

Every team member MUST read this document carefully

CMPS310 Software Engineering

- Group Project -

Milestone-1: Requirements Analysis and Design (15%)

This is a compulsory project. If you do not submit this, your grade will be 0 in this course.

Minimum 2 and maximum 4 members in each team.

Submission Due: October 10, 2021 on Blackboard

Fall 2021

Objectives of the Project

The purpose of this project is to reinforce the concepts discussed in class. The project gives you the opportunity to practice the concepts and techniques taught in the class on a realistic problem. The main objectives of the project are to practice the Requirements Specification, and OO Analysis and Design Modeling for a software solution to a problem.

Background

Mr. Ahmed is the Director of Immigration in a country. Your team has been contacted by Mr. Ahmed to develop a software system for the Immigration System. He has prepared a description of some basic functions of the system currently done manually. Mr. Ahmed wants an automatic Immigration system that should work as described below:

Currently, the visa application processing is a manual system based on paper work. Many immigration officers work in the office to approve visas. An accountant looks after the payment of visa fees for the applications. Several administrative staff work to prepare paper works such as receiving visa application, making bill, etc. A Law Officer maintains communications with the police office for criminal clearance of all applications. The immigration office has a computer based system that handles the salary of its employees, actual payments of visa fees, and the account of applicants. This is a standard, commercial-off-the-shelf package called AccSys. Mr. Ahmed plans to employ only one staff to handle the new automated software system. The new system will work as outlined below.

The immigration office processes three types of visa applications: Tourist visa, Work visa, and Family visa. For tourist visa, the tourist first requests for online application form. The system displays the form. The tourist fills the form with his/her details and attaches the copy of photo and passport. If any information is missing, it asks for the missing information. The system saves all information and checks if the person applied for visa in the past. It retrieves the status of the previous application. If there is no serious problem with the previous application, the system automatically contacts the Police System for criminal record of the person, otherwise rejects the application. The Police System sends its feedback to the system immediately. If the police feedback is okay, it verifies the rules for visa duration according to the nationality of the applicant. The system maintains a database on the rules for all nationalities. Some nationalities get 30 days, some get 10 days and some get 90 days. The system determines the duration of the visa based on these rules. It then asks for the credit card details of the person. The system forwards the card details to the bank for the payment. The bank sends the payment status to the system that prepares the visa with duration and assigns a unique visa number if the payment is okay. If the payment is not okay, the system rejects the application. The visa needs to be approved by the Immigration Officer. The approval process takes some steps from the Immigration officer. These steps are explained later. Once approved, the system notifies AccSys about the payment with the visa number, otherwise it rejects the application. Finally, the system informs the tourist about the visa status.

For the work visa, the employer of the person requests for online application form. The system displays the form. The employer enters details of the person, and the photo of the person. If any information is missing, it asks for the missing information. The system saves all information. The system automatically contacts the Employer System for the copy of the job offer confirmation of the person and the police report, otherwise rejects the application. The employer must collect the police report about the person from the police station and submits it to the system. The system verifies the job confirmation and the police report. If everything is

okay, the system checks with its database on how many total visas have been issued so far to this employer. Every employer has a limitation of total number of work visa they can get. If the total number is less than the limitation, it makes a bill for the employer and sends this bill to AccSys. However, if the limitation is already reached, the system rejects the application. It then asks AccSys for a financial report about the employer. If the report from AccSys is good, the system prepares the work visa, assigns a unique visa number, and associates this with the employer data in the system. If the report is not good, it rejects the application. The visa needs to be approved by the Immigration Officer. The approval process takes some steps from the Immigration officer. It is described later. Once approved, the system increments the total visa number issued to this employer by one, otherwise rejects the application if not approved. Finally, inform the employer about the status of the application.

For family visa, the employee requests for online application form. The system displays the form. The employee enters details of the family members, and their photos. If any information is missing, it asks for the missing information. The system saves all information. It finds the visa status of the employee. If the visa expires in less than 6 months, it asks the employee to extend the visa first and terminates the session. Otherwise it gets the income information of the employee from its database. The system computes if the employee can maintain his/her family with the income. If the income is not satisfactory, it rejects the application, otherwise the system contacts the police system for the criminal record of the family members of the employee. It then computes the visa duration based on the visa of the employee if the police report is good, otherwise it rejects the application. The system prepares the visa with duration, and assigns a unique visa number. The visa needs to be approved by the Immigration Officer. The approval process takes some steps from the Immigration officer. It is explained later. Finally, the system informs the employee about the status of the application.

Anyone can request for the extension of visa. The applicant first submits the visa number. The system retrieves the visa information. It then computes the remaining duration of the visa. If the duration of the remaining visa is more than one month, the system asks the applicant to apply later and ends the session; otherwise it asks the applicant to pay the extension fee to AccSys directly. Once the fee is paid, AccSys sends the receipt to the system that extends the visa. However, if AccSys does not send the receipt, the system rejects the application. The system prepares the visa with new duration. It updates the applicant's information with new duration of the visa. Finally, it informs the applicant about the extension.

Anyone can also apply for the cancellation of the visa. In order to cancel an existing visa, the applicant submits the visa number. The system retrieves the visa information. It then changes the status of the visa to "Cancelled." However, if it is for a work visa, the cancellation needs to be approved by the Immigration Officer. The system updates the applicant's data in the system. For work visa cancellation, it then decrements the total number of visa allocated to the employee by one. For other visa types, no decrement is needed. The system informs AccSys about the cancellation with the visa number. It sends cancellation to the applicant.

A staff of the Immigration Office can prepare weekly report for overstays. The report includes details of persons whose visas have already expired. The staff requests the system for a overstay report. The system searches for those visas which have already expired but the persons are still staying in the country. It makes a list of such persons with their passport details and visa numbers. It then sends this list to the Police System. It returns a status report to the immigration system that updates the information based on the status report. The system then prepares a final report. It sends it to the Immigration Officer if the number of overstays exceed 50.

For the approval process of visas by the Immigration Officer, the system first checks with AccSys if the payment is made by the tourist, or the bill was issued to the employer for work visa application. The system also checks if the duration of visa issued is correct. If all are okay, it informs the Immigration Officer who approves the visa in the system; otherwise it asks the Immigration Officer not to approve.

Mr. Ahmed wants that the managing of the above activities of the immigration system should be automated as much as possible. There will be also possibility that the administrative staff can generate various summary reports. At this stage, she wants you to analysis ONLY the functionalities of the immigration system. Mr. Ahmed also warns you that you should not

analyze any functionality of other systems in this phase. You need to define the system boundary carefully.

Additional Information

It is likely that you will require additional information about the operations of the system to complete this project. When a software engineer is working on a system design in industry it is common for the engineer to seek more information about the problem. For this project, your client is your **Lab Instructor**. You can ask any question directly to her. Send her email or see her during her office hours. In most cases, you need to make logical assumptions. You may also explore other sources such as Internet and related literature in order to know more about how such a system works, what are its typical core business entities, services and functions. Note, the above description may be confusing or incomplete. It is your responsibility to find additional information or clarifications from available sources. You **MUST** attach your justifications for any assumptions that you make with your project.

Tasks of Your Project

Milestone 1: Requirements Analysis

This project concentrates on the technical aspects of the software engineering process, and hence emphasizes the analysis and design components developed during the process. The focus of this Milestone-1 is on the requirements analysis to produce the Use case model, the class diagrams and the system interaction models using the Unified Modeling Language (UML) and Visual Paradigm tool. The body of your Milestone 1: Requirements Analysis and Design will consist of the following deliverables:

1. Propose:
 - a. A data flow diagram (DFD) of the system; include major processes, data files, data elements, and external entities (12%).
 - b. A use case diagram of the system (12%):
 - c. Explain which of these two you prefer best to analyze a system and why (6%).
2. Develop *use case specifications* for most complex and key 5 use cases selected from your use case diagram. Your proposed each use case specification should include *brief description, primary actor(s), trigger, pre-condition(s), post-condition(s), normal scenario (actor action-system response table), alternative flows (if any)*. Use the “Use cases specification template” available from Blackboard (25%).
3. Using *object-oriented design fundamentals (objects, inheritance, abstraction, classification, encapsulation, modularity, responsibility driven design, patterns, etc.)*,
 - a) Complete design class diagram of the entire system with all required classes, their attributes and types, relationships (aggregation, generalization, association) with multiplicity where applicable, methods with major parameters, and visibility of attributes and methods (18%).
 - b) Explain briefly how you applied design principles in your class diagram. In your explanation, give examples from your class diagram (2%).
4. Prepare *design sequence diagrams* for all 5 use cases proposed in Task 2 (25%).

Any assumptions you made regarding the system description. Assignment components will be evaluated for **accuracy, clarity, relevancy, and completeness** (especially among components and among artifacts) of your document.

- Each student must upload their electronic copy of Milestone-1 to Blackboard as a **Word Document and .vpp files** by the due date and time.
- Your word document and .vpp files must include all diagrams produced in Visual Paradigm.

Each student must submit an individual electronic copy on Blackboard by the due date and time.

Grading scheme for Milestone-1: Requirements Analysis

Tasks	Criteria	Grade
1	(a) DFD (12%), (b) Use case diagram (12%), (c) explanation (6%)	30
2	5 use case specifications using the template (5 x 5%= 25%)	25
3	Design Class diagram of the entire system-18% for (a); 2% for (b)	20
4	5 design sequence diagrams of your 5 use cases (5 x 5% = 25%)	25
Total		100

More details will be provided for the subsequent millstones

Submission requirements

Your assignment group/team **MUST** comply with the following submission requirements; **otherwise grade will be deducted:**

1. Your group should have four members. If you have less than 4 member in your group, please contact your lab instructor. You will form your own group.
2. Each member must submit the electronic copy individually on Blackboard. The cover page of your submission MUST contain the following items in four bullets:

[Each member of the group will be required to submit a peer group evaluation with an estimate of the contribution from each member to the project. Write the percentage contribution made by each team member so that it adds up to 100%. This evaluation *may* be used to adjust the marks awarded to each team member]

- Effort distribution of the student:

SID:_____	STUDENT NAME: _____	Effort given_____%
SID:_____	STUDENT NAME: _____	Effort given_____%
SID:_____	STUDENT NAME: _____	Effort given_____%
SID:_____	STUDENT NAME: _____	Effort given_____%

- Course number_____
- Submission date_____
- Class section: **L01/L51/L52/L53/L54** (select one)
- DECLARATION: *We hereby certify that no part of this project or product has been copied from any other student's work or from any other sources except where due acknowledgement is made in the project. No part of this project/product has been written/produced for us by any other persons.*

Note: If the above submission requirements are not met, up to 10% marks will be deducted from this milestone.

3. Be aware of

- *Submitted work must be students' own work*

You cannot copy the project from other groups.