Addendum to Unit 1: Handling “Weak Entities” in the ER Design
Definition of Weak Entity-Sets

- An entity-set is “weak” if a key cannot be built from its immediate attributes.
- The key must be formed by using attributes of related entity-sets.
- This arises when many-one relationships are used to connect entity-sets in a hierarchy.
Example with Weak Entities

Entity: Species(Sname)
Entity: Genus(Gname)
Relationship: Member_Of(Species,Genus)

Data:

Gname   Sname
felis    domesticus  (domestic cat)
felis    rufus        (bobcat)
bovis    domesticus   (domestic cow)

Species is weak, because \{Sname\} is not a key for Species.
The key of Species is \{Gname,Sname\}.
**Relational Implementation with Weak Entities**

- We *still* represent each entity set by a relation with its primary key attributes, only now these attributes may come from other entity sets.
- We still represent relationships by combining the primary keys.
- Example implementations:
  - GENUS(Gname,...)
  - SPECIES(Gname,Sname,...)
  - COMPATIBLE(Gname,Sname,Gname,Sname)
Diagram Notation for Weak Entities

- Use box with double border to indicate an entity set that is weak
- Use diamond with double border to indicate a many-one relation that leads to attributes in the key of a weak entity
- Underline all attributes that contribute to a key
- The key for an entity can then be obtained by gathering attributes that are reachable through double-bordered diamonds and rectangles
**Example with a Chain of Weak Entities**

Entity: Genus(Gname)
Entity: Species(Sname)
Entity: Variety(Vname)
Relationship: Member_Of(Species,Genus)
Relationship: Member_Of(Variety,Species)

Implementation:
GENUS(Gname,...)
SPECIES(Gname,Sname,...)
VARIETY(Gname,Sname,Vname,...)
Double-Bordered Relationships Don’t Need to Be Implemented

- These relationships are already encoded in the keys of the tables for the weak entity sets
- Examples:
  - Member_Of(Species, Genus) is already encoded in the table SPECIES(Gname, Sname, ...)
  - Member_Of(Variety, Species) is already encoded in the table VARIETY(Gname, Sname, Vname, ...)
- Why is this true in general?
Applying this General Method to an Earlier Example

Entity: Employee(EID)
Entity: Programmer()
Entity: Language(Lname)
Relationship: IsA(Programmer,Employee)
Relationship: Knows(Programmer,Language)

Implementation:
EMPLOYEE(EID), PROGRAMMER(EID), LANGUAGE(LNAME), KNOWS(EID,LNAME)