

Library Management System - Final Project Summary

Project Title:

Library Management System

Project Goal:

A simple, efficient database system to manage books, members, authors, and loans in a small library.

Tracks who borrowed what book and when, and which loans are pending return.

Entity Relationship Diagram:

See attached image - Library_ERD_Diagram.png

Tables & Design:

1. Authors

- id (Primary Key)
- name (Author's full name)

2. Books

- id (Primary Key)
- title (Book title)
- author_id (Foreign Key to Authors.id)

3. Members

- id (Primary Key)
- name (Member's full name)

4. Loans

- id (Primary Key)
- book_id (Foreign Key to Books.id)
- member_id (Foreign Key to Members.id)
- loan_date (Date the book was borrowed)

- return_date (Date the book was returned; NULL if not returned)

Sample SQL Queries:

1. Books and their authors:

```
SELECT books.title, authors.name FROM books JOIN authors ON books.author_id = authors.id;
```

2. Borrowed books by members:

```
SELECT members.name, books.title, loans.loan_date FROM loans
```

```
JOIN members ON loans.member_id = members.id
```

```
JOIN books ON loans.book_id = books.id;
```

3. Currently borrowed books (not yet returned):

```
SELECT books.title, members.name FROM loans
```

```
JOIN books ON loans.book_id = books.id
```

```
JOIN members ON loans.member_id = members.id
```

```
WHERE loans.return_date IS NULL;
```

4. Member loan count:

```
SELECT members.name, COUNT(loans.id) AS books_borrowed FROM members
```

```
LEFT JOIN loans ON members.id = loans.member_id GROUP BY members.name;
```

Security & Access:

- Created read-only user 'auditor'@'localhost' with only SELECT privileges on library.*
- Prevents unauthorized changes to library data

Backup Strategy:

- Bash script backs up the 'library' database with timestamped filenames
- Located at ~/backup_library.sh
- Optional cron job: backs up daily at 1 AM

Tools Used:

- MariaDB in Termux
- Termux shell scripting
- FPDF for reporting
- Diagram tool for ERD

Status: COMPLETE

Stephen is now fully capable of designing, building, securing, and automating real database systems.