C++ Programming

Library System Project

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Background

- Many libraries have a library system
  - Helps adding books and searching for them
  - Maintains information about the borrowed books
- We will create a simple version of this classical systems
- The main user for the system is an admin
  - Who might add a book, user or perform some relevant operation
  - You don’t need to provide login/logout functionalities in this console system
- The system starts with a menu
  - It shows all possible choices
  - The admin selects a choice.
    - Some operation is performed
  - Then the main menu is listed again

The menu

- Take a minute to read these choices

```
Library Menu;
1) add_book
2) search_books_by_prefix
3) print_who_borrowed_book_by_name
4) print_library_by_id
5) print_library_by_name
6) add_user
7) user_borrow_book
8) user_return_book
9) print_users
10) Exit

Enter your menu choice [1 - 10]:
```

Books operations: Adding a book

- Every system needs data. The core data here is the book and users
- The admin needs to be able to add books
- Each book has the following information
  - id (integer) - name - quantity
  - Example: 101, CppHowToProgram, 7
    - We have 7 copies for book CppHowToProgram (no spaces)
    - The book ID is 101
      - In real projects: our code typically generates the IDs

Books operations: Searching for a book

- Searching your database of books is a typical operation
- We will search the system using book name.
- Instead of the complete book name, we will allow a **prefix**
  - Prefix: The first letters of a word
- Assume we have 3 books in the system, their names:
  - CppHowToProgram, CppForDummies, CppForAdvancedLevels, CoreJava
- Query
  - Cpp ⇒ CppHowToProgram, CppForDummies, CppForAdvancedLevels
  - CppFo ⇒ CppForDummies, CppForAdvancedLevels
  - Core ⇒ CoreJava
  - Java ⇒ Nothing

Book Operations: Listing books

- Another typical operations is to just list all books in the system
  - But we can order data in several ways!
- We will allow sorted either based on IDs or Names
- Assume entered books were
  - ID: 1111, Name: Math1
  - ID: 5041, Name: ArabicLiterature
  - ID: 1011, Name: Math2
- Sorting by name ⇒ ArabicLiterature, Math1, Math2
- Sorting by ID ⇒ Math2, Math1, ArabicLiterature

Book Operations: Listing users borrowed a book

- Given that several users may borrow a book, the admins may want to know who borrowed what. Remember we have several copies per book.
- Input: Book Name
  - E.g. Math1
- Output: list of the user names who borrowed the book
  - E.g. Mostafa, John, Mark, Ali

User Operations: Add a user

- Each user has only an Id(integer) and name
  - Feel free to add more
- We only request 2 operations
  - Borrowing a book
  - Returning a book
- Feel free to add more features
  - List the system users, ordered by name or ID
  - List borrowed book of a specific user
  - Add more info about user: email & address

User Operation: Borrow a book

- Borrowing books is a repetitive scenario in libraries
- Each book already have a specific number of copies (the quantity)
- To borrow a book, this quantity must be > 0
  - Otherwise, this book can’t be borrowed
- After borrowing, the quantity must be decreased
- The admin enters the user name and the book name
  - If there is enough quantity of the book, the system does the following:
    - Mark that this user borrowed a copy
    - Decrease the quantity with 1
  - If there is no available copies, the system notifies the admin

User Operation: Return a book

- Same logic, but this time the system do the reverse:
  - Mark that the user returned a copy
  - Increment the current quantity
- Note
  - Anytime we try to list the system books, overall data should be correct and proper

"Acquire knowledge and impart it to the people."

"Seek knowledge from the Cradle to the Grave."