

Identify the actors and the objects in the following scenario to register a patient in a hospital management system:

The administrator enters the patient's name, address, date of birth and emergency contact details into the system. If the patient has only public health insurance, the administrator enters the patient's medicare number, and the system verifies this with government health database. If the patient also has private health insurance, then the administrator enters also the patient's private health insurance details, and the system verifies these details with the private health insurance system. When these details are verified as correct, the system saves the patient's details and confirms the registration.

Actors:

Administrator, Government Health Database, Private Health Insurance System
(The last two are external systems)

Objects:

Patient
Administrator
Address
EmergencyContact
PublicHealthInsurance
PrivateHealthInsurance
Registration

Assumptions:

- * Address contains street number, street name, suburb, and postcode and so is large enough to be an object.
- * Other nouns identified that are not considered to be objects include: patient's name and date of birth. They are considered to be stored as primitive types or strings and are attributes of other objects.
- * EmergencyContact is assumed to contain a contact person's name and phone number (and most likely the address and relationship to the patient) and so should be an object rather than an attribute.
- * the noun "details" appears a few times. It is not considered to be an object as the word refers to the attributes of some objects.

Note: you may have different assumptions from the above.

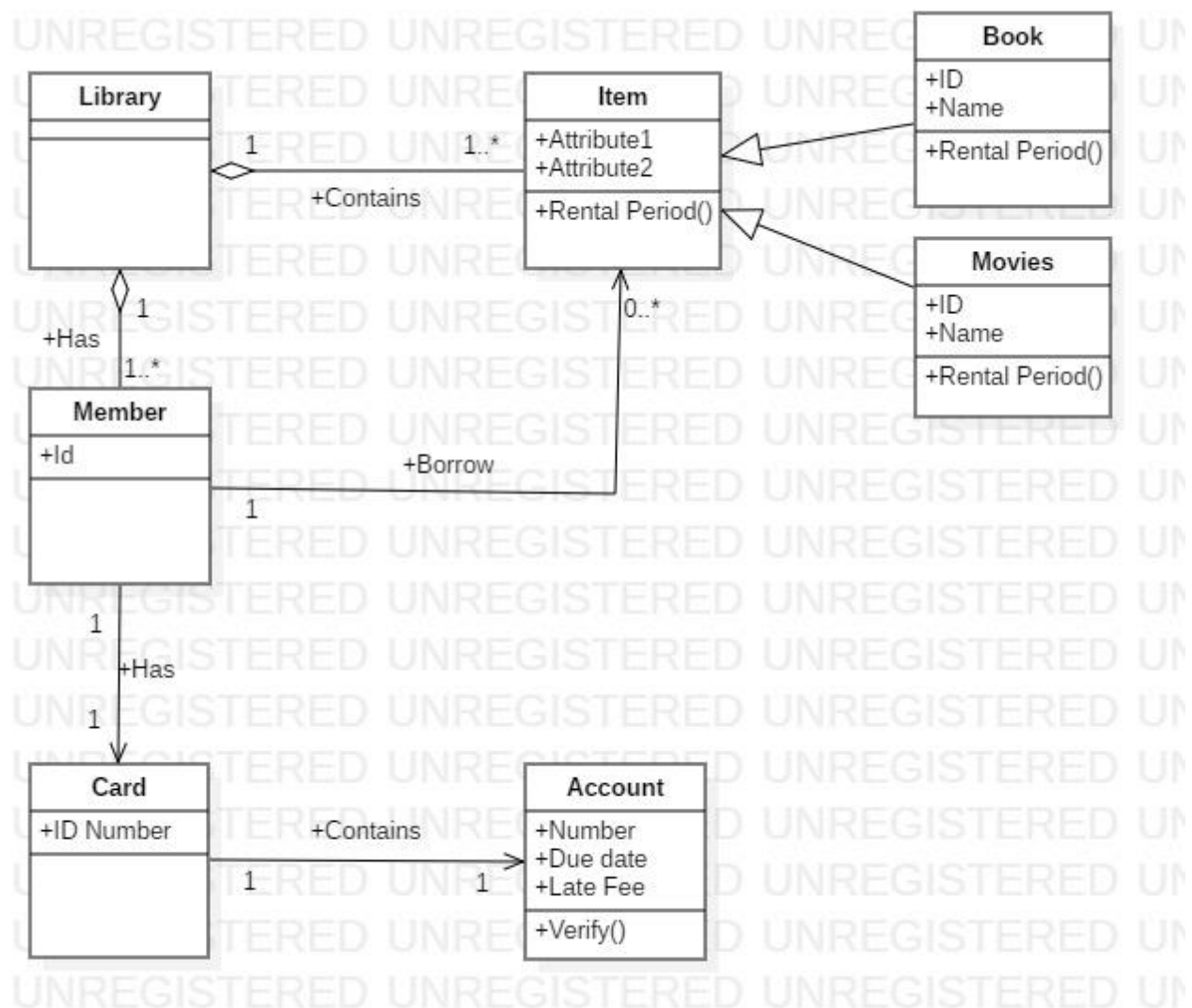
Comments:

- * Highlighted in yellow are actors.
- * Other nouns are highlighted in pink. Some of them (e.g., name, date of birth) are obvious attributes of other entity objects. Address is large enough to be an entity object as it can include street number, street name, suburb, and postcode. You should provide a brief statement about your assumption to some of the nouns if it is not clear or obvious to you whether they should be attributes or objects. A rule of thumb is: if the noun is small enough to be represented by a primitive type (int, float, char, etc) or a string (char array) then it should definitely be an attribute; otherwise it should be an object.
- * The word "system" is a noun but should not be an object as it refers to the whole hospital management system.
- * Don't forget to include Registration as an object in your answer. This is the most important entity object. At the end of the registration process, the system should generate a Registration object that records all the details such as a registration number, the date the registration takes place, a reference to the Patient object, a reference to the patient's public health insurance etc. Although these details are not given in the description, it should be clear that Registration is an entity object.

Class Diagram - Exercises

Task 1: Create a class diagram for a web based public library. A public library typically stores a collection of books, movies, or other library items available to be borrowed by people living in a community. Each library member typically has a library account and a library card with the account's ID number, which she can use to identify herself to the library. A member's library account records which items the member has borrowed and the due date for each borrowed item. Each type of item has a default rental period, which determines the item's due date when the item is borrowed. If a member returns an item after the item's due date, the member owes a late fee specific for that item, an amount of money recorded in the member's library account.

Solution:



Task 2: Create a class diagram based on the following description. You have been asked to build

a management system for a group of archeologists. The group is comprised of multiple teams of researchers. Each team has a letter ID (e.g., team A, team B). Each researcher belongs to one of the teams, and has an ID number, a first name, and a last name. There are two types of researchers: field and lab staff. Each field staff member has a favorite region (string). Each lab researcher supports up to 2 field researchers. Some researchers may not be supported by a lab researcher. The company also manages an inventory of equipment. Researchers of any type may check out up to 3 pieces of equipment. Each piece of equipment has a serial number and replacement cost.

Task 3: Imagine that you are tasked with developing a system for a pizza shop. Given the following description, create a class diagram (in the form of a UML class diagram). Include all conceptual classes, attributes, associations, and generalization relationships mentioned in the descriptions. Label all associations and include all multiplicities.

A customer places orders. A customer has a name and phone number. There are two types of orders: pick-up and delivery. A pick-up order has a pick-up time. A delivery order has an address and deliver-by time. All orders consist of a set of items. There are two types of items: pizzas and drinks. All items have a price. A pizza has a size and a crust type. A pizza also has a number of toppings. A topping has a topping type and a price. Some pizzas are special pizzas that have a name (e.g., "Hawaiian" or "Meat Lovers"). A drink has a brand and a flavor

TASK 4: Consider the world of libraries. A library has books, videos, and CDs that it loans to its users. All library material has a id# and a title. In addition, books have one or more authors, videos have one producer and one or more actors, while CDs have one or more entertainers. The library maintains one or more copies of each library item (book, video or CD). Copies of all library material can be loaned to users. Reference-only material is loaned for 2hrs and can't be removed from the library. Other material can be loaned for 2 weeks. For every loan, the library records the user, the loan date and time, and the return date and time. For users, the library maintains their name, address and phone number. Draw a class diagram (or two, if this is more convenient) for the description above. Make sure to show attributes, multiplicities and aggregations/compositions, where appropriate.

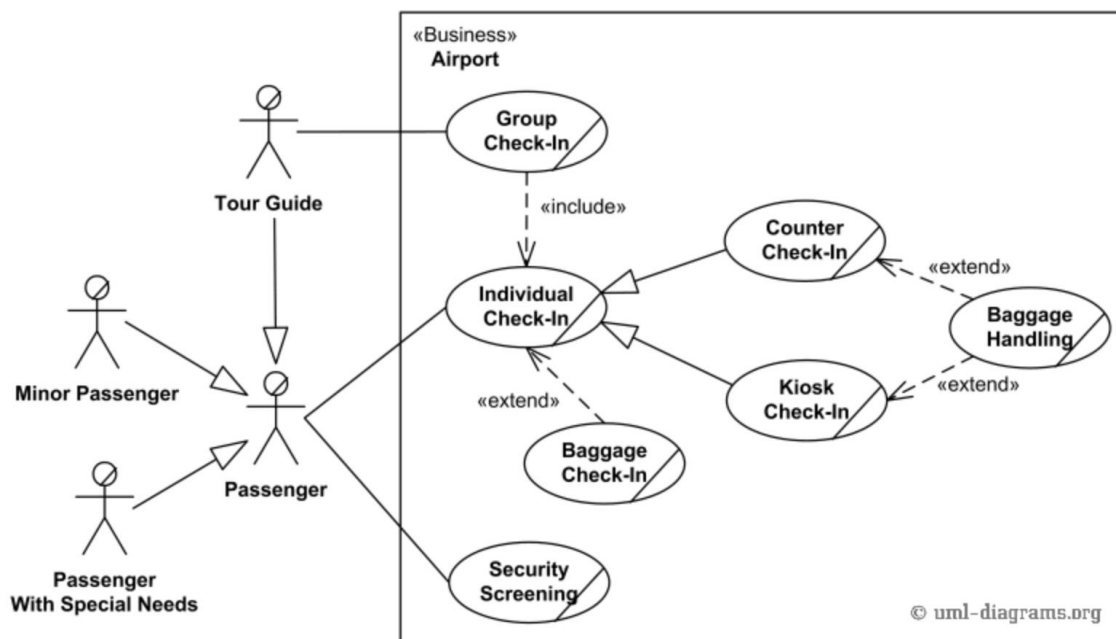
TASK 5: Draw a UML class diagram to capture the following situation: "Every student is enrolled in a course. Each student may be enrolled in a set of units. Some units are core units for one or more courses and some units are elective units for one or more courses."

Use-case Diagrams – Exercises

TASK1: When a passenger wants to travel by air, he/she needs to do check-in and undergo security screening. A tour guide can do a group check-in of a group of passengers, and each one of the group members needs to do individual check in. An individual can do check-in either through Kiosk or through designated counters. While checking-in, the check-in luggage needs to be taken care of. There can be passengers with special needs or passengers who are minors, and they get early check-in facility.

Design the Use-case diagram for the scenario described above.

Sample Solution



TASK2: Create a Use Case Diagram (in UML) for the following explanation of the workings of an Internet auction system:

1. Types of users
 1. Anyone
 1. Anyone may use the search features of the system.
 2. Anyone may look at an auction's information.
 2. Members
 1. Only members may bid or place items for sale.
 2. All members must register with the system.
 3. Members must supply their name and a valid e-mail address.
 4. After registering, the system will create an account for the member.
 1. A password will be mailed to the e-mail address specified.
 5. Members must log in to bid or place an item for sale.
 6. Members who forget their password can have it re-mailed to them.
2. Auctions
 1. An auction involves an item, a seller, and zero or more bidders.
 2. Items and sellers
 1. Sellers put up items for auction

2. The item must include a name, a closing time, and a minimum bid.
 3. The item may include a description and a picture.
 4. Sellers may have any number of auctions active at one time.
3. Bids and bidders
 1. Any member may bid in any auction.
 2. Bids may be placed at any time before the closing time.
 3. A bid must be at least the minimum bid, and higher than any bid so far.
4. Ending an auction.
 1. No matter how an auction ends, it is immediately removed from the list of active auctions.
 2. If no bids are placed before the closing time, the auction is closed unsuccessfully and the seller notified by e-mail.
 3. If at least one legal bid has been placed before the closing time, the auction is closed successfully. The winning bidder and the seller are both mailed each other's contact information and the winning bid.
 4. The seller may cancel the auction up to 24 hours before the closing time. All bidders on this auction will be mailed a notice of the cancellation.
3. Searching
 1. Any user may search through active auctions by keyword.
 2. All active auctions with name or description containing the keyword are presented to the user.
 1. The auctions are sorted by closing time in chronological order.
 2. The user may click a link to go directly to the auction.

TASK3: “An **Online Public Access Catalog (OPAC)** is an e-Library website which is part of **Integrated Library System (ILS)**, also known as a **Library Management System (LMS)**, and managed by a library or group of libraries. Patrons of the library can search library catalog online to locate various resources - books, periodicals, audio and visual materials, or other items under control of the library. Patrons may reserve or renew item, provide feedback, and manage their account.” Design the Use-case diagram for the above scenario.

TASK4: Study the details given below in connection with the ATM and design the use-case diagram for the same.

“An automated teller machine (ATM) or the automatic banking machine (ABM) is a banking subsystem that provides bank customers with access to financial transactions in a public space without the need for a cashier, clerk, or bank teller. The customer uses bank ATMs to do transactions such as Check Balances of his/her bank accounts, Deposit Funds, Withdraw Cash, and/or Transfer Funds. ATM Technician provides Maintenance and Repairs. All these functionalities also involve Bank, whether it is related to customer transactions or to the ATM servicing.

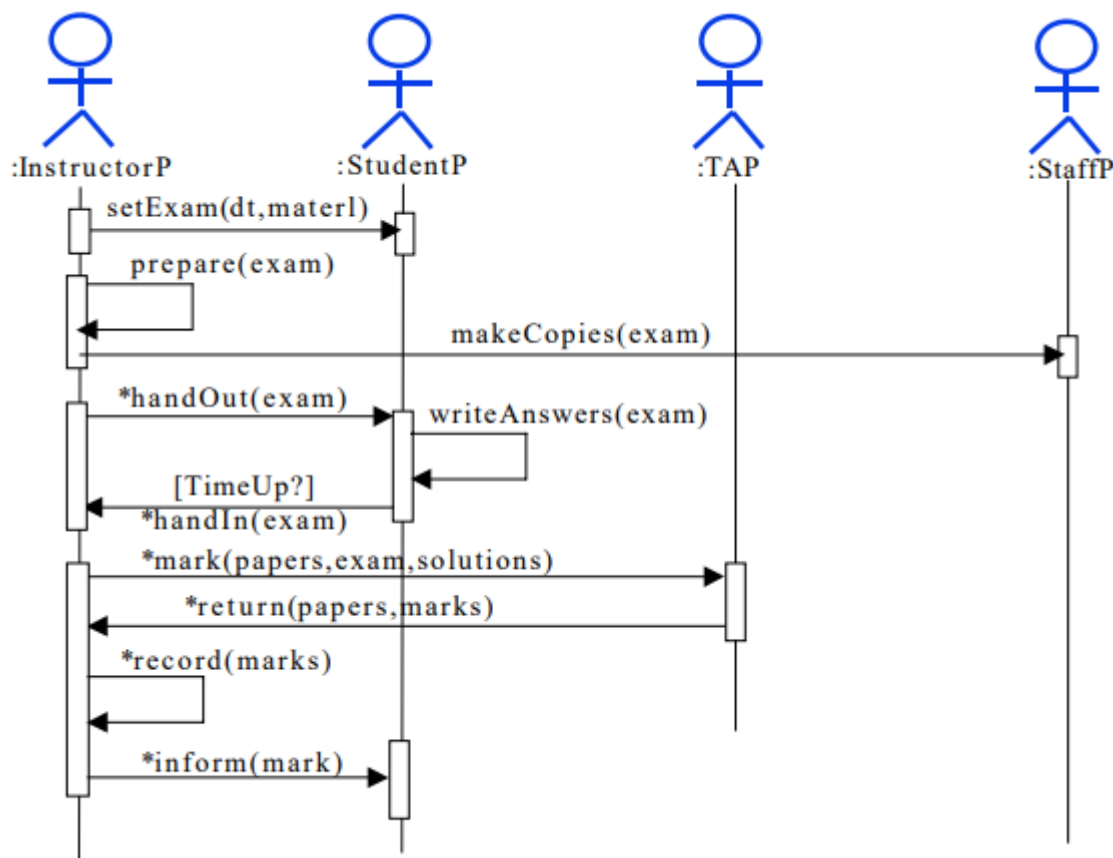
On most bank ATMs, the customer is authenticated by inserting a plastic ATM card and entering a personal identification number (PIN). *Customer Authentication* is required for every ATM transaction. Customers may need some help from the ATM and can request help, by selecting the Help menu item. ATM Technician maintains or repairs Bank ATM. Maintenance includes Replenishing ATM with cash, ink or printer paper, Upgrades of hardware, firmware or software, and remote or on-site Diagnostics. Diagnostics is also needed in Repair.”

Time-sequence Diagram – Examples

TASK1:

To give an exam, an instructor first notifies the students of the exam date and the material to be covered. She then prepares the exam paper (with sample solutions), gets it copied to produce enough copies for the class, and hands it out to students on the designated time and location. The students write their answers to exam questions and hand in their papers to the instructor. The instructor then gives the exam papers to the TAs, along with sample solutions to each question, and gets them to mark it. She then records all marks and returns the papers to the students.

Draw a sequence diagram that represents this process. Make sure to show when is each actor participating in the process. Also, show the operation that is carried out during each interaction, and what its arguments are.



TASK2:

The following scenario is to register a patient in a Hospital Management System(HMS):

The administrator enters the patient's name, address, date of birth and emergency contact details into the system. If the patient has only public health insurance, the administrator enters the patient's medicare number, and the system verifies this with government health database. If the patient also has private health insurance, then the administrator enters also the patient's private health insurance details, and the system verifies these details with the private health insurance system. When these details are verified as correct, the system saves the patient's details and confirms the registration.

TASK3: Elevator Problem

A product is to be installed to control elevators in a building with m floors. The problem concerns the logic required to move elevators between floors according to the following constraints:

Each elevator has a set of m buttons, one for each floor. These illuminate when pressed and cause the elevator to visit the corresponding floor. The illumination is canceled when the elevator visits the corresponding floor.

Each floor, except the first floor and top floor has two buttons, one to request an up-elevator and one to request a down-elevator. These buttons illuminate when pressed. The illumination is canceled when an elevator visits the floor and then moves in the desired direction.

When an elevator has no requests, it remains at its current floor with its doors closed.