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Library Management System

Entity Relationship Diagram (ERD)

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Introduction

This document provides a detailed description of the data structure for the Library Management System as modeled in the attached ERD. Each entity and its attributes (including primary and foreign keys), and all the inter entity relationships (with cardinalities) are comprehensively outlined.

Entity Descriptions

Library Branch

1. Attributes

- Branch ID (Primary Key)
- Name
- Address
- Department ID (Foreign Key from Department)

2. Relationships

- Department: One Library Branch can have multiple Departments (1:M)

Book

1. Attributes

- ISBN (Primary Key)
- Title

- Author Name
- Price
- Publisher ID (Foreign Key from Publisher)

2. Relationships

- Publisher: Many Books (M) are published by one Publisher (1)
- Staff: Each Book can be maintained by multiple Staff members (M:N)
- Reader: Books can be loaned by multiple Readers (M:N)
- Reservation: Each Book can have multiple Reservations (1:M)

Publisher

1. Attributes

- Publisher ID (Primary Key)
- Name
- Year Of Publication

2. Relationships

- Book: One Publisher (1) publishes many Books (M)

Staff

1. Attributes

- Staff ID (Primary Key)
- Name
- Login ID (Foreign Key from System)

- Department ID (Foreign Key from Department)
- Manager ID (Foreign Key to Staff - for hierarchical relationships)

2. Relationships

- Book: Each Staff member can maintain multiple Books (1:M)
- Reports: One Staff member manages multiple Reports (1:M)
- Reader: Staff can track multiple Readers, and Readers can be tracked by multiple Staff (M:N)
- System: Each Staff member has exactly one login (1:1)
- Department: Multiple Staff members belong to one Department (M:1)
- Reports To: Staff can report to one Manager (another Staff member) (M:1)

Reader

1. Attributes

- User ID (Primary Key)
- Name (Composite: First Name, Middle Name, Last Name)
- Email
- Phone Number

2. Relationships

- Book: Readers can loan multiple Books, and Books can be loaned to multiple Readers (M:N)

- Staff: Readers can be tracked by multiple Staff members, and each Staff member can track multiple Readers (M:N)
- Reservation: One Reader can have multiple Reservations (1:M)
- Fine: One Reader can have multiple Fines (1:M)

Reports

1. Attributes

- Report ID (Primary Key)
- User ID (Foreign Key from Reader)
- ISBN (Foreign Key from Book)
- Title
- Staff ID (Foreign Key from Staff)

2. Relationships

- Staff: Many Reports (M) are managed by one Staff member (1)
- Reader: Reports relate to Readers through User ID (M:1)
- Book: Reports relate to Books through ISBN (M:1)

System

1. Attributes

- Login ID (Primary Key)
- User Name
- Password

2. Relationships

- Staff: Each System Login is assigned to exactly one Staff member (1:1)

Department

1. Attributes

- Department ID (Primary Key)
- Name
- Manager ID (Foreign Key from Staff)

2. Relationships

- Staff: One Department can have multiple Staff members (1:M)
- Library Branch: Multiple Departments can belong to one Library Branch (M:1)
- Reports To: Manager relationships within the department

Reservation

1. Attributes

- Reservation ID (Primary Key)
- User ID (Foreign Key from Reader)
- ISBN (Foreign Key from Book)
- Reserve/Return Date
- Status

2. Relationships

- Reader: Many Reservations (M) are registered by one Reader (1)
- Book: Reservations relate to Books through ISBN (M:1)

Fine

1. Attributes

- Fine ID (Primary Key)
- User ID (Foreign Key from Reader)
- Amount
- Date
- Reason

2. Relationships

- Reader: Many Fines (M) are paid by one Reader (1)
-

Relationship Summary

Relationship	Entity 1	Cardinality	Entity 2	Cardinality	Description
Publishes	Publisher (1)	1	Book (M)	Many	Each publisher publishes many books.
Maintain	Staff (1)	1	Book (N)	Many	Multiple staff maintain

					multiple books.
Loans	Reader (M)	M	Book (N)	Many	Readers loan multiple books and books are loaned to multiple readers.
Manages	Staff (1)	1	Reports (M)	Many	Staff track manages multiple reports.
Tracks	Staff (1)	M	Reader (M)	Many	Staff tracks multiple readers.
Login	Staff (1)	1	System (1)	1	Each staff member has a unique login in the system.
Reports To	Staff	(M)	Staff	(1)	Staff report to a manager (hierarchical)
Registers	Reader	(1)	Reservation	(M)	Readers register

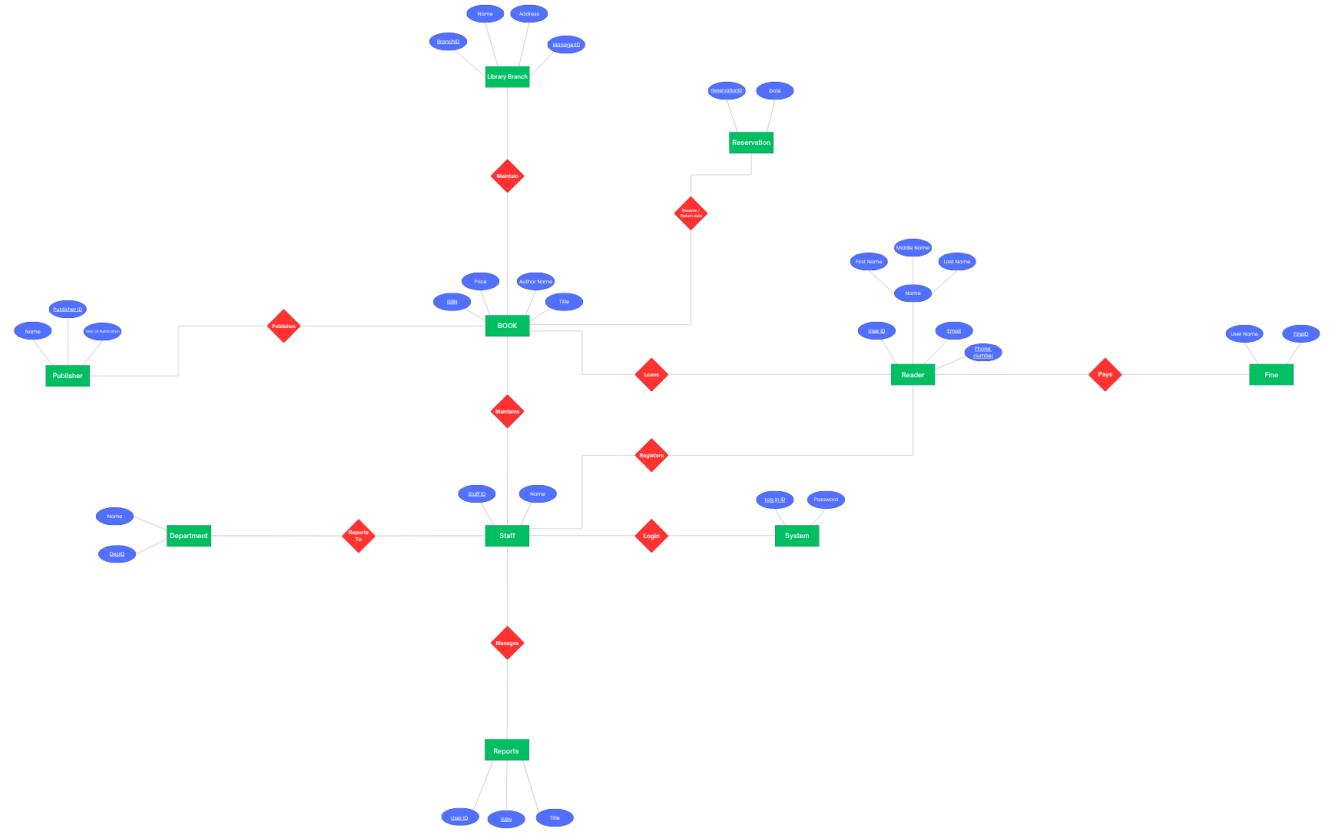
					multiple reservations
Pays	Reader	(1)	Fine	(M)	Readers pay multiple fines
Manages	Department	(1)	Staff	(M)	Each department has multiple staff members
Has	Library Branch	(1)	Department	(M)	Each branch has multiple departments

Keys Overview

Entity	Primary Key	Foreign Key
Book	ISBN	Publisher ID
Publisher	Publisher ID	None

Staff	Staff ID	Login ID, Department ID, Manager ID
Reader	User ID	None
Reports	Report ID	Staff ID, User ID, ISBN
System	Login ID	None
Library Branch	Branch ID	None
Department	Department ID	Manager ID
Reservation	Reservation ID	User ID, ISBN
Fine	Fine ID	User ID

ERD



Github Link:-

[Library Management System ERD](#)