Library Management System Design

1. Introduction

This document will outline the design of a library management java program. This program's has multiple purposes which are to manage memberships, adding materials, add materials, issuing and returning items as well as generating reports for inventory and loans.

2. Class Diagram

The system is designed using object-oriented principles with the following classes and their relationships:

- **Library:**

  - Manages members and materials.

  - Contains methods for library operations such as adding members, adding materials, issuing items, returning items, and generating reports.

- **Member:**

  - Represents a library member with basic details like first name, last name, etc.

- **AdultMember:**

  - Inherit from Member and adds a membership ID.

- **ChildMember:**

  - Inherits from Member and adds a guardian reference.

- **Material:**

  - Represents reference materials in the library.

- **Book, Magazine, DVD:**

  - Different types of materials are inherited from Material class with specific attributes.

3. Justification

- **Library Class:**

  - Manages the core functionalities of the library.

- Keeps track of members and materials.

- Facilitates library operations.

- **Member Class:**

  - Represents common attributes and behaviors of library members.

- **AdultMember and ChildMember Classes:**

  - Extend Member to provide specific functionalities for adult and child members.

- **Material, Book, Magazine, DVD Classes:**

  - Represent different types of reference materials with specific attributes.

  - Inheritance allows for reusing common attributes and behaviors defined in Material.

4. Methods and Responsibilities

- **Library Class:**

  - **addMember(Member member)**: Adds a new member to the library.

  - **addMaterial(Material material)**: Adds a new material to the library's catalogue.

  - **issueItem(String membershipId, String itemReference)**: Issues an item to a member.

  - **returnItem(String itemReference)**: Marks an item as returned.

  - **generateInventoryReport()**: Generates a report of all items in the library's catalogue.

  - **generateLoansReport()**: Generates a report of all issued items and their borrowers.

  - **lookupMembership(String membershipId)**: Retrieves details of a member based on their membership ID.

  - **exit()**: Exits the application.

5. Conclusion

The designed library management system provides a much more organized approach to management. There can always be more added to this system to upgrade its qualities. Please see the UML Diagram Below.