Logical Design

Team: DataVerse

(Nora Manolescu, Kaitlyn Clements, Sam Muehlebach, Kyler Luong, Ben Stonestreet)

Introduction

Project Overview

This is a library database that will provide an easy, efficient, user-friendly platform for managing book inventory, tracking checkouts and returns, and administering user access to library resources. The design will be implemented to improve organization and simplify library operations. It will enhance user experience by easily providing information such as book availability, due dates, and user activity. This will be done using MySQL.

Scope

Using a MySQL-based relational database, we are able to organize and categorize each book and digital media item by different attributes such as title, author or creator, ISBN, etc. We are able to use it for clients in the database using unique ID, name, contact information, membership type, and account status. We are also using a user-friendly interface for library staff and for clients as well. The UI will consist of searching for items, reserving, for the client side, while for the staff side being able to track transactions between customers and the status for the items.

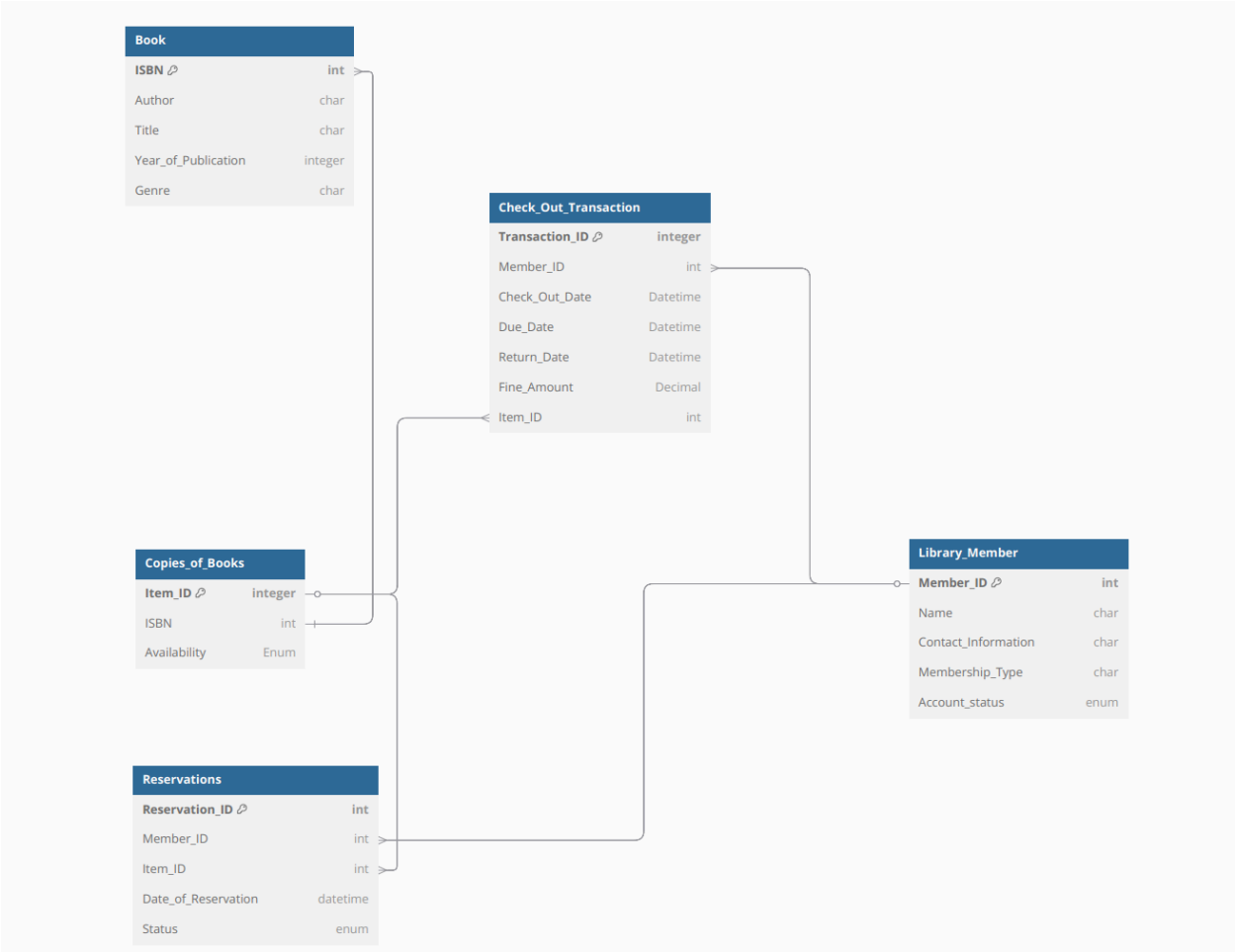
Relational Schema Mapping

- **Primary Keys:**
  - Book
    - Primary Key: **ISBN**
  - Copies_of_Books
    - Primary Key: **ItemID**
  - Library_Member
    - Primary Key: **MemberID**
  - Check_Out_Transaction
    - Primary Key: **TransactionID**

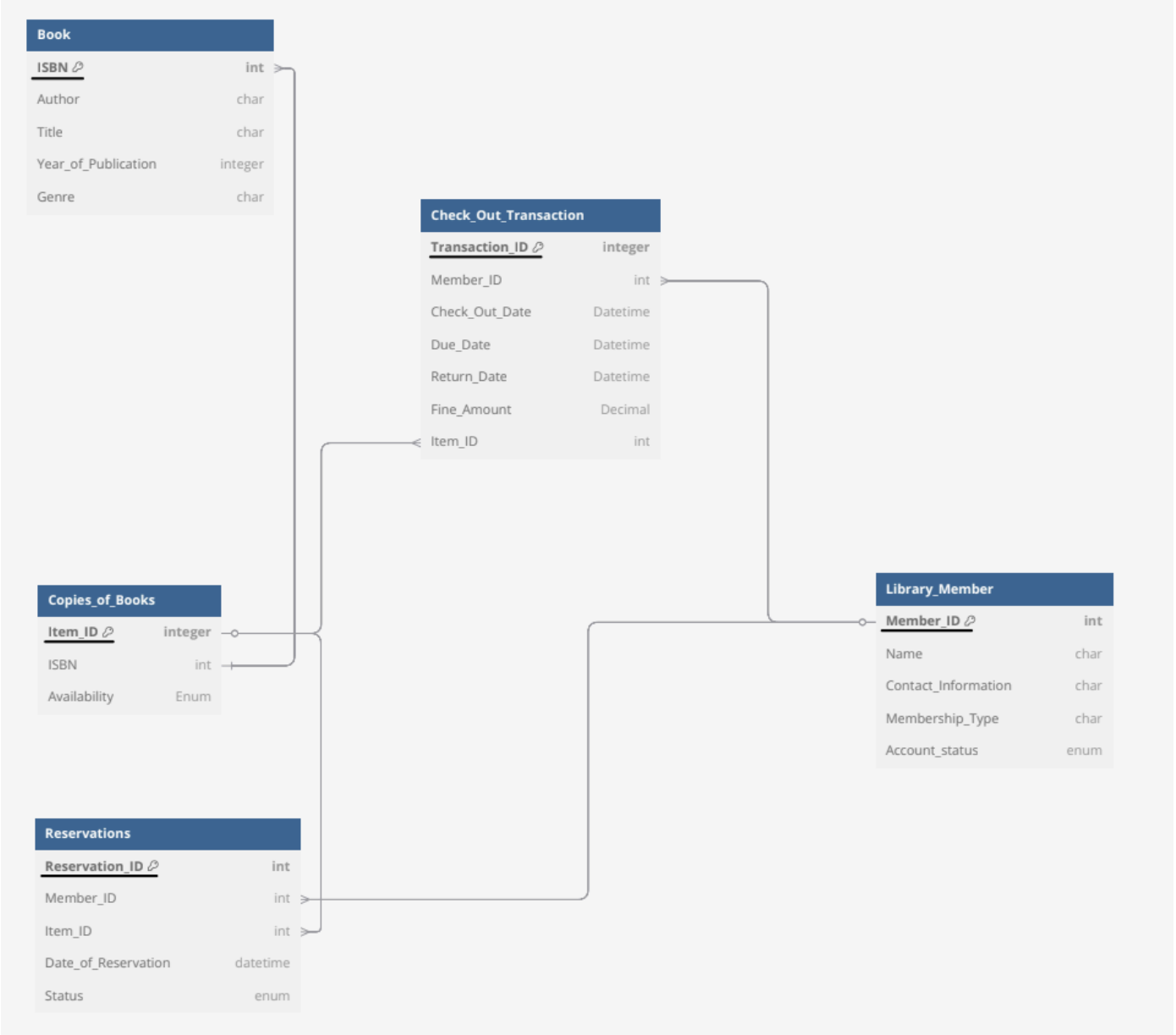
- **Foreign Keys:**
    - Copies_of_Book
        - Foreign Key: **ISBN** -> **Book**
    - Check_out_Transaction
        - Foreign Key: **MemberID** -> **Library_Member**
    - Reservations
        - Foreign Key: **MemberID** -> **Library_Member**

- **Functional Dependencies (FDs):**
    - Book
        - Primary Key: ISBN
        - Functional Dependencies: **ISBN -> Title, Author, Year_of_Publication, Genre**
    - Cropies_of_Books
        - Primary Key: ItemID
        - Functional Dependencies: **ItemID -> ISBN, Availability**
    - Library_Member
        - Primary Key: MemberID
        - Functional Dependencies: **MemberID -> Name, Contact_Information, Membership_Type, Account_Status**
    - Check_Out_Transaction
        - Primary Key: TransactionID
        - Functional Dependencies: **TransactionID -> MemberID, Check-Out_Date, Due_Date, Return_Date, Fine_Amount, ItemID**
    - Reservations
        - Primary Key: ReservationID
        - ReservationID -> **MemberID, ItemID, Date_of_Reservation, Status**

Relational Schema Diagram



*Below: Same diagram after manually underlining unique keys in each relation.


Book
ISBN int
Author char
Title char
Year_of_Publication integer
Genre char
Check_Out_Transaction
Transaction_ID integer
Member_ID int
Check_Out_Date Datetime
Due_Date Datetime
Return_Date Datetime
Fine_Amount Decimal
Item_ID int
Copies_of_Books
Item_ID integer
ISBN int
Availability Enum
Library_Member
Member_ID int
Name char
Contact_Information char
Membership_Type char
Account_status enum
Reservations
Reservation_ID int
Member_ID int
Item_ID int
Date_of_Reservation datetime
Status enum

Schema Documentation with a Data Dictionary

Relation table name in boldface

Foreign Key in Italics

Book

Attribute Name	Data Type	Description
ISBN	Char	International Standard Book Number, unique to each edition and variation of a book.
Author	Char	The author(s) of the book.
Title	Char	The title of the book.
Pub_Year	Int	The year the book was published.
Genre	Char	The genre of the book.

Copies_of_book

Attribute Name	Data Type	Description
Item_ID	Int	The unique identification number of the copy.
ISBN	Int	International Standard Book Number, unique to each edition and variation of a book. Foreign key from Book relation.
Availability	Enum: Available, Unavailable	The status of whether the copy is available.

Library_member

Attribute Name	Data Type	Description
Member_ID	Int	The unique identification number of the member.
Name	Char	The full name of the member.
Contact_info	Char	The email address of the member.
Membership_type	Enum: General, Premium	The membership type of the member.
Account_status	Enum: Active, Inactive, Suspended	The status of the member's account.

Reservations

Attribute Name	Data Type	Description
Reservation_ID	Int	The unique identification number of the reservation.
Member_ID	Int	The identification number of the member who the reservation is for. Foreign Key from Library_member relation.
Item_ID	Int	The identification number of the copy reserved. Foreign key from copies_of_book relation.
Reservation_date	Datetime	The date the reservation is placed.
Status	Enum: Active, Cancelled	The status of the reservation.

Check_out_transaction

Attribute Name	Data Type	Description
Transaction_ID	Int	Unique identification number of the transaction.
Member_ID	Int	Member who made the transaction. Foreign Key from Library_member relation.
Check_out_date	Datetime	Date transaction occurred on.
Due_date	Datetime	The date the book has to be returned.
Return_date	Datetime, Nullable	The date the book was returned.
Fine_amount	Datetime, Nullable	The fine that occurred if applicable.
Item_ID	Int	The identification number of the item was checked out. Foreign key from copies_of_book relation.