

## Entities:

- Games
  - Primary Key: Title
  - Other attributes: duration, minPlayer, maxPlayer, rating
- GameInstance
  - Primary Key: Id, Title
  - Foreign Key:
    - MemberID references Member
    - Title references Game
  - Other attributes: datePurchased, language
- Publisher
  - Primary Key: Name
  - Other attributes: Email, country, address, phone number
- Genre
  - Primary Key: Name
- Members
  - Primary Key: Member Number
  - Other attributes: Name, Email, Phone number, Year
  - ISA (partial coverage)
- Execs
  - Primary Key: MemberNum
  - Foreign Key: MemberNum references Members
  - O: Position
- Events
  - Primary Key: name, date
  - Other attributes: startTime, endTime, location, description

## Relationships:

- PublishedBy
  - Games are published by at least one publisher
  - Publishers can publish zero or more games
- hasGenre
  - Games have a genre
  - There must be at least one genre for a game
  - There can be many games for genre
- instanceOf
  - GameInstances are instances of Games
  - There must be at least and at most one game for a game instance
  - There can be many instances of a game
- Borrow
  - Members borrow gameInstance
  - Members can borrow as many games as they want
  - Games can at most be borrowed by one member

- Attend
  - Members attend events
  - Members can attend as many events as they want
  - Events can have as many members as they want
- Manages
  - Execs manage the borrow record
  - Execs can manage as many borrow records as they want
  - A borrow record can be managed by exactly 1 exec
- Hosts
  - Execs host an event
  - Execs can host as many events as they want
  - Events have to be hosted by at least one exec

Underlined attributes are primary keys, bolded attributes are foreign

## Entities:

### Events:

R(name, date, description, startTime, endTime, location)

FDs: Name, date → description, startTime, endTime, location

Does not violate BCNF, as (name, date) is a key.

As such, it is also in 3NF.

### Game instance:

R(id, borrowed, datePurchased, language, **gameTitle**)

Foreign: gameTitle references Game

FDs: ID, gametitle → borrowed, datePurchased, language

Does not violate BCNF, as (id, title) is a key.

As such, it is also in 3NF.

### Game:

R(title, rating, minPlayer, maxPlayer)

FDs: title → rating, minPlayer, maxPlayer

Does not violate BCNF, as (title) is a key.

As such, it is also in 3NF.

### Publisher:

R(name, phoneNumber, email, country)

FDs: name → phoneNumber, email, country

Does not violate BCNF, as (name) is a key.

As such, it is also in 3NF.

### BorrowRecord:

R(recordID, expectedReturnDate, actualReturnDate, dateBorrowed, timeBorrowed, **memberNumber**, **execNumber**)

Foreign: memberNumber references Member, execNumber references ExecutiveMember

FDs: recordID → expectedReturnDate, actualReturnDate, dateBorrowed, timeBorrowed, memberNumber, execNumber

Does not violate BCNF, as (recordID) is a key.

As such, it is also in 3NF.

**ExecutiveMember:**

R(memberNumber, position)

FDs: memberNumber -> position

Does not violate BCNF, as (memberNumber) is a key.

As such, it is also in 3NF.

**Member:**

R(memberNumber, year, name, phoneNumber, email)

FDs: memberNumber -> name, email, phoneNumber, year

Does not violate BCNF, as (memberNumber) is a key.

As such, it is also in 3NF.

**Genre:**

R(name)

Does not violate BCNF as there is only one attribute (the key).

As such, it is also in 3NF.

## Relationships:

### **PublishedBy:**

R(publisherName, gameTitle, datePublished)

FDs: title, publisherName -> datePublished

Does not violate BCNF, as (title, publisherName) is a key.

As such, it is also in 3NF.

The remainder of the relationship tables have only foreign keys (to the entities that the relationship involves), therefore all of them will be in BCNF, and thus 3NF.

### **Attends:**

R(memberNumber, eventName, eventDate)

Foreign: memberNumber references Member, eventName and eventDate references Event

### **Hosts:**

R(memberNumber, eventName, eventDate)

Foreign: memberNumber references Member, eventName and eventDate references Event

### **HasGenre:**

R(gameTitle, genreName)

Foreign: gameTitle references Game, genreName references Genre

### **Uses:**

R(id, gameTitle, eventName, eventDate)

Foreign: id and gameTitle references GameInstance, eventName and eventDate references Event

### **Contains:**

R(recordID, gameID, gameTitle)

Foreign: gameId and gameTitle reference GameInstance, recordID references  
BorrowRecord