UML includes the following 9 diagrams:

1. **Class diagram**: These diagrams depict the behavioral pattern of the system, i.e. how each and every class is inter-related to the other one, which relationship exists among each of the classes, etc. There would be only one class diagram possible for a single system. Class diagrams of one system can be linked to the class diagrams of another system, provided, there is a multi-system requirement.

2. **Object diagram**: Object diagram is similar to the above mentioned class diagram and is said to be a real entity or an instance of the Class used to mention the extra properties of an entity in addition to the properties depicted by the class.

3. **Use case diagram**: Use case diagram comprises of use cases and actors such that there would be various kinds of relationships among the use cases and the actors. A use case diagram shows all the actions that a particular actor needs to perform through out the system at every (any) point of time. There would be only one use case diagram per each system.

4. **Sequence diagram**: This diagram, as the name suggests, contains the sequence of flow of actions that are processed through a system and the life lines of the entities, when and how are they accessed. It also contains the security like which entity can process which entity and which one is visible, etc. There can be many number of sequence diagrams per each activity being done.

5. **Collaboration diagram**: This diagram is a polymorphic form of the sequence diagram in which the representation is different but application is the same. If we are able to create one sequence diagram, then it’s very simple to create its collaboration diagram with a single key click that varies from to software. There can be many number of collaboration diagrams per each activity being done because there can be many number of sequence diagrams.

6. **Activity diagram**: This diagram denotes the structural flow of the activities in the form of flow chart with decision boxes enhanced and hence is also used for troubleshooting like raising exceptions when a particular action is done and the alternative to be done when something abnormal is done. There can be only one activity diagram for the entire system including all the activities that a system can perform.

7. **Statechart diagram**: This diagram is a polymorphic form of the activity diagram in which the representation is different but application is the same. It looks similar to a finite state machine state transition diagrams.

8. **Deployment diagram**: Deployment diagram is employed when we need to deploy the application we developed. A single deployment diagram is possible for a single system.

9. **Component diagram**: Component diagram represents the components in which the particular application needs to be installed or implemented on. It also shows the type of relation that exists among the various components that are represented. Hence, only a single component diagram representing all the components and their relations is needed for the entire system.

Library Management System

Problem Statement:

- The case study titled Library Management System is library management software for the purpose of monitoring and controlling the transactions (of books) in a library.
- This case study on the library management system gives us the complete information about the library and the daily transactions done in a Library.
- Maintaining the record of new s and retrieve the details of books available in the library (focusing on operations in a library like adding new member, new books, and up new information, searching books and members, facility to borrow and return books).
- An attractive user interface, combined with strong searching, insertion and reporting capabilities.
- Report generation facility of library system (also to generate/print hard copy).

The following are the brief description on the functions achieved through this case study:

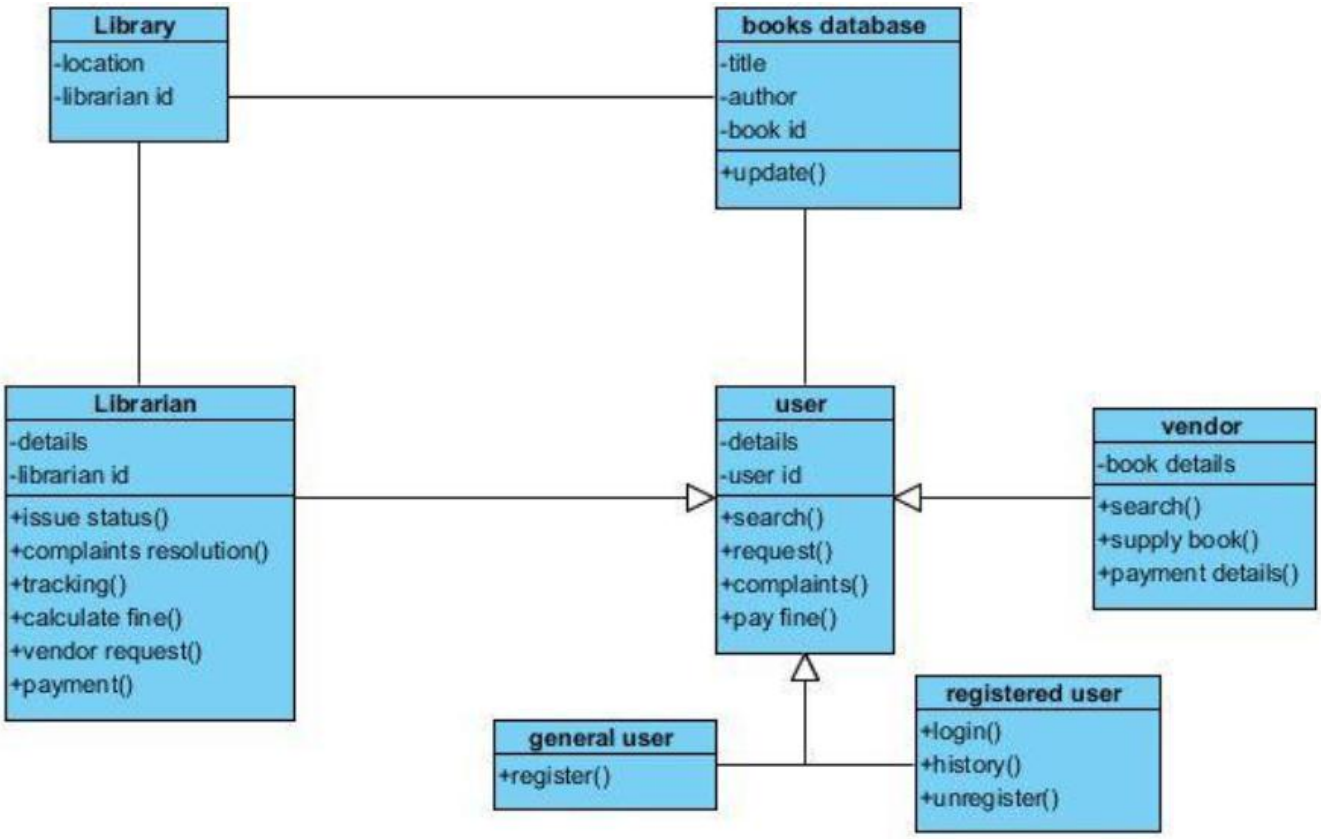
End-Users:

- Librarian: To maintain and update the records and also to cater the needs of the users.
- Reader: Need books to read and also places various requests to the librarian.
- Vendor: To provide and meet the requirement of the prescribed books.

Class Diagram

Classes identified:

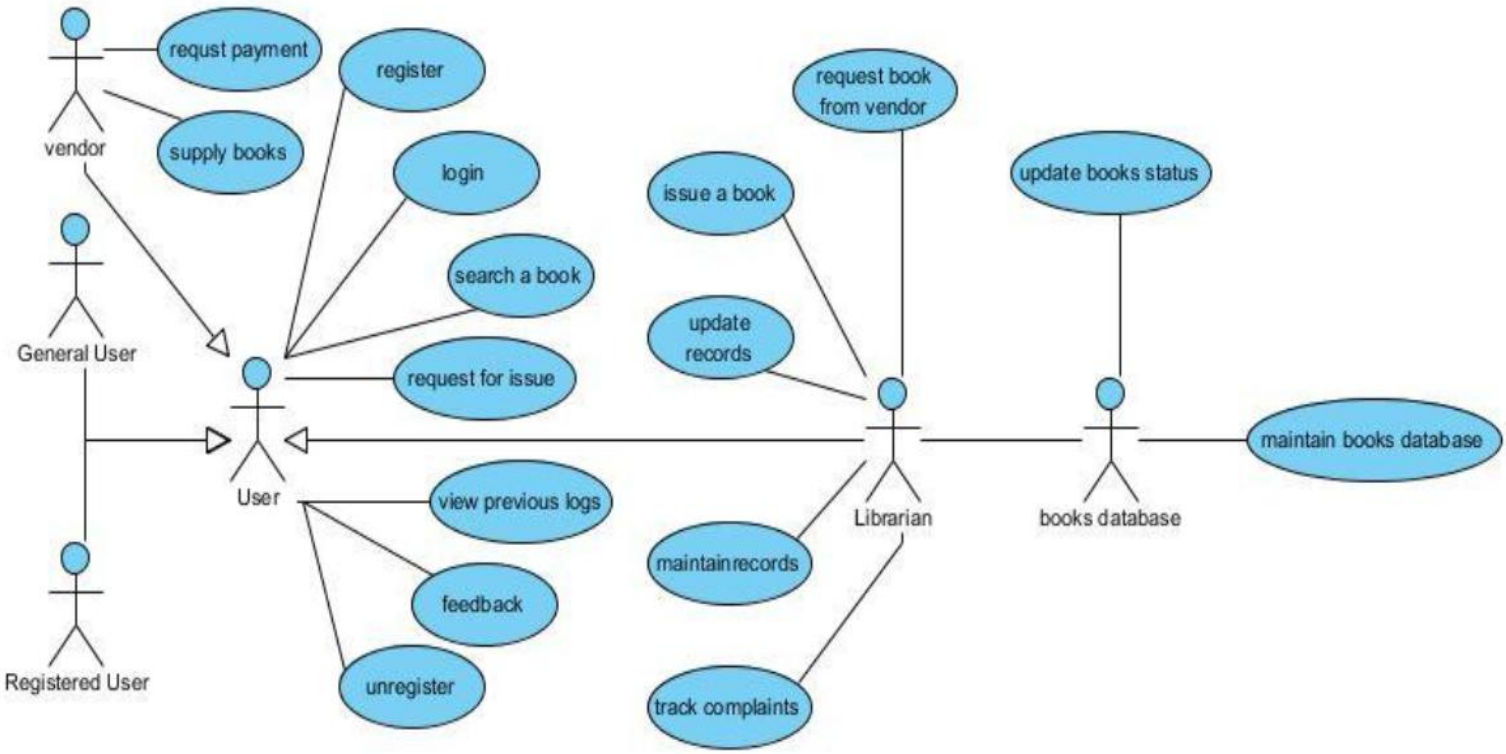
Library
Librarian
Books Database
User
Vendor



Use-case Diagram

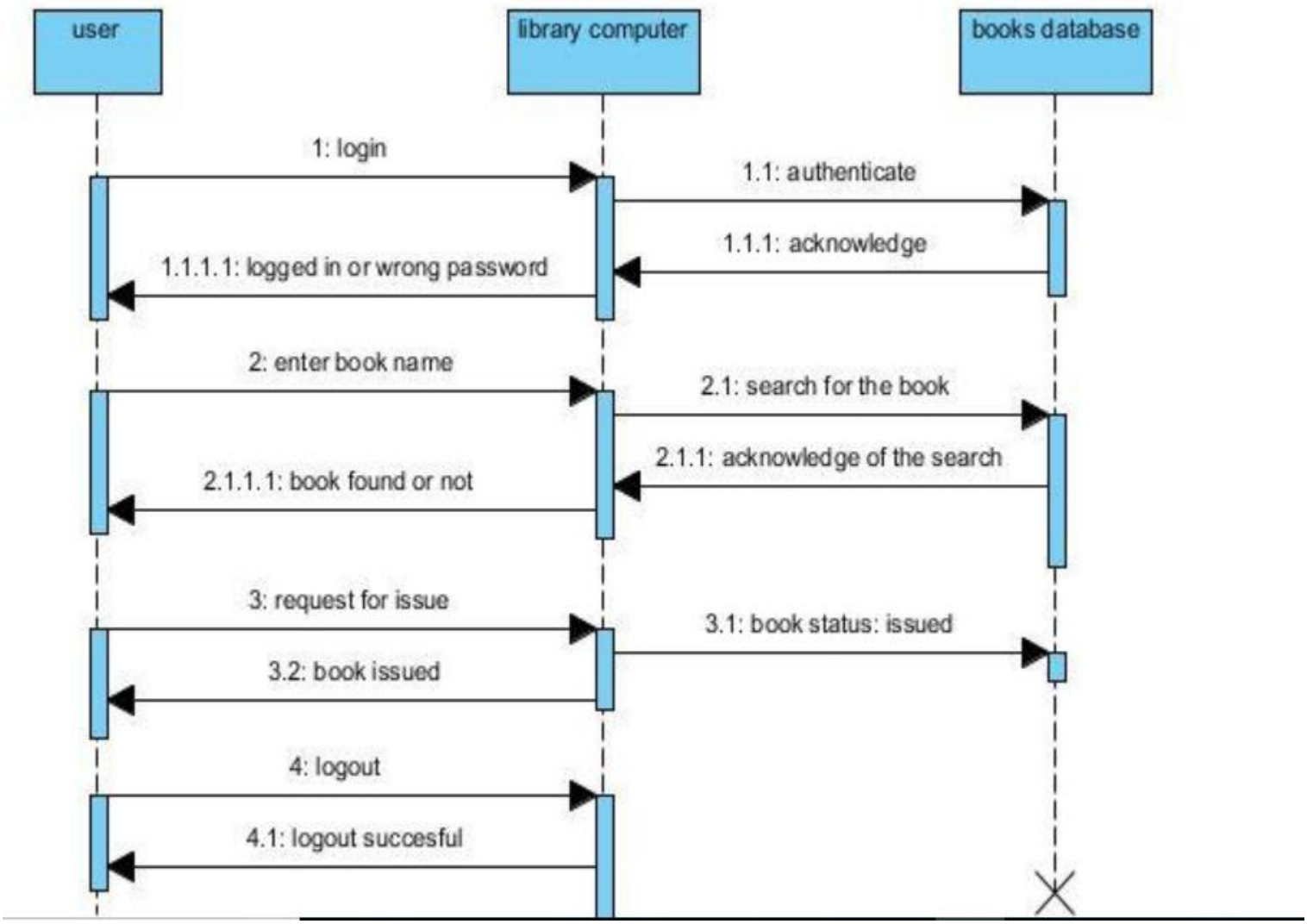
Actors vs Use Cases:

Librarian
•Issue a book
•Update and maintain records
•Request the vendor for a book
•Track complaints
User
•Register
•Login
•Search a book
•Request for issue
•View history
•Request to the Librarian
•Unregister
Books Database
•Update records
•Show books status
Vendors
•Provide books to the library
•Payment acknowledgement



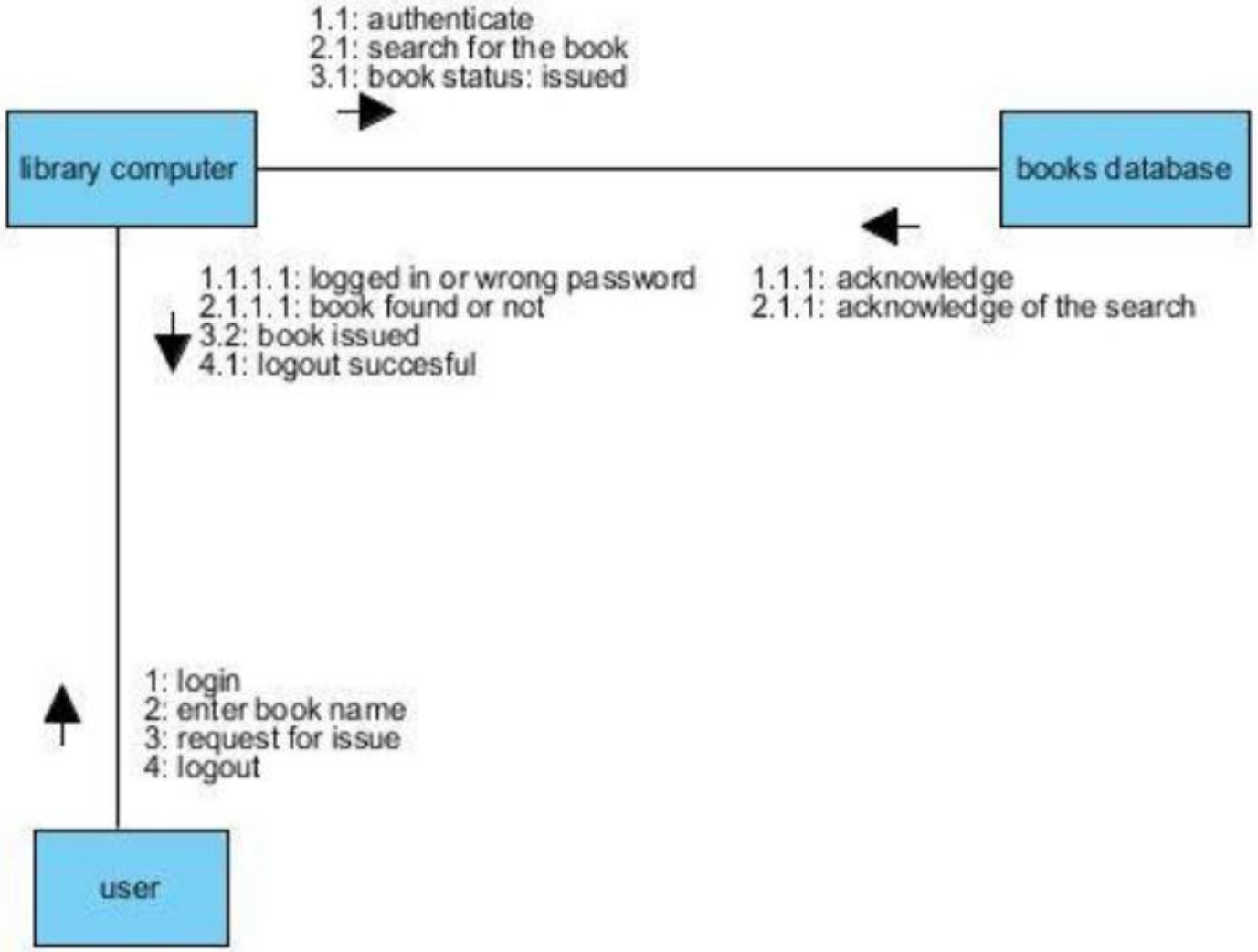
Sequence Diagram

Sequence diagram for searching a book and issuing it as per the request by the user from the librarian:



Collaboration Diagram

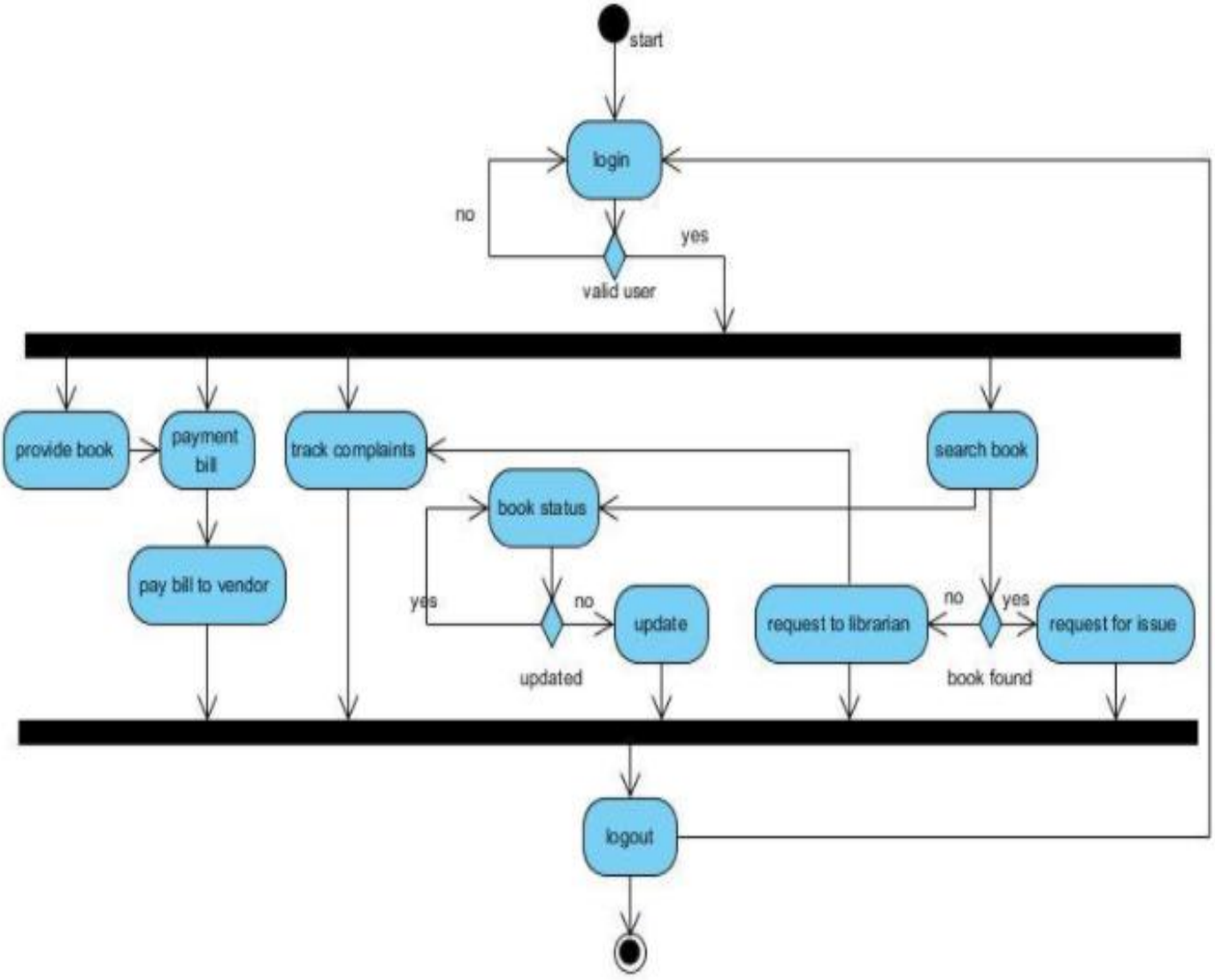
Collaboration Diagram for searching a book and issuing it as per the request by the user from the librarian:



Activity Diagram

Activities:

User Login and Authentication
Search book operation for Reader
Acknowledge and Issue books to the users by the Librarian
Provide books requested by the Librarian from the Vendor
Bill payment from the Librarian to the Vendor
Status of the books updated in the Books Database



State Chart Diagram

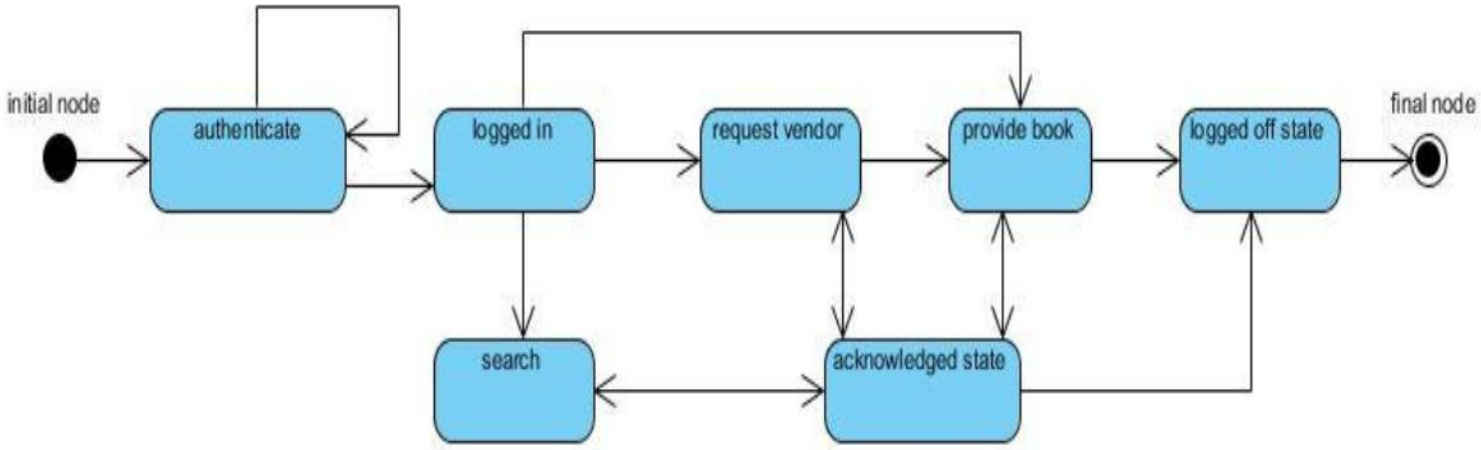
States:

Authentication

Successfully logged on or re-login
Search for a book (user) / request the vendor (librarian) / provide the requested book (vendor)
Receive acknowledgement
Logged off / re-search / new function

Transitions:

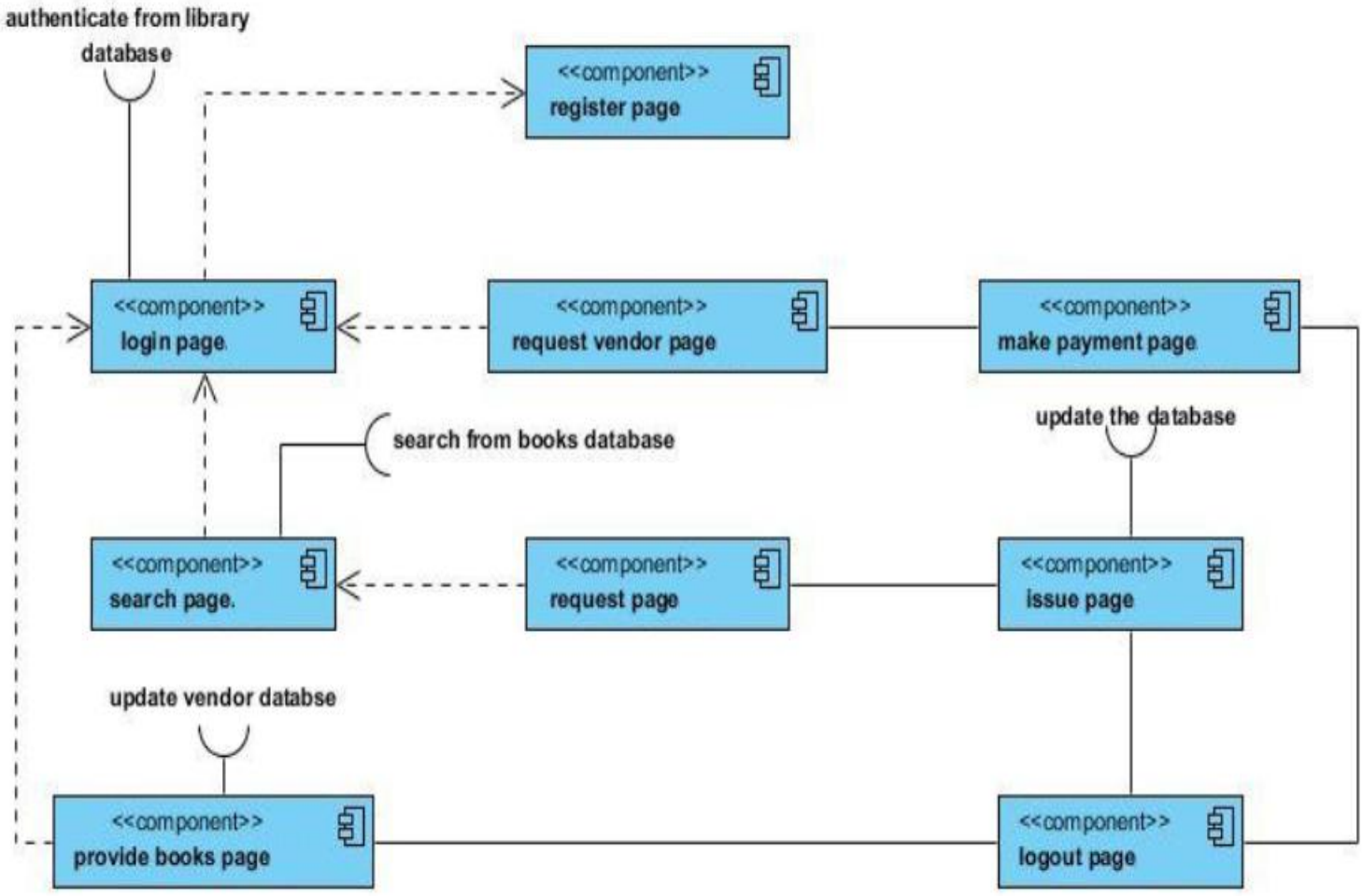
Authenticate ---> Logged in
Logged in ---> Search <---> Acknowledgement
Logged in ---> Request Vendor <---> Provide Book <---> Acknowledgement
Logged in ---> Provide Book <---> Acknowledgement
Acknowledgement ---> Logged off



Component Diagram

Components:

Register Page (visitor / vendor)
Login Page (user / librarian / vendor)
Search Page (user / librarian / vendor)
Request Vendor Page (librarian)
Request Book Issue Page (user / vendor)
Issue Status Page (librarian)
Make Payment Page (librarian / vendor)
Provide Books Page (librarian)
Logout Page (user / librarian / vendor)



Deployment Diagram

Systems Used:

Local Consoles / Computers for login and search purposes by users, librarian and vendors.

Library LAN Server- interconnecting all the systems to the Database.

Internet to provide access to Vendors to supply the requested books by the Librarian

Vendor Server- to maintain the records of the requests made by the librarian and books provided to the library