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Database Design

8-1

Modeling Historical Data

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Objectives

- This lesson covers the following objectives:
 - Identify the need to track data that changes over time
 - Construct ERD models that incorporate elements of “data over time”
 - Identify the UID of an entity that stores historical data; explain and justify the choice of UID

Purpose

- How tall were you at age 5? How tall were you at age 10? How tall are you right now?
- If your parents wrote this down when you were young, they were keeping track of historical data
- Most businesses need to track some historical data
- This helps them find trends and patterns that are the basis for business innovations or process improvements
- For example, rental history of a movie is useful to a video store. It tells managers which movies are popular and which should be moved to the back shelf

Model Data Over Time

- When is it necessary to model data over time?
- Ask your client:
 - Is an audit trail required?
 - Can attribute values change over time?
 - Can relationships change over time?
 - Do you need to produce reports on older data?
 - Do you need to keep previous versions of the data? If so, for how long?

Data Over Time Example

- An organization needs to keep data about employees' salaries
- All employees are paid weekly
- Initially, the following EMPLOYEE entity was modeled
- Additional requirements now specify that the organization needs to keep a historical record of how and when employees' salaries have changed during their employment

EMPLOYEE

Id

* First name

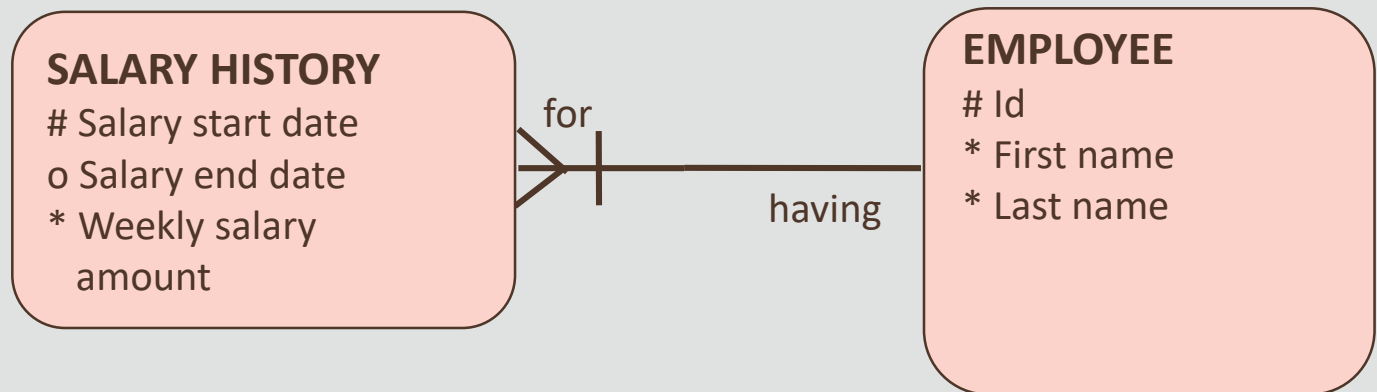
* Last name

* Weekly salary amount

* Salary start date

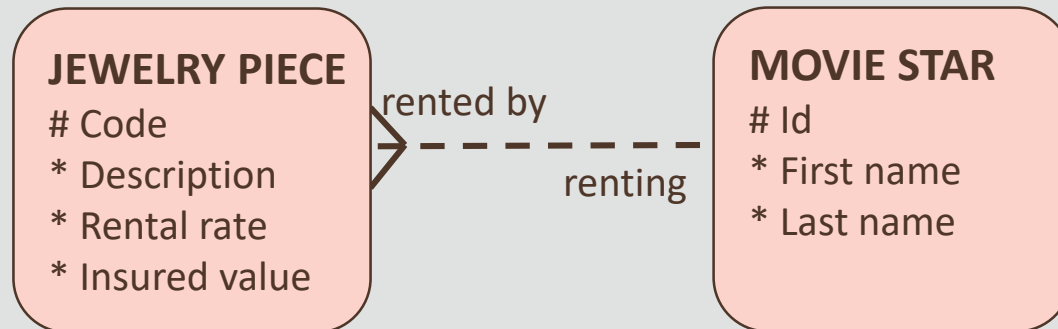
Model Salary Changes

- To model salary changes over time, add a SALARY HISTORY entity
- The UID of the SALARY HISTORY entity is the related EMPLOYEE id and the salary start date



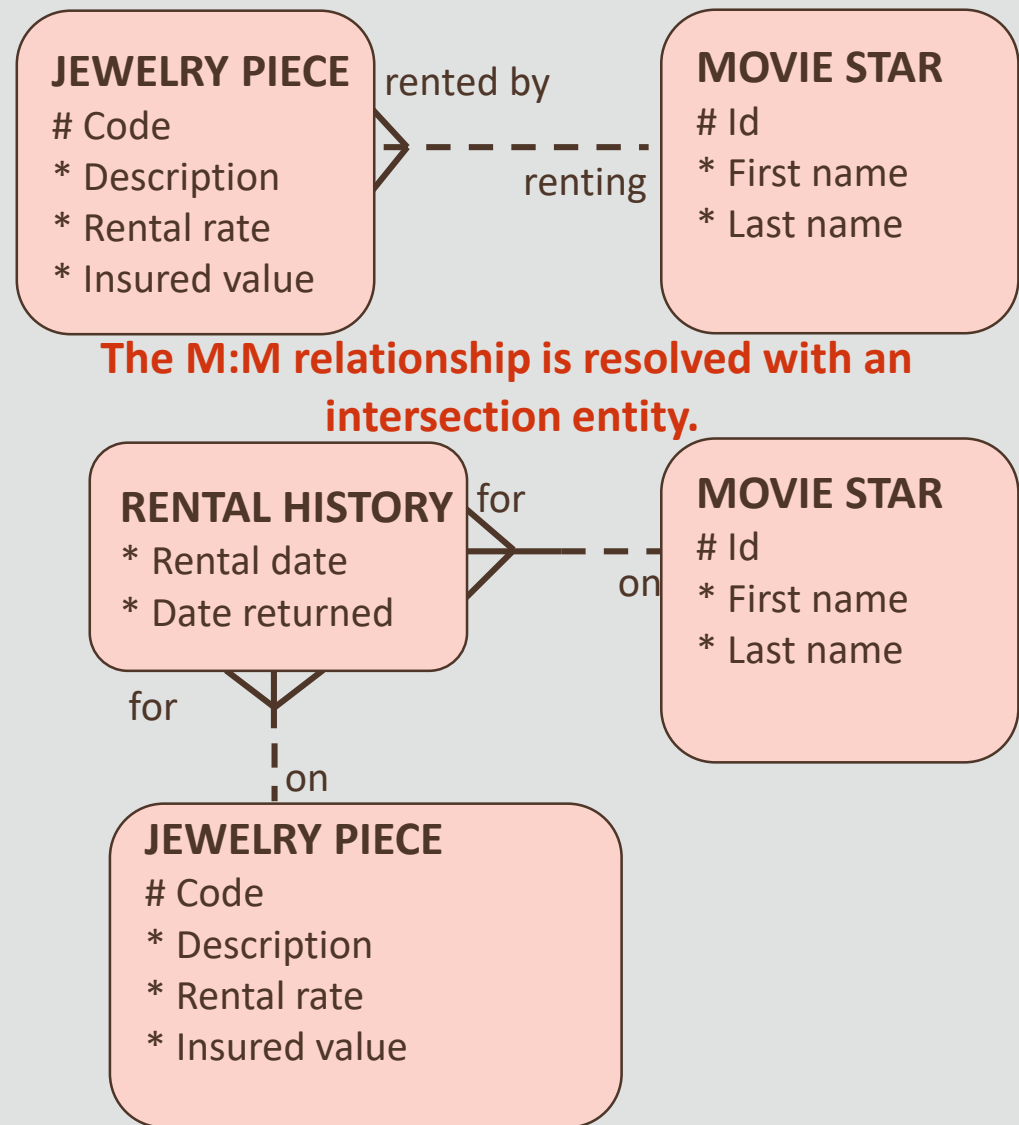
Model Rental Over Time

- A jewelry store rents pieces (necklaces, bracelets and so on) to movie stars for special occasions, such as award ceremonies or movie premieres
- They would like to track the rental history of a jewelry piece
- The following ER model will only track the current renter of a piece of jewelry
- How would you revise the relationship to track history?



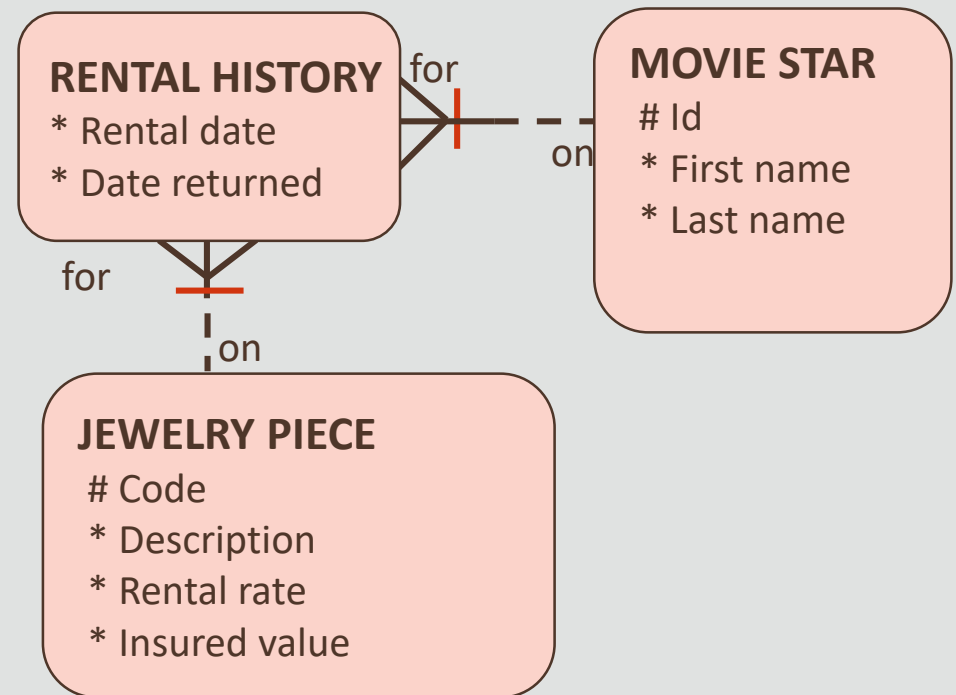
Resolve M:M

- The relationship between JEWELRY PIECE and MOVIE STAR should be revised to a M:M, which is then resolved with an intersection entity RENTAL HISTORY
- Next we need to determine the UID of RENTAL HISTORY



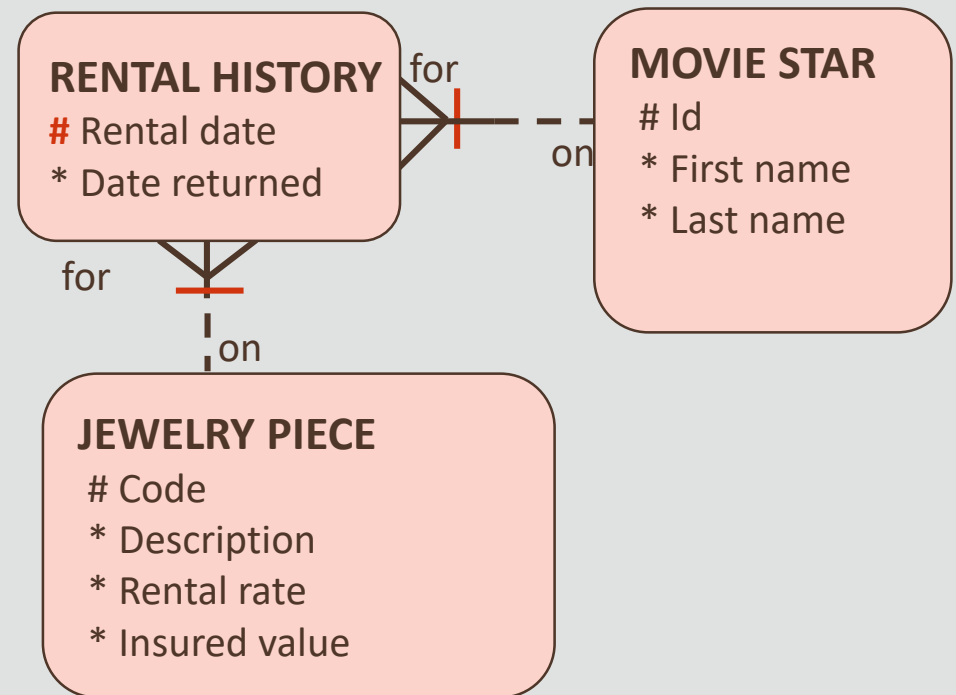
Determine UID

- Option 1: Barred relationship
 - Drawing a Barred relationship is not a suitable UID here, as this would not allow a MOVIE STAR to rent the same JEWELRY PIECE on different dates



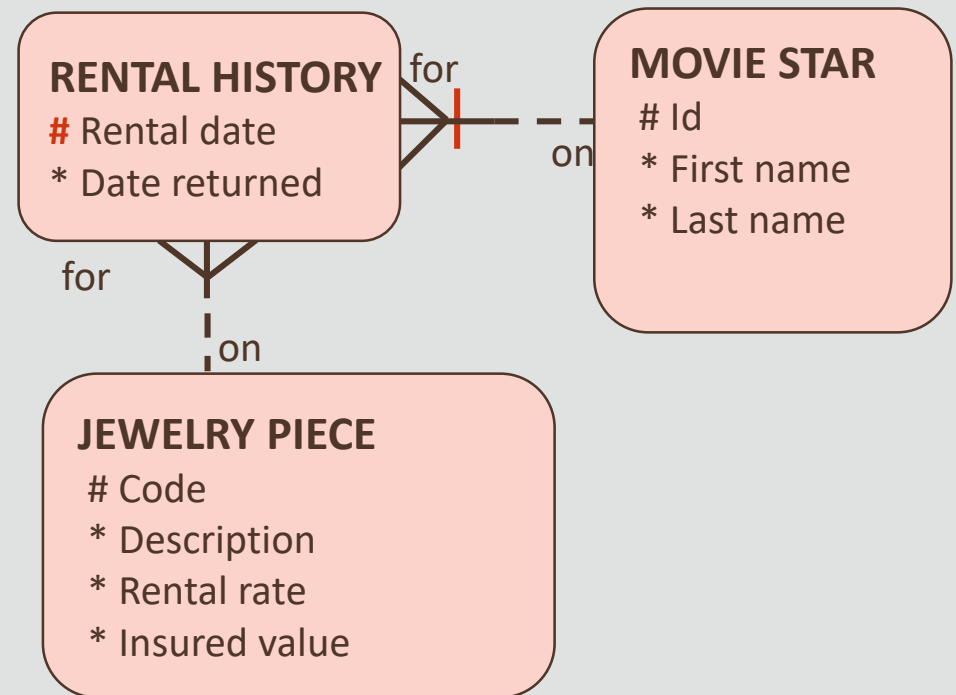
Determine UID

- Option 2: Barred relationship and Rental Date
 - Adding rental date to the UID would allow a MOVIE STAR to rent the same JEWELRY PIECE on different dates, but would also permit different MOVIE STARS to rent the same JEWELRY PIECE on the same date!



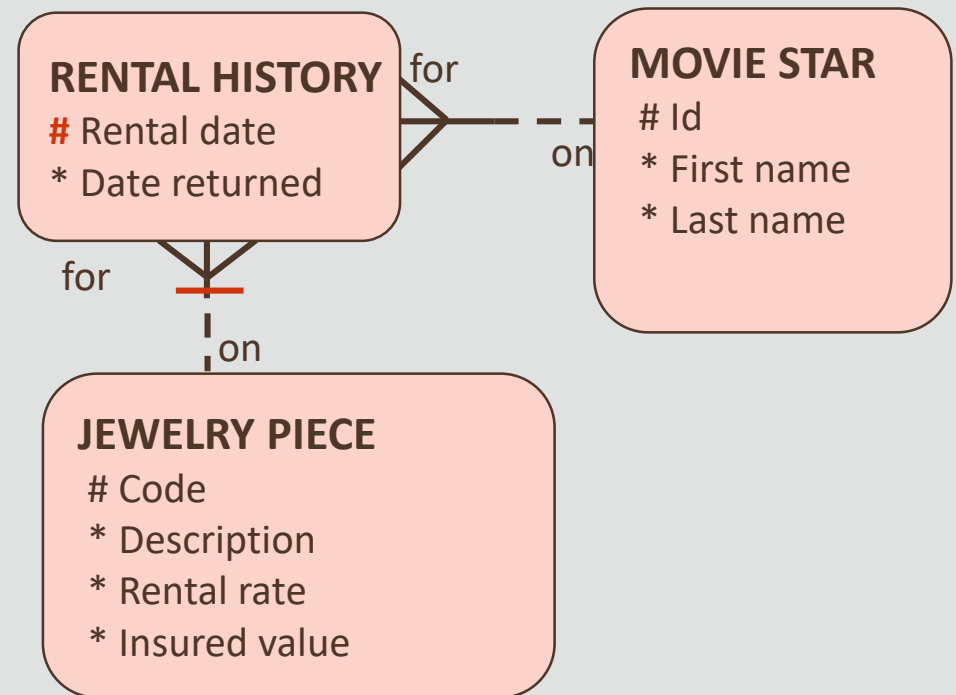
Determine UID

- Option 3: Barred relationship between MOVIE STAR and RENTAL HISTORY with Rental Date
 - This model would not permit the same MOVIE STAR to rent more than one JEWELRY PIECE on a given day



Determine UID

- Option 4: Barred relationship between JEWELRY PIECE and RENTAL HISTORY with Rental Date
 - This model says that a JEWELRY PIECE can be rented only once on the same date



Terminology

- Key terms used in this lesson included:
 - Audit trail
 - Historical data

Summary

- In this lesson, you should have learned how to:
 - Identify the need to track data that changes over time
 - Construct ERD models that incorporate elements of “data over time”
 - Identify the UID of an entity that stores historical data; explain and justify the choice of UID



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