

Entity Relationship Models 1

27 October 2009
Lecture 2

Topics for Today

- Entity Relationship Diagrams
 - Simple to Complex
 - Entities, Attributes, Entity Sets
 - Relationships and Relationship Sets
 - Additional Features
- Source: Ramakrishnan and Gehrke 2.1-2.7

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Why use ERD?

- Useful for:
- Requirements Analysis
 - Think about relationships and objects
 - Concretize ideas
- Conceptual Database Design:
 - Organizing data in a schema is hard – pictorial help
 - Easy to see connections and constraints
- Logical Database Design:
 - To communicate requirements between teams or designers
 - Acts as documentation

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What is an Entity?

- Basically any noun you can describe:
 - Student
 - Car
 - Book
 - College
 - Courage ✖
 - Four ✖
- Attributes:
 - Descriptors of entities
 - All the ones that are interesting enough for the database
- Entities Sets are like classes – *entities* are instances

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Entity Example

- A student might be identified by (attributes):
 - Student Id number
 - Name
 - National ID number
 - Address
 - Height
 - Degree track
 - Phone Number
 - Email address
 - Passport Number
- Which would be appropriate for a college student relation?

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Attributes

- Attributes have a given domain
 - Strings
 - Numbers
 - Sets
 - Formats
- Attributes must identify an entity in an entity set uniquely
 - The *Key* is the set of attributes which together uniquely identify each entity in the entity set
 - Other possibilities (also keys, but not in use) are called *Candidate Keys*
- Keys must be minimal
 - Why?

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Attributes Example

- Back to the Students example:
 - Student Id
 - Name
 - Address
 - Degree Track (Major)
 - Phone Number

Student Id	Name	Address	Major	Phone Number
45	Sam Smith	Simon 45	Information Systems	04-444-4444
59	Alan Arts	Antson 10	Information Systems	055-555-5555
63	Karen Kim	Kalbot 56	Information Systems	077-777-7777

Student Id	Name	Address	Major	Phone Number
45	Sam Smith	Simon 45	Information Systems	04-444-4444
59	Alan Arts	Antson 10	Information Systems	055-555-5555
63	Karen Kim	Kalbot 56	Information Systems	077-777-7777
74	Sue Smith	Simon 45	Mathematics	04-444-4444
103	Karen Kim	Karlil 104	Mathematics	096-666-6666

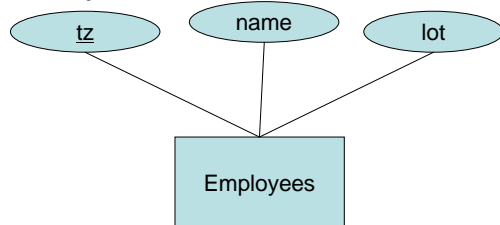
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Employee Example and Diagram

- Employees have:
 - National Id
 - Name
 - Parking Lot



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Relationships

- A **relationship** is an association between two or more entities
 - Relationships can be sets too

- Formally, a relationship set is of n-tuples where each entity belongs to some entity set:

$$\{(e_1, \dots, e_n) \mid e_1 \in E_1, \dots, e_n \in E_n\}$$

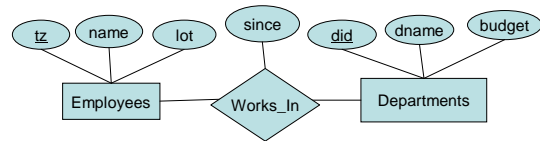
- This is read "A relationship is a set of tuples of the form e_1, e_2, \dots, e_n such that e_1 is a member of entity set E_1 , e_2 is a member of entity set E_2 , etc."

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Relationship Example



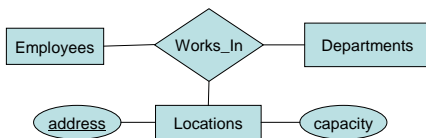
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Relationships and Sets

- An **instance** of a relationship set is a relationship
- Relationships can binary:



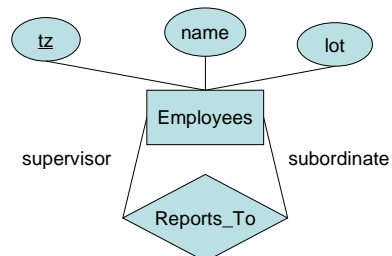
- Or Ternary
- Or more

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Reflexive Relationships



- Sometimes a role label can help identify important aspects of a relationship

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So far

- Entity Relationship Diagrams
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Additional Features of ERD

- ERDs can also represent more complex aspects of relationships:
 - Key Constraints
 - Participation Constraints
 - Weak Entities
 - Inheritance
 - Aggregation

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Key Constraints

- Types of Key Constraints:
 - One to one
 - One to Many
 - Many to Many

- Examples:

- One to One – 1 TZ to 1 person



- One to Many – 1 mother to Many children



- Many to Many – Many addresses to Many residents

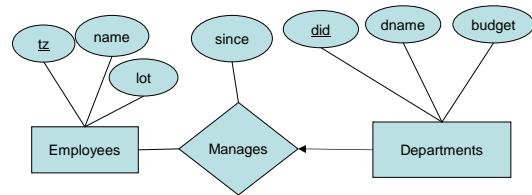


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Key Constraint Example



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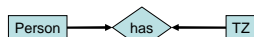
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Participation Constraints

- Whether each member of an entity set must appear in the relationship
 - Thick line on its side if yes

- Examples:

- Each person must have a TZ, every TZ is for a person



- Each child must have a mother



- Not everyone has an address, every address has someone there

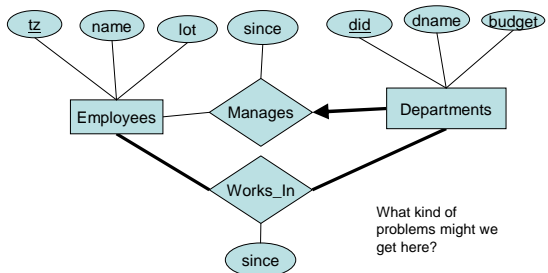


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Participation Example



What kind of problems might we get here?

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Conclusion

- Entity Relationship Diagrams
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 - Entities, Attributes, Entity Sets
 - Relationships and Relationship Sets
 - Additional Features

Word of the day

- Jargon – the language, especially the vocabulary, peculiar to a particular trade, profession, or group: