The American University in Cairo
Computer Science and Engineering Department

Fundamentals of Computing II
Spring 2020
CSCE110

Call Center Ticketing Application

Introduction

This application is about the Call Center ticketing application. The main idea of this application is that a Customer will issue a written ticket to the call center's agent. The ticket can be either a complaint of bad service or an inquiry about service. For example, if you are writing a ticket that WE call center through their web application, you will be either writing a ticket saying that my line is not working, or I need to subscribe in a different package. The agent will receive the ticket and assigned and will try to answer the requester using the available information s/he has or the facilities that s/he is using. If the agent is not able to resolve the ticket or to answer an inquiry, s/he will forward the ticket to the Technical Support. The Technical Support will work on the ticket as well and answer back to the Call Center agent using the same ticket with a reply. The agent will answer back to the customer on the same ticket augmenting the reply. The reply in WE case that your line is working now, or your subscription have been modified. The customer can call again and cancel the ticket. As well, the Technical support can put the ticket on-hold or suspend the ticket wait for an action to happen. The ticketing cycle is governed by certain SLAs (Service Level Agreement). The Call Center agent assigns an urgency level to the ticket according to his/her understanding about the urgency level. Based on the urgency level, the ticket has to be resolved according to the certain SLA. Moreover, within each urgency level the agent sets a priority level. The tickets are handled according to SLA AND priority levels. This means that the agent picks the most urgent tickets with the highest priority. If the SLA is breached, a notification must go to the manager of either the Call Center or the Technical Support about the delayed tickets. It is out of the scope of this application the managers' reaction through the system. The manager's reaction will be done verbally and not through the system. The manager of Call Center and the Technical Support
It is noted that the ticket is assigned to the free agent and assigned to the free Technical Support in round robin manner. If all the agents are not free, a message to the customer will be displayed that the call center is not free now.
The student must choose a domain of interest to build this application based upon. Any domain of interest is welcomed. For example, you can base your application based on Banking Call Center (NBE, CIB, or QNB) , Telecommunication like (WE, Orange, Vodafone), Car Maintenance service, requesting medicine like Yodaway, etc. That is provided the main flow and functionality described above is being *strictly maintained.* In this assignment, I will shed a light about an example in the banking sector.

Application Specifications

There are four main contributors (actors) in the application as follows:

Customer:

The customer has several use cases (scenarios) in the meeting mainly:

- Registration of the main customer's information.
- Searching for the ticket(s) owned by the customer using several criteria such as the customer ID and the Date.
- The customer can create, modify, and cancel the ticket.

Call Center agent:

The call center has several use cases (scenarios) in the meeting mainly:

- The agent adds/modifies his/her own data
- The agent replies to the customer when there is the reply to the customer's inquiry or a complaint
- The agent can search tickets using a date, ticket IDs, ticket status, customer IDs, or any applicable data
- Displaying the status of all the tickets in a given date or by given customer IDs
- The agent can escalate the ticket or close it.

Technical Support agent:

The Technical Support agent works on the ticket assigned by the Call center and performs the same operations like the Call Center.

Managers (Call Center or Technical Support):

- The manager of the Call Center or the Technical Support is alerted when there are delayed tickets. So, s/he maintains a list of delayed tickets.
- The manager views a set of reports as follows:
    - The set of delayed tickets at his/her area which breached SLAs
    - The total number of tickets in a given day and a total for a week
    - The status of all the tickets from certain date to another

Call Center Supervisor

- The call center supervisor's functionality is to read the customer's tickets and assigns the suitable urgency and priority levels.

- As well, s/he will be able to view the related reports the call center manager is allowed to view.

General Specifications

1. The above description of actors does not mean that there are only four classes in the application, nor the methods will be the same as described. It is just a high-level description of the actors. Some or many other classes should be created. It is important to comply with the application's functionality and the workflow.
2. There should be a class that routes the ticket to the free agent based on the urgency level and the priority set by the supervisor of the call center.
3. This application has a *super admin* user where s/he will add, modify, and delete the profiles for:
    - Call Center agents
    - Call Center or Technical Support managers
    - Call Center supervisor
4. For the customer, s/he manages creating his own data.
5. The customer, the agent, and the Technical Support will login to the application using username and password. The usernames and passwords are saved encrypted on the file. For encryption, there are already ready-made libraries and codes in the internet. Example is: https://snipplr.com/view/69666/encrypting-passwords-in-c
6. The SLAs (Service Level Agreements) should be defined in a setup file. The manager for the Call Center or the Technical Support can change the SLA whenever s/he wants
7. The tickets are escalated automatically which means that the agents will not call a function for escalations
8. This application works on 24/7 basis which meant that the agents are resolving tickets all day and the SLA is being applied all day.

Technical Specifications

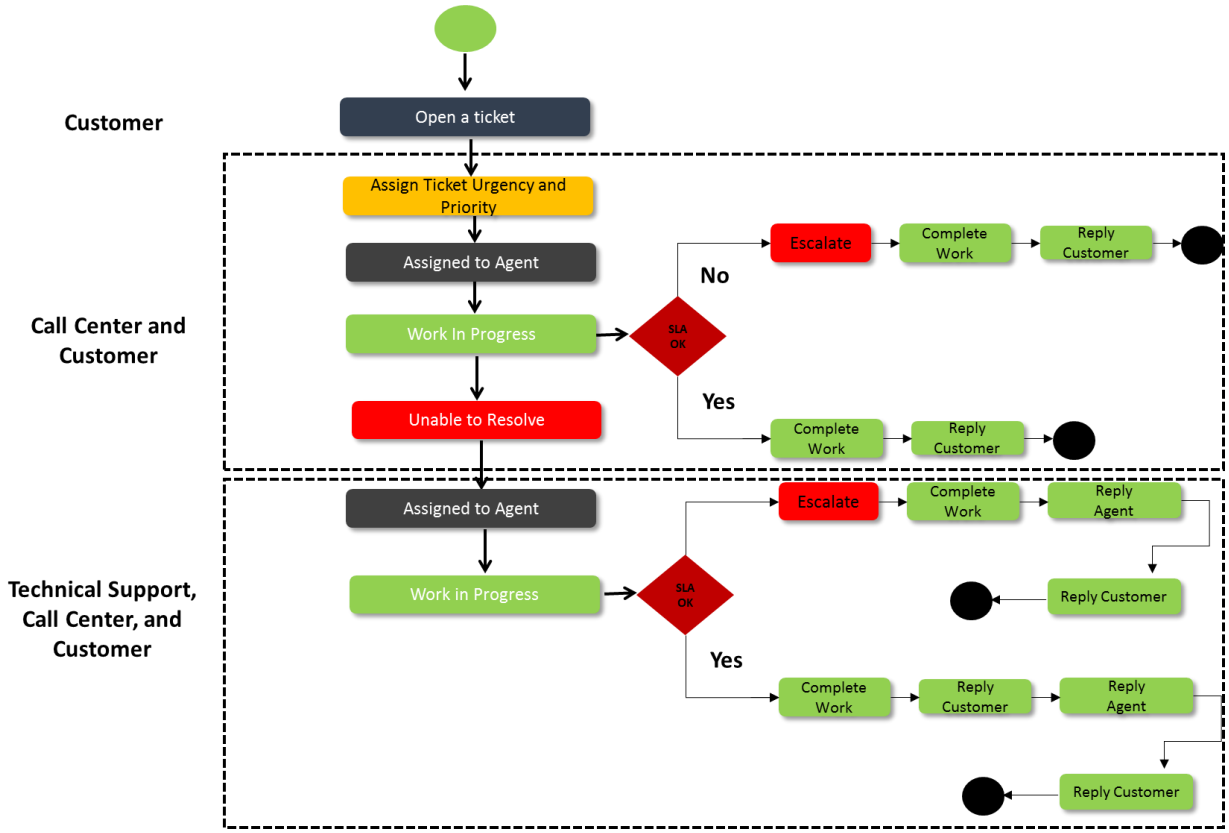
- All Data Structures should be done using Templates such as Linked List, Stacks, Queues etc.
- Proper Object-Oriented design should be followed using UML with correct relationships.
- The application should have a menu driven application or a web interface where by based on the user name and the password the user is being identified and has the relevant set of options.

Technical Workflow

The below diagram shows the typical workflow for the application starting by:

a. Opening a ticket by a customer

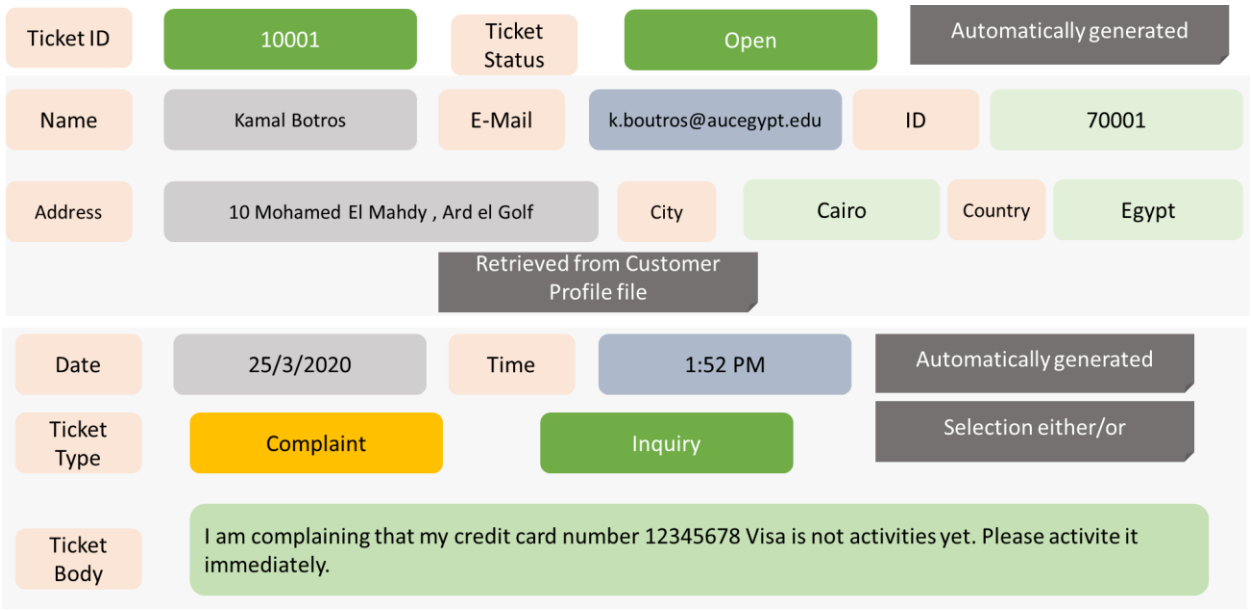
b. Assigning the ticket to a free agent according to the priority and the urgency level set by the call center supervisor
    i. The agent will work on the ticket and the ticket status will be changed from open to work in progress
    ii. If the ticket is resolved within SLA, the call center will reply to the customer and close the case.
    iii. If the ticket is not resolved within SLA, the ticket will be reported escalated to the Call Center Manager as reported as delayed. The work will be still on progress till the Call center will reply to the customer and close the case.
c. If the agent is unable to resolve the case, the ticket is assigned to the Technical Support agent and will do the following:
    i. Working in progress to resolve the ticket
    ii. If the ticket is resolved within SLA, the Technical Support will reply to the Call Center Agent and subsequently to the customer and close the case.
    iii. If the ticket is not resolved within SLA, the ticket will be reported escalated to the Technical Support Manager. The work will be still on progress till the Technical Support will reply to the Call Center then the customer. The Call center will close the case.



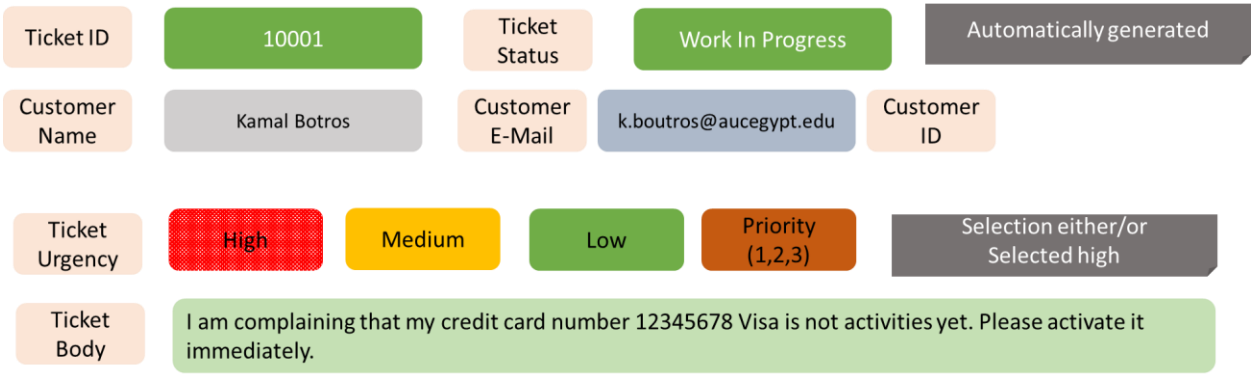
Sample Screens

The following is a set of sample screens to guide you on how the application is running.

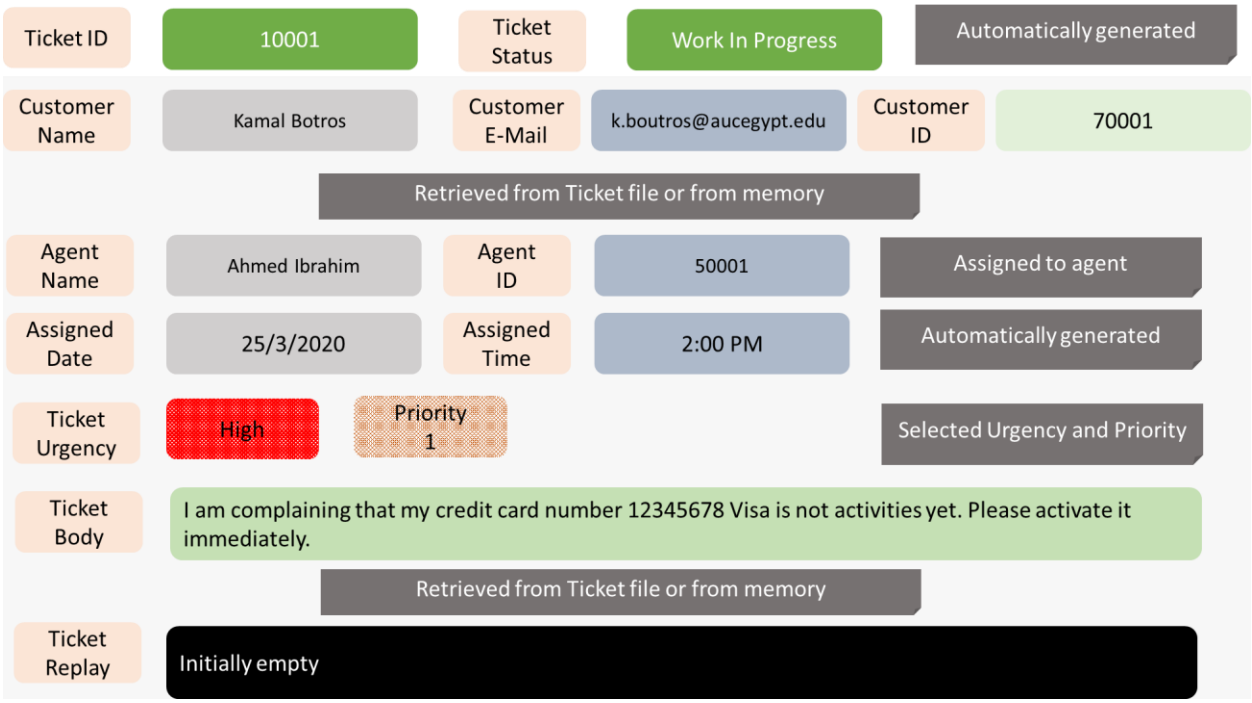
The below screen shows the main screen where the customer submits a ticket to the call center with a status open.



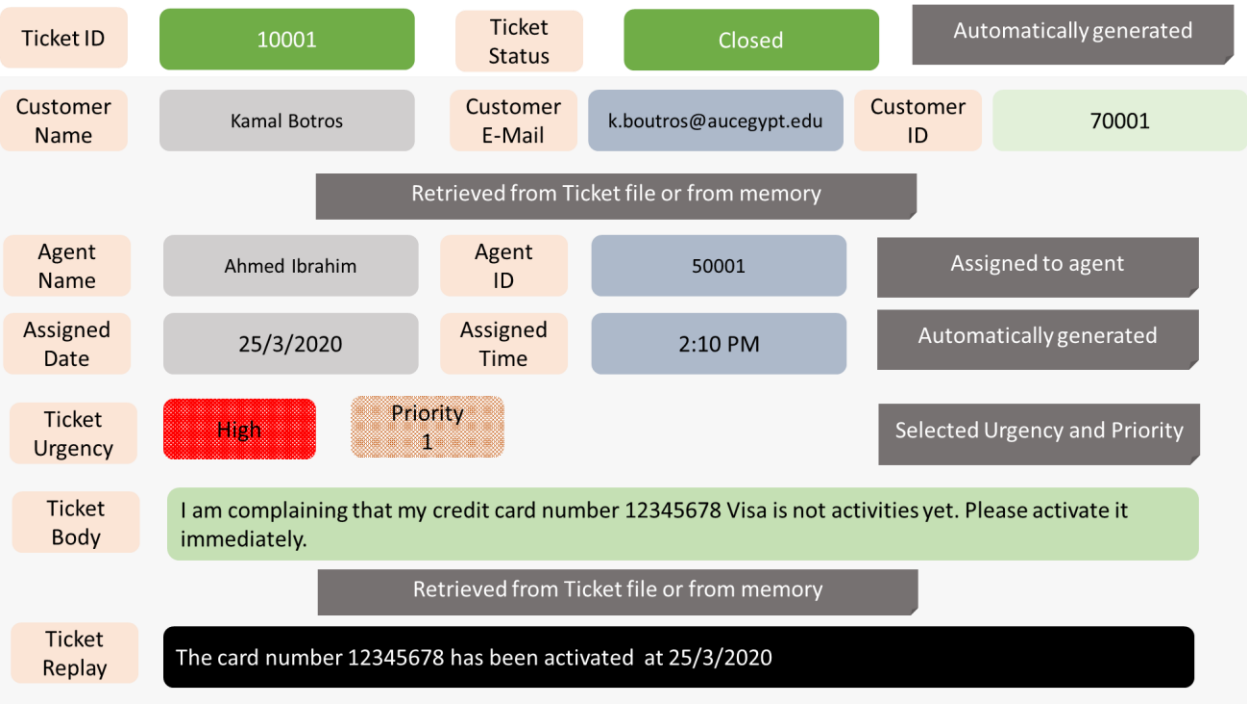
The below screen shows the main screen where the supervisor assigns an urgency level and the priority level for the ticket.



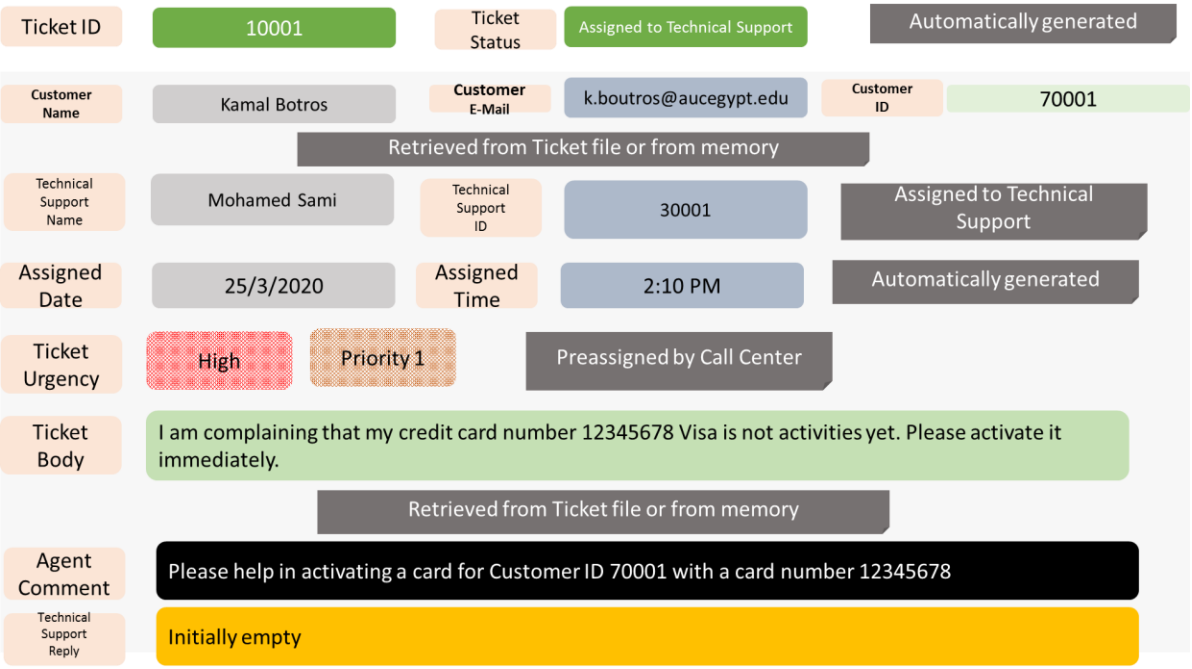
The below screen shows the main screen where the agent works on a ticket with a ticket status Work in Progress



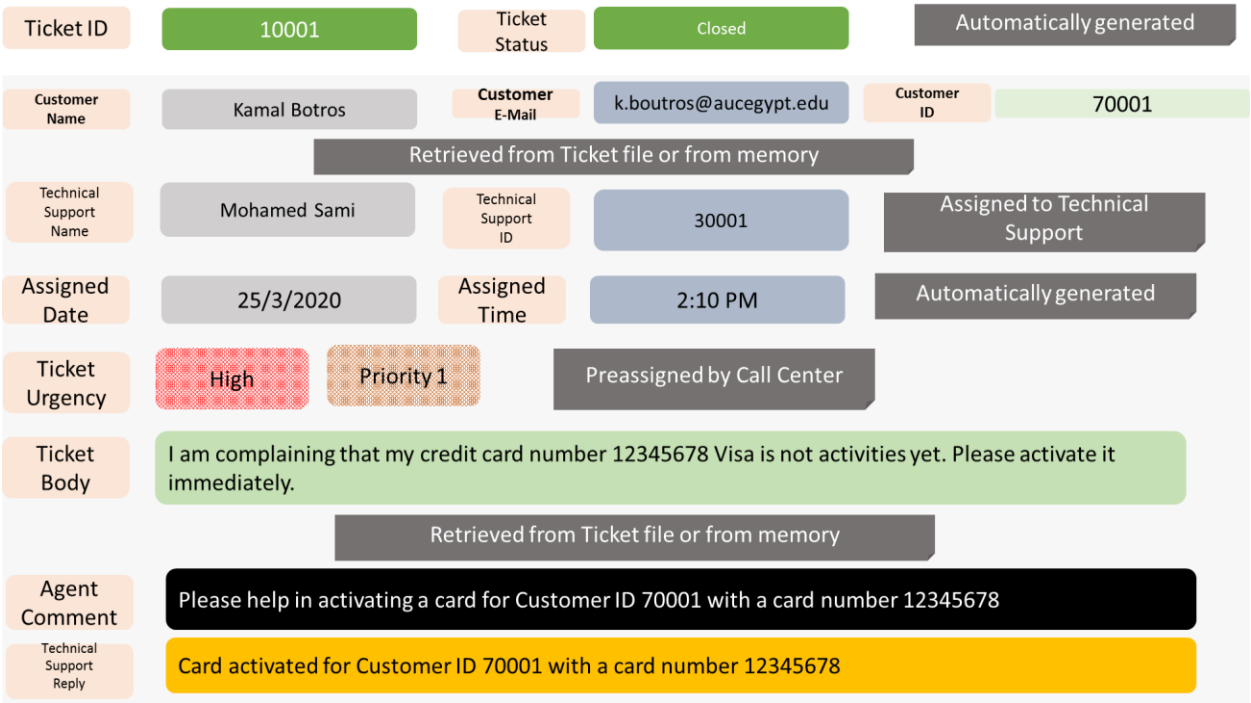
The below screen shows the main screen where the agent closes a ticket with reply to the customer.



The below screen shows the main screen where the agent assigns a case to Technical Support and s/he starts working at.



The below screen shows the main screen where the Technical Support closes the case at his side and replies to the Call Center agent.



Supporting Use Case

If the chosen application is a Call Center for the bank , below is a sample list of inquiries and complaints/services that might occur.

Complaints or Services	Inquiries
My balance is not correct	What is the limit of my credit card?
My credit card is not working	What is the balance of my saving or current account?
I did not make this purchase on my credit card	Can I activate my account online?
You deducted more than what should I pay from my debit card	Can I do a card for my son who is 12 years old ?
My card points should be more	Can I buy a banking certificate of deposit online ?
I charged a commission that I should not pay	Do you have new services for students ?
Please activate my credit card	What is the commission on the credit card?

For more information you may visit:
https://www.nbe.com.eg/NBE/E/#/EN/Home
https://www.mybanktracker.com/news/customer-banking-complaints
https://www.cibeg.com/English/Personal/Pages/default.aspx

Requirements

Initial Project Design Documentation: April 8th 2020

You are required to submit a first draft document to set the basis of the project. In this document, you need to include the following:

1. Names of members
2. List of classes and the functions of each class.
3. General UML Class Diagram for the application.
4. List of test cases that you are going to test the application with

Milestone 1: April 20th 2020

The first milestone is about the implementation of the functionality for the customer and the call center, and supporting classes

Milestone 2: May 5th 2020

The second milestone is about the implementation of the functionality for the Technical support and integrate it with the main application.

Milestone 3: May 10th 2020

The third milestone is about the following:

- Group Demo and presentation
- Final report describing the application (structure is to be shared later). The report should be divided as common part like UML, test cases and specific documentation for each member of the group.

After third milestone, each student will be examined in his part individually and assigned a grade based on his/her contribution.

Guidelines

- Though the project is a group project, each student will be questioned and examined *"individually"* in his/her own part. There are common parts like UML and they will be part of the individual examination.
- There should be an *equal* distribution of the overall work in the application. An example of equal distribution for this application:
    - One student might build all the templates needed and some supporting classes
    - Other student will build customer, call center functionality, and the test cases.
    - Other student will build the Technical Support, other supporting classes, and the application's main interface.
- Try as much as possible to use the same code of your assignments.
- Please make your code readable.
- Add comments to your code and choose short and descriptive variable and function names.

- Kindly note that any detection of copyright violation, plagiarism or cheating will result in the cancellation of the project

Bonus

Suggested extra features for **BIG Bonus** grades:

- Making a web application on HTML where the c++ code will be the backend of the application. It will be similar to any commercial website like amazon.com. The assistant and I will provide more help in that regard. For more information about this, please visit:
  - http://chriswu.me/blog/writing-hello-world-in-fcgi-with-c-plus-plus/
  - http://www.nongnu.org/fastcgipp/doc/2.1/
- Sending a mail notification to the customer about the status of his/her ticket. To do so, please visit:
  - https://www.emailarchitect.net/easendmail/kb/vc.aspx?cat=0
- Connecting to a Database instead of file. For your info, if you do it, it will save a tremendous amount of time.
  - https://stackoverflow.com/questions/16424828/how-to-connect-mysql-database-using-c
- Be creative :)

Assuring Points

- All TAs are available to help you during your project at any phase. Nevertheless, they should respond to your concerns and not write the code for you.

- Groups will be allocated to TAs, to assure availability.