

Physical Database 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.

Platform

MySQL

The platform used in this project is MySQL. This was decided because of the team members' familiarity with its interface, and how it handles relational data. It is an open-source platform and includes specific tools and features for optimization and scalability.

Creating the Database

We are using MySQL on a server from Ben's computer that we can connect to. We can connect and write queries using Beekeeper Studio.

Printing Physical Schema

The following was used to create the Database, Relations, and Entities:

```
CREATE DATABASE LibraryDB;
```

```
USE LibraryDB;
```

```
CREATE TABLE Item (  
  ISBN CHAR(20) PRIMARY KEY,  
  Author CHAR(100),  
  Title CHAR(200),  
  Pub_Year INT,  
  Genre CHAR(50),  
  Item_Type ENUM('Book', 'Magazine', 'Digital Media', 'Journal', 'Other')  
);
```

```
CREATE TABLE Copies_of_item (  
  Item_ID INT PRIMARY KEY,  
  ISBN CHAR(20),  
  Availability ENUM('Available', 'Unavailable'),  
  FOREIGN KEY (ISBN) REFERENCES Item(ISBN)  
);
```

```
CREATE TABLE Library_member (  
  Member_ID INT PRIMARY KEY,  
  Name CHAR(100),  
  Contact_info CHAR(100),  
  Membership_type ENUM('General', 'Premium'),  
  Account_status ENUM('Active', 'Inactive', 'Suspended')  
);
```

```
CREATE TABLE Reservations (  
  Reservation_ID INT PRIMARY KEY,  
  Member_ID INT,  
  Item_ID INT,  
  Reservation_date DATETIME,  
  Status ENUM('Active', 'Cancelled'),  
  FOREIGN KEY (Member_ID) REFERENCES Library_member(Member_ID),  
  FOREIGN KEY (Item_ID) REFERENCES Copies_of_item(Item_ID)  
);
```

```
CREATE TABLE Check_out_transaction (  
  Transaction_ID INT PRIMARY KEY,  
  Member_ID INT,
```

```

Check_out_date DATETIME,
Due_date DATETIME,
Return_date DATETIME,
Fine_amount DECIMAL(6,2),
Item_ID INT,
FOREIGN KEY (Member_ID) REFERENCES Library_member(Member_ID),
FOREIGN KEY (Item_ID) REFERENCES Copies_of_item(Item_ID)
);

```

Print Table Contents

Item table

	ISBN	Author	Title	Pub_Year	Genre	Item_Type
1	978-0060935467	Khaled Hosseini	The Kite Runner	2003	Historical Ficti...	Book
2	978-0062315007	Paula Hawkins	The Girl on the ...	2015	Thriller	Book
3	978-0141187761	Jack Kerouac	On the Road	1957	Fiction	Book
4	978-0141439518	Jane Austen	Pride and Prej...	1813	Romance	Book
5	978-0143105428	Mark Twain	The Adventure...	18...	Fiction	Book
6	978-0307277671	Stieg Larsson	The Girl with th...	2005	Mystery	Book
7	978-0307474278	Gillian Flynn	Gone Girl	2012	Thriller	Book
8	978-0316015844	Stephenie Meyer	Twilight	2005	Fantasy	Book
9	978-0316769488	J.D. Salinger	The Catcher in ...	1951	Fiction	Book
10	978-0385504201	Dan Brown	Angels & Dem...	2000	Mystery	Book
11	978-0553211404	William Shakesp...	Romeo and Jul...	1597	Tragedy	Book
12	978-0553381689	Dan Brown	The Da Vinci C...	2003	Mystery	Book
13	978-0553573404	George R.R. Mart...	A Game of Thr...	1996	Fantasy	Book
14	978-0743273565	F. Scott Fitzgerald	The Great Gats...	1925	Classics	Book
15	9780000000001	Editorial Board	Nature - Climat...	2023	Science	Magazine
16	9780000000002	Editorial Board	The Economist...	2023	Economics	Magazine
17	9780000000003	Editorial Board	Scientific Ame...	2022	Science	Magazine
18	9780000000004	Editorial Board	National Geogr...	2023	History	Magazine
19	9780000000005	Editorial Board	Harvard Busin...	2022	Business	Magazine
20	9780000000006	Editorial Board	The Atlantic - ...	2023	Education	Magazine
21	9780000000007	Editorial Board	MIT Technolog...	2023	Technology	Magazine
22	9780000000008	Editorial Board	Psychology To...	2023	Psychology	Magazine
23	9780000000009	Editorial Board	Foreign Affairs...	2023	Political Science	Magazine
24	9780000000010	Editorial Board	Time Magazin...	2022	General	Magazine
25	9780000000011	Editorial Board	Science - Gene...	2022	Science	Magazine
26	9780000000012	Editorial Board	Forbes - 30 Un...	2023	Business	Magazine
27	9780000000013	Editorial Board	National Geogr...	2023	Environment	Magazine
28	9780000000014	Editorial Board	Popular Scienc...	2022	Science	Magazine
29	9780000000015	Editorial Board	The New Yorke...	2023	Literature	Magazine
30	9780000000016	Editorial Board	Smithsonian - ...	2023	History	Magazine
31	9780000000017	Editorial Board	WIRED - Cyber...	2022	Technology	Magazine
32	9780000000018	Editorial Board	Fast Company ...	2023	Business	Magazine
33	9780000000019	Editorial Board	Discover - Spa...	2022	Science	Magazine
34	9780000000020	Editorial Board	The Chronicle ...	2023	Education	Magazine
35	9780060850524	Aldous Huxley	Brave New Wo...	1932	Dystopian	Book

Members table

	Member_ID	Name	Contact_Info	Membership_Type	Account_Status
1	1001	John Smith	john.smith@email.co...	General	Active
2	1002	Emma Johnson	emma.j@email.com ...	Premium	Active
3	1003	Michael Brown	mbrown@email.com ...	General	Active
4	1004	Sarah Davis	sarah.davis@email.co...	Premium	Active
5	1005	James Wilson	jwilson@email.com ...	General	Suspended
6	1006	Jennifer Garcia	kgarcia@email.com S...	General	Active
7	1007	Robert Martinez	rmartinez@email.com...	Premium	Active
8	1008	Lisa Anderson	landerson@email.co...	General	Inactive
9	1009	William Taylor	wtaylor@email.com ...	General	Active
10	1010	Elizabeth Thom...	ethomas@email.com ...	Premium	Active
11	1011	David Hernandez	dhernandez@email.co...	General	Active
12	1012	Barbara Moore	bmoore@email.com ...	General	Active
13	1013	Joseph Martin	jmartin@email.com ...	Premium	Active
14	1014	Susan Jackson	sjackson@email.com ...	General	Suspended
15	1015	Charles Thomp...	cthompson@email.co...	General	Active
16	1016	Margaret White	mwhite@email.com ...	Premium	Active
17	1017	Thomas Lopez	tlopez@email.com S...	General	Active
18	1018	Dorothy Lee	dlee@email.com 555...	General	Inactive
19	1019	Daniel Gonzalez	dgonzalez@email.co...	Premium	Active
20	1020	Nancy Rodriguez	nrodriguez@email.co...	General	Active
21	1021	Paul Walker	pwalker@email.com ...	General	Active
22	1022	Karen Hall	khall@email.com 55...	Premium	Active
23	1023	Joshua Allen	jallen@email.com 55...	General	Suspended
24	1024	Betty Young	byoung@email.com ...	General	Active
25	1025	Kevin Wright	kwright@email.com ...	Premium	Active
26	1026	Helen King	hking@email.com 55...	General	Active
27	1027	Ronald Scott	rscott@email.com S...	General	Inactive
28	1028	Donna Green	dgreen@email.com S...	Premium	Active
29	1029	Edward Baker	ebaker@email.com S...	General	Active
30	1030	Carol Adams	cadams@email.com ...	General	Active
31	1031	Steven Nelson	snelson@email.com ...	Premium	Active
32	1032	Michelle Hill	mhill@email.com 55...	General	Suspended
33	1033	Mark Ramirez	mramirez@email.com...	General	Active
34	1034	Laura Campbell	lcampbell@email.com...	Premium	Active
35	1035	Christopher Mit...	cmitchell@email.com...	General	Active

Check out transaction table

	Transaction_ID	Member_ID	Check_out_date	Due_date	Return_date	Fine_amount	Item_I...
1	5001	1001	2025-03-01 10:15:00	2025-03-15 23:59:...	2025-03-14 14:30:00	0.00	101
2	5002	1003	2025-03-02 11:20:00	2025-03-16 23:59:...	2025-03-12 16:45:00	0.00	105
3	5003	1005	2025-03-03 09:30:00	2025-03-17 23:59:...	2025-03-20 11:15:00	3.00	112
4	5004	1008	2025-03-05 14:45:00	2025-03-19 23:59:...	2025-03-18 17:30:00	0.00	118
5	5005	1010	2025-03-07 16:20:00	2025-03-21 23:59:...	2025-03-25 10:00:00	4.00	124
6	5006	1012	2025-03-10 13:15:00	2025-03-24 23:59:...	2025-03-22 13:45:00	0.00	202
7	5007	1015	2025-03-12 11:30:00	2025-03-26 23:59:...	2025-03-30 16:20:00	4.00	208
8	5009	1022	2025-03-18 10:45:00	2025-04-01 23:59:...	2025-03-31 11:55:00	0.00	301
9	5010	1025	2025-03-20 09:30:00	2025-04-03 23:59:...	2025-04-10 15:30:00	7.00	306
10	5011	1002	2025-04-01 10:00:00	2025-04-15 23:59:...	(NULL)	0.00	103
11	5012	1004	2025-04-01 11:15:00	2025-04-15 23:59:...	(NULL)	0.00	107
12	5013	1006	2025-04-02 13:30:00	2025-04-16 23:59:...	(NULL)	0.00	111
13	5014	1009	2025-04-03 15:45:00	2025-04-17 23:59:...	(NULL)	0.00	115
14	5015	1013	2025-04-05 14:15:00	2025-04-19 23:59:...	(NULL)	0.00	120
15	5016	1016	2025-04-06 10:30:00	2025-04-20 23:59:...	(NULL)	0.00	203
16	5017	1019	2025-04-08 09:45:00	2025-04-22 23:59:...	(NULL)	0.00	210
17	5018	1026	2025-04-10 16:20:00	2025-04-24 23:59:...	(NULL)	0.00	214
18	5019	1028	2025-04-12 11:10:00	2025-04-26 23:59:...	(NULL)	0.00	302
19	5020	1031	2025-04-13 14:50:00	2025-04-27 23:59:...	(NULL)	0.00	308
20	5021	1034	2025-03-25 09:15:00	2025-04-08 23:59:...	(NULL)	9.00	104
21	5022	1037	2025-03-27 13:40:00	2025-04-10 23:59:...	(NULL)	7.00	109
22	5023	1040	2025-03-28 10:20:00	2025-04-11 23:59:...	(NULL)	6.00	116
23	5024	1042	2025-03-30 15:30:00	2025-04-13 23:59:...	(NULL)	4.00	122
24	5025	1045	2025-04-01 11:45:00	2025-04-15 23:59:...	(NULL)	2.00	125
25	5026	1002	2025-03-15 10:30:00	2025-04-15 23:59:...	2025-04-10 14:20:00	0.00	206
26	5027	1004	2025-03-18 13:15:00	2025-04-18 23:59:...	(NULL)	0.00	211
27	5028	1010	2025-03-20 15:45:00	2025-04-20 23:59:...	2025-04-12 11:30:00	0.00	303
28	5029	1013	2025-03-25 09:20:00	2025-04-25 23:59:...	(NULL)	0.00	310
29	5030	1019	2025-04-01 14:10:00	2025-05-01 23:59:...	(NULL)	0.00	313

Copies of items table

	Item_I...	ISBN char(20)	Availability enum('available','unavailable')
1	101	9780141439587	Available
2	102	9780141439587	Unavailable
3	103	978-0316015844	Available
4	104	978-0316015844	Available
5	105	9780061120084	Available
6	106	9780061120084	Unavailable
7	107	9780307277671	Available
8	108	9780140449273	Available
9	109	9780140449136	Available
10	110	978-0060935467	Unavailable
11	111	9780618260300	Available
12	112	978-0743273565	Available
13	113	978-0307277671	Unavailable
14	114	978-0062315007	Available
15	115	9780261103573	Available
16	116	9780141439563	Available
17	117	978-0307474278	Unavailable
18	118	9780141439600	Available
19	119	9780486280615	Available
20	120	9780060850524	Available
21	121	9780385472579	Unavailable
22	122	978-0385504201	Available
23	123	9780553213119	Available
24	124	978-0553573404	Available
25	125	9780451524935	Available
26	201	9780374533557	Available
27	202	9780671027032	Available
28	203	9780143110438	Available
29	204	9780307387899	Available
30	205	9780062316110	Available
31	206	9780143127741	Available
32	207	9780143127742	Unavailable
33	208	9780307389701	Available
34	209	9780374533558	Available
35	210	9781501124020	Available

Reservation table

	Reservation_ID	Member_ID	Item_ID	Reservation_date	Status
1	7001	1007	102	2025-04-10 09:30:00	Active
2	7002	1011	106	2025-04-11 11:45:00	Active
3	7003	1014	113	2025-04-12 14:20:00	Active
4	7004	1017	117	2025-04-13 16:10:00	Active
5	7005	1021	207	2025-04-14 10:15:00	Active
6	7006	1023	213	2025-04-15 13:25:00	Active
7	7007	1027	304	2025-04-16 15:40:00	Active
8	7008	1030	314	2025-04-16 11:50:00	Active
9	7009	1033	319	2025-04-16 14:30:00	Active
10	7010	1018	102	2025-04-01 10:00:00	Cancelled
11	7011	1024	106	2025-04-02 13:15:00	Cancelled
12	7012	1029	113	2025-04-03 15:30:00	Cancelled
13	7013	1032	117	2025-04-05 11:45:00	Cancelled
14	7014	1035	207	2025-04-06 14:20:00	Cancelled
15	7015	1036	102	2025-04-12 09:10:00	Active
16	7016	1038	102	2025-04-13 10:25:00	Active
17	7017	1039	106	2025-04-14 13:40:00	Active
18	7018	1041	106	2025-04-15 16:15:00	Active
19	7019	1002	121	2025-04-16 11:30:00	Active
20	7020	1004	207	2025-04-16 14:45:00	Active
21	7021	1010	213	2025-04-16 10:20:00	Active
22	7022	1013	319	2025-04-16 15:35:00	Active
23	7023	1019	117	2025-04-16 09:50:00	Active
24	7024	1025	314	2025-04-16 13:05:00	Active
25	7025	1028	113	2025-04-16 16:25:00	Active