

MONASH UNIVERSITY

CSE3308 Software Engineering: Analysis and Design Practice Class 4

Object-Oriented Analysis: Use Cases and Class Diagrams

1 University Library System

An Australian university is planning to computerise its library system. You have been chosen to do the analysis and design. The following requirements for the system have been specified:

- The system records all the items in the library's collection. Each copy of an item in the collection also has a unique identifier. At present, the library has books, periodicals and audio tapes in its collection. It is anticipated that other kinds of items may be added to the collection in future (e.g. CD-ROMs).
- Each item has a title, year of publication, publisher and a unique call number associated with it. Books have an author or editor, and an ISBN number. Periodicals have a volume and number, and an ISSN number. The number of copies of each item in the library is also recorded.
- A copy of an item that is in the library is said to be *on shelf*. Only copies of items that are *on shelf* may be borrowed. When a client borrows that copy, it is said to be *on loan*. If the client does not return the copy within the specified time, it is said to be *overdue*. Copies of items can also be placed *on reserve*, meaning that they are in the library, but cannot be borrowed. Copies of items can also be temporarily removed from the library for maintenance work to be done on them. While this work is being done, the copy is said to be *at binder*. When the work is finished, the copy is returned to the library.
- Each copy of an item in the collection has a bar code attached to it. Library staff members scan this using a bar code reader to identify a particular copy of an item to the system when they wish to modify its status (e.g. when a client borrows it).
- The system records all the clients of the library. A client may be a student or a staff member. Students may be either undergraduate or post-graduate students. Students borrow at most four things at a time. Post-graduate students and staff members can borrow up to eight things at a time.
- Each client has a smart-card. The smart-card records a unique ID number for each client, which is read whenever the client must be identified to the system.

- When a client borrows a copy of an item, the client must be identified and the loan must be recorded. Each loan is for a fixed number of days, with a start date and a due date. If the client does not return the copy before the due date, an email is automatically generated and sent to the client to inform her or him of the problem.
- Clients can not borrow any more copies of items while they have loans which are overdue.
- A library staff member's work-station consists of a keyboard, screen, bar code reader and smart-cart reader.
- It must be possible to search the collection for items based on their titles and/or authors. Public access terminals will be provided for this purpose. When an item is located, the terminal will display the information about it, as well as the status of each of the copies in the collection.
- Clients may place requests for items which are currently unavailable. The client's identity must be verified when a request is placed. When a copy of the requested item becomes available, the client is notified.

1.1 Use Cases

1. Write Expanded Use Cases for the following interactions:
 - (a) Client borrowing a book from the library.
 - (b) Client placing a request for an item.
2. Draw a Use Case Diagram to illustrate the above Use Cases.
3. Analysis indicates that the above Use Cases share some behaviour. How could this be modeled using UML? Draw a new Use Case Diagram showing your improved model.

1.2 Class Diagram

Using UML notation, draw a Class Diagram that supports the situation described above. You do not need to include any attributes or operations on your Class Diagram, you need only show the associations between classes.