Database Design

7-2
Hierarchies and Recursive Relationships
Objectives

This lesson covers the following objectives:

• Define and give an example of a hierarchical relationship
• Identify the UIDs in a hierarchical model
• Define and give an example of a recursive relationship
• Represent a recursive relationship in an ERD given a scenario
• Construct a model using both recursion and hierarchies to express the same conceptual meaning
Purpose

- Often, roles are organized by hierarchy -- at work (manager, crew chief, front-counter clerk, food preparers), or in school (headmaster or principal, assistant headmaster or assistant principal, teachers, staff).

- Hierarchical data is very common.

- Understanding it will help you model:
  - Business organizational charts
  - Building structures
  - Family trees
  - and many other hierarchies found in the real world
Relationships in an Organizational Chart

- An Organization's reporting hierarchy can be represented by this organizational chart.
Relationships in an Organizational Chart

- An organizational chart can be represented by this data model.
- We create an entity for each level, with a relationship to the next level.
- What are the UIDs for each entity?
Another Relationship Example

• Notice the barred relationships.

• Here you have a case of the cascading UIDs:
  – the UID of FLOOR is the combination of FLOOR number and the BUILDING id
  – the UID of SUITE is the combination of SUITE number and the FLOOR number and the BUILDING id
  – the UID of ROOM is the combination of ROOM id and SUITE number and FLOOR number and the BUILDING id
Hierarchy Versus Recursive Relationship

• Both of these models represent all employees.
• The one on the left is a hierarchical structure.
• The one on the right uses a recursive relationship.
Hierarchies and Recursive Relationships

• A relationship cannot be both hierarchical and recursive at the same time.

• Which one do you think is better?
Hierarchy Versus Recursive Relationship

• Hierarchical: Hierarchical structures are more explicit and are easier for most people to understand because they are very similar to an organizational chart.

• Each entity can have its own mandatory attributes and relationships, if the business requires this (instead of all optional attributes and relationships, as you would have in a recursive).

• In this way, your data model truly reflects the business rules.
Hierarchy Versus Recursive Relationship

• Recursive: Recursive relationships tend to be simpler because you are using only one entity.

• Your diagram will be less “busy.”

• However, they are less specific – you cannot have mandatory attributes or relationships unless they are mandatory in all instances of the entity.
Drawing Convention

- The ERD convention to show a recursive relationship is drawn as a loop, also known as a “pig’s ear”.

![Diagram of recursive relationship]

EMPLOYEE
- # badge number
- * first name
- * job
  - o salary
  - o budget
  - o bonus plan
  - o car plan

managed by

the manager of

Loop (or pigs ear)
Automobile Manufacturing Business Scenario

• For an automobile manufacturing organization, consider all elementary parts, subassemblies, assemblies, and products as instances of an entity called COMPONENT.
• The model can be created as a simple recursive relationship.
Automobile Manufacturing Business Scenario

- Model Bill of Materials data as a many-to-many recursive relationship:
  - Each COMPONENT may be a part of one or more COMPONENTS.
  - Each COMPONENT may be made up of one or more COMPONENTS.
Terminology

Key terms used in this lesson included:

• Hierarchal relationship
• Recursive relationship
Summary

In this lesson, you should have learned how to:

• Define and give an example of a hierarchical relationship
• Identify the UIDs in a hierarchical model
• Define and give an example of a recursive relationship
• Represent a recursive relationship in an ERD given a scenario
• Construct a model using both recursion and hierarchies to express the same conceptual meaning