Database Description for Library Management System

The Library Management System facilitates the management of library resources across multiple locations, each offering a diverse range of materials such as books, DVDs, and e-books. Each library location has a unique identifier, a name, an address, and a contact number. Library users, including members, librarians, and administrators, each have specific roles and responsibilities.

For each user, we maintain essential details: their unique user ID, username, password, first and last names, and email address. Administrators manage the system and user accounts, while librarians assist users with inquiries, handle loans and reservations, and ensure compliance with library policies.

Each book in the library has a unique identifier, a title, an author, a description, an ISBN number, an edition, and an availability status. Books are categorized into distinct categories, which include a category ID, name, and description to help users locate resources easily.

For tracking loans, we keep detailed records for each transaction, including the loan ID, book ID, user ID, checkout date, due date, return date, and any applicable fines. Each loan also tracks the librarian who processed it and the location where the book is stored.
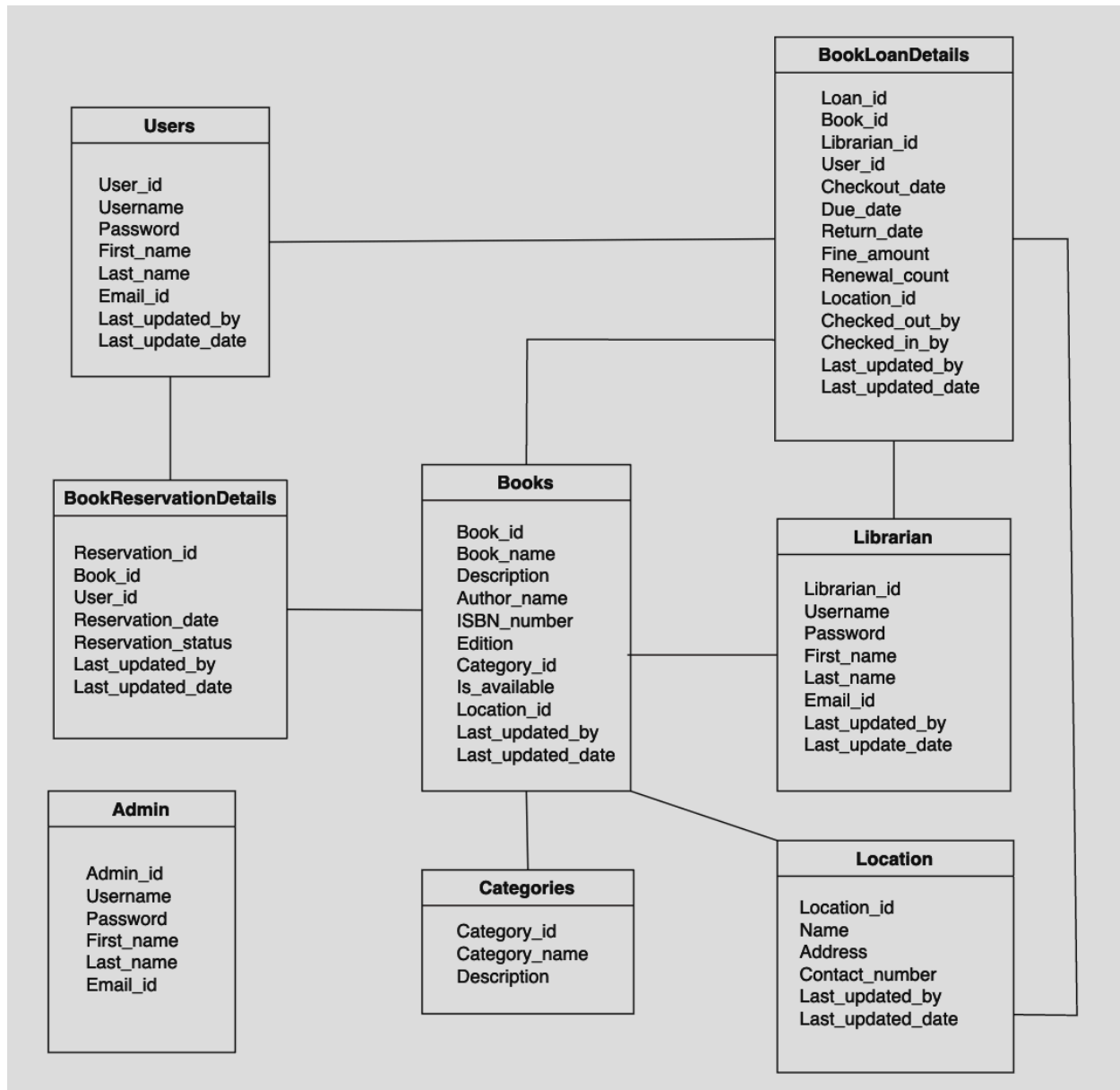
Reservations are recorded for books that are currently checked out. Each reservation has a unique ID, the book ID, user ID, reservation date, and status. This system allows users to reserve materials and be notified when they become available.

Admins have access to system management functions, allowing them to oversee user accounts, manage resources, and configure system settings. They can generate reports to monitor usage statistics, user activity, and resource management, ensuring transparency and efficient operations.

This system provides a streamlined workflow for managing library resources, user interactions, and operational oversight. By ensuring that members can independently check out and return materials, renew items, and reserve popular titles, while allowing librarians to assist and enforce policies, the system fosters a user-friendly environment. The automation of fine collection and renewal tracking, combined with role-based access and reporting capabilities, creates an effective and efficient solution for modern library management.

NoSQL Database Model

Document Data Model

Admin collection has access to all the other collections.

Database collection for all the tables:

Collection 1 - <u>Users</u> contains
- User_id
- Username
- Password
- First_name
- Last_name
- Email_id
- Last_updated_by
- Last_update_date

Collection 2 – <u>Admin</u> contains
- Admin_id
- Username
- Password
- First_name
- Last_name
- Email_id

Collection 3 - <u>Librarian</u> contains
- Librarian_id
- Username
- Password
- First_name
- Last_name
- Email_id
- Last_updated_by
- Last_update_date

Collection 4 – <u>Books</u> contains
- Book_id
- Book_name
- Description
- Author_name
- ISBN_number
- Edition
- Category_id
- Is_available
- Location_id

- Last_updated_by
- Last_updated_date

Collection 4 – <u>Categories</u> contains
- Category_id
- Category_name
- Description

Collection 5 - <u>Book Loan Details</u> contains
- Loan_id
- Book_id
- Librarian_id
- User_id
- Checkout_date
- Due_date
- Return_date
- Fine_amount
- Renewal_count
- Location_id
- Checked_out_by
- Checked_in_by
- Last_updated_by
- Last_updated_date

Collection 6 - <u>Book Reservation Details</u> contains
- Reservation_id
- Book_id
- User_id
- Reservation_date
- Reservation_status
- Last_updated_by
- Last_updated_date

Collection 7– <u>Locations</u> contains
- Location_id
- Name
- Address
- Contact_number
- Last_updated_by
- Last_updated_date

Database sample records :

Users:

```
[
  {
    "_id": "507f191e810c19729de860fd",
    "User_id": 1,
    "Username": "john_doe",
    "Password": "hashed_password1",
    "First_name": "John",
    "Last_name": "Doe",
    "Email_id": "john.doe@example.com",
    "Last_updated_by": "admin",
    "Last_update_date": "2024-10-01T10:00:00Z"
  },
  {
    "_id": "507f191e810c19729de860fe",
    "User_id": 2,
    "Username": "jane_smith",
    "Password": "hashed_password2",
    "First_name": "Jane",
    "Last_name": "Smith",
    "Email_id": "jane.smith@example.com",
    "Last_updated_by": "admin",
    "Last_update_date": "2024-10-02T11:00:00Z"
  },
  {
    "_id": "507f191e810c19729de860ff",
    "User_id": 3,
    "Username": "alice_jones",
    "Password": "hashed_password3",
    "First_name": "Alice",
    "Last_name": "Jones",
    "Email_id": "alice.jones@example.com",
    "Last_updated_by": "admin",
    "Last_update_date": "2024-10-03T12:00:00Z"
  }
]
```

Admin

[
  {
    "_id": "507f191e810c19729de86100",
    "Admin_id": 1,
    "Username": "admin1",
    "Password": "hashed_admin_password1",
    "First_name": "Admin",
    "Last_name": "User1",
    "Email_id": "admin1@example.com"
  },
  {
    "_id": "507f191e810c19729de86101",
    "Admin_id": 2,
    "Username": "admin2",
    "Password": "hashed_admin_password2",
    "First_name": "Admin",
    "Last_name": "User2",
    "Email_id": "admin2@example.com"
  },
  {
    "_id": "507f191e810c19729de86102",
    "Admin_id": 3,
    "Username": "admin3",
    "Password": "hashed_admin_password3",
    "First_name": "Admin",
    "Last_name": "User3",
    "Email_id": "admin3@example.com"
  }
]

Librarian

[
  {
    "_id": "507f191e810c19729de86103",
    "Librarian_id": 1,
    "Username": "librarian1",
    "Password": "hashed_librarian_password1",
    "First_name": "Libby",
    "Last_name": "One",

```json
      "Email_id": "librarian1@example.com",
      "Last_updated_by": "admin",
      "Last_update_date": "2024-10-01T09:00:00Z"
   },
   {
      "_id": "507f191e810c19729de86104",
      "Librarian_id": 2,
      "Username": "librarian2",
      "Password": "hashed_librarian_password2",
      "First_name": "Libby",
      "Last_name": "Two",
      "Email_id": "librarian2@example.com",
      "Last_updated_by": "admin",
      "Last_update_date": "2024-10-02T10:00:00Z"
   },
   {
      "_id": "507f191e810c19729de86105",
      "Librarian_id": 3,
      "Username": "librarian3",
      "Password": "hashed_librarian_password3",
      "First_name": "Libby",
      "Last_name": "Three",
      "Email_id": "librarian3@example.com",
      "Last_updated_by": "admin",
      "Last_update_date": "2024-10-03T11:00:00Z"
   }
]
```

Books

```json
[
   {
      "_id": "507f191e810c19729de86106",
      "Book_id": 1,
      "Book_name": "The Great Gatsby",
      "Description": "A novel by F. Scott Fitzgerald.",
      "Author_name": "F. Scott Fitzgerald",
      "ISBN_number": "9780743273565",
      "Edition": "1st",
      "Category_id": 1,
```

      "Is_available": true,
      "Location_id": 1,
      "Last_updated_by": "librarian1",
      "Last_updated_date": "2024-10-01T12:00:00Z"
   },
   {
      "_id": "507f191e810c19729de86107",
      "Book_id": 2,
      "Book_name": "1984 (E-Book)",
      "Description": "A dystopian novel by George Orwell, available in digital format.",
      "Author_name": "George Orwell",
      "ISBN_number": "9780451524935",
      "Edition": "1st",
      "Category_id": 2,
      "Is_available": true,
      "Location_id": 2,
      "Last_updated_by": "librarian2",
      "Last_updated_date": "2024-10-02T13:00:00Z"
   },
   {
      "_id": "507f191e810c19729de86108",
      "Book_id": 3,
      "Book_name": "Inception (DVD)",
      "Description": "A science fiction film directed by Christopher Nolan.",
      "Author_name": "Christopher Nolan",
      "ISBN_number": "1234567890123",
      "Edition": "Blu-ray",
      "Category_id": 3,
      "Is_available": false,
      "Location_id": 3,
      "Last_updated_by": "librarian3",
      "Last_updated_date": "2024-10-03T14:00:00Z"
   },
   {
      "_id": "507f191e810c19729de86109",
      "Book_id": 4,
      "Book_name": "To Kill a Mockingbird",
      "Description": "A novel by Harper Lee.",
      "Author_name": "Harper Lee",
      "ISBN_number": "9780061120084",

```json
      "Edition": "50th Anniversary",
      "Category_id": 1,
      "Is_available": true,
      "Location_id": 1,
      "Last_updated_by": "librarian1",
      "Last_updated_date": "2024-10-04T10:00:00Z"
    },
    {
      "_id": "507f191e810c19729de8610a",
      "Book_id": 5,
      "Book_name": "The Catcher in the Rye (E-Book)",
      "Description": "A novel by J.D. Salinger, available in digital format.",
      "Author_name": "J.D. Salinger",
      "ISBN_number": "9780316769488",
      "Edition": "1st",
      "Category_id": 2,
      "Is_available": true,
      "Location_id": 2,
      "Last_updated_by": "librarian2",
      "Last_updated_date": "2024-10-05T11:00:00Z"
    },
    {
      "_id": "507f191e810c19729de8610b",
      "Book_id": 6,
      "Book_name": "The Matrix (DVD)",
      "Description": "A science fiction film directed by the Wachowskis.",
      "Author_name": "Lana Wachowski, Lilly Wachowski",
      "ISBN_number": "9780792170010",
      "Edition": "Blu-ray",
      "Category_id": 3,
      "Is_available": true,
      "Location_id": 3,
      "Last_updated_by": "librarian3",
      "Last_updated_date": "2024-10-06T12:00:00Z"
    }
]
```

Categories

```
[
  {
    "_id": "507f191e810c19729de860fd",
    "Category_id": 1,
    "Category_name": "Physical Book",
    "Description": "Printed books that can be checked out."
  },
  {
    "_id": "507f191e810c19729de860fe",
    "Category_id": 2,
    "Category_name": "E-book",
    "Description": "Digital versions of books available for download."
  },
  {
    "_id": "507f191e810c19729de860ff",
    "Category_id": 3,
    "Category_name": "DVD",
    "Description": "Digital Video Discs available for rent."
  }
]
```

Book Loan Details

```
[
  {
    "_id": "507f191e810c19729de86109",
    "Loan_id": 1,
    "Book_id": 1,
    "Librarian_id": 1,
    "User_id": 1,
    "Checkout_date": "2024-10-05T10:00:00Z",
    "Due_date": "2024-10-19T10:00:00Z",
    "Return_date": "2024-10-18T09:00:00Z",
    "Fine_amount": 0,
    "Renewal_count": 0,
    "Location_id": 1,
    "Checked_out_by": "librarian1",
    "Checked_in_by": "librarian1",
    "Last_updated_by": "librarian1",
```

      "Last_updated_date": "2024-10-18T10:00:00Z"
    },
    {
      "_id": "507f191e810c19729de8610a",
      "Loan_id": 2,
      "Book_id": 2,
      "Librarian_id": 2,
      "User_id": 2,
      "Checkout_date": "2024-10-06T11:00:00Z",
      "Due_date": "2024-10-20T11:00:00Z",
      "Return_date": null,
      "Fine_amount": 0,
      "Renewal_count": 0,
      "Location_id": 2,
      "Checked_out_by": "librarian2",
      "Checked_in_by": null,
      "Last_updated_by": "librarian2",
      "Last_updated_date": "2024-10-06T11:00:00Z"
    },
    {
      "_id": "507f191e810c19729de8610b",
      "Loan_id": 3,
      "Book_id": 3,
      "Librarian_id": 3,
      "User_id": 3,
      "Checkout_date": "2024-10-07T12:00:00Z",
      "Due_date": "2024-10-21T12:00:00Z",
      "Return_date": null,
      "Fine_amount": 5.00,
      "Renewal_count": 1,
      "Location_id": 3,
      "Checked_out_by": "librarian3",
      "Checked_in_by": null,
      "Last_updated_by": "librarian3",
      "Last_updated_date": "2024-10-28T12:00:00Z"
    },
    {
      "_id": "507f191e810c19729de8610c",
      "Loan_id": 4,
      "Book_id": 2,

      "Librarian_id": 2,
      "User_id": 1,
      "Checkout_date": "2024-10-10T10:00:00Z",
      "Due_date": "2024-10-24T10:00:00Z",
      "Return_date": "2024-10-26T10:00:00Z",
      "Fine_amount": 3.00,
      "Renewal_count": 0,
      "Location_id": 2,
      "Checked_out_by": "librarian2",
      "Checked_in_by": "librarian1",
      "Last_updated_by": "librarian2",
      "Last_updated_date": "2024-10-26T11:00:00Z"
   }
]

Book Reservation Details
[
   {
      "_id": "507f191e810c19729de8610d",
      "Reservation_id": 1,
      "Book_id": 1,
      "User_id": 1,
      "Reservation_date": "2024-10-04T10:00:00Z",
      "Reservation_status": "active",
      "Last_updated_by": "librarian1",
      "Last_updated_date": "2024-10-04T10:00:00Z"
   },
   {
      "_id": "507f191e810c19729de8610e",
      "Reservation_id": 2,
      "Book_id": 2,
      "User_id": 2,
      "Reservation_date": "2024-10-05T11:00:00Z",
      "Reservation_status": "completed",
      "Last_updated_by": "librarian2",
      "Last_updated_date": "2024-10-05T11:00:00Z"
   },
   {

    "_id": "507f191e810c19729de8610f",
    "Reservation_id": 3,
    "Book_id": 3,
    "User_id": 3,
    "Reservation_date": "2024-10-06T12:00:00Z",
    "Reservation_status": "cancelled",
    "Last_updated_by": "librarian3",
    "Last_updated_date": "2024-10-06T12:00:00Z"
  }
]

Location
[
  {
    "_id": "507f191e810c19729de8610c",
    "Location_id": 1,
    "Name": "St. Louis Public Library - Central Library",
    "Address": "1301 Olive St, St. Louis, MO 63103",
    "Contact_number": "314-622-3100",
    "Last_updated_by": "admin",
    "Last_updated_date": "2024-10-01T09:00:00Z"
  },
  {
    "_id": "507f191e810c19729de8610d",
    "Location_id": 2,
    "Name": "Kansas City Public Library - Central Library",
    "Address": "14 W 10th St, Kansas City, MO 64105",
    "Contact_number": "816-701-3400",
    "Last_updated_by": "admin",
    "Last_updated_date": "2024-10-02T09:00:00Z"
  },
  {
    "_id": "507f191e810c19729de8610e",
    "Location_id": 3,
    "Name": "Columbia Public Library",
    "Address": "100 W Broadway, Columbia, MO 65203",
    "Contact_number": "573-443-3161",
    "Last_updated_by": "admin",
    "Last_updated_date": "2024-10-03T09:00:00Z"
  }]