

Library Application

1. Introduction

A library application was created using a modern design approach. The database system uses PostgreSQL, which claims to be the world's most advanced open source database. MySQL could have been used instead, however Postgres has some more features to offer such as special types and schema namespaces. The application interface is Apache Web Server. Using a micro framework called Flask, I implemented the application in Python and deployed it to a linux server through Digital Ocean.

The application has two sets of users. The first group are the administrators and the second are readers. Since both share some common attributes I decided to extend them from another common group in the database called actors. Admins login with an email address and a password. Readers may do the same but also have the option to use their card number instead of their email. Once inside the admin may view information regarding books, branches, readers, inventory, and various statistics. They have the authority to add a reader, and add more book copies to a branch.

Readers can search for books, but in this application they don't see if a book is available at a particular branch. After they search for book matching a particular title or author, they can either checkout that book or they can reserve it. The system makes sure that the reader does not go over a limit of 10 books but the reader will not see that process. The reader should be able to return their books also, however I was not able to implement that on time. Finally they can see the status of their account as a list of checkouts and reservations.

2. Database Design

Legend:

Primary Key	Foreign Key	Composite Key	Both Primary / Foreign
Strong Entity [S]	Weak Entity [W]	Relation [R]	

<i>Actor[S]</i>	<i>Admin[W]</i>	<i>Author[S]</i>	<i>Publisher[S]</i>																												
<table><tr><td>ID</td><td>integer</td></tr><tr><td>name</td><td>string</td></tr><tr><td>email</td><td>string</td></tr><tr><td>phone</td><td>integer</td></tr><tr><td>address</td><td>string</td></tr></table>	ID	integer	name	string	email	string	phone	integer	address	string	<table><tr><td>ActorID</td><td>integer</td></tr><tr><td colspan="2"><i>Reader[W]</i></td></tr><tr><td>ActorID</td><td>integer</td></tr><tr><td>card</td><td>integer</td></tr></table>	ActorID	integer	<i>Reader[W]</i>		ActorID	integer	card	integer	<table><tr><td>ID</td><td>integer</td></tr><tr><td>name</td><td>string</td></tr></table>	ID	integer	name	string	<table><tr><td>ID</td><td>integer</td></tr><tr><td>name</td><td>string</td></tr><tr><td>adress</td><td>string</td></tr></table>	ID	integer	name	string	adress	string
ID	integer																														
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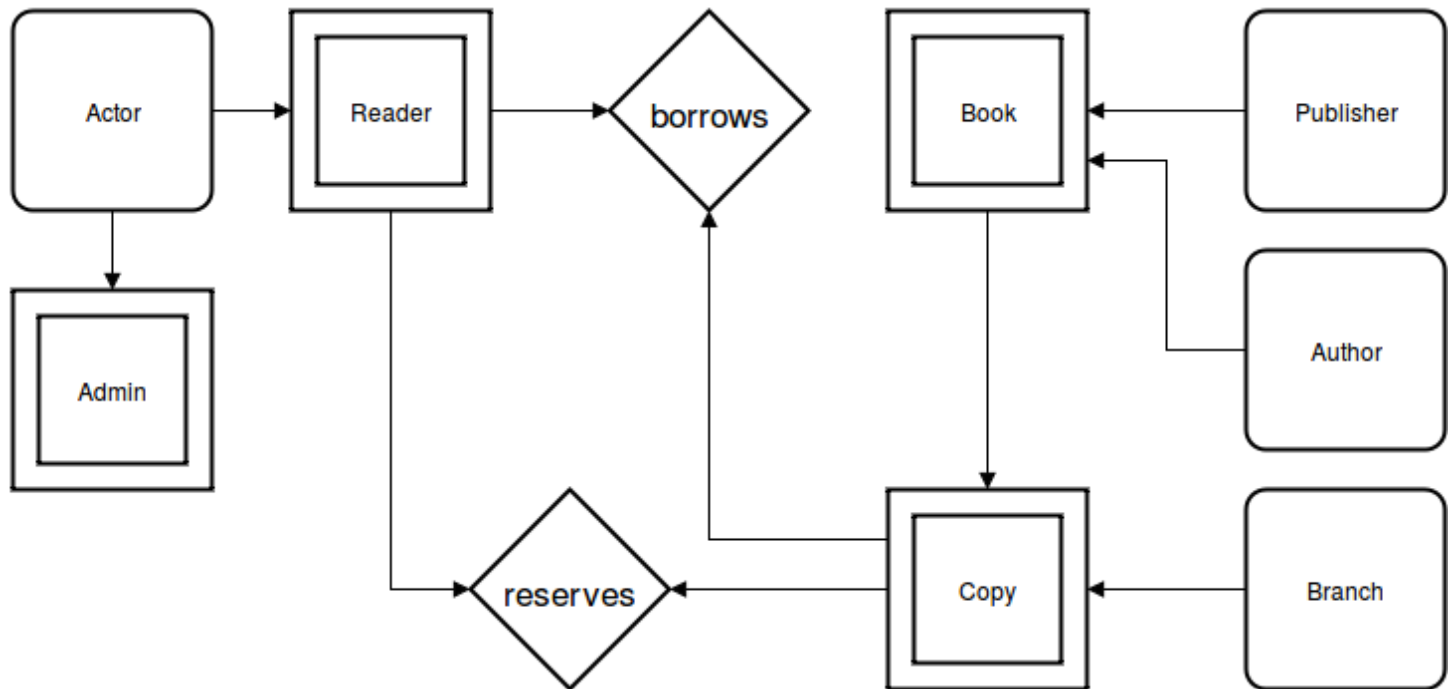
<i>Book[W]</i>		<i>Branch[S]</i>				<i>Copy[R]</i>	
ISBN	integer	ID	integer			ID	integer
pubdate	date	name	string			ISBN	integer
title	string	address	string			BranchID	integer
AuthorID	integer					code	integer
PublishID	integer					lock	bool

<i>Borrow[R]</i>				<i>Reserve[R]</i>			
CopyID	integer			CopyID	integer		
ReaderID	integer			ReaderID	integer		
pickup	date						
return	date						
payment	money						

Relations:

Admin	(1, 1)	is	(1, 1)	Actor
Admin	(1, 1)	is	(1, 1)	Actor
Author	(0, N)	writes	(0, 1)	Book
Publisher	(0, N)	publishes	(0, 1)	Book
Branch	(0, N)	shelves	(0, M)	Book
Reader	(0, 1)	borrows	(0, 10)	Book Copy
Reader	(0, 1)	reserves	(0, 10)	Book Copy

Initial Entity Relation Diagram:



3. SQL Statements

The code for database creation is provided as two files. **Rebuild.sql** destroys any schemas within the database called csci760 and then recreates them and their corresponding tables, views, and functions. **Inflate.sql** should be executed after rebuilding is complete. This script creates some test users and fills the library systems with some branches and books. Each branch gets 10 copies of every book by default. The functional statements that query the database are all generated on the fly in a python file called **base.py**.

4. Installation

Requirements:

1. Debian Linux Operating System
2. PostgreSQL
3. Python3
4. Flask
5. Apache
6. WSGI

Instructions:

1. As the postgres user create your database owned by an appropriate user.
2. Execute the rebuild and inflate scripts.
3. Extract zip project to an appropriate location under /srv.
4. Create an apache virtual host file to serve the web-application.

5. Appendix

Login

csci760.nydev.me/login

Email someone@example.com

Card # 10001234

Password Password

Login

Login Page

Admin Home

csci760.nydev.me/admin

Search

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Toggle Views

Books

Readers

Branches

Inventory

Card #	Last Name	First Name	Email	Phone	Address
10000000	Khullar	Rajan	rajan@nydev.me	0	NYIT
10000001	nydev	bot01	bot01@nydev.me	0	NYIT
10000002	nydev	bot02	bot02@nydev.me	0	NYIT
10000003	nydev	bot03	bot03@nydev.me	0	NYIT
10000004	nydev	bot04	bot04@nydev.me	0	NYIT
10000005	nydev	bot05	bot05@nydev.me	0	NYIT
10000006	nydev	bot06	bot06@nydev.me	0	NYIT
10000007	nydev	bot07	bot07@nydev.me	0	NYIT
10000008	nydev	bot08	bot08@nydev.me	0	NYIT
10000009	nydev	bot09	bot09@nydev.me	0	NYIT
10000010	nydev	bot10	bot10@nydev.me	0	NYIT
10000011	nydev	bot11	bot11@nydev.me	0	NYIT
10000012	nydev	bot12	bot12@nydev.me	0	NYIT
10000013	nydev	bot13	bot13@nydev.me	0	NYIT

Admin View Readers

Toggle Views					
Books	Readers	Branches	Inventory		
ISBN	Title	Author	Publisher	Address	Date
1000000000001	Things Happen	Matthew Warshaw	Pub 1	Princeton	05/03/2016
1000000000002	Encyclopedia Alpha	John Adams	Pub 2	Harvard	05/03/2016
1000000000003	Encyclopedia Beta	John Adams	Pub 1	Harvard	05/03/2016
1000000000004	Encyclopedia Gamma	John Adams	Pub 2	Harvard	05/03/2016
1000000000005	Encyclopedia Theta	John Adams	Pub 1	Harvard	05/03/2016
1000000000006	Encyclopedia Iota	John Adams	Pub 2	Harvard	05/03/2016
1000000000007	Encyclopedia Omega	John Adams	Pub 1	Harvard	05/03/2016
1000000000008	Life of Pi	Mary Jane	Pub 2	Soul	05/03/2016
1000000000009	The School Bus	Mary Jane	Pub 1	Soul	05/03/2016
1000000000010	Martian War	Mary Jane	Pub 2	Soul	05/03/2016
1000000000011	Data Structures	Alan Turing	Pub 1	Internet	05/03/2016
1000000000012	Subway Six	Mary Jane	Pub 2	Soul	05/03/2016
1000000000013	Alphabet Soup	Joseph Stalin	Pub 1	Princeton	05/03/2016
1000000000015	The Chateau	William Clinton	Pub 2	Internet	05/03/2016
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ISBN

1000000012345

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Books

Readers

Branches

Inventory

ID	Name	Address
1	New York Library	New York
2	Boston Library	Massachusetts
3	Nanjing World Library	Nanjing

Admin View Branches

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Inventory

ISBN	Branch	Count
10000000000001	1	10
10000000000001	2	10
10000000000001	3	10
10000000000002	1	10
10000000000002	2	10
10000000000002	3	10
10000000000003	1	10
10000000000003	2	10
10000000000003	3	10
10000000000004	1	10
10000000000004	2	10
10000000000004	3	10
10000000000005	1	10
10000000000005	2	10

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Admin Book Copy Status

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Add Book Copy

Branch #

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ISBN

1000000012345

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Status Book Copy

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Add Reader

Card #

10001234

Name

First

Last

Email

someone@example.com

Phone #

1234567890

Address

Submit

Add Book Copy

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ISBN

1000000012345

Amount

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Admin Add New Reader

Home Page

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Checkout Book

Branch # ISBN

Reserve Book

Branch # ISBN

Return Book

Branch # ISBN

Checkouts

Branch # ISBN Title Author Due Date

Reservations

Branch # ISBN Title Author

Reader General Functions

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Search Books

Mode

Publisher

Key

Pub 1

Submit

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ISBN	Title	Author	Publisher	Address	Date
1000000000001	Things Happen	Matthew Warshaw	Pub 1	Princeton	05/03/2016
1000000000003	Encyclopedia Beta	John Adams	Pub 1	Harvard	05/03/2016
1000000000005	Encyclopedia Theta	John Adams	Pub 1	Harvard	05/03/2016
1000000000007	Encyclopedia Omega	John Adams	Pub 1	Harvard	05/03/2016
1000000000009	The School Bus	Mary Jane	Pub 1	Soul	05/03/2016
1000000000011	Data Structures	Alan Turing	Pub 1	Internet	05/03/2016
1000000000013	Alphabet Soup	Joseph Stalin	Pub 1	Princeton	05/03/2016
1000000000016	Universal History	John Adams	Pub 1	Princeton	05/03/2016
1000000000018	Computer Arch	Matthew Warshaw	Pub 1	City	05/03/2016
1000000000020	I am the Wizard Now	Harry Potter	Pub 1	Hogwarts	05/03/2016

Reader Search Books by Publisher

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Key

ISBN	Title	Author	Publisher	Address	Date
1000000000001	Things Happen	Matthew Warshaw	Pub 1	Princeton	05/03/2016
1000000000017	Python Machines	Matthew Warshaw	Pub 2	City	05/03/2016
1000000000018	Computer Arch	Matthew Warshaw	Pub 1	City	05/03/2016
1000000000019	How to Linux	Matthew Warshaw	Pub 2	City	05/03/2016

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Branch # ISBN

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Branch # ISBN

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Checkouts

Branch #	ISBN	Title	Author	Due Date
1	1000000000001	Things Happen	Matthew Warshaw	2016-05-25

Reservations

Branch #	ISBN	Title	Author
3	1000000000002	Encyclopedia Alpha	John Adams
2	1000000000005	Encyclopedia Theta	John Adams

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Reader View Account