National University of Computer and Emerging Sciences

Laboratory manual # 3
For
Software Design and Architecture

Course Instructor	Amir Iqbal
Lab Instructor	Muhammad Hashir Mohsineen Syeda Aina Batool
Email	hashir.mohsineen@lhr.nu.edu.pk ainnie.batool275@gmail.com
Section	BSE-4D
Date	14-02-24
Semester	Spring 24

Instructions for lab submission:
You have to submit source files along with a word document. In the word document you have to give the heading of each exercise/question, then paste your UML diagram. Save your word document in the following format: roll number-lab no-section i.e. 21I-0008-lab1-BSE4D.

Objective:

- ☐ Understanding and designing UML sequence diagrams

Software for this lab:

- ☐ StarUML
- ☐ Visual Paradigm

Create UML sequence diagrams for the following scenarios:
You have to identify the actors/ objects and show the sequence of interactions according to the given scenarios.
You can make assumptions and add more details.

1. **Exercise: Online Music Retailer**

Scenario: Customer (a valid user of online music store) is able to purchase gift tokens by using in-app points and paying from card is completely optional. Assume a customer has enough in-app points to purchase a gift token.

The customer decides to purchase a gift token from the online music store. They select the value of the token and proceed to buy it.
Optional: If the customer decides to pay for the token (by card), they provide payment details and complete the transaction.
After the purchase, the customer receives a unique token code representing the gift token. They receive this code via email.
The customer decides to send the token code to their friend as a gift. They may choose to send it via email.
The friend receives the token code and decides to redeem it. They visit the online music store's website to do so.
The friend enters the received token code into the designated field on the website.
If the token code is incorrect or expired, the system prompts the friend to enter a valid code or contact support.
The system validates the token code to ensure it's genuine and active.
If the token code is valid, the friend selects the MP3 tracks they wish to purchase from the online store's catalog.
The friend completes the purchase process by adding the selected MP3 tracks to their cart and proceeding to checkout.

If there's any remaining balance on the token after purchasing the MP3 tracks, the system prompts the friend to create an account to redeem remaining points in future. They can choose the option to create an account or simply end the purchase process.
The friend successfully completes the purchase transaction. They receive the purchased MP3 tracks for download or streaming.

2. **Exercise: MEDICAL RECORD KEEPING**

The scenario starts with a patient visiting the doctor for a consultation.
The doctor begins by recording the patient's information, including name, age, and medical history, into the medical record system.

The doctor records details of the consultation, such as the reason for the visit, symptoms described by the patient, and any physical examinations performed.
If the doctor diagnoses an illness during the consultation, they record the diagnosis in the patient's medical record. If no diagnosis is made during the consultation, this step is skipped.
If the doctor prescribes medication to the patient, they enter the prescription details into the medical record, including the drug name, dosage, frequency, and duration.
If necessary, the doctor may order lab tests or diagnostic procedures for the patient. If no lab tests are ordered during the consultation, this step is skipped.
If the doctor determines that a follow-up appointment is necessary, they schedule it in the medical record system.

At regular intervals, the medical record system initiates an audit check to ensure data accuracy and compliance with medical guidelines.

The auditor reviews the medical records of patients within the system. The auditor reviews the records of each patient in the system until all records have been reviewed.

If the auditor detects any abnormalities or discrepancies in the medical records, they alert the responsible medical staff for further investigation and correction. If no abnormalities are found during the audit check, the process continues without interruption.

3. **Exercise: Concurrent Web Server Requests:**

Multiple users simultaneously access a web application hosted on a server.
Each user sends a request to the server to perform various operations, such as fetching data, updating information, or submitting forms.

Upon receiving requests from multiple users, the web server handles them concurrently, allowing for parallel execution of request processing.
Each request may involve accessing and modifying shared resources, such as a database, to fulfill the user's request.

As the server processes each request, it interacts with the database to retrieve or update relevant data.
Requests may involve reading from the database to fetch information or writing to the database to store new data or update existing records.

Critical Region - Database Update:
When a request involves updating shared data in the database, the server enters a critical region to ensure data integrity.
Within this critical region, the server ensures that only one request at a time can modify the shared data to prevent race conditions or inconsistencies.
Other requests that require access to the same shared data are queued and executed sequentially to avoid conflicts and maintain data consistency.

After processing each request and ensuring the integrity of shared data, the server generates responses to send back to the respective users.
Responses may include the requested data, confirmation messages, or error notifications.