Database Design

6-1

Artificial, Composite, and Secondary UIDs

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Objectives

- This lesson covers the following objectives:
  - Define the different types of unique identifiers (UIDs)
  - Define a candidate UID and explain why an entity can sometimes have more than one candidate UID
  - Analyze business rules and choose the most suitable primary UID from the candidates
  - Recognize and discuss the issues of identification in the real world

Purpose

- The unique identifier (UID) is very important in relational databases

- It is the value or combination of values that enables the user to find that one unique item among all the rest

- Identifying just the right attribute, or combination of attributes and relationships, is a skill that any database designer must master

- The unique identifier enables you to find your record in a file, a particular card in a deck of cards, your package in a warehouse, or a specific piece of data in a database

Simple UIDs vs. Composite UIDs

- A UID that is a single attribute is a simple UID
- However, sometimes a single attribute is not enough to uniquely identify an instance of an entity
- If the UID is a combination of attributes, it is called a composite UID

CONCERT TICKET
Ticket number
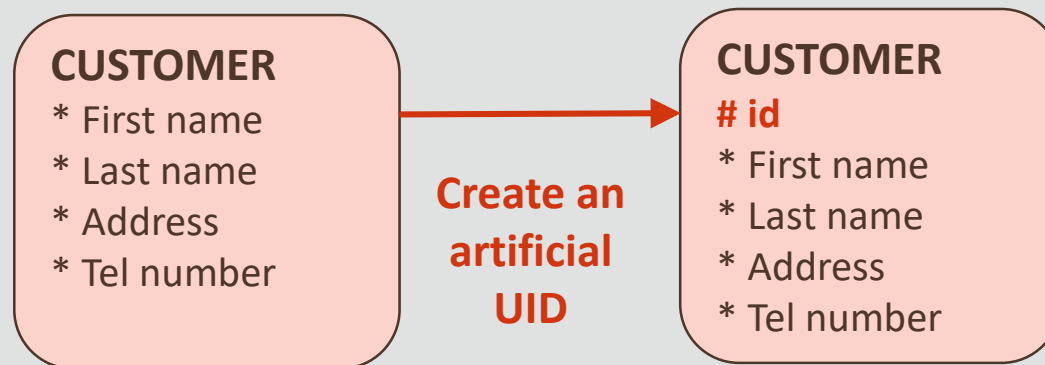* Name

Simple Unique Identifier

CONCERT TICKET
Date of performance
Seat number
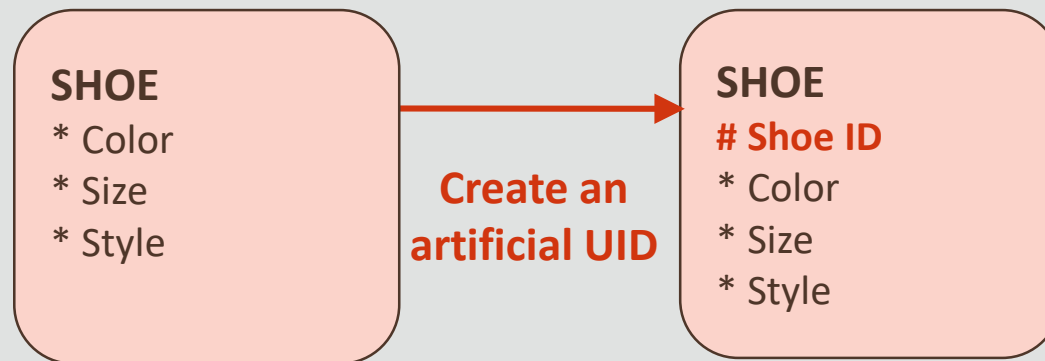
Composite Unique Identifier

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Artificial UIDs

- Artificial UIDs are those that don't occur in the natural world but are created for purposes of identification in a system

- People are not born with "numbers," but a lot of systems assign unique numbers to identify people: student numbers, customer IDs, etc
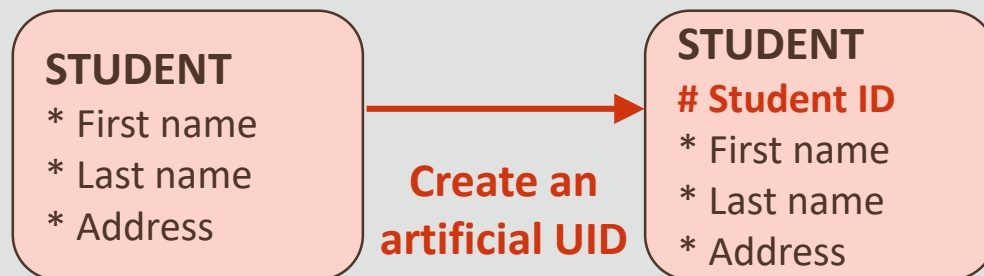
CUSTOMER
* First name
* Last name
* Address
* Tel number

Create an artificial UID

CUSTOMER
 # id
* First name
* Last name
* Address
* Tel number

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Artificial UIDs

- A shoe has a color, a size, a style, but no truly descriptive "number"

- However, a shoe store will assign unique numbers to each pair of shoes so they can be uniquely identified

```
+------------------+           +------------------+
| SHOE             |  Create an| SHOE             |
| * Color          |---------->| # Shoe ID        |
| * Size           | artificial| * Color          |
| * Style          |    UID    | * Size           |
|                  |           | * Style          |
+------------------+           +------------------+
```

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Artificial UID Example

- How can we uniquely identify a STUDENT?
- Could we use a combination of first name and last name?
  - Only if we are sure that the combination is unique
- Often, it is simpler and more straightforward to create an artificial attribute and make it the unique identifier
- A UID can be both artificial and composite

STUDENT
* First name
* Last name
* Address

Create an artificial UID →

STUDENT
 # Student ID
* First name
* Last name
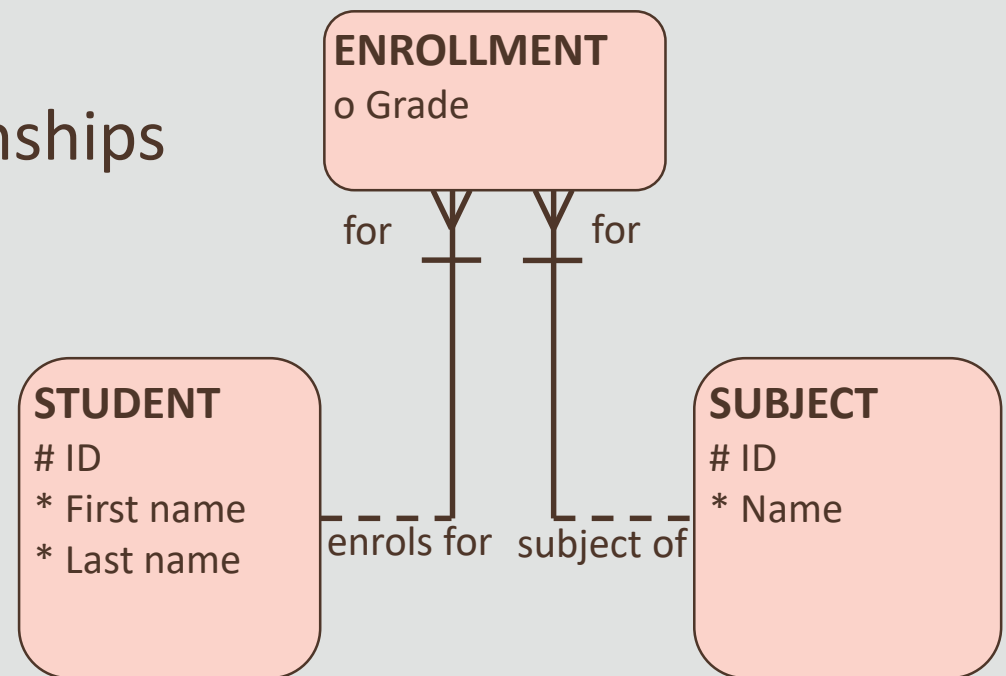* Address

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UIDs from Barred Relationships

- Sometimes the UID is a combination of an attribute and a relationship

- What is the UID of ACCOUNT? Is it artificial? Is it composite?

- Two people could have the same bank account number, but at different banks

- Bank to bank transfers always need the bank routing number in addition to the bank account number

ACCOUNT
Number
* Balance
* Date opened

at

have

BANK
Number
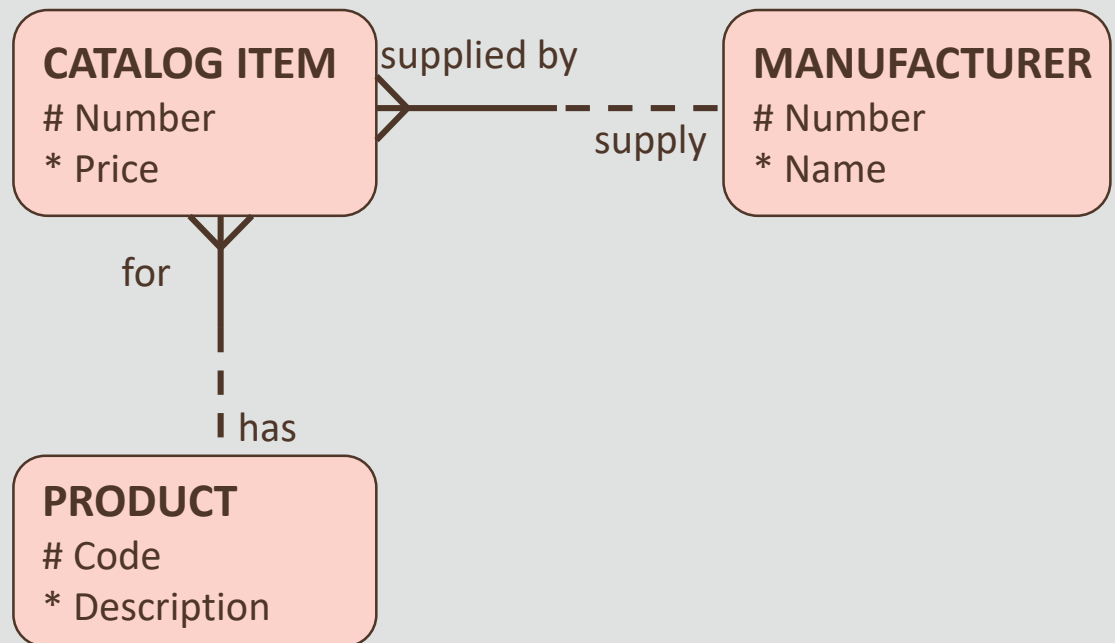* Name
* Location

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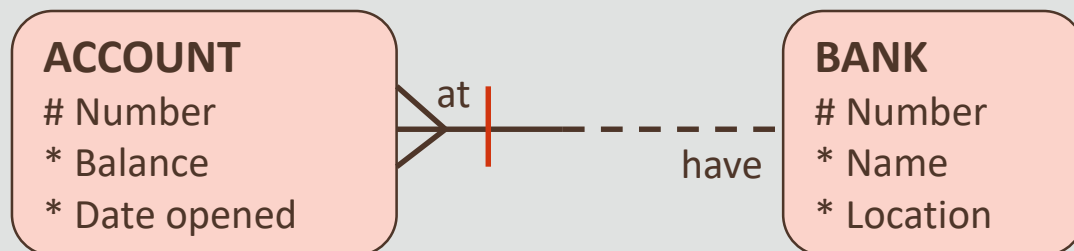
UID from Barred Relationship Intersection Entity

- As we've seen before, the resolution of a M:M relationship often results in barred relationships from the intersection entity to the original ones

- In this example, the UID of ENROLLMENT comes from STUDENT and SUBJECT

- The bars on the relationships tell you this

ENROLLMENT
o Grade

for   for

STUDENT
ID
* First name
* Last name

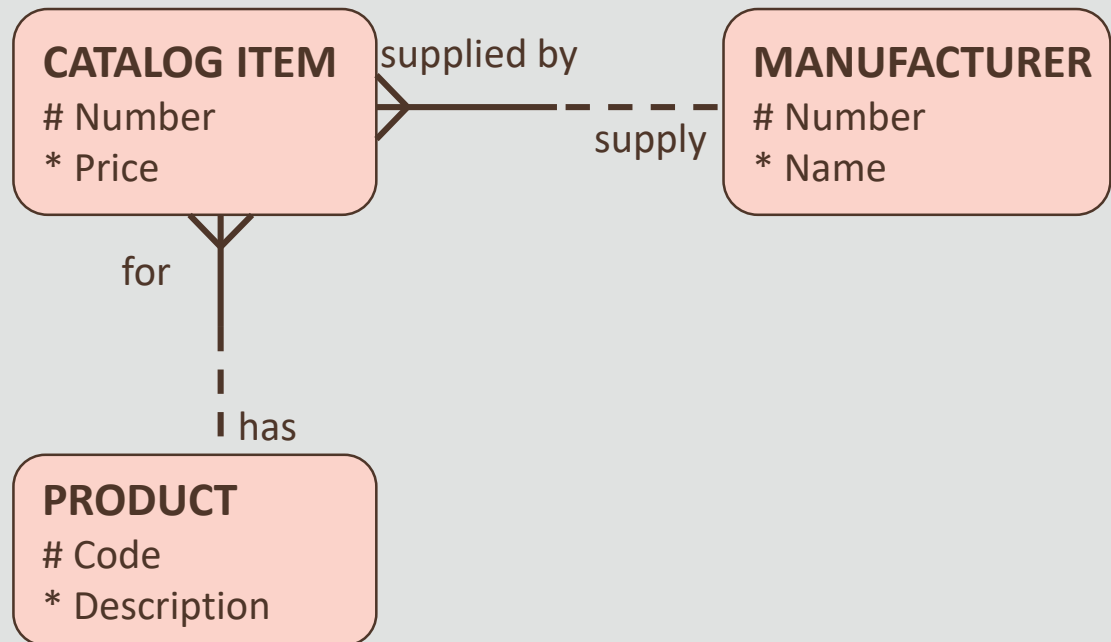enrols for   subject of

SUBJECT
ID
* Name

Artificial UID Intersection Entity

- It is possible for an intersection entity to use an artificial attribute as the UID, instead of the barred relationships to the originating entities

CATALOG ITEM
Number
* Price

MANUFACTURER
Number
* Name

supplied by

supply

for

has

PRODUCT
Code
* Description

Artificial UID Intersection Entity

- Each MANUFACTURER may produce one or more PRODUCTs (shoes, shirts, jeans, etc.)
- Each PRODUCT may be produced by one or more MANUFACTURERs (Nike shoes, Adidas shoes, Levi's jeans, etc.)

CATALOG ITEM
Number
* Price

supplied by

supply

MANUFACTURER
Number
* Name

for

has

PRODUCT
Code
* Description

Artificial UID Intersection Entity

- CATALOG ITEM resolves this many-to-many relationship

- An item in a catalog can be uniquely identified by the manufacturer number and the product code

- The relationships are not barred, an artificial UID – catalog number – has been created instead

CATALOG ITEM
Number
* Price

supplied by

MANUFACTURER
Number
* Name

supply

for

has

PRODUCT
Code
* Description
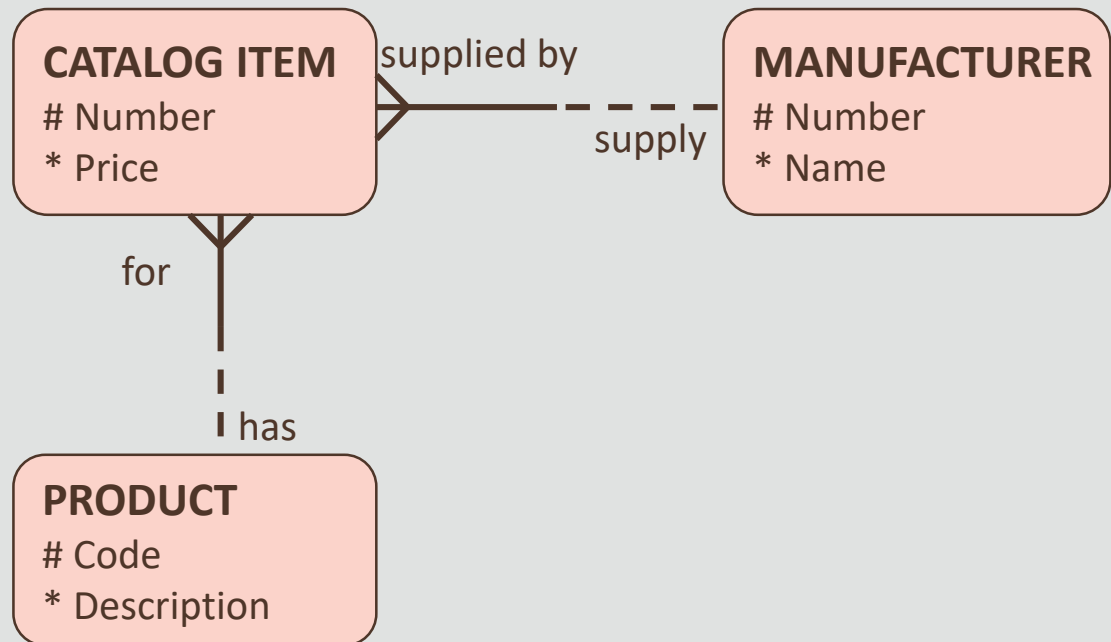
Candidate UIDs

- Sometimes two or more possible UIDs exist
- For example, when you order a product from a commercial website, you will usually be assigned a unique customer code and asked to enter your e-mail address
- Each of these uniquely identifies you, and each could be chosen as the UID
- These are both candidate UIDs
- Only one of the candidate UIDs is chosen as the actual UID, this is called the primary UID
- The other candidates are called secondary UIDs

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Candidate UIDs

- Student ID has been chosen as the primary UID in both of these STUDENT entities

- The first entity has one secondary UID, while the second has two secondary UIDs (one of which is composite)

STUDENT
 # Student ID
(#) Badge number
* First name
* Last name
* Address

One Primary UID
One Secondary UID

STUDENT
 # Student ID
(#1) Badge number
(#2-1) First name
(#2-2) Last name
* Address

One Primary UID
Two Secondary UIDs

Identification: Database vs. Real World

- Unique identifiers make it possible for us to distinguish one instance of an entity from another

- As you will see later, these become primary keys in the database

- A primary key allows you to access a specific record in a database

- In the real world, however, it is sometimes not so easy to distinguish one thing from another

Terminology

- Key terms used in this lesson included:
  - Artificial UID
  - Candidate UID
  - Composite UID
  - Primary UID
  - Secondary UID
  - Simple UID
  - UID

Summary

- In this lesson, you should have learned how to:
  - Define the different types of unique identifiers (UIDs)
  - Define a candidate UID and explain why an entity can sometimes have more than one candidate UID
  - Analyze business rules and choose the most suitable primary UID from the candidates
  - Recognize and discuss the issues of identification in the real world

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