



UNIVERSITY OF ENGINEERING & MANAGEMENT, KOLKATA

Course Name : Database Management System



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Module 2: Entity-Relationship Model

Entity-Relationship Model

- Design Phases
- Modeling
- Constraints
- E-R Diagram
- Design Issues
- Weak Entity Sets
- Extended E-R Features
- Design of the Bank Database
- Reduction to Relation Schemas
- Database Design
- UML

Design Phases

- The **initial phase** of database design is to characterize **fully the data needs of the prospective database users**.
- Next, the **designer chooses a data model** and, by applying the concepts of the chosen data model, **translates these requirements into a conceptual schema** of the database.
- **A fully developed conceptual schema** also indicates the **functional requirements** of the enterprise. In a “specification of functional requirements”, users **describe the kinds of operations** (or transactions) that will be performed on the data.

Design Phases (Cont.)

The process of **moving from an abstract data model to the implementation** of the database proceeds in two final design phases.

- **Logical Design – Deciding on the database schema.** Database design requires that we find a “good” collection of relation schemas.
 - **Business decision** – What attributes should we record in the database?
 - **Computer Science decision** – What relation schemas should we have and how should the attributes be distributed among the various relation schemas?
- **Physical Design** – Deciding on the physical layout of the database

Design Approaches

- Entity Relationship Model (covered in this chapter)
 - Models an enterprise as a collection of *entities* and *relationships*
 - Entity: a “thing” or “object” in the enterprise that is distinguishable from other objects
 - Described by a set of *attributes*
 - Relationship: an association among several entities
 - Represented diagrammatically by an *entity-relationship diagram*:
- Normalization Theory
 - Formalize what designs are bad, and test for them

Outline of the ER Model

ER model -- Database Modeling

- The ER data model was developed to facilitate database design by allowing specification of an enterprise schema that represents the overall logical structure of a database.
- The ER model is very useful in **mapping the meanings and interactions of real-world enterprises onto a conceptual schema**. Because of this usefulness, many database-design tools draw on concepts from the ER model.

ER model -- Database Modeling

- The ER data model employs three basic concepts:
 - entity sets,
 - relationship sets,
 - attributes.
- The ER model also has an **associated diagrammatic representation**, the ER diagram, which can express the overall logical structure of a database graphically.

Entity Sets

- An **entity** is an object that exists in real world and is distinguishable from other objects.
 - Example: a specific person, company, event, plant
- An **entity set** is a set of entities of the same type that share the same properties.
 - Example: set of all persons, companies, trees, holidays
- An entity is represented by a set of **attributes**; i.e., **descriptive properties possessed by all members of an entity set**.
 - Example:
instructor = (ID, name, street, city, salary)
course = (course_id, title, credits)
- A subset of the attributes form a **primary key** of the entity set; i.e., uniquely identifying each member of the set.

Entity Sets -- *instructor* and *student*

instructor_ID instructor_name

76766	Crick
45565	Katz
10101	Srinivasan
98345	Kim
76543	Singh
22222	Einstein

instructor

student-ID student_name

98988	Tanaka
12345	Shankar
00128	Zhang
76543	Brown
76653	Aoi
23121	Chavez
44553	Peltier

student

Types of Entity

Tangible Entity

E.g. Car, Pen, Bank-locker

Intangible Entity

E.g. Bank_Account

Thank You

