Team ORCHID

Library Database Project
Conceptual Modeling

Version 1.2

Table of Contents

Introduction

This document outlines the entities and relations of a library database.

Project Overview

The Library Database Project aims to simplify data management and improve daily operations for a single library. This system helps librarians easily track inventory, manage user accounts, keep records of borrowed items, and create useful reports. Library staff and visitors will have appropriate access based on their roles, ensuring easy and organized interactions with the library's resources.

Scope

This database is designed for a single library, handling its catalog, user accounts and item loans, and Item reservation. It is not intended for multi-branch systems but provides essential features to support daily operations. The system enables structured and accessible interactions for all users, from staff to guests.

Modeling Components

The following section describes each entity in the database.

In each entity's attribute subsection, bolded text denotes the attribute name, and the following text denotes its data type. The underlined attribute denotes the primary key of an entity. A _ signifies a value decided upon by the library administrators.

Account

Account entities contain information about a single user.

Account Attributes

Account ID. Integer.

- The account ID is an integer that uniquely identifies a user's account.
- Constraints: Primary key.

Account Type ID. Integer.

- The account type ID of the type of the account.
- Constraints: Foreign key referencing the account type table.

Account Status. Boolean.

- An account restriction is determined by a library employee. If set to true, this account cannot borrow or reserve items. An account may become restricted due to late fees or lost/damaged items at the library's discretion.

Name. String.

- Name is a user-inputted attribute that contains the account user's name.
- It contains three sub-attributes of first name, middle initial, and last name.
- Constraints: Cannot be NULL.

Address. String.

- Address is a user-inputted attribute that contains the account user's address.

Date of Birth. Date.

- Date of Birth (DOB) is a user-inputted attribute that contains the account user's date of birth. It can be used to determine if an account owner is a student account.
- Constraints: Cannot be NULL. Must be in the YYYY-MM-DD format.

Email. String.

- Email is a user-inputted attribute that contains the account user's email address. Considered a sub-attribute of contact information.
- Constraints: Must be a unique value.

Phone Number. String.

- Phone number is a user-provided attribute that contains the account user's phone number. Considered a sub-attribute of contact information.
- Constraints: Must be in the (###)-###-#### format.

Parent ID. Integer.

- A parent ID is empty for any adult-type accounts. For student-type accounts, it is a foreign key that contains the account ID of their guardian's account.
- Constraints: Foreign key for the Account table. Cannot equal the account ID of a student account. If the account type is student, it cannot be NULL.

Account Relations

Below is a list of relationships involving accounts. Full details on each are included in the *Entity Relations* section.

- **Borrows.** Account to item relation.

- **Parents.** Account to account relation.
- **Reserves.** Account to item relation.
- **Picklist.** Account to account type relation.

Account Type

Account type entities describe options in a picklist for account type. Refers to one of several options allowing for different interactions with the database and/or other entities. The entities that will exist are Adult, Student, and Staff.

Account Type Attributes

Account Type ID. Integer.

- The account type ID is an integer that uniquely identifies an account type.
- Constraints: Primary key.

Name. String.

- Name is an attribute that describes the account type.
- Constraints: Cannot be NULL.

Contributor

Contributor entities contain information about a contributor to a work. This includes authors, music artists, and film directors among others.

Contributor Attributes

Contributor ID. Integer.

- The contributor ID is an integer that uniquely identifies a contributor.
- Constraints: Primary key.

Name. String.

- Name is an attribute consisting of three sub attributes: first name, last name, and middle initial.
- Constraints: First and last name cannot be NULL.

Contributor Relations

Below is a list of relationships involving contributor entities. Full details on each are included in the *Entity Relations* section.

- **Contributions.** Contributor to contribution relation.

Contribution

Contribution represents the relationship between contributors and items.

Contribution Attributes

Contribution ID. Integer.

- The contribution ID is an integer that uniquely identifies a contribution.
- Constraints: Primary key.

Item ID. Integer.

- The item ID is the unique identifier of the item that was contributed to.
- Constraints: Foreign key.

Contributor ID. Integer.

- The contributor ID refers to the identifier for the contributor involved on the contributor table.
- Constraints: Contributor ID is a foreign key.

Contribution Role ID. Integer.

- The contribution role ID of the role of the contributor.
- Constraints: Foreign key referencing the contribution role table.

Contribution Relations

Below is a list of relations involving contribution entities. Full details on each are included in the Entity Relations section.

- **Contributions.** Representative of the Contributions relation between contributors and items.
- **Picklist.** Contribution to contribution role relation.

Contribution Role

Contribution role entities describe options in a picklist for contribution role. Refers to the role that the contributor had during the project. Options can be added by the library as needed.

Contribution Attributes

Contribution Role ID. Integer.

- The contribution role ID is an integer that uniquely identifies a contribution role.
- Constraints: Primary key.

Name. String.

- Name is an attribute that describes the contribution role.
- Constraints: Cannot be NULL.

Genre

Genre entities describe options in a picklist for genre. Options can be added by the library as needed.

Genre Attributes

Genre ID. Integer.

- The genre ID is an integer that uniquely identifies a genre.
- Constraints: Primary key.

Name. String.

- Name is an attribute that describes the genre.
- Constraints: Cannot be NULL.

Item

Item entities are the objects that the library may loan out. A single item may be a book, magazine, a DVD, or a CD.

Item Attributes

Item ID. Integer.

- Item ID is the unique identifier of each item in the library.
- Constraints: Primary key.

Item Type. String.

- The item type ID of the item type of the item.
- Constraints: Foreign key referencing the item type table.

Title. String.

- Title of the item.

Description. String.

- Description of the item, such as a book summary.

Genre ID. Integer.

- The genre ID of the genre of the item.
- Constraints: Foreign key referencing the genre table.

ISBN. String.

- Acronym for International Standard Book Number. Identifies a book with the International ISBN agency, a standard used worldwide.
- Will be NULL for other item types.
- Constraints: Must be 10 characters long if a book was published before 2007, or 13 characters if published on or after January 1, 2007.

Publication Year. Integer.

- Year in which an item was released.

Publication Date. Date.

- Specific date on which an item was published, if available.

Publisher. String.

- The name of the company that published the item.

Issue Number. Integer.

- For magazines, issue number of a given item specified by the magazine publisher.
- NULL if not a magazine item.

Explicit. Boolean.

- For CDs, identifies if the item has a parental advisory warning, meaning that student accounts cannot borrow it.
- NULL if not a CD.

Rating ID. Integer.

- For DVDs, identifies the MPA rating of a movie via a rating ID from the rating table. If a movie is rated R or above, it cannot be borrowed by a student.
- NULL if not a DVD.
- Constraints: Foreign key referencing the rating table.

Total Quantity. Integer.

- The quantity of the item that the library owns.

Quantity Available. Integer.

- The quantity of the item that is currently available for borrowing.
- Constraints: Cannot be greater than the Total Quantity.

Reservation Amount. Integer.

- The amount of reservations currently placed on an item to show how long the queue for borrowing may be.

Item Relations

Below is a list of relationships involving items. Full details on each are included in the *Entity Relations* section.

- **Contributions.** Contributor to item relation.
- **Loans.** Account to item relation.
- **Reserves.** Account to item relation.
- **Picklist.** Item to item type relation.
- **Picklist.** Item to genre relation.
- **Picklist.** Item to rating relation.

Item Type

Item type entities describe options in a picklist for item type. The entities that will exist are Books, DVDs, CDs and magazines.

Item Type Attributes

Item Type ID. Integer.

- The item type ID is an integer that uniquely identifies an item type.
- Constraints: Primary key.

Name. String.

- Name is an attribute that describes the item type.
- Constraints: Cannot be NULL.

Loan

Loan entities contain information related to an account borrowing an item.

Loan Attributes

Loan ID. Integer.

- The loan ID is a unique identifier for each loan transaction.
- Constraints: Primary key. Must be unique.

Item ID. Integer.

- The item ID is the unique identifier of the borrowed item.
- Constraints: Foreign key referencing the Item table.

Account ID. Integer.

- The account ID is the unique identifier of the user borrowing the item.
- Constraints: Foreign key referencing the Account table. Cannot be a restricted account.

Loan Out Date. Date.

- The date when the item was borrowed.
- Constraints: Cannot be NULL. Must be in YYYY-MM-DD format.

Due Date. Date.

- The date when the borrowed item is expected to be returned.
- Constraints: Cannot be NULL. Must be later than the Loan Out Date. Must follow YYYY-MM-DD format.

Return Date. Date (Nullable).

- The actual date when the item was returned.
- Constraints: Can be NULL if the item is not yet returned. If provided, must be on or after the Loan Out Date and on or before the Due Date unless extended.

Loan Relations

Below is a list of relationships involving loans. Full details on each are included in the *Entity Relations* section.

- **Borrows**. Representative of the Borrows relation between accounts and items.

Rating

Rating entities describe options in a picklist for rating. The entities that will exist are G, PG, PG-13, R, and NC-17.

Rating Attributes

Rating ID. Integer.

- The rating ID is an integer that uniquely identifies an rating.
- Constraints: Primary key.

Name. String.

- Name is an attribute that describes the rating.
- Constraints: Cannot be NULL.

Reservation

Reservation entities contain information related to an account reserving a book in order to borrow it in the future.

Reservation Attributes

Reservation ID. Integer.

- The reservation ID serves as a unique identifier for each reservation made.
- Constraints: Primary key. Must be eight digits.

Item ID. Integer.

- Item ID is the unique identifier of the Item that is being reserved. It is a foreign key referencing the item table.
- Constraints: Foreign key value must exist in item table.

Account ID. Integer.

- The account ID is the unique identifier of the user making the reservation. It is a foreign key referencing the account table.
- Constraints: Foreign key value must exist in Account table. Cannot be a restricted account.

Reservation Date. Date.

- The reservation date serves to denote the beginning of the date window when an item will only be able to be reserved by a specific user.
- Constraints: Cannot be NULL. Must be a date in the future relative to the latest reservation end date associated with the item to be reserved on this table. Must follow YYYY-MM-DD format.

Reservation End Date. Date.

- The reservation end date marks the end of the reservation window.
- Constraints: Cannot be NULL. Must be a date past the reservation date. Must follow YYYY-MM-DD format.
- Optional Constraints: Cannot exceed _ days after the reservation date.

Reservation Relations

Below is a list of relationships involving reservations. Full details on each are included in the *Entity Relations* section.

- **Reserves.** Representative of the Reserves relation between accounts and items.

Entity Relations

This section describes the relationships between the entities listed above.

Picklist

A relation that describes the relationship between the picklist entities (Account Type, Contribution Role, Genre, Item Type, and Rating) and their corresponding attributes in other entities.

These relations are account type-to-account, contribution role-to-contribution, genre-to-item, item type-to-item, and rating-to-item. All are one-to-many.

- The *picklist* relation describes a relation between a picklist and an entity. It is used to provide controlled vocabulary lists for important sections, preventing misspellings and incorrect inputs.
- Each entity may only have one value from the picklist specified.
- This relationship is tracked by attributes of the form “picklist name” ID in the entity.

Parent

An account-to-account relation. One-to-many.

- The *parent* relation describes a relation between the account table and itself. If an account is of type student, it must have an adult-type account that serves as its guardian to pay late fees.
- An adult account may have multiple children.
- This relationship is tracked by the parent ID attribute in the account entity.

Borrows

An account-to-item relation formally represented by the Loans entity. One-to-many.

- The *borrows* relation describes the action of an account borrowing an item. A loan entity connects these two entities and contains additional information about the borrowing instance.
- The connection between an account and a borrow is ‘creates’. The connection between an item and a borrow is ‘borrows’.

- An account may have multiple loans.
- This relationship is tracked by the account ID attribute in the loan entity.

Reserves

An account-to-item relation formally represented by the Reservations entity. One-to-many.

- The *reserves* relation describes the action of an account reserving an item. A reservation entity connects these two entities and contains additional information about the reservation instance.
- The connection between an account and a reservation is ‘creates’. The connection between an item and a reservation is ‘reserves’.
- An account may have multiple reservations.
- This relationship is tracked by the account ID and item ID attributes in the reservation entity.

Contributions

A contributor-to-item relation formally represented by the contribution entity. Many-to-one.

- The *contributions relation describes* one or more contributor(s) being connected to an item, whether by being an author, director, or producer. A contributors entity connects these two entities and contains information about what the contributor’s role in creating the item was.
- The connection between a contributor and an item is ‘contributed to.’ The connection between an item and its contributors is ‘created by.’
- An item may have multiple contributors, or none if it’s a magazine issue.
- The relationship is tracked by the item ID and contributor ID in the contribution entity.

Entity-Relationship Diagram

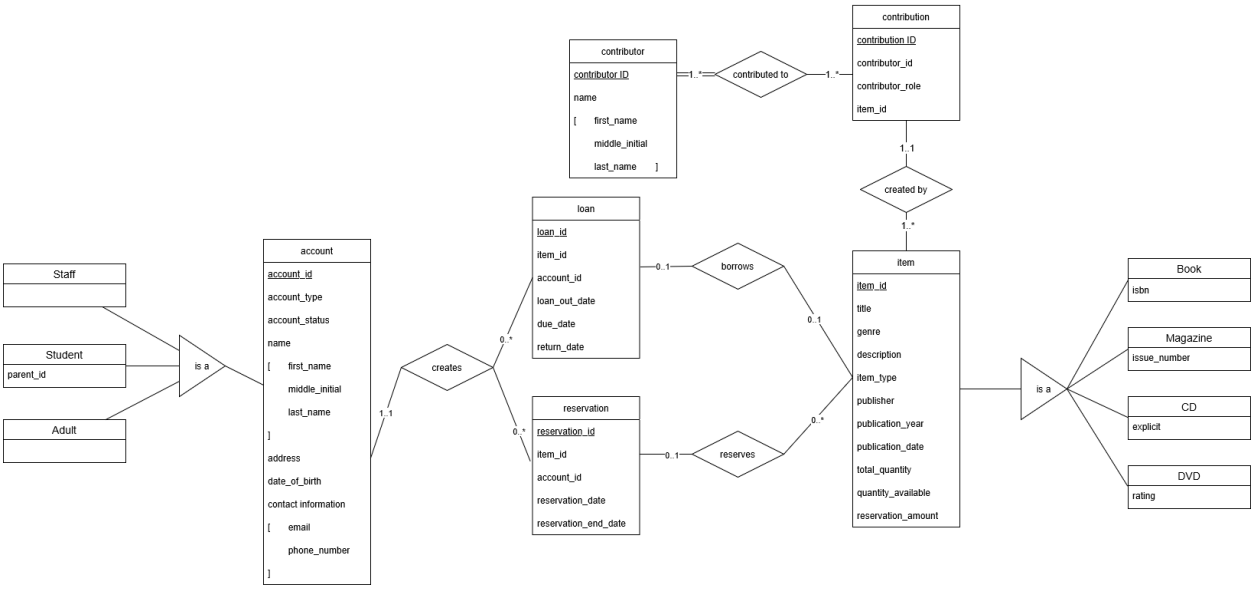

Figure 1. The entity relationship diagram.