CS445 - Introduction to
Database Management Systems

Fall Semester 2015

LECTURE 7

The Entity-Relationship Model: Part 2
ISA, Aggregation, Example

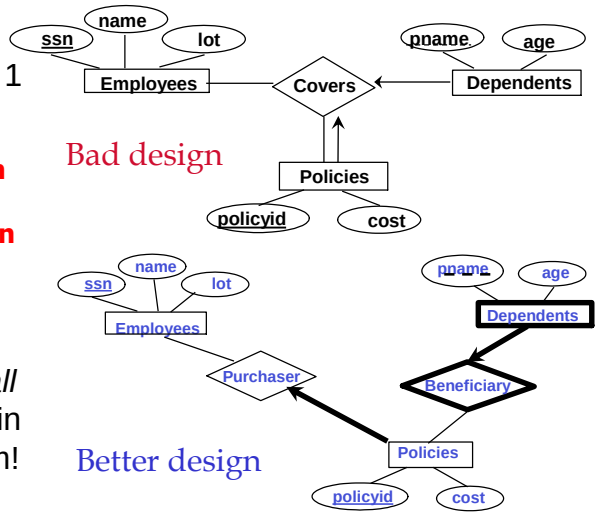
TEXTBOOK REFERENCE: CHAPTERS 2,3 R&G

Binary vs. Ternary Relationships

If each policy is owned by just 1 employee:

Key constraint on Policies would mean policy can only cover 1 dependent!

Think through *all* the constraints in the 2nd diagram!



Binary vs. Ternary Relationships (Contd.)

- Previous example illustrated case when two binary relationships were better than one ternary relationship.
- Opposite example: a ternary relation Contracts relates entity sets Parts, Departments and Suppliers, and has descriptive attribute *qty*. No combination of binary relationships is an adequate substitute.

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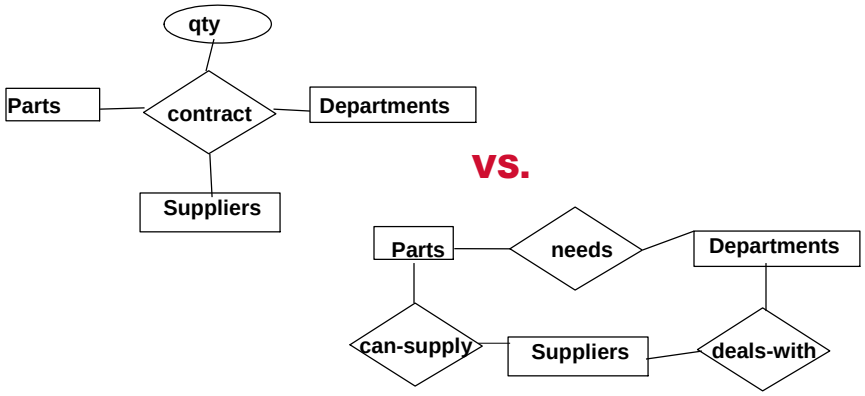
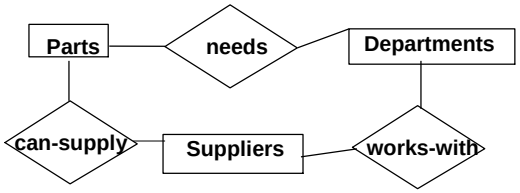


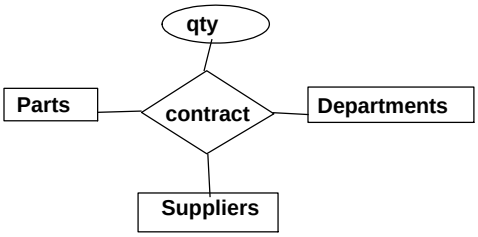
Binary Relationships (Cont.)



- A Supplier can be authorized to supply certain Parts (Office Depot can supply pens)
- A Department needs particular Parts (Department 14 needs pens)
- A Supplier can be work with certain Departments (Office Depot supplies Department 14)

THUS: Office Depot can supply pens to Department 14

Ternary Relationships (Cont.)



- A ternary relationship means that a particular Supplier must be authorized to supply a particular Part to a particular Department

Ternary Relationships (cont)

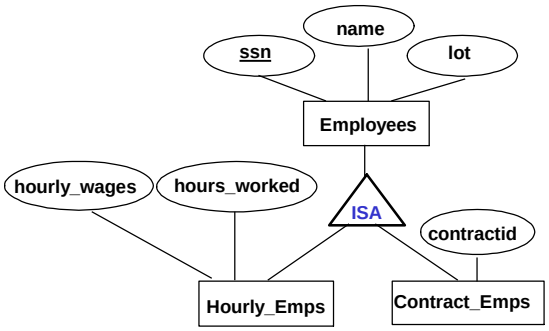
- Thus…if the only relationships we knew were:
  - Office Max can supply computer to Department 12
  - Office Depot can supply pencil sharpener to Department 12
  - Staples can supply computer to Department 12

THEN Office Depot could NOT supply a computer to Department 12 even though:

- Office Depot has computers
- Department 12 needs computers
- Office Deport supplies other things for Department 12 (sharpener)

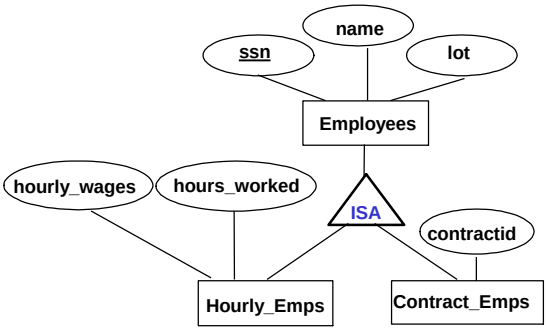
ISA (`is a') Hierarchies

- If we declare A **ISA** B, every A entity is also considered to be a B entity.

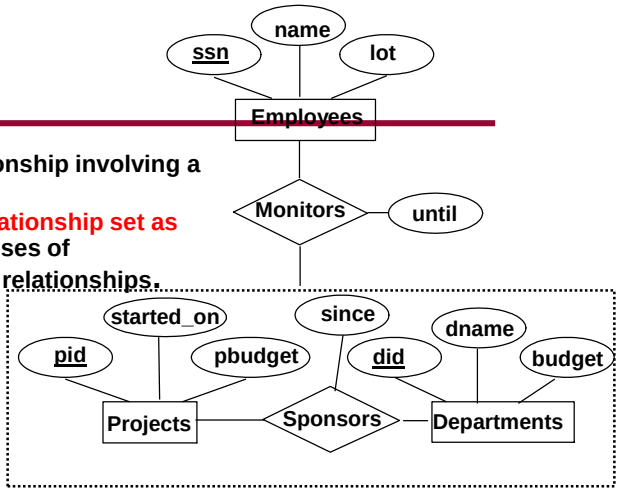


ISA (`is a') Hierarchies

- *Overlap constraints*: Can Simon be an Hourly_Emps as well as a Contract_Emps entity? (*Allowed/disallowed*)
- *Covering constraints*: Does every Employees entity also have to be an Hourly_Emps or a Contract_Emps entity? *(Yes/no)*
- Reasons for using ISA:
  - To add descriptive attributes specific to a subclass.
    - ✓i.e. not appropriate for all entities in the superclass
  - To identify entities that participate in a particular relationship
    - ✓i.e., not all superclass entities participate



Aggregation



- **Used to model a relationship involving a *relationship set*.**
- **Allows us to treat a relationship set as an entity set for purposes of participation in (other) relationships.**

Aggregation vs. ternary relationship?

- Monitors is a distinct relationship, with a descriptive attribute.
- Also, can say that each sponsorship is monitored by at most one employee.

Conceptual Design Using the ER Model

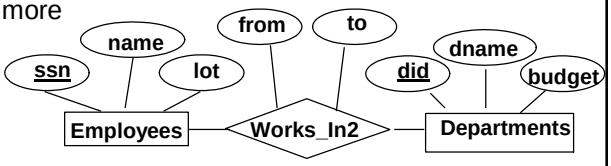
- ER modeling *can* get tricky!
- Design choices:
  - Should a concept be modeled as an entity or an attribute?
  - Should a concept be modeled as an entity or a relationship?
  - Identifying relationships: Binary or ternary? Aggregation?
- Note constraints of the ER Model:
  - A lot of data semantics can (and should) be captured.
  - But some constraints cannot be captured in ER diagrams.
    - ✓ We'll refine things in our logical (relational) design

Entity vs. Attribute

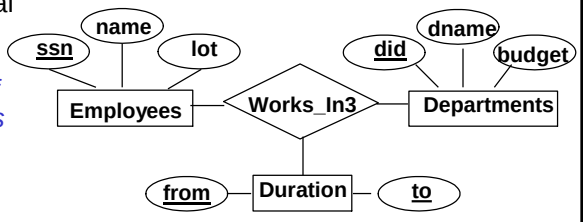
- Should *address* be:
  - attribute of Employees or
  - an entity (related to Employees)?
- Depends upon use of address information, and the semantics of the data:
  - ✓ If several addresses per employee, *address* must be an entity.
  - ✓ If structure (city, street, etc.) is important, *address* must be modeled as an entity.

Entity vs. Attribute (Cont.)

- Works_In2 does not allow an employee to work in a department for two or more periods.



- Similar to the problem of wanting to record several addresses for an employee: we want to record *several values of the descriptive attributes for each instance of this relationship.*



Exercise 2.5: In Text

- Each musician has a SSN, a name, an address and a phone number. Musicians may have the same address, but no address has more than one phone.
- Each instrument has a name and a musical key
- Each album has a title, a copyright, a format, and an album identifier.
- Each song has a title, an author, and a song identifier.
- Each musician may play several instruments, and a given instrument may be played by several musicians.
- Each album has a number of songs on it, but no song may appear on more than one album.
- Each song is performed by one or more musicians, and a musician may perform a number of songs.
- Each album has exactly one musician who acts as its producer. A musician may produce several albums.