Second Normal Form

by Sophia

WHAT'S COVERED

In this lesson, you will explore the second normal form (2NF), built on the first normal form (1NF) from our previous lesson. This section is in two parts. Specifically, this lesson covers:

1. Introduction
2. Movie Ratings Example

1. Introduction

With the second normal form (2NF), the database must first be in the first normal form (1NF). Once it is in the first normal form (1NF), the other criterion is to ensure that each non-key attribute is functionally dependent on the primary key. As a reminder, **functional dependency** means that the primary key should determine each column in a table that is not a primary key. You will need to review each attribute to determine if it is dependent on and specific to the primary key in each table.

TERM TO KNOW

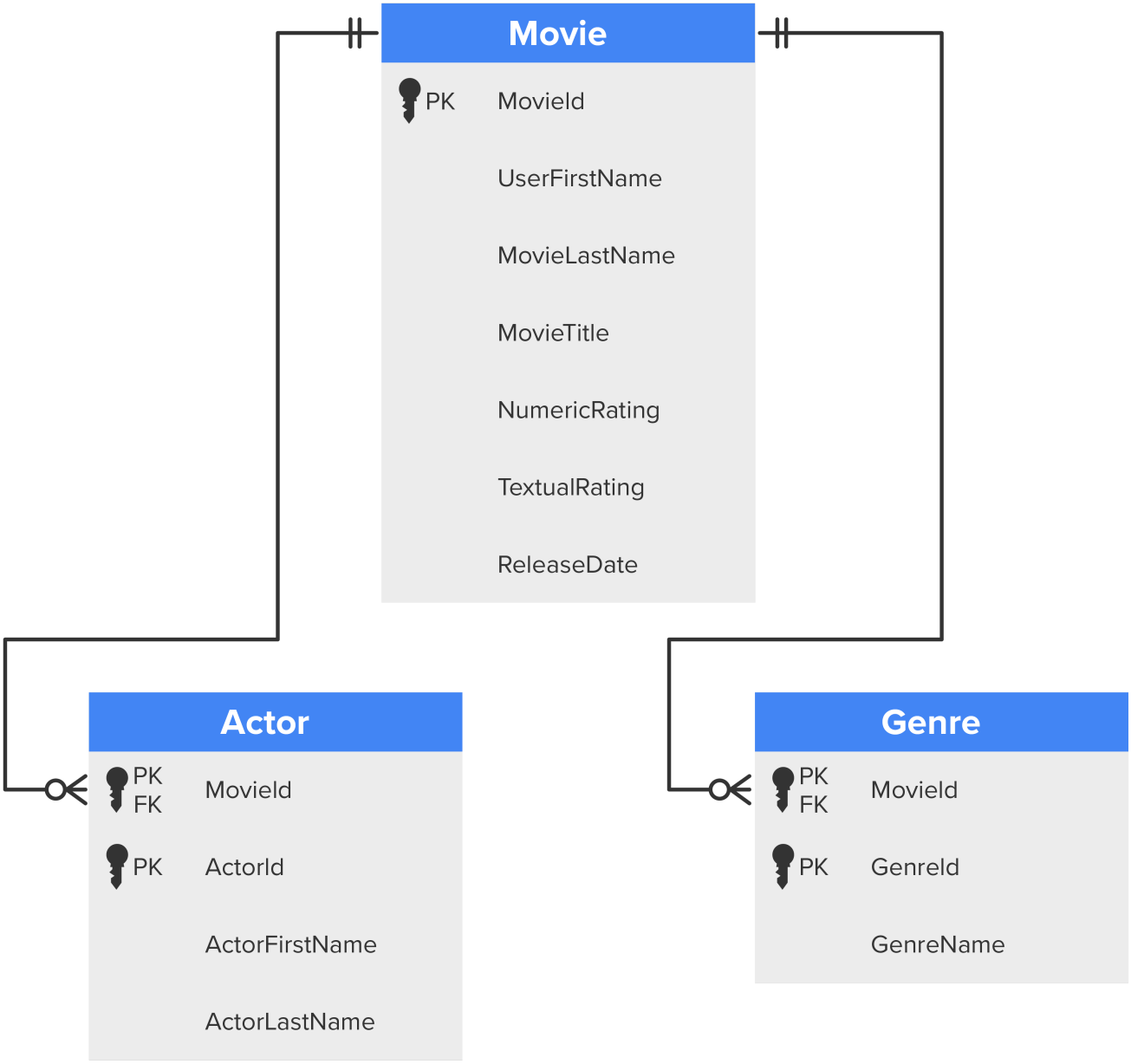
Functional Dependency

A situation in which the primary key determines the value of each attribute that is not a primary key.

2. Movie Ratings Example

For the movie ratings database, at the end of the first normal form (1NF), you had the following tables:

- Movie (MovieId, UserFirstName, UserLastName, MovieTitle, NumericRating, TextualRating, ReleaseDate)
- Actor (MovieId, ActorId, ActorFirstName, ActorLastName)
- Genre (MovieId, GenreId, GenreName)



Let's now review each column in the Movie table to determine if it is dependent on and specific to the primary key:

- **MovieId:** The MovieId is the primary key of the Movie table, so you can ignore it.
- **UserFirstName:** No, the UserFirstName does not depend on the MovieId, as it is specific to the user that is creating the rating.
- **UserLastName:** No, the UserLastName does not depend on the MovieId, as it is also specific to the user that is creating the rating.
- **MovieTitle:** Yes, the MovieTitle should be directly dependent on the MovieID, as a different MovieId should also mean a different MovieTitle.
- **NumericRating:** No, the NumericRating is not unique to the MovieId. A MovieId could have many different NumericRatings by different users.

- **TextualRating:** No, the TextualRating is not unique to the MovieId. A MovieId could have many different TextualRatings by different users.
- **ReleaseDate:** Yes, the ReleaseDate should be directly dependent on the MovieID, as a different MovieId should also mean a different ReleaseDate.

In the Actor table:

- **MovieId, ActorId:** These are primary keys, so you can ignore them for now.
- **ActorFirstName:** Not entirely. The ActorFirstName is dependent on the ActorId but not on the MovieId. This creates an issue with a many-to-many relationship between the Movie and Actor tables.
- **ActorLastName:** Not entirely. The ActorLastName is dependent on the ActorId but not on the MovieId. This also creates an issue with a many-to-many relationship between the Movie and Actor tables.

In the Genre table:

- **MovieId, GenreId:** These are primary keys, so you can ignore them for now.
- **GenreName:** Not entirely. The GenreName is dependent on the GenreId but not on the MovieId. This creates an issue with a many-to-many relationship between the Movie and Genre tables.

Let's begin to resolve these issues.
Let's start with the UserFirstname and the UserLastName in the Movie table; both of these are unique to a user, although two different users could have the same name. This could create some problems in our data, so you need to create a User table with a primary key, which you will call UserId:

- User (UserId, UserFirstName, UserLastName)

Next, you need a Rating table. The rating is related to the User and the Movie and should contain the UserId and MovieId as foreign keys, along with the NumericRating and TextualRating:

- Rating (UserId, MovieId, NumericRating, TextualRating)

Then, you need to determine if those two foreign keys combined would be unique. This depends on the business rules and whether a user can submit multiple ratings per movie. If a user cannot post more than one rating per movie, the combined values of the UserId and MovieId can be set as a composite primary key. However, since this was not specified in our business rules, it would be safer to create a separate primary key to allow a user to add more than one rating for a movie. Adding a RatingID as a primary key, the Rating table now looks like this:

- Rating (RatingId, UserId, MovieId, NumericRating, TextualRating)

Our Movie table now contains only the following:

- Movie (MovieId, MovieTitle, ReleaseDate)

Next, you turn your attention to the Actor and Genre tables, which have columns that only partially depend on the primary key due to the many-to-many relationships that are still in place.

- Actor (MovieId, ActorId, ActorFirstName, ActorLastName)
- Genre (MovieId, GenreId, GenreName)

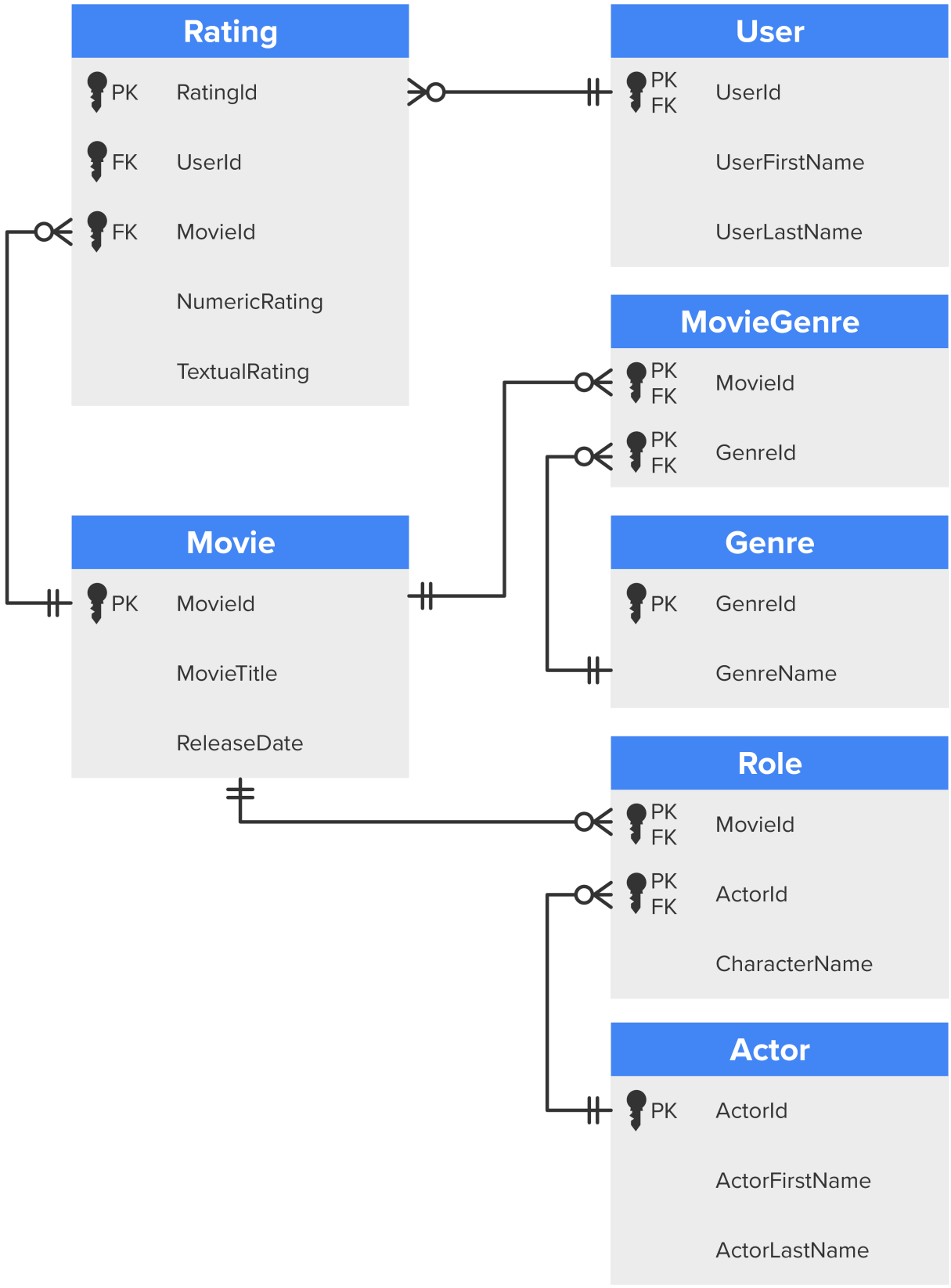
As you've established, an actor can act in many movies, and a movie can have many actors. However, an actor in a movie acts in a specific role. So, our many-to-many relationship can be defined by a bridge table named Role to join the two tables of Actor and Movie together:

- Movie (MovieId, MovieTitle, ReleaseDate)
- Role (ActorId, MovieId, CharacterName)
- Actor (ActorId, ActorFirstName, ActorLastName)

The ActorId and MovieId can be set up as a composite primary key in the MovieGenre table.
You can also build a bridge table for the many-to-many relationship between Movie and Genre, called MovieGenre:

- Movie (MovieId, MovieTitle, ReleaseDate)
- MovieGenre (MovieId, GenreId)
- Genre (GenreId, GenreName)

The GenreId and MovieId can be set up as a composite primary key in this bridge table.
The resulting ERD for our second normal form (2NF) would look like the following:



SUMMARY

In this lesson, you learned in the **introduction** that, first and foremost, before a database can enter the second normal form (2NF) stage, it needs to be in the first normal form (1NF) first. Next, you learned how to ensure dependency on the primary key using the **movie ratings example**. Additional tables were created to complete the final second normal form (2NF).

Source: THIS TUTORIAL WAS AUTHORED BY DR. VINCENT TRAN, PHD (2020) AND Faithe Wempen (2024) FOR SOPHIA LEARNING. PLEASE SEE OUR TERMS OF USE.

TERMS TO KNOW

Functional Dependency

A situation in which the primary key determines the value of each attribute that is not a primary key.