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Public Library Catalog System

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Project Description

As both a student and someone who feels strongly about the accessibility of information I believe that libraries are invaluable resources that can help educate us and provide us with various resources that can make a difference in our lives. I am a library worker and have been working at my local library for the past 3 years and over time I've seen the impact the resources we've provided the community has made. Having had experience for such a long time with my local library system I've seen the capabilities and the limitations the library can have which is why I intend to create a database that can address these. With any publicly available resource, there come issues when it grows in scale, specifically with the library it can lead to the mismanagement of items and user information that can negatively impact both the library and patrons alike. The most common issue I've seen is items appearing on patrons' accounts even after they've been checked in, deleted, and sometimes even paid for if they were fined. This leads to many difficult conversations and has led to these patrons no longer using the library. The unfortunate aspect of this is that it affects low-income patrons, teachers, and mostly children granted their Library card.

To address these issues I'd like to design my database in such a manner that it will diversify the types of accounts available to users, rather than having a singular account classification. There should be many depending on the situation. Currently, a lot of libraries offer welcome cards which are available to any Patron so long as they can provide contact information but have limitations placed on them for the same reason that they lack other information that can verify their identity if and when they need to be contacted. I am similarly adapting this by having specific types of accounts based on age, use, institutional affiliation, and personal circumstances. This will be a vast improvement upon the pre-existing Library systems Foundation-wide since

most children will have the same accessibility as adults and even institutional cards for teachers even though they should have limitations based on them to protect them and their families from having to pay needless fines. Personal circumstances can also be a factor in the way people use libraries because not everyone will have a stable housing situation or the means to come to the library physically which by having as a consideration will increase the accessibility of library resources. By creating this database in the manner described it can then be adapted to any County library system meaning that interlibrary loans will be much easier to manage and will make it possible for patrons to check out and return materials regardless of their registration within that County so long as they have some form of library affiliation.

As of right now, the two most commonly used services within Library systems are Carl X for internal transactions and Millennium which is now being phased out by Sierra for external transactions. Due to these Services being split up, it can cause various issues when it comes to interlibrary loans from one County to another leading to patrons being fined massive amounts for something that is potentially an error due to the software. The other issue is the fact that because these software Solutions rely on Library systems having an already established database they often carry over outdated information which can in some cases result in decades-old transactions still appearing on someone's account. The use of my database will allow software solutions such as Sierra and Carl X to work alongside each other seamlessly without any information you need to manually input or any conflicts due to potential differences in classifications and data fields.

Lastly, when thinking of use cases for the database the following three were the ones I had in mind to effectively display the use of the database model. Teachers placing holds and checking items out will be able to have priority for item holds, and extended loan periods, and the responsibility for the items will be on their institution. Children will have most of the same

access as a full-service card but their cards will be linked to that of their parents to ensure parents are aware of any issues such as fines, and items returned will be removed from their accounts immediately and placed onto a library review account to prevent potential mistakes. Adult patrons will be able to decide on the type of card they would like to sign up for based on their use and or circumstances, welcome cards in the form of E-Cards will be given. These only allow for the use of computers in the library and for patrons to access all online and digital materials and resources, and full-service cards will be given the same access but will also be able to check out items in person but without the restrictions of a welcome and child account.

Functional Requirements

1. Public Library

- i. Must have Sections
 - Children
 - Young Adult
 - Adult
- ii. Must have an Address
 - Must be a Library Address
- iii. Must have Items
- iv. Must have Transactions

2. Patron

- i. Must be a Type of Patron
- ii. Must be registered

3. Guest

- i. Must be given temp card number
- ii. All other data fields are left empty
- iii. Cannot check out items
- iv. Can only use computers
- v. Is not registered

4. E-Card Patron

- i. Has an electronic library card number (userId)
- ii. Can check out ebooks and other digital items
- iii. Must have an email
- iv. Must have a birthday
- v. Must have full name
- vi. All other data fields are left empty

5. Child Patron

- i. Can only have one account
- ii. Has a forked library card number (userId) from parent account
 - If parent card number is 923328897 then child is 923328897-#
 - Is granted priority on children's activity kits
- iii. Can check out 10 physical items and 15 digital items for 21 days
- iv. Must have a parent account linked
 - Must have an email to register
 - Must have a phone number
 - Must have an Address
- v. Must have a birthday to register
- vi. Must have full name

6. Full-Service Patron

- i. Can only have one account
- ii. Can have many child accounts
- iii. Has a standard library card number (userId)
 - Gets no priority on items
- iv. Can check out 100 physical items and 50 digital items for 21 days
- v. Must have an email
- vi. Must have a phone number
- vii. Must have an Address
- viii. Must have a birthday
- ix. Must have full name

7. Institutional Patron

- i. Can only have one Institutional account AND one personal account
- ii. Has an Institutional library card number (userId)
 - Is granted priority on book and electronic kits
 - Is granted priority after Child accounts on children's activity kits
- iii. Can check out 250 physical items and no digital items for 4 weeks
- iv. Must have an email
- v. Must have a phone number
- vi. Must have Institutional Address
- vii. Must have full name

8. Staff Patron

- i. Can only have one account
- ii. Has a Staff library card number (userId)
 - Is granted priority after Child AND Institutional accounts on book and electronic kits
 - Is granted priority after Child AND Institutional accounts on children's activity and electronic kits
- iii. Can check out 250 physical items and 50 digital items for 21 days
- iv. Must have an email
- v. Must have a phone number
- vi. Must have an Address
- vii. Must have a birthday
- viii. Must have full name

9. Residential Address

- i. Must have Street Number
- ii. Must have a Street Name
- iii. Must have Street Type
- iv. Must have City
- v. Must have State
- vi. Must have Zipcode

10. Apartment Address

- i. Must have Street Number
- ii. Must have a Street Name
- iii. Must have Street Type
- iv. Must have a Sub Building Number
- v. Must have Apartment Number
- vi. Must have City
- vii. Must have State
- viii. Must have Zipcode
- ix. Must have Office Phone Number

11. P.O. Box Address

- i. Must have Street Number
- ii. Must have a Street Name
- iii. Must have Street Type
- iv. Must have P.O. Box Number
- v. Must have City
- vi. Must have State
- vii. Must have Zipcode
- viii. Must have Servicer
- ix. Must have Servicer Phone Number

12. Institutional Address

- i. Must have Street Number
- ii. Must have a Street Name
- iii. Must have Street Type
- iv. Must have School District
- v. Must have City
- vi. Must have State
- vii. Must have Zipcode
- viii. Must have Office Phone Number

13. Library Address

- i. Must have Street Number
- ii. Must have a Street Name
- iii. Must have Street Type
- iv. Must have City
- v. Must have State
- vi. Must have Zipcode
- vii. Must have County Region
- viii. Must have County ID

14. A/V

- i. Can only be checked out once at a time
- ii. Can only be checked out when all materials are present
- iii. Must have Item barcode number (itemId)
- iv. Must have Section Assigned
- v. Must have a timestamp length
- vi. Must have Title
- vii. Must have Call Number

15. Fiction Item

- i. Can only be checked out once at a time
- ii. Must have Item barcode number (itemId)
- iii. Must have Section Assigned
- iv. Must have Title
- v. Must have an Author
- vi. Must have Call Number

16. NonFiction Item

- i. Can only be checked out once at a time
- ii. Must have Item barcode number (itemId)
- iii. Must have Section Assigned
- iv. Must have a Dewey decimal number
- v. Must have Title
- vi. Must have an Author
- vii. Must have Call Number

17. Archival

- i. Can only be viewed inside the library
- ii. Cannot be checked out
- iii. Must have a Dewey decimal number
- iv. Must have an Item Type
- v. Must have Title
- vi. Must have a Subject
- vii. Must have Call Number

18. Periodical Item

- i. Can only be checked out once at a time
- ii. Current issue cannot be checked out
- iii. Must have Item barcode number (itemId)
- iv. Must have Section Assigned
- v. Must have Title
- vi. Must have Date
- vii. Must have Volume/Issue
- viii. Must have Call Number

19. Kit Item

- i. Can only be checked out once at a time
- ii. Can only be checked out when all materials are present
- iii. Must have Item barcode number (itemId)
- iv. Must have Section Assigned
- v. Must have Title
- vi. Must have Call Number

20. Pass Item

- i. Can only be checked out once at a time
- ii. Can only be checked out when all materials are present
- iii. Must have Item barcode number (itemId)
- iv. Must have Title
- v. Must have Call Number

21. Computer Item

- i. Can only be used by patrons
- ii. Can only assigned to one user at a time
- iii. Must have Item barcode number (itemId)
- iv. Must have Section Assigned

22. Digital Item

- i. Must have digital item number
- ii. Must have Call Number
- iii. Must have Title

23. Study Room

- i. Can only be used by patrons
- ii. Can only assigned to a group of 3 at a time
- iii. Are limited to 60 min but can be extended
- iv. Must have Room Number
- v. Must have Section Assigned

24. Meeting Rooms

- i. Must be reserved 3 weeks in advance
- ii. Are limited to 8 hours max and 1 hour min
- iii. Must have Room Number
- iv. Must have Section Assigned
- v. Must have a listed description of the meeting
- vi. Must be open to the public
 - If private fee must be paid
- vii. Must provide patron information of at least one person
 - Listed patron must return meeting room key

25. Payment

- i. Must have library card number
- ii. Must have staff library card number
- iii. Must have total paid
- iv. Must have date
- v. Must have transaction id
- vi. Must have library address

26. Requests

- i. Must have Library Card Number
- ii. Must have Item Barcode Number
- iii. Must have User's Preferred Branch

27. Holds

- i. Must have Library Card Number
- ii. Must have Item Barcode Number
- iii. Must have User's email
- iv. Must have Library Address

28. Checkout

- i. Must have item barcode number
- ii. Must have library card number
- iii. Must have transaction id (trackingId)
- iv. Must have library address
- v. Must have a date

Non-Functional Requirements

1. Performance

- i. Library Transactions will be able to be performed simultaneously without conflicts and strain on the database
- ii. Requested and Held items will have status updates every day to prevent conflicting Patron Transactions
- iii. Digital Items will be separate from physical items on patron records to allow simultaneous transactions

2. Security

- i. Library card numbers are unique when created and assigned, upon the closure of an account or request for new library card old numbers are deleted and cannot be generated once more
- ii. Child account can only access account information in branch with Parent accounts being able to access information online and in branch
- iii. Accounts will be locked if library card is reported lost or stolen with a new library card number being assigned

3. Scalability

- i. Database is capability of expansion in order to account for new patrons, items, and transactions while avoiding compromising county wide performance
- ii. Data is stored locally and remotely, locally stored information is vital item, patron, and transaction information while remotely shared information is limited to allow branch level expansion without affecting other libraries
- iii. Main admin branch will be able to handle a large portion of the database in the form of transactions and general item and patron information taking a load off of the branches

4. Capability

- i. Items and Patrons are abstractions which will allow for future expansion on account types and new forms of materials
- ii. Digital Transactions such as Ebooks and Audio Books will be supported independently of in branch transactions
- iii. Account types will allow for different priority levels and capabilities to ensure patron need and circumstance is considered

5. Environmental

- i. Database will be hosted on server farm located in the main administrative branch with energy efficient design to remove the need for various large servers at each branch allowing for remote transfer and manipulation of data
- ii. In branch servers will be small raid configurations using solid state drives which can be stored in electrical room
- iii. As storage is expanded on servers old HDD's will be repurposed for archival and back up storage and be replaced with SSD's

6. Coding Standard

- i. Client Side support will be offered through the use of explicit error handling and reporting allowing staff to have accurate information on ongoing issues for them to generate work requests
- ii. Documentation and commenting will be common place and regularly updated for new and old staff to be able to work irregardless of familiarity with the database
- iii. Future Proofing will be essential and prioritized in order to make sure improvements and expansion to the database can be done without making it inaccessible county wide for a long period of time

7. Storage

- i. Patron information will be stored remotely but split amongst libraries and main admin branch and provided a capacity of 10 terabytes with capability of expansion
- ii. Transaction information will be stored remotely but split amongst libraries and main admin branch and be given 2 terabytes
- iii. Item information will be stored primarily with owning branches and share limited information remotely to other branches, capacity will be based on patron count of respective library

8. Privacy

- i. Patrons can only access their accounts with their respective library card number and birthday
- ii. Patron transactions will be deleted from record upon return of items
- iii. Parent accounts can only see amount of items checked out and fines on account but cannot see item details and content matter

Entity Relationship Diagram

Normalization Techniques Used

Enhanced Entity-Relationship Diagram

Normalization Techniques Used

ORM Architecture