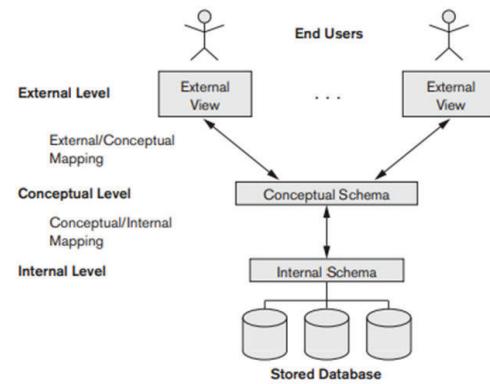
Three Schema architecture

□ **Goal:** To separate the **user application** and the **physical database**

□ Schema can be defined in 3 levels:

1. Internal level
2. Conceptual level
3. External level





1.Internal level

Describe the physical structure of the database

2.Conceptual level

Hide the details of the physical storage structure and concentrates on describing entities, data types, relationships etc.

3.External level

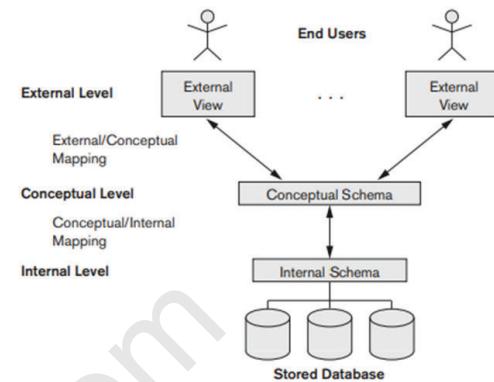
Describes the part of the database that a user is interested in and hides the rest of the database from the user group

index

- Database Languages
- Database architectures
- ER model
- Entity set ,attributes and relationships
- Weak entities
- Constraints

Database languages

1. **DDL(Data Definition Language)**: used to specify the conceptual schema only
2. **SDL(Storage Definition Language)** :used to specify the internal schema
3. **VDL(View Definition Language)**: to specify user views and their mapping to the conceptual schema



4. **DML(Data Manipulation Language)**: for manipulation of data in the database

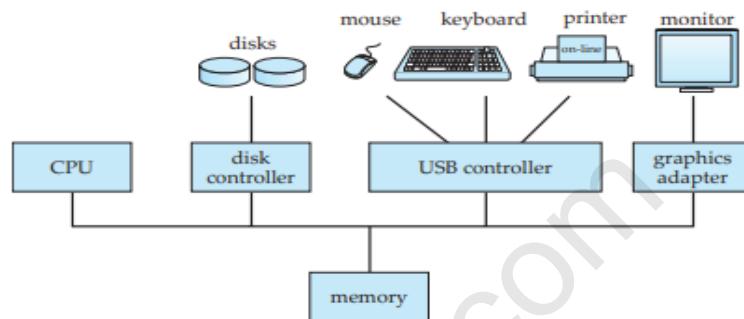
Types of DML:

1. **High-level(or non-procedural DML)**:specify ***what data are needed*** without specifying how to get those data.
2. **Low-level(or procedural DML)**: specify ***what data are needed*** and ***how to get*** those data

Database architectures

1. Centralized architecture

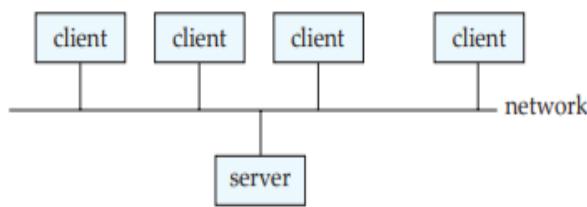
They run on a single computer system and do not interact with other

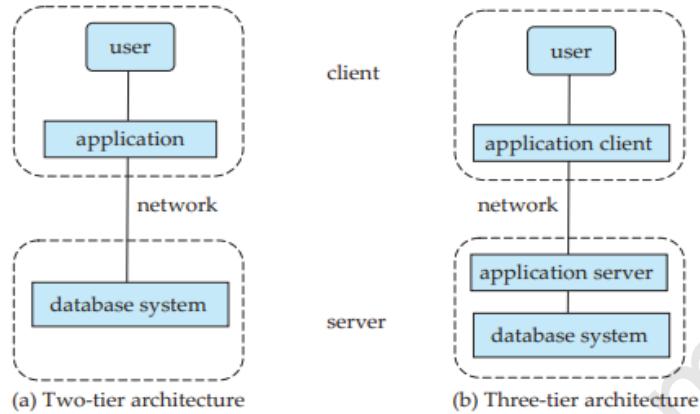


2. Client–Server Systems

Client: User machine that provides user interface capabilities and local processing

Server: Provides services to client machines





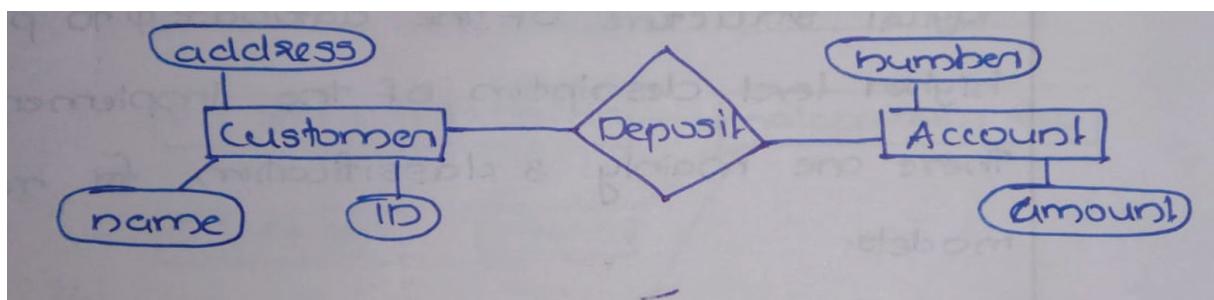
ER model

- A popular high-level conceptual data model.
- Conceptual data models use concepts such as **entities**, **attributes**, and **relationships**.

Entity: An entity represents a real-world object

Relationship: Relationship among those objects

Attributes: Set of properties for describing the entities



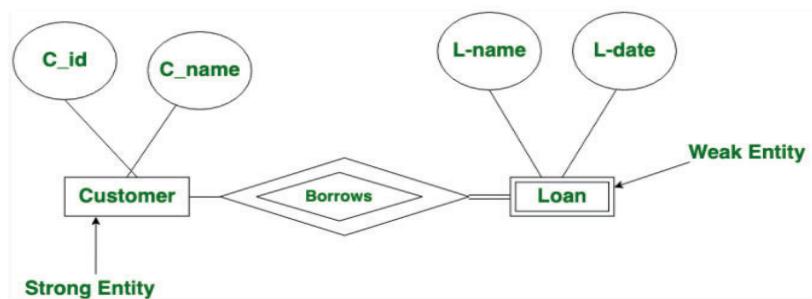
ENTITY

- An **entity** represents a real-world object
- It can be person, place, job etc
- A collection of entities that have the same attributes is called **entity type**. Eg: STUDENT
- Collection of entities of a particular entity type at a point in time is called **entity set**

STUDENT		
Name	Student_number	Class
Smith	17	1
Brown	8	2

Weak entity

- ❑ The entity sets which do not have sufficient attributes to form a **primary key** are known as **weak entity sets**



DIFFERENT TYPES OF ATTRIBUTES

1. Simple and composite attributes

Composite attribute can be **divided into further parts**(Eg:Name) and **simple** attribute **cannot be divided** into further(Eg:Age)

2. Single-valued and multi-valued attribute

Single-valued attribute have a **single value** for a particular entity(Eg:Age) and **multi-valued** attribute can have **set of values** for a particular entity(Eg: Languages known)

3. Derived and stored attributes

Derived attribute can be **derived from other** attributes(Eg:Age) and **stored** attributes are attributes **from which** the values of **other attributes are derived** (Eg:Birth date)

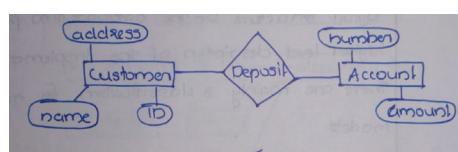
RELATIONSHIP

- It is the association among 2 or more entities
- Eg: teacher **teaches** student
- The number of entity types that participate in a relationship is called **degree of relationship**

1. Unary relationship: Exist when there is an association with only **one entity**

2. Binary relationship: **two entities**

3. Ternary relationship: **three entities**



constraints

1. Mapping Cardinalities or cardinality ratios

Maximum number of relationship instances that an entity can participate in.

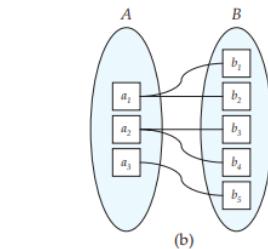
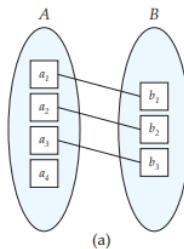


Figure 7.5 Mapping cardinalities. (a) One-to-one. (b) One-to-many.

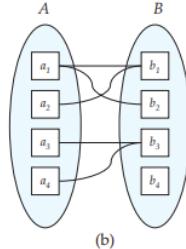
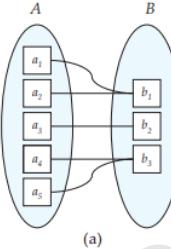


Figure 7.6 Mapping cardinalities. (a) Many-to-one. (b) Many-to-many.

2. Participation Constraints

Specifies whether existence of an entity depends on its being related to another entity

2 types: Total & Partial

