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Database Design

7-1

Arcs

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Objectives

- This lesson covers the following objectives:
  - Define the term "constraint" as it applies to data modeling
  - Identify an exclusive OR relationship in a business scenario
  - Diagram an arc constraint to represent an exclusive OR relationship
  - Distinguish between the use of an arc and a subtype in the data model

Purpose

- Arcs in data modeling help designers clarify an exclusive OR across relationships
- The more explicitly you can define the client's requirements, the more accurate your final implementation will be

What is a Constraint?

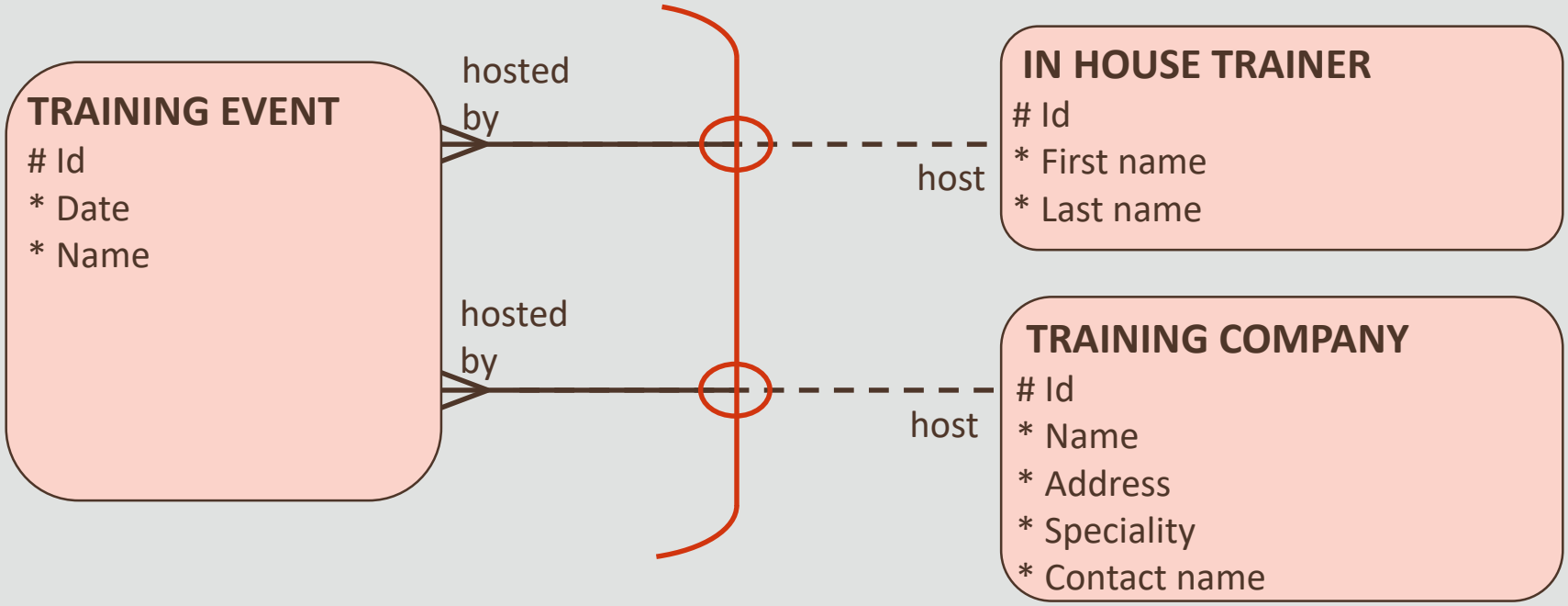
- Every business has restrictions on which attribute values and which relationships are allowed
- These restrictions are called constraints
- They may refer to a single attribute of an entity, or to relationships between entities
- We already know about several kinds of constraints; for example, every EMPLOYEE must work in one and only one DEPARTMENT
- In this lesson, we will see another kind of constraint—an exclusive OR constraint

Exclusive OR Relationship

- Mutually exclusive relationships sometimes exist between entities and are also known as Exclusive OR Relationships
- An Exclusive OR relationship is a relationship between one entity and two (or more) other entities where only one of the relationships can exist at a time
- In ERDs, we model this type of relationship with an Arc

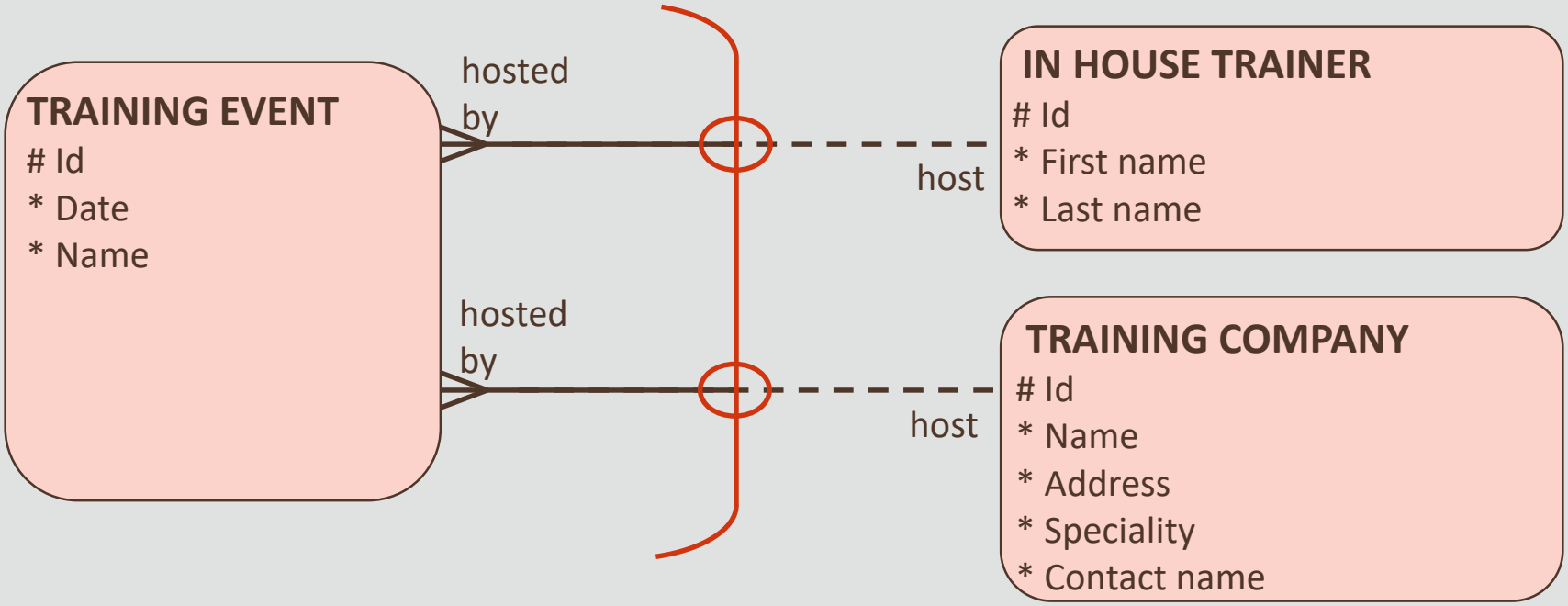
Exclusive OR Relationship

- For example:
  - a TRAINING EVENT can be hosted by either an IN HOUSE TRAINER or an external TRAINING COMPANY



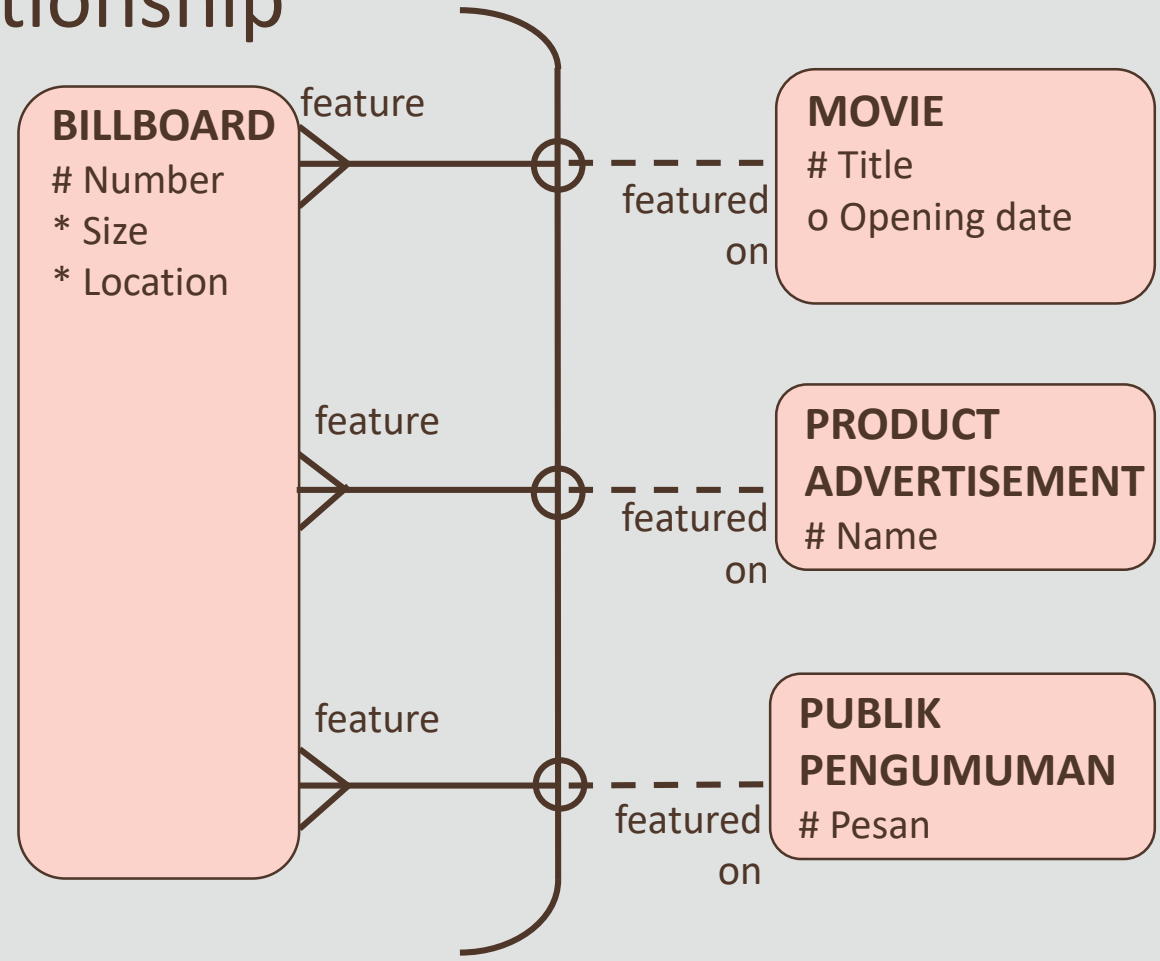
Exclusive OR Relationship

- Each TRAINING EVENT must be hosted by one and only one IN HOUSE TRAINER OR one and only one TRAINING COMPANY



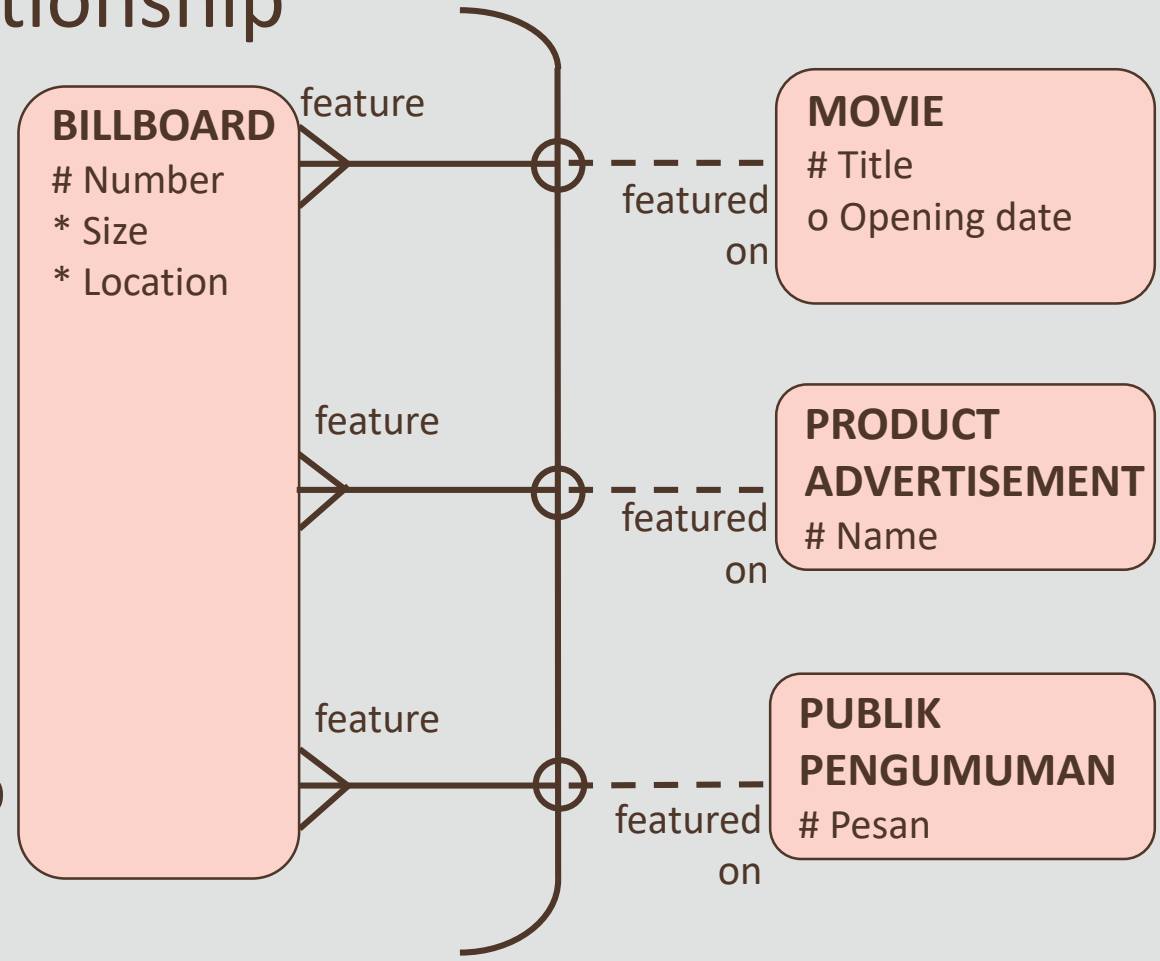
Exclusive OR Relationship

- Another Example:
  - A billboard is an advertising space that can feature a movie, a product, or a public announcement
  - It may contain advertising about only one of these at a time



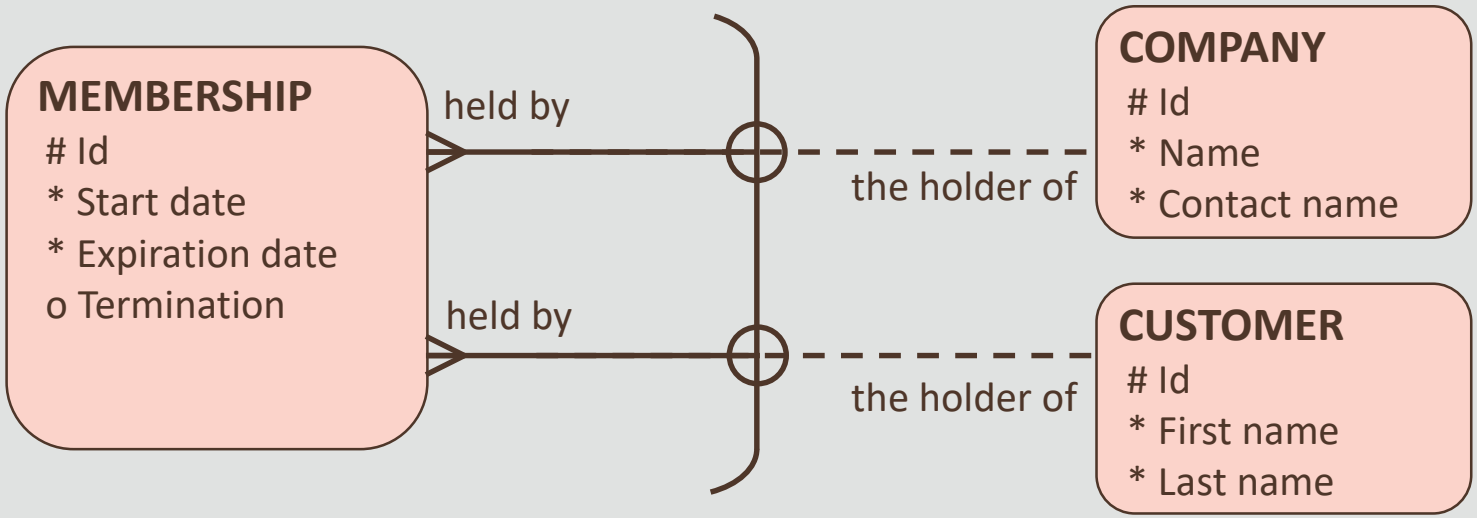
Exclusive OR Relationship

- Each “feature” has own characteristics or attributes
- The arc tells the reader of the diagram that only one of these “features” will have a relationship with each instance of a BILLBOARD



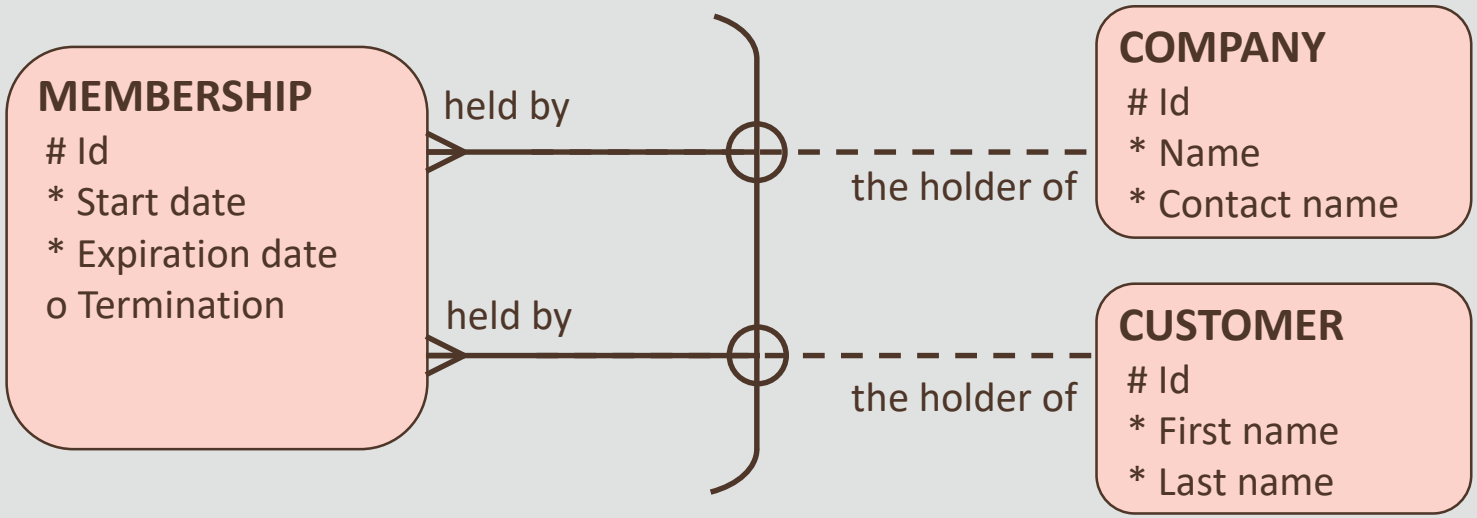
Representing Exclusive OR Relationships in the ERD

- Arcs are a way to represent mutually exclusive relationships in the ERD



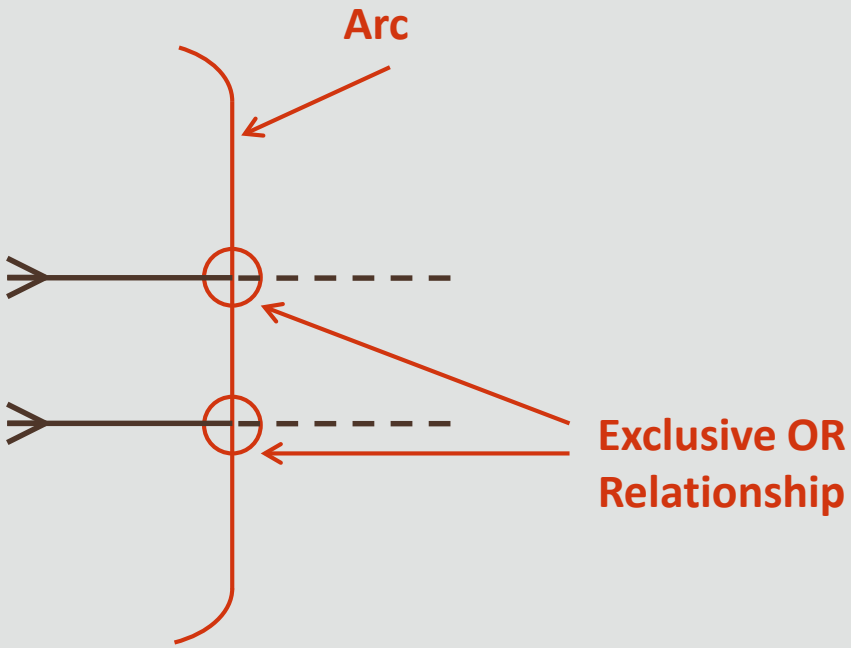
Representing Exclusive OR Relationships in the ERD

- This arc represents the exclusive OR relationship - each MEMBERSHIP must be held by one COMPANY or must be held by one CUSTOMER, but not both



Representing Exclusive OR Relationships in the ERD

- An arc is represented on an ERD as a solid line with curved ends
- A circle is drawn on the arc for every relationship that is part of the arc



Arcs

- An arc always belongs to one entity
- Arcs can include more than two relationships
- Not all relationships of an entity need to be included in an arc
- An entity may have several arcs
- An arc should always consist of relationships of the same optionality

Arcs

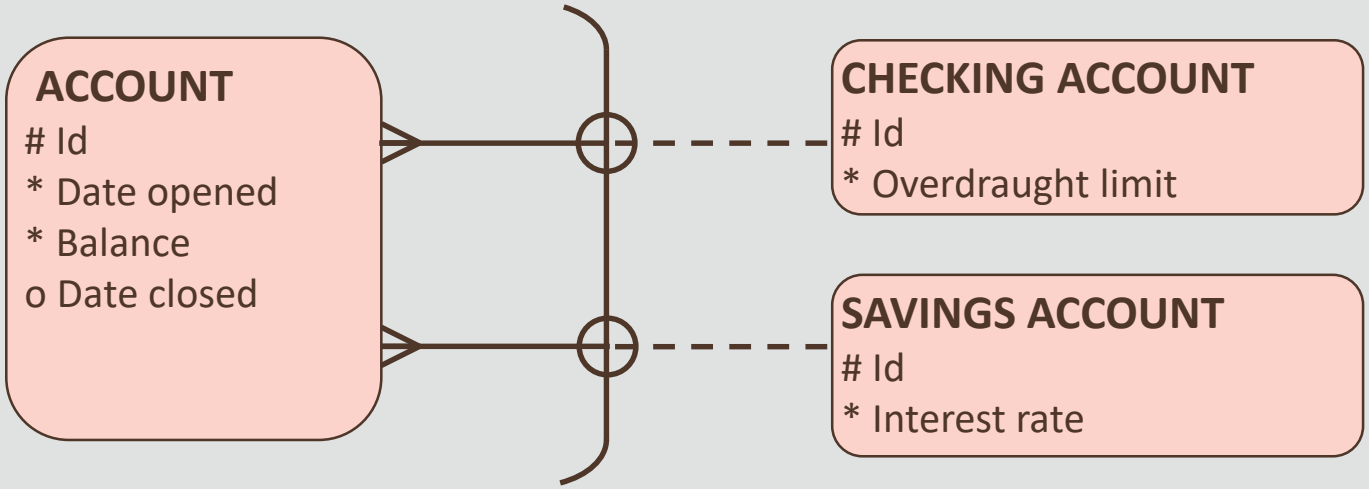
- All relationships in an arc must be mandatory or all must be optional
- Relationships in an arc may be of different cardinality, although this is rare

Arcs, Supertypes, and Subtypes

- Arcs and Super/subtypes both model mutual exclusiveness
- Certain situations are best modeled as an arc, and others as supertype and subtypes

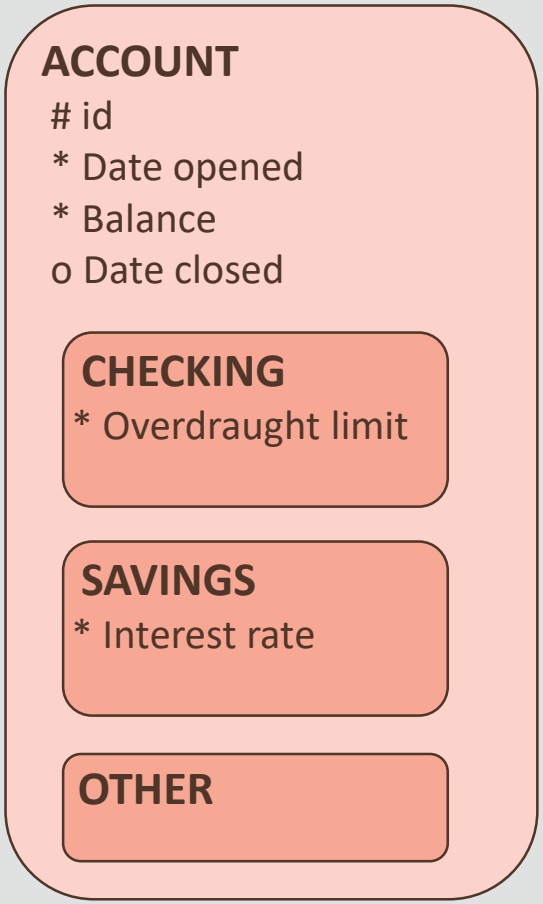
Arcs, Supertypes, and Subtypes

- Example 1:
  - CHECKING ACCOUNT and SAVINGS ACCOUNT are “types” of ACCOUNT



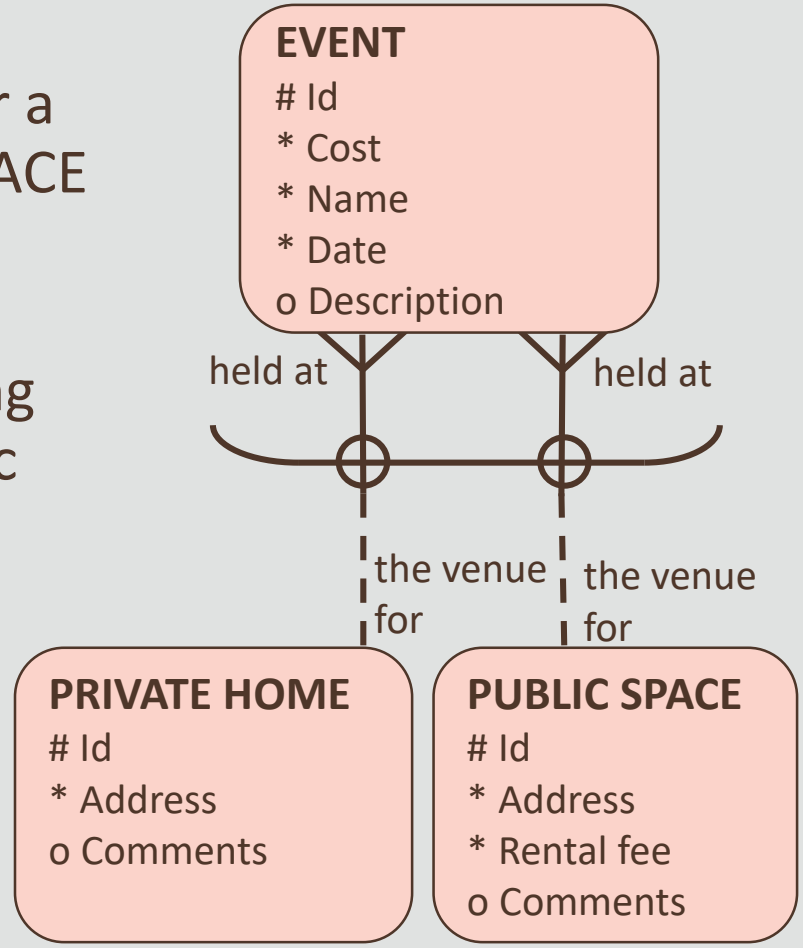
Arcs, Supertypes, and Subtypes

- This should be modeled as supertype and subtypes



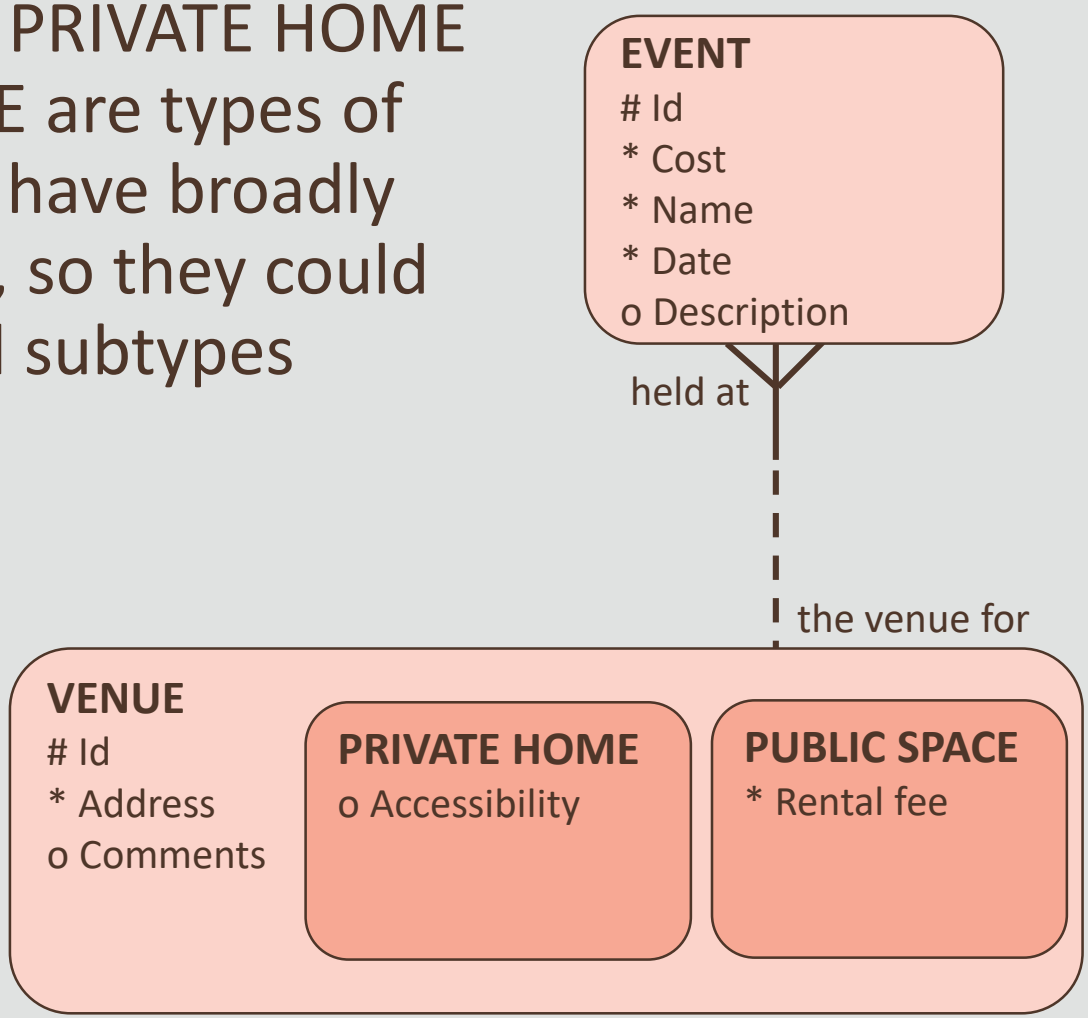
Arcs, Supertypes, and Subtypes

- Example 2:
  - An EVENT can be held at either a PRIVATE HOME or a PUBLIC SPACE
  - If the entities that are related through the arc are similar, there may be a case for creating a super/subtype without an arc



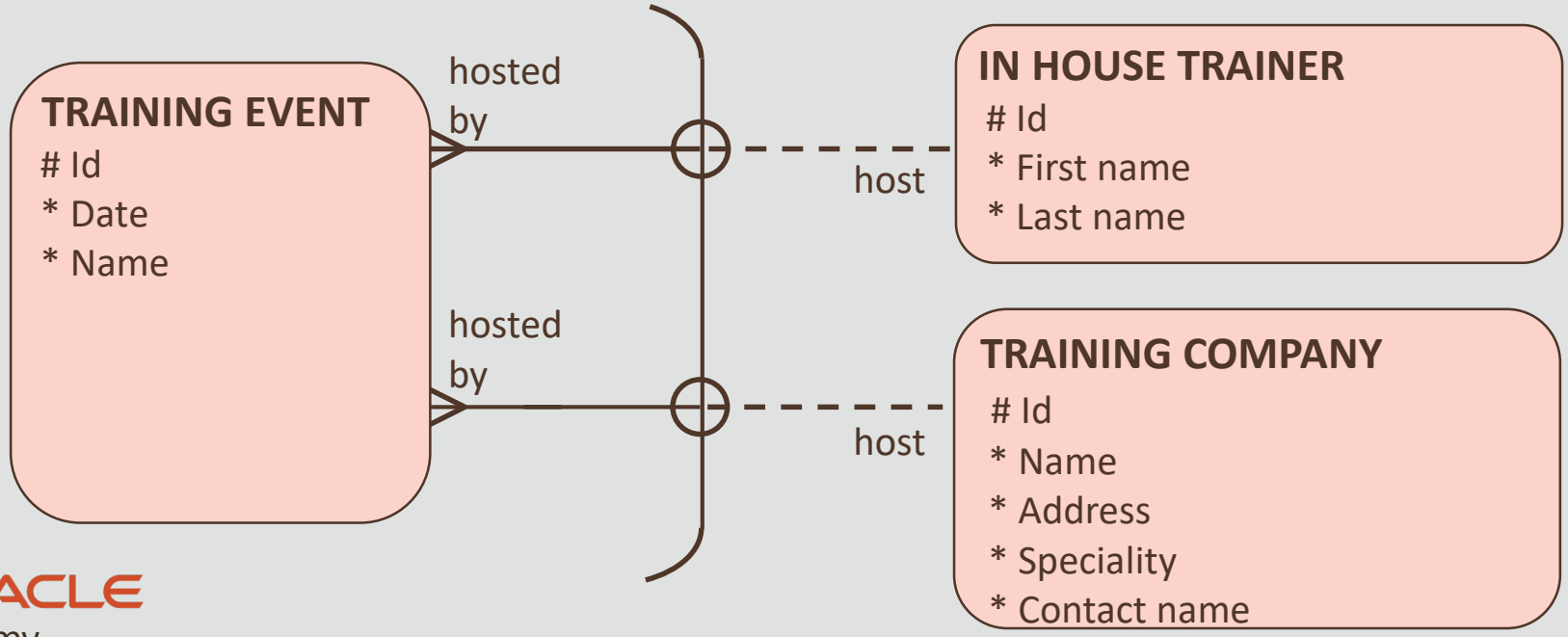
Arcs, Supertypes, and Subtypes

- In this case, both PRIVATE HOME and PUBLIC SPACE are types of VENUE, and they have broadly similar attributes, so they could be supertype and subtypes



Arcs, Supertypes, and Subtypes

- Example 3:
  - IN HOUSE TRAINER and TRAINING COMPANY are NOT types of TRAINING EVENT, and they do not share common attributes
  - This is best to model with an arc



Terminology

- Key terms used in this lesson included:
  - Arc
  - Constraint
  - Exclusive OR relationship
  - Mutually exclusive relationship

Summary

- In this lesson, you should have learned how to:
  - Define the term "constraint" as it applies to data modeling
  - Identify an exclusive OR relationship in a business scenario
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