



Database Design

3-1 Identifying Relationships



Objectives

This lesson covers the following objectives:

- Interpret and describe relationship optionality
- Interpret and describe relationship cardinality
- Relate (connect or join) entities by applying the rules of cardinality and optionality

Purpose

- Being able to identify the relationships between entities makes it easier to understand the connections between different pieces of data.
- Relationships help you see how different parts of a system affect each other.
- For example, the entities STUDENT and COURSE are related to each other.
- To accurately model the business, the relationships between entities are as important as the entities themselves.

Relationships in Families

- A relationship is the way in which two or more people or things are connected.
- Family relationships categorize relationships between people, for example mother, father, aunt and cousin.
- The name of the relationship tells us how the family members are connected.



Relationships in Data Models

Relationships:

- Represent something of significance or importance to the business
- Show how entities are related to each other
- Exist only between entities (or one entity and itself)
- Are bi-directional
- Are named at both ends
- Have optionality
- Have cardinality

What is Optionality in a Relationship?

- Relationships are either mandatory or optional.
- Consider the two entities EMPLOYEE and JOB.
- Based on what you know about instances of the entities, you can determine optionality by answering two questions:
- Must every employee have a job?
 - In other words, is this a mandatory or optional relationship for an employee?
- Must every job be assigned to an employee?
 - In other words, is this a mandatory or optional relationship for a job?

What is Cardinality in a Relationship?

- Cardinality measures the quantity of something.
- In a relationship, it determines the degree to which one entity is related to another by answering the question, “How many?”
- For example:
 - How many jobs can one employee hold? One job only? Or more than one job?
 - How many employees can hold one specific job? One employee only? Or more than one employee?
 - Note: The cardinality of a relationship only answers whether the number is singular or plural; it does not answer with a specific plural number.

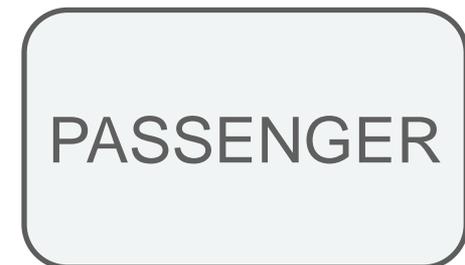
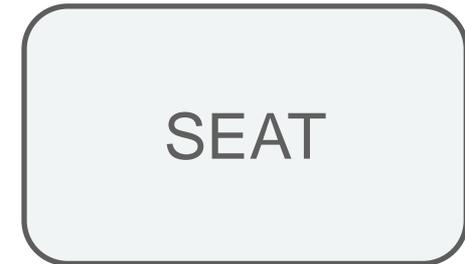
Optionality and Cardinality

Examples:

- Each EMPLOYEE must hold one and only one JOB
- Each JOB may be held by one or more EMPLOYEES
- Each PRODUCT must be classified by one and only one PRODUCT TYPE
- Each PRODUCT TYPE may classify one or more PRODUCTS

Relationships

- Each SEAT may be sold to one or more PASSENGERs
- Each PASSENGER may purchase one SEAT
- SEAT is sold to a PASSENGER (or PASSENGERs -- hence, overbooking)
- PASSENGER purchases or books a SEAT



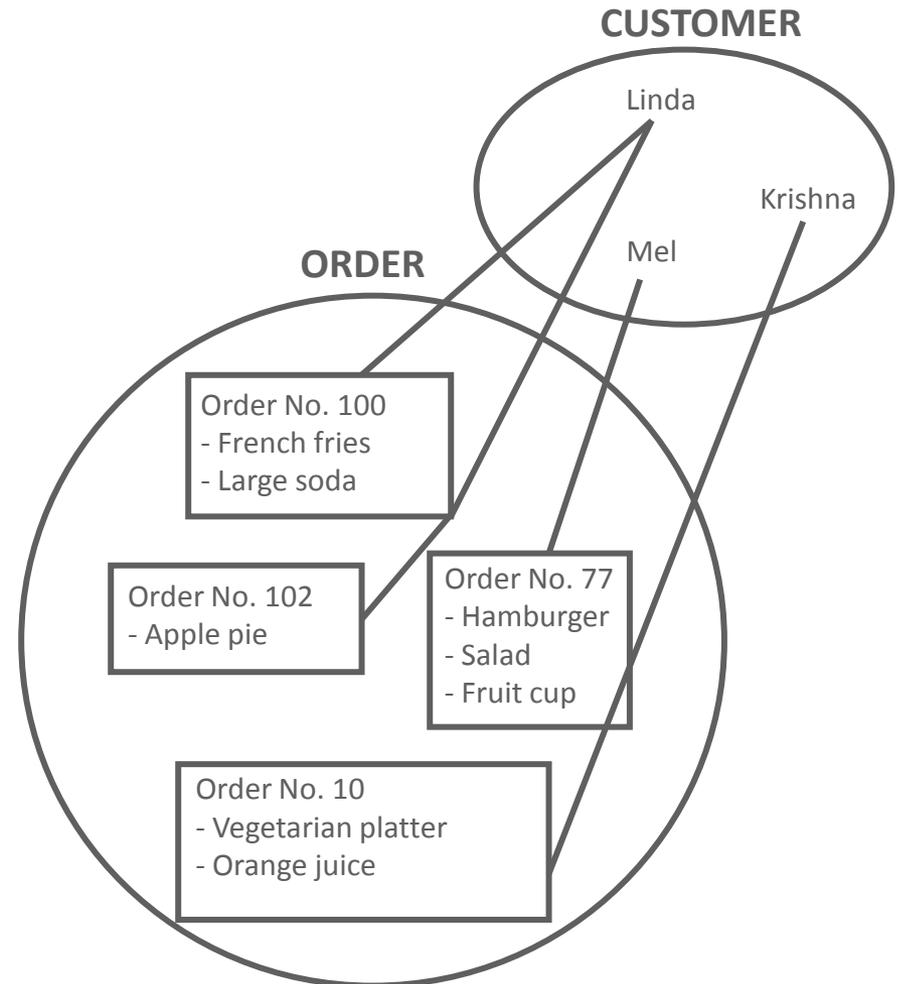
Business Scenario 1

What are the relationships in the following business scenario?

- “In our restaurant, a customer walks up to the counter and places their order. A customer can order for him or herself only, or for him/herself and others. For example, a mother orders for herself and her children.
- We consider the mother to be the customer who owns the order and is responsible for payment. Over a period of time, a customer can place as many orders as he wants.”

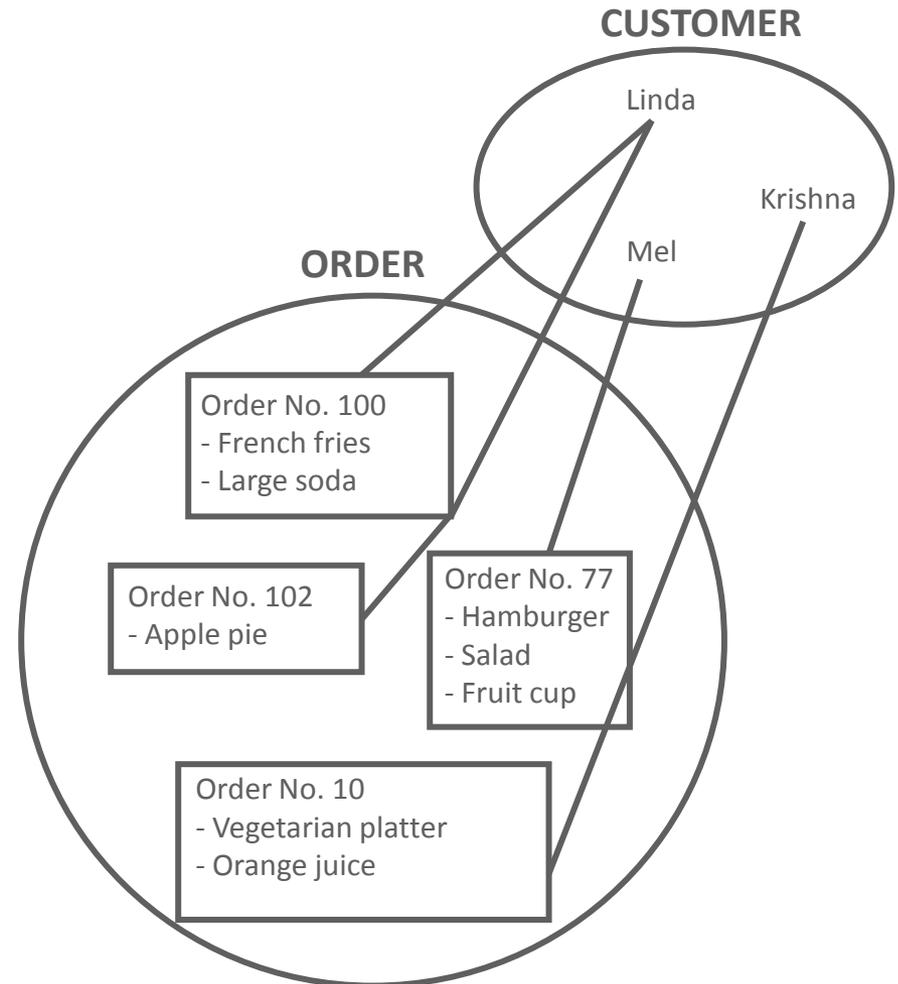
Business Scenario 1

- CUSTOMER places ORDERS: optionality and cardinality
- Optionality = **Must** or **may**?
- Each ORDER **must** be placed by one (and only one) CUSTOMER.
- Each CUSTOMER **must** place one or more ORDERS.



Business Scenario 1

- Cardinality = **How many?**
- Each ORDER must be placed by **one and only one** CUSTOMER.
- Each CUSTOMER must place **one or more** ORDERS.



Business Scenario 2

- A relationship can join one entity to itself.
- Examine the following scenario:
 - “We need to keep track of our employees and their managers. Every employee has one manager, including the managing director who manages him/herself. Each manager can manage several employees.”



Business Scenario 2

- Since managers are also employees, both are listed in the same entity: EMPLOYEE.

RELATIONSHIP

Each **EMPLOYEE** **may** be managed by **one and only one**
EMPLOYEE

Each **EMPLOYEE** **may** manage **one or more** **EMPLOYEEs**

Terminology

Key terms used in this lesson included:

- Cardinality
- Optionality
- Relationship

Summary

In this lesson, you should have learned how to:

- Interpret and describe relationship optionality
- Interpret and describe relationship cardinality
- Relate (connect or join) entities by applying the rules of cardinality and optionality

