System Requirements Document

By: SoftWhere

ECSE 326: Software Requirements Engineering
Fall 2019

Deliverable 4: System Requirements Specification Document

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1: Introduction

1.1 System Purpose

The new project of the Eaton Center consists of the addition of a loyalty program system in the Eaton Center. The loyalty program rewards the returning customers and seeks to satisfy Montreal Eaton Center Development Project's (MECD) business goals:

- Increase the number of returning customers
- Increase the net sales
- Increase the overall reputation of the Center

1.2 System Scope

The Eatoncentive Loyalty Program (henceforth known as ELP) consists of the set up of a new loyalty program which rewards returning clients of the Eaton Center. The ELP seeks to satisfy MECD's business goals (see section 1.1). ELP will include the development of a ELP Mobile Application (iOS/Android) (henceforth known as ELPMA) for the loyalty program infrastructure offered by the Eaton Center and will provide a loyalty point system uniformly across all participating shops as well as eateries (cafes and restaurants) within the Eaton center. The ELP will collect information about customers and build up customer profiles to aid in market research and targeted advertisements and provide the profiles to MECD. However, offices located in the upper floors of the Center as well as government services will not be part of the loyalty point system.

The project is expected to launch in the first quarter of 2020 and will be active for 6 month pilot period. After a pilot period of 6 months, the purposes (see section 1.1) of ELP will be evaluated and should the Eaton Center decide on a successful project, the maintenance of the ELPMA will then be transferred to the Eaton Center technical staff.

1.3 System Overview

The Eaton center is at the core of the shopping area downtown Montreal. Located at the metro station McGill, it is ideal for customers who are looking for an efficient and easily accessible shopping location. It's entrance from the metro, the streets and other malls offers a diversity of customer flow. Its various shop diversity offers products for a very big range of customers, from parents shopping for their newborn, to teenagers looking for the newest technology.

The new loyalty program will consist of a point system; for every purchase made by a customer in the Center, customers will be rewarded with points which can be reused in the Center. This loyalty program should also be extended to a IOS/Android mobile application (ELPMA) which can let customers easily access their account and access the internet of the Eaton Center.

1.3.1 System Context

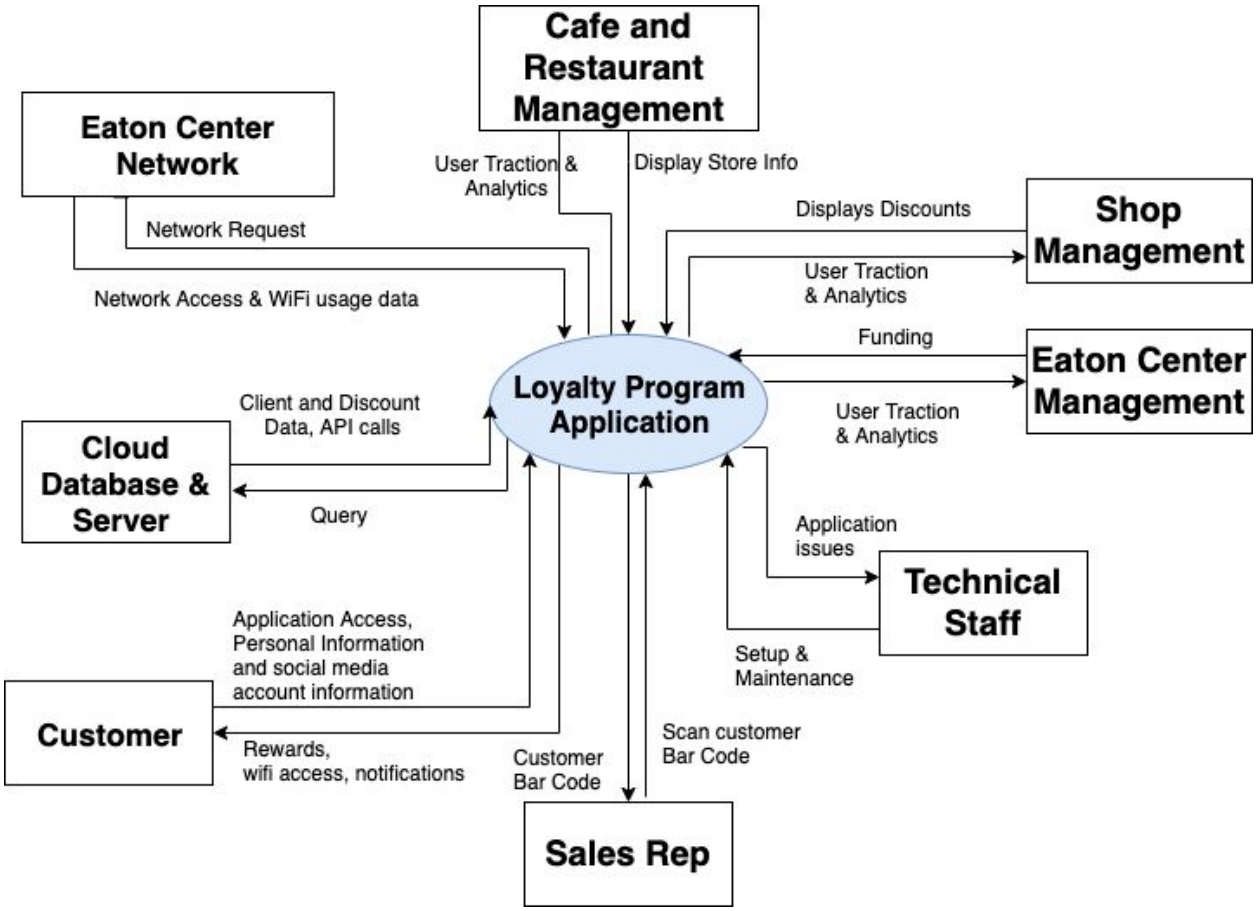

Figure 1: Context Diagram

1.3.2 System Functions

A. WiFi Connection

The ELPMA will interact with the Eaton Center's Network to automatically connect customers to the free WIFi provided by the Center. A customer account will be necessary in order to access the free WiFi.

B. Customer Profile

Customers will need to create an account in order to have access to the ELPMA's features. The account can be created within the ELPMA and is fast to set-up. Each customer account will be used to analyze the customer profile and the information will be shared exclusively with the MECD.

C. Loyalty Points Card

During a transaction, the system will allow the customer to show the sales rep their personal account number (Bar Code) to scan or manually enter, which would earn them points. Each purchase will

reward the customer with a specific amount of points. These points can be used as currency to purchase new items from the participating shops of the Eaton Center.

D. Display Discounts

Shop managers will be able to use the ELPMA to display discounts, and in return, the ELPMA will provide them with user analytics and traction. The ELPMA will also provide the customers with exclusive member discounts and notify them about deals registered by shop managers.

1.3.3 User Characteristics

Customers:

There are two types of customers in the Eaton Center but they essentially share the same values that are pleasure (Hedonism) and loyal (Benevolence).

Employees:

They work in the Eaton center (restaurants, shops or cleaning). Some walk around the center during their free time (pleasure) and sometimes make purchases. Others go to the food court to buy their lunch.

Visitors:

They are people who visit the Eaton center. Some are passers-by while others intentionally come to eat or to shop for what they need. (Hedonism) More importantly, some are regular customers (loyal) that come to the same store to buy what they need (Benevolence). This may usually due to the fact that they get promotions or are rewarded when purchasing at this specific store.

Shop owners:

They are the owners of the stores present in the Eaton Center. Their primary goal is to make profits off their business(Achievement-successful) and to satisfy customers' needs (Benevolence - helpful). Every shop has its own culture (Tradition) and goals (Self-Direction) and have different techniques to increase their sales (promotion, card system, rewards etc.).

1.4 Definitions

Customer

A person who buys something from the Eaton Center using money (NOT points from the Loyalty Program).

Application

The mobile interface of the Loyalty Program in both IOS and Android.

Success

The success of the Loyalty Program will be defined by the Eaton Center depending on how much the net profit and overall satisfaction increases over the pilot period.

2: References

- ISO/IEC/IEEE 29148-2011(E) – Systems and software engineering – Life cycle process – Requirements engineering dated 2011-12-01
- Group 11 High Level Requirements Document

3: System Requirements

3.1 Domain Model

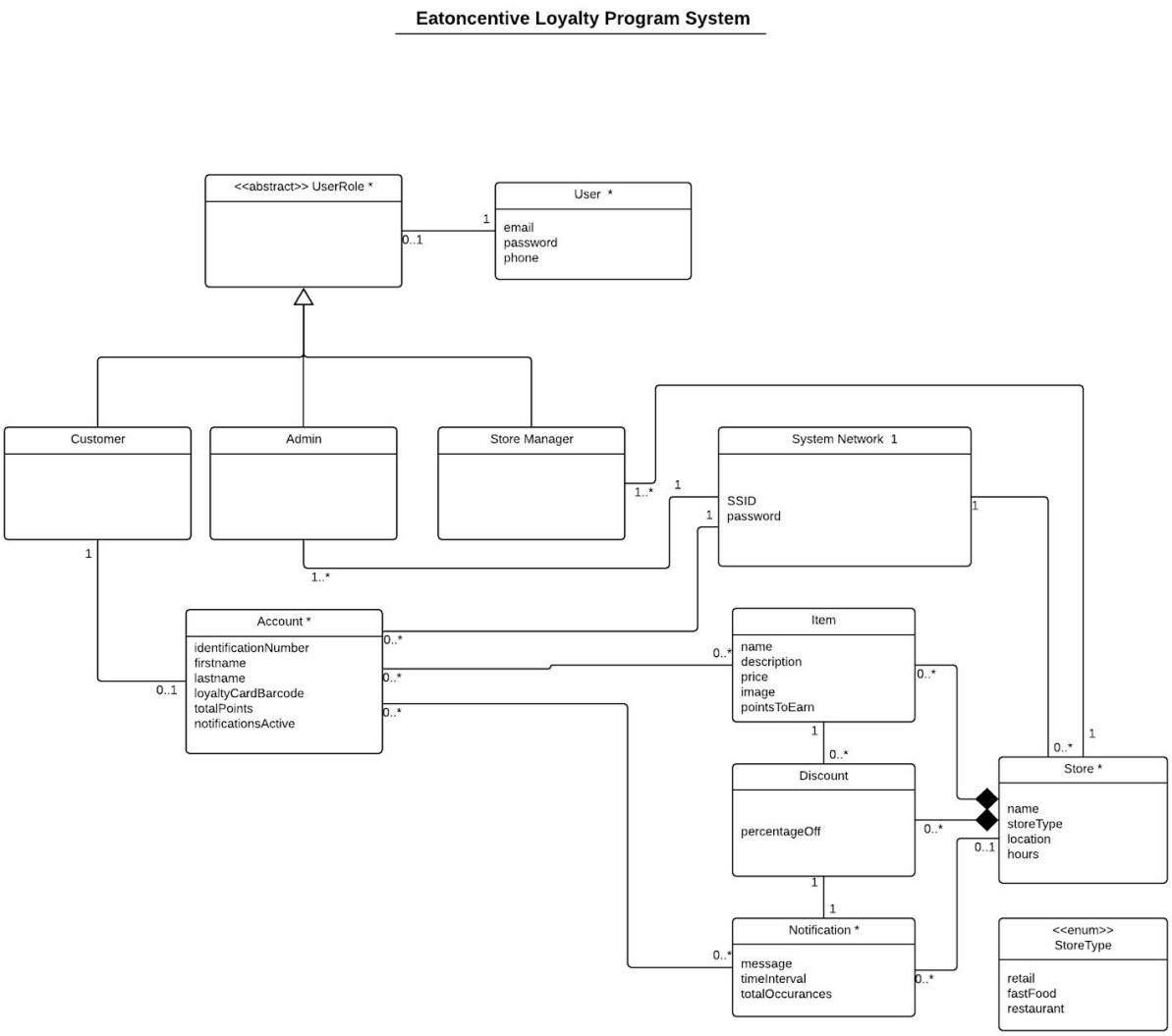

Figure 2: Domain Model

3.2 State machine

The following state machine depicts the different states of the ELPMA while being used by a user. It promotes a simple, secure and reliable app model.

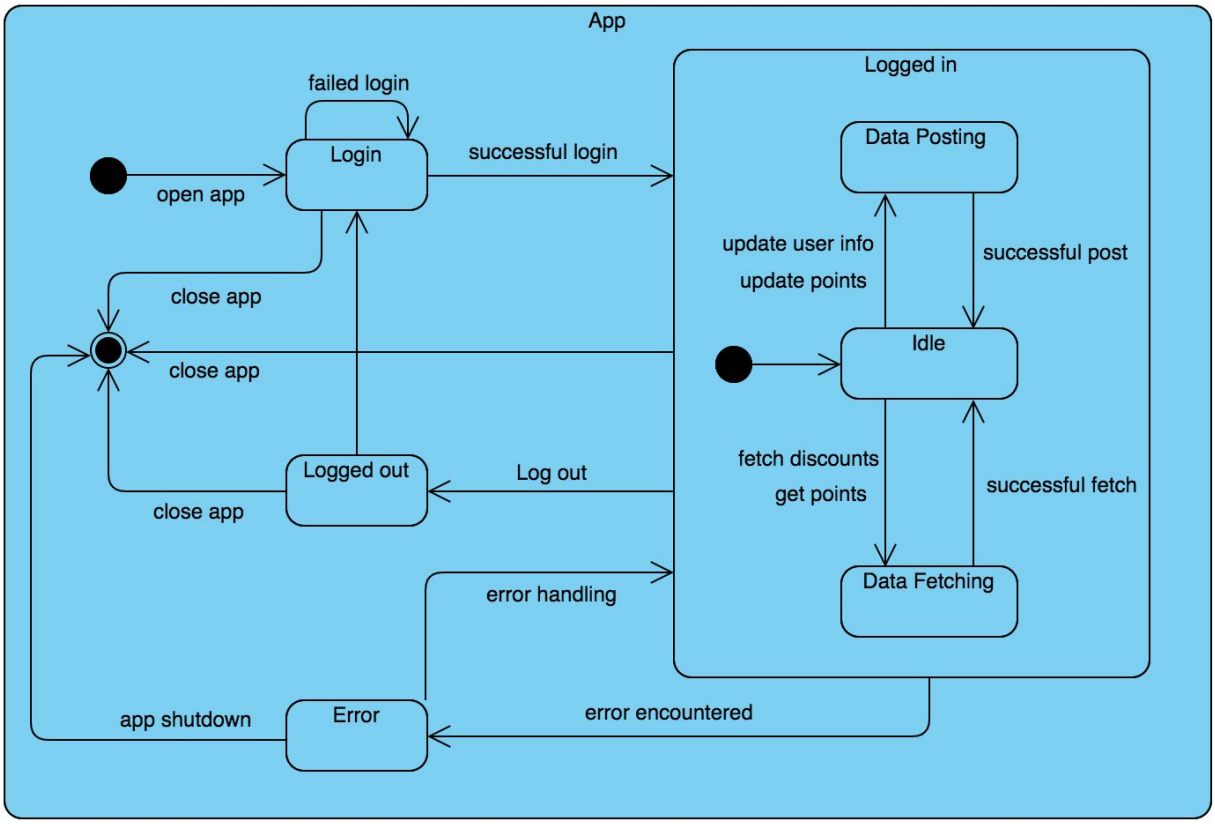

Figure 3: ELPMA State Machine

3.3 Use Case Model

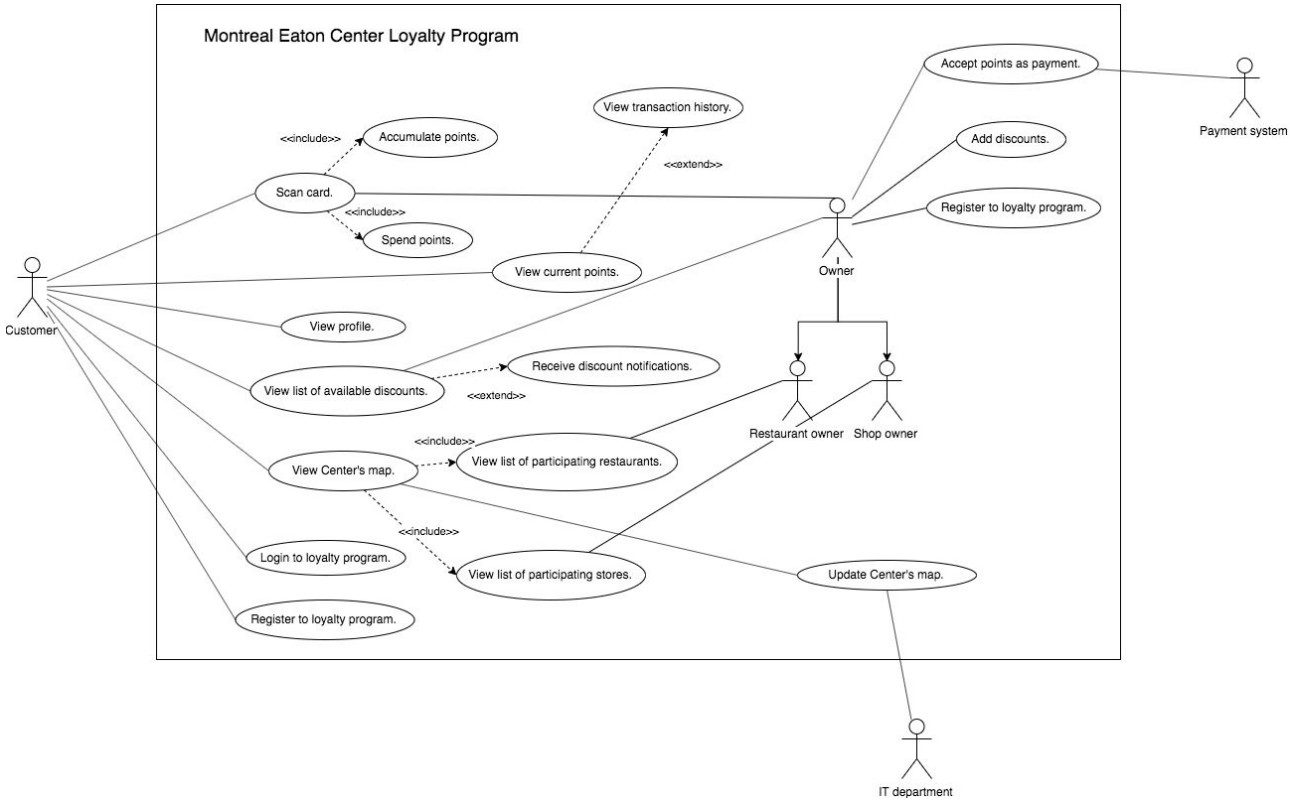

Figure 4: Use Case Model

3.4 System Mockup

Figure 6: Overview of ELPMA user interfaces

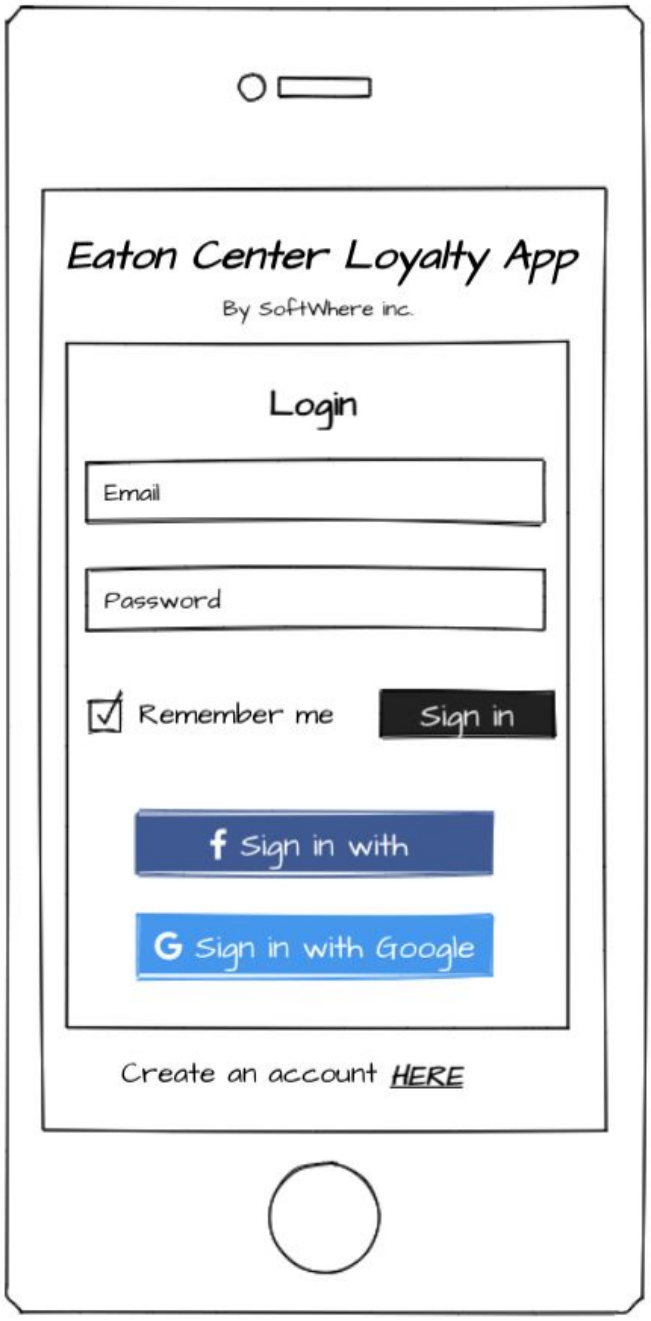

Figure 7: ELPMA login page, first view after downloading ELPMA

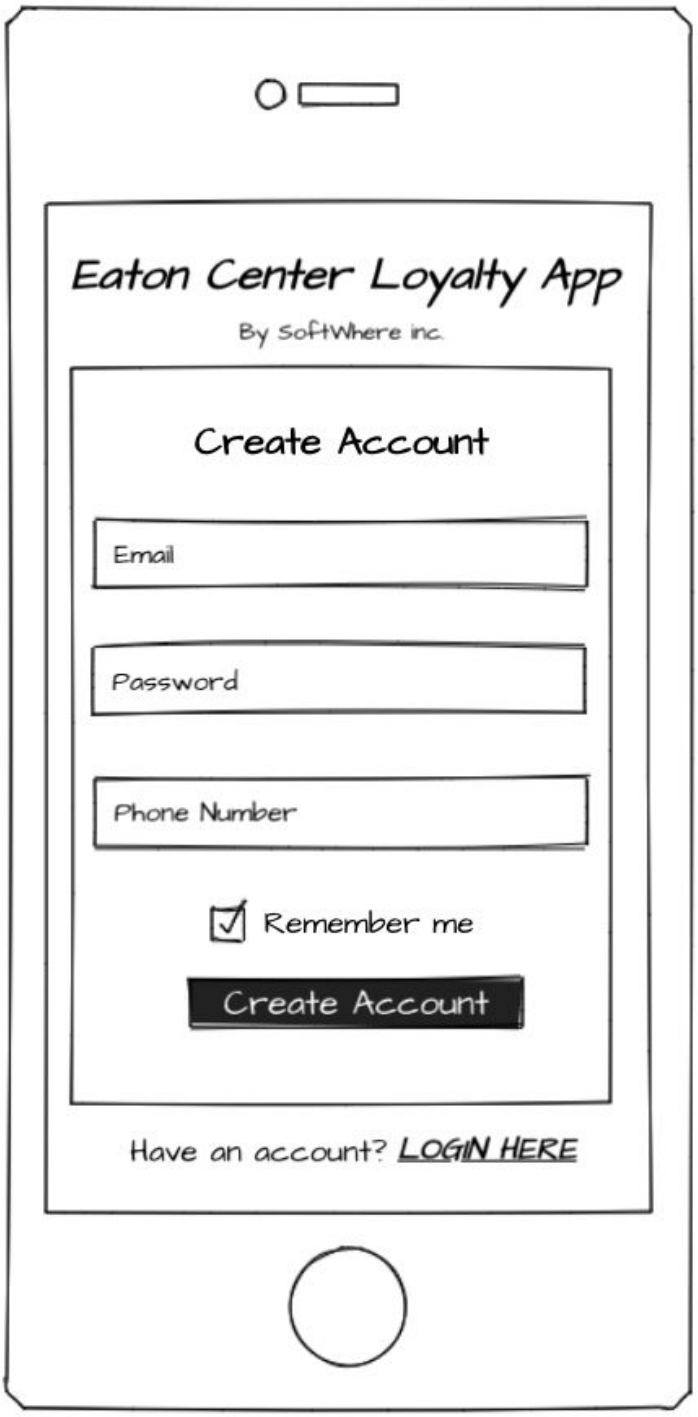

Figure 8: ELPMA account creation view, allowing the creation of a completely new user to the system.

Figure 9: ELPMA barcode to be scanned during purchases in order to acquire loyalty points. Account code included for manual input.

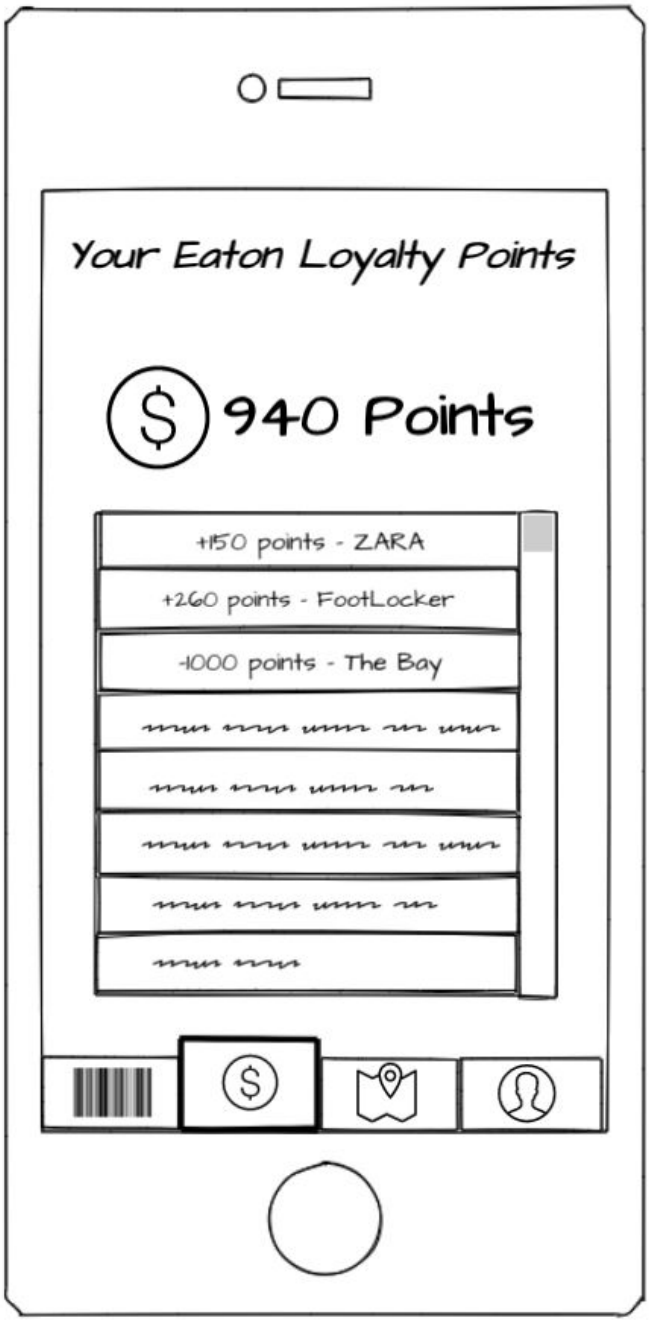

Figure 10: ELPMA point summary page including total accumulate loyalty points with a history of point transactions.

Figure 11: ELPMA map view, indicating indoor location of mobile device and nearby available discounts.

Figure 12: ELPMA map view of the eaton center with a bubble displaying discount of nearby shop after being clicked.

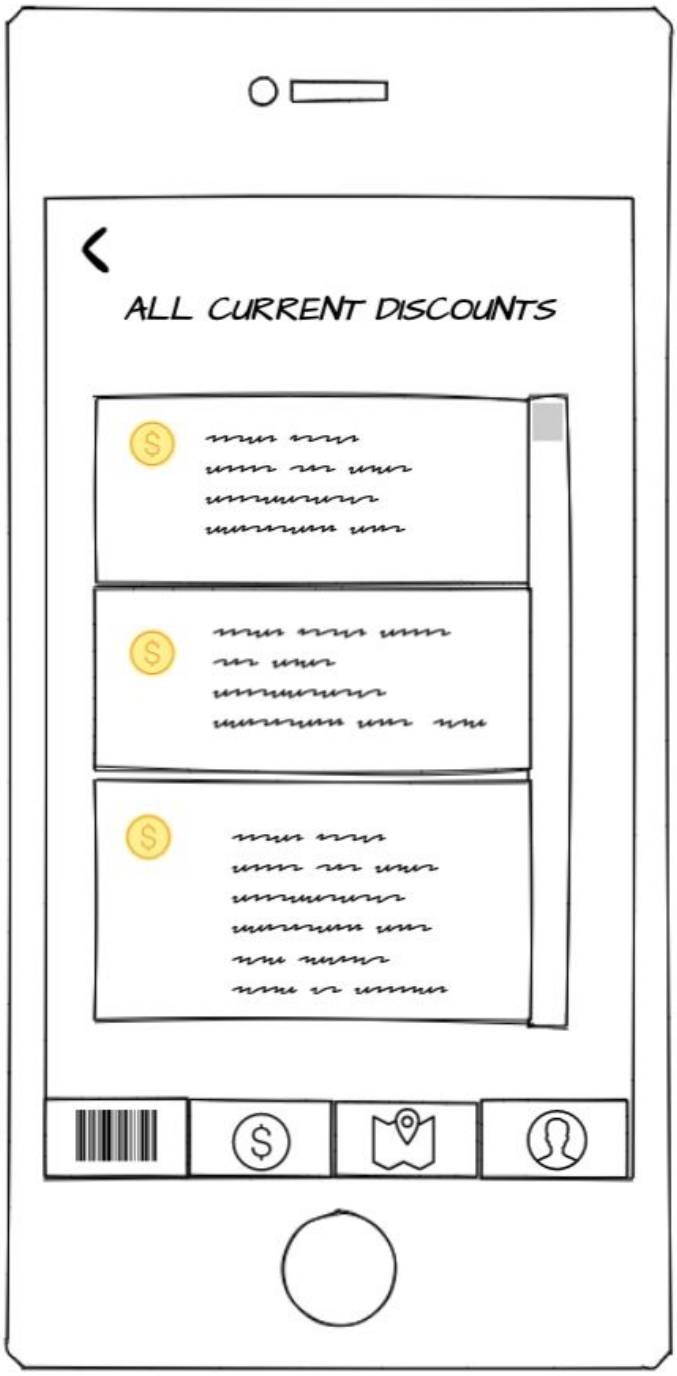

Figure 13: ELPMA page displaying summary of all available discounts within center.

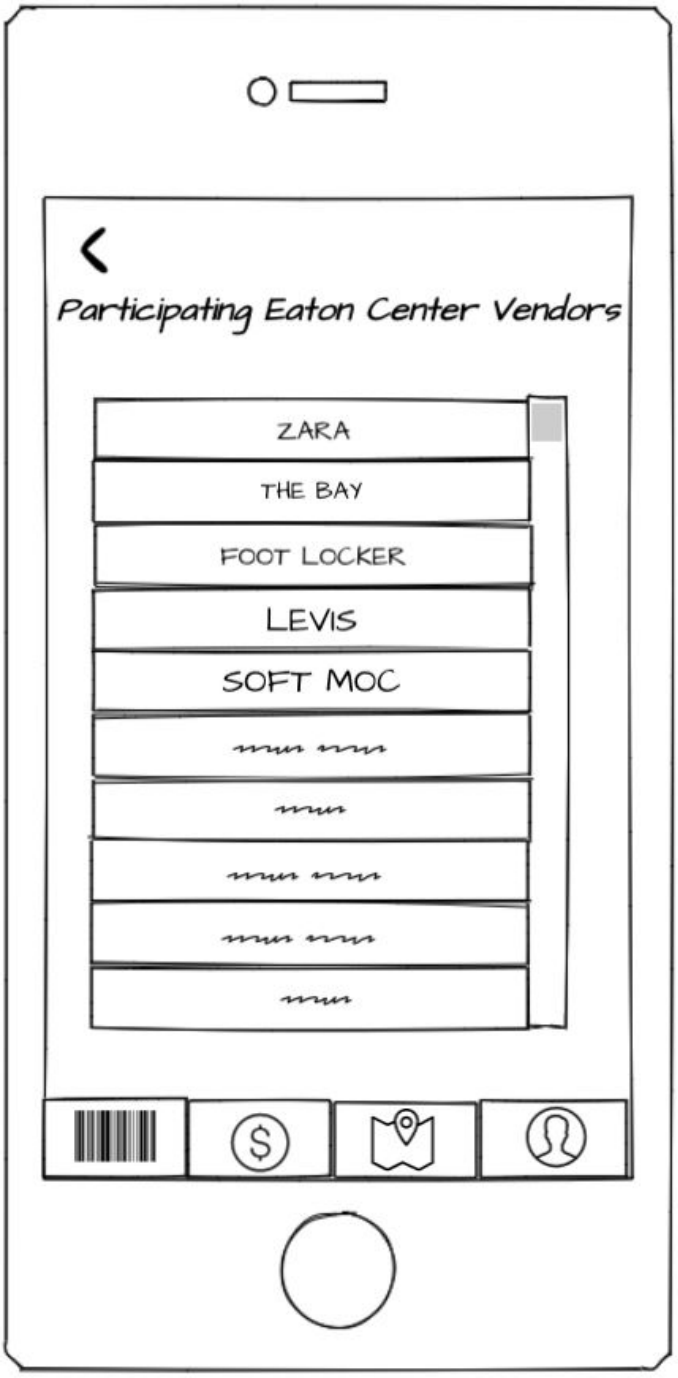

Figure 14: ELPMA view of all participating shops, cafes and restaurants within the eaton center.

Figure 15: ELPMA view of logged in account details with options to edit or log out completely.

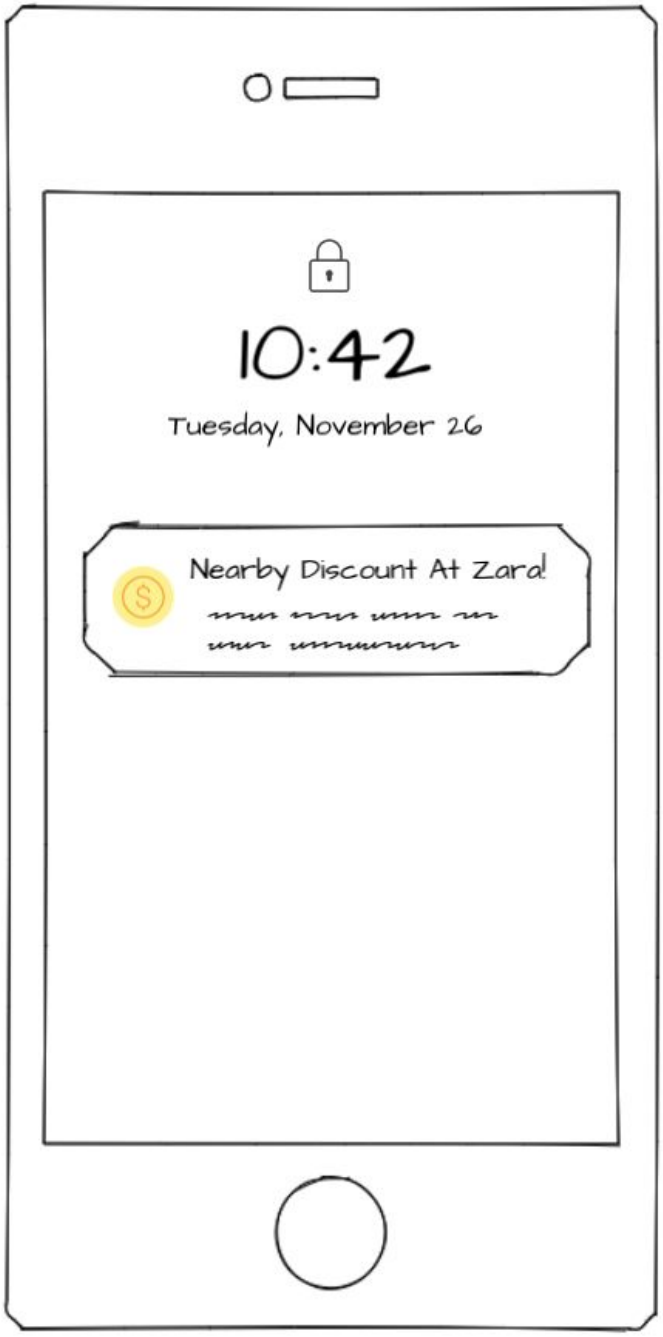

Figure 16: ELPMA out-of-app notification of nearby discounts (prompted by user proximity to stores and account purchase history).

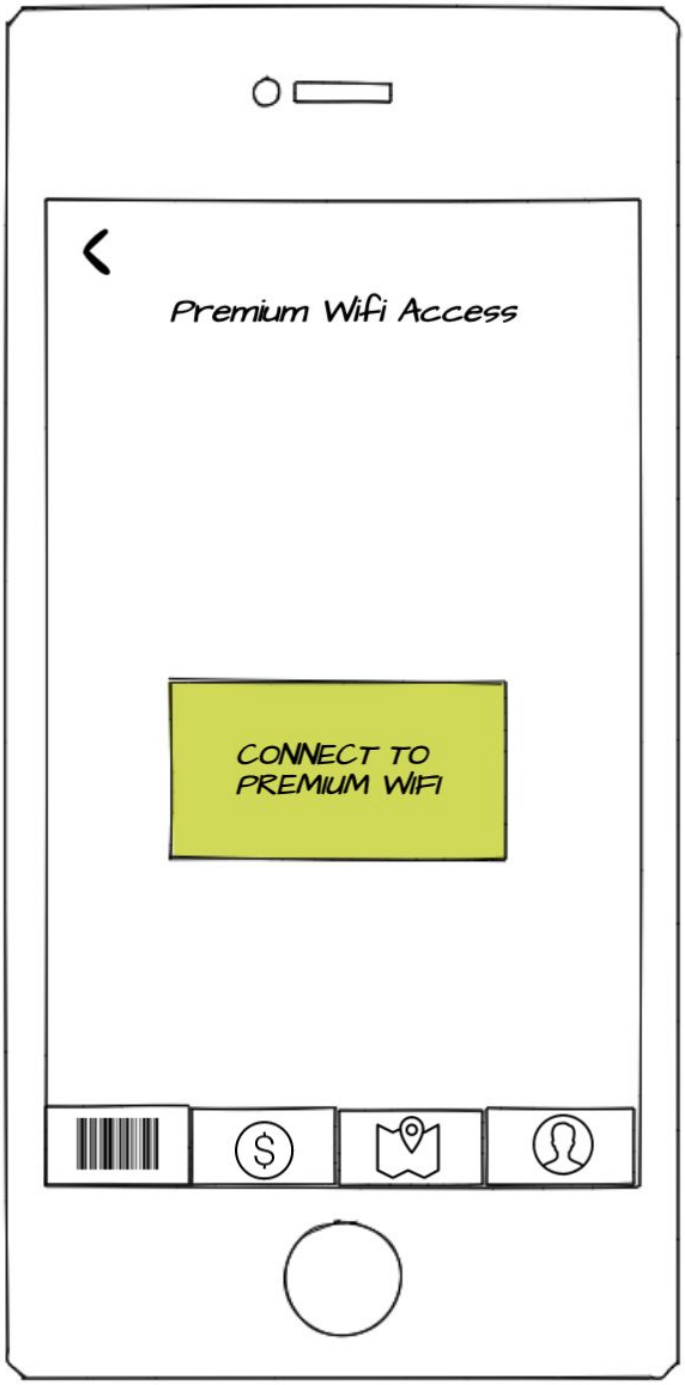

Figure 17: ELPMA page to connect user to the Eaton Center Premium wifi. An exclusive offering to users of the mobile application.

3.5 Functional Requirements

3.5.1 Register to the loyalty program (Kamy)

Primary Actors: Customer
Secondary Actors:
Intention: The intention of the customer is to create an account in the ELP.
Multiplicity: There can be multiple customers registering to the system at a given time.
Precondition: The customer has a smartphone and has installed the ELPMA.

Basic Flow:

1. Customer clicks on the “Sign Up” button on the landing page of the application.
2. Customer fills in required username, password and email fields.
3. Customer requests to register an account with the given parameters.
4. System VALIDATES customer’s username and password.
5. System sends customer a confirmation link through given email.
6. Customer confirms his account through email.
7. System creates an account for the customer within the database.
8. System redirects the customer to login page.

Postcondition:
The system registered the user account and prompts the user to login.

Alternative flow (bf 4)

1. System determines that the username or password are not given in valid format.
2. System informs the customer and prompts to enter valid parameters.

Postcondition:
The system informed the customer, and is ready for the customer to enter valid credentials.

Alternative flow (bf 5)

3. System encounters network error while registering customer’s account
4. System informs the customer and prompts them to try again.

Postcondition:
The system informed the customer, and is ready for the customer to try registering again.

User Story:
As a customer of Eaton Center, I want to register to the ELP, so that I can start accumulating reward points and benefits when I shop at the Eaton Center.

Acceptance Criteria:
Customer can register an account successfully 99% of the time.

Related Requirements:
Functional Requirements:
The ELP system shall allow a customer to register for a user account by specifying a username, a password, an email and a phone number.
The ELP system shall verify that the customer's username is unique.
The ELP system shall verify that the customer's password is at least 6 characters long.
The ELP system shall verify that the customer's email is valid by sending the customer a confirmation link through his email.
The ELP system shall verify that the phone number given by the customer is in valid format.

Non-functional Requirements:
The ELP system shall allow a customer to register in under 2 minutes in 95% of the cases without any training provided.
The ELP system shall verify the validity of the account in under 3 seconds in 95% of the cases.
The ELP system shall create a valid customer's account with a success rate of 99.9%, where failure could be caused by network errors, etc.
The ELP system shall allow up to 1 000 000 accounts to be registered concurrently in the system.

3.5.2 Accumulate Points (Sophie)

Primary Actors: Customer
Secondary Actors: Cashier
Intention: The intention of the customer is to accumulate points for the ELP.
Multiplicity: There can be multiple customers obtaining points at the same time.
Precondition: The customer has registered an account with the ELP.

Basic Flow:

1. The customer makes a purchase in the Participating shops in the Eaton Center.
2. The cashier scans the account number of the loyalty program.
3. The System validates the account.
4. The System adds the amount of points based on the amount purchased in the account.

Postcondition:
The system accredited points to the account of the customer.

Alternative flow (bf 2)

5. The cashier manually enters the account number of the loyalty program.
6. The System continues from step 3.

Postcondition:
The system validates the account.

Alternative flow (bf 4)

7. The System does not find the account in the system.
8. The System aborts.

Postcondition:
The system aborts and the customer can try again.

Alternative flow (bf 4)

9. The System encounters a network issue while finding the account.
10. The System aborts.

Postcondition:
The system aborts and the customer can try again.

User Story:
As a customer of Eaton Center, I want to accumulate points into the loyalty program so I can exchange the points for rewards.

Acceptance Criteria:
Points are registered correctly 97% of the time.

Related Requirements:
Functional Requirements:
The ELP system shall allow a cashier to scan the account number of a customer.
The ELP system shall allow a cashier to manually enter the account number of a customer.
The ELP system shall verify that the account number is valid.
The ELP system shall accredit a correct amount of points to the given account.

Non-functional Requirements:
The ELP system shall accredit points within 10 seconds 95% of the time.
The ELP system shall verify the validity of the given account number in under 2 seconds in 95% of the cases.
The ELP system shall let up to 5 000 customers accumulate points at the same time.

3.5.3 View Current Points (Lucas)

Primary Actors: Customer
Secondary Actors: N/A
Intention: The intention of the customer is to view their current total amount of points on the ELPMA.
Multiplicity: There can be multiple customers viewing their points on the ELPMA at a given time.
Precondition: The customer has a mobile phone, has installed and has an account with the ELP.

Basic Flow:

1. Customer opens the ELP.
2. Customer clicks on the “My Points” button on the landing page of the application
3. System fetches user’s total points
4. System displays the user’s total points

Postcondition:
The customer views his total amount of points.

Alternative flow (bf 3)

1. System encounters network error while registering fetching customer point data.
2. System informs the customer and prompts them to try again.

Postcondition:
The system informed the customer, and is ready for the customer to try again.

User Story:
As a customer who is part of the Montreal Eaton Center loyalty program, I want to be able to my total amount of points accumulated so far, in order to see if my next purchase can be made with points.

Acceptance Criteria:
User total points are displayed correctly 99% of the time.

Related Requirements:
Functional Requirements:
The ELP system shall allow a customer to view his total amount of points.
The ELP system shall allow a customer to pay for an item with his points.
The ELP system shall accredit a correct amount of points to the given account after a purchase is made.
The ELP system shall deduct points from a given account after a purchase has been made with points.
The ELP system shall accredit a correct amount of points to the given account after a purchase is made.

Non-functional Requirements:

The ELP system shall accredit points within 10 seconds 95% of the time.

The ELP system shall deduct points within 10 seconds 95% of the time.

The ELP system shall fetch the user's total amount of points in under 2 seconds in 95% of the cases.

The ELP system shall let up to 10 000 customers view their points at the same time

3.5.4 View Participating Stores (Mia)

User story
As a customer who is part of the ELP, I want to be able to see all stores who are participating in the program so I make a better choice when it comes to choosing the store I want to shop at ─ I want to shop at stores that are part of the program to accumulate points.

Use case : View list of participating stores.
Intention: The intention of the customer is to view a list of participating stores to know where collect points.
Multiplicity: There can be multiple customers interacting with the system at a given time, on different accounts.
Primary Actors: Customer
Secondary Actors: N/A
Precondition: The customer is registered and logged into the ELPMA. There are more than one stores participating in the program.

Basic Flow

1. Customer clicks on Center's map tab.
2. Customer clicks on "View Loyalty Stores" button.
3. System fetches updated list of participating stores.
4. System displays updated list of participating stores.

Postcondition: The customer is able to view the list of participating stores.

Alternative flow (bf1)

1. Customer clicks on a wrong tab.
2. Customer can't find which tab to view loyalty stores, so clicks on multiple tabs before finding it.

Alternative flow (bf2)

1. System can't fetch updated list of participating stores because of bad internet connection
2. System displays outdated list of participating stores.
3. System informs customer that the list might not be the most recent one.

Postcondition: System informed the customer. List of participating is still displayed.

Acceptance Criteria:
List of participating stores displays in less than 2s 95% of the time and is always the most updated list.

Related Requirements:

Functional Requirements

The ELP system shall allow the user to view a list of participating stores.

The ELP system shall always display the most recent list of participating stores.

Non-functional Requirements

The ELP system shall display the list of participating stores in less than 2 seconds, 95% of the time.

The ELP system shall add a store to the list of participating stores in less than 10 seconds,95% of the time, when a new store registers.

The ELP system shall remove a store from the list of participating stores in less than 10 seconds, 95% of the time, when a store deletes their account.

The ELP system shall allow up to 20 stores to register/unregister at the same time.

3.5.5 View List Of Available Discounts (Jeffrey)

Primary Actors: Customer
Secondary Actors: N/A
Intention: The intention of the customer is to view all available discounts of stores and restaurants participating in the ELP.
Multiplicity: There can be multiple customers viewing the available discounts at a given time.
Precondition: The customer is registered and logged into the ELPMA.

Basic Flow:

1. Customer clicks on Center's map tab.
2. Customer clicks on the "All discounts" button.
3. System fetches all currently active discounts
4. System displays the list of available discounts

Postcondition:
The customer views a list of all available discounts

Alternative flow (bf1)

1. Customer clicks on the wrong tab.
2. Use case continues at Step 1.

Alternative flow (bf3)

1. System determines that there are no available discounts
2. System informs the customer and prompts them to check later.

Postcondition:
The customer views no available discounts.

Alternative flow (bf3)

3. System can't fetch active discounts due to bad internet connection.
4. System informs the customer and prompts them to check later.

Postcondition:
The customer views no available discounts.

User story
As a customer who is part of the ELP, I want to be able to view all available discounts of stores and restaurants participating in the loyalty program. So I can benefit from signing up to the program that is to save money in my purchases at the Eaton Center.

Acceptance Criteria:
Discounts displayed are active 99% of the time.

Related Requirements:
Functional Requirements:
The ELP System shall allow a user to view all available discounts of participating stores and restaurants.
The ELP System shall allow always display a list of active discounts.
The ELP System shall only display discounts of participating stores.

Non-functional Requirements:
The ELP System shall display the list of available discounts in less than 2 seconds, 95% of the time.
The ELP System shall add a discount to the list of active discounts in less than 10 seconds, 95% of the time, when a store or restaurant activates a discount code.
The ELP System shall remove a discount from the list of active discounts in less than 10 seconds, 95% of the time, when a discount expires.
The ELP System shall remove a discount from the list of active discounts in less than 10 seconds, 95% of the time, when a store or restaurant deactivates a discount code.
The ELP System shall allow up to 20 stores/restaurants to add or remove discounts at the same time.

3.5.6 View Profile (Max)

Primary Actors: Customer
Intention: The intention of the customer is to view their profile's details and confirm the correctness of their account information.
Multiplicity: There can be multiple customers viewing their profile details on the ELPMA at a given time.
Precondition: The customer has a mobile phone, has the ELP installed, has an account with the ELP and is connected to wifi or a mobile data network.

Basic Flow:

1. Customer opens the ELP.
2. Customer clicks on the profile icon in the tool bar located at the bottom of the display.
3. System fetches information related to the profile currently logged in on customer's phone.
4. System displays fetched user data.
5. User confirms that they are logged into the right account.
6. User confirms that account details are correct.

Postcondition:
The customer views their account details.

Alternative flow (bf 3)

3. System encounters network error while fetching customer's information
4. System informs the customer, prompting them to try again

Postcondition:
The system informed the customer, prompted them to try again and returned to previous page.

Alternative flow (bf 5)

5. User confirms they are logged into the wrong account.
6. User presses large red "LOGOUT" button.
7. System logs user out and displays login page.

Postcondition:
User is no longer logged into any account, user is returned to login page.

Alternative flow (bf 6)

8. User confirms that one or more of their account details are erroneous.
9. User presses "Edit Details" and corrects erroneous details.
10. System saves new account details.

Postcondition:
System informs user that details have been changed, user views same account page with correct details.

User Story:
As a customer of the Eaton center and a member of the ELP, I want to be able to see my account information to not only make sure that I am logged into the correct account (so the points I acquire are attributed to my desired account) but also to make sure all my details are up to date and none of them were wrongly inputted.

Acceptance Criteria:
User information is fetched and displayed correctly 97% of the time.

Related Requirements:
Functional Requirements:
The ELP system shall allow a customer to view their personal account details.
The ELP system shall allow a customer to edit their personal account details.
The ELP system shall correctly store personal account details as inputted.

Non-functional Requirements:
The ELP system shall store changed information within 5 seconds 95% of the time.
The ELP system shall fetch the user's information in under 2 seconds in 95% of the time.
The ELP system shall let up to 10,000 customers view their account information at the same time.

3.5.7 Remaining use Cases

- View list of participating restaurants.
- Login to loyalty program.
- Spend points
- Use discount code
- Connect to wifi through application
- View center’s map
- Login to loyalty program
- View transaction history
- Update Center’s map
- Add Discounts
- Accept points as payments
- Activate discount notifications
- Deactivate discount notifications

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3.6 Performance Requirements

Time Behavior Requirements

TBR1: The ELP system shall store changed information within 5 seconds 95% of the time.
TBR2: The ELP system shall fetch the user's information in under 2 seconds in 95% of the time.
TBR3: The ELP system shall accredit points within 10 seconds 95% of the time.
TBR4: The ELP system shall deduct points within 10 seconds 95% of the time.
TBR5: The ELP system shall verify the validity of the given account number in under 2 seconds in 95% of the cases.
TBR6: The ELP system shall allow a customer to register in under 2 minutes in 95% of the cases without any training provided.
TBR7: The ELP system shall verify the validity of the account in under 3 seconds in 95% of the cases.
TBR8: The ELP system shall display the list of participating stores in less than 2 seconds, 95% of the time.
TBR9: The ELP system shall add a store to the list of participating stores in less than 10 seconds, 95% of the time, when a new store registers.
TBR10: The ELP system shall remove a store from the list of participating stores in less than 10 seconds, 95% of the time, when a store deletes their account.
TBR11: The ELP System shall display the list of available discounts in less than 2 seconds, 95% of the time.
TBR12: The ELP System shall add a discount to the list of active discounts in less than 10 seconds, 95% of the time, when a store or restaurant activates a discount code.
TBR13: The ELP System shall remove a discount from the list of active discounts in less than 10 seconds, 95% of the time, when a discount expires.
TBR14: The ELP System shall remove a discount from the list of active discounts in less than 10 seconds, 95% of the time, when a store or restaurant deactivates a discount code.

Throughput Requirements

TR15: The ELP system must be able to process 100 transactions per second during peak time.
TR16: The ELP system shall let up to 50,000 customers view their account information at the same time.
TR17: The ELP system shall let up to 5 000 customers accumulate points at the same time.
TR18: The ELP system shall let up to 10 000 customers view their points at the same time
TR19: The ELP system shall allow up to 1 000 000 accounts to be registered concurrently in the system.
TR20: The ELP system shall allow up to 20 stores to register/unregister at the same time.
TR21: The ELP System shall allow up to 20 stores/restaurants to add or remove discounts at the same time.

3.7 System Interface

- The ELP system shall be able to interact with current in-store payment systems.
- The ELP system shall support geolocation of the Eaton Center's map.
- The ELP system shall support push notifications of the nearest store discounts through internet connection.
- The ELP system shall be compatible with all smartphones.
- The ELP system shall provide a user friendly interface that conforms to commonly used mobile application user interface look-and-feel and human-computer interaction conventions.
- The ELP system shall be intuitive enough such that the user is able to fully understand how to use the app after 5 minutes of exploring it.

3.8 System Operations

Maintainability Requirements:

- New versions of the ELP system shall accessed and updated via the “App Store” on the user’s device.
- Installation of a new version shall leave all database contents and all personal settings of the application unchanged.
- The mean time to fix a defect with the ELP system shall be 2 days.
- Each class and function shall be thoroughly documented.
- No method should exceed 200 lines of code.
- The cyclomatic complexity of the code should not exceed 7.
- System maintenance shall occur once every three months.

Reliability:

- The precision of the calculations in the ELP system should be at least 10^-3
- The defect rate of the ELP system should be less than 1 failure per 672 hours of operation (1 month).
- The ELP system should be able to handle up to 1000 simultaneous requests.
- The system shall perform a backup of the application data saved in the application database once every two weeks.
- The EPL System shall only be developed using stable libraries and interfaces.
- The EPL System shall rely on multiple servers in order to avoid system crashes.

3.9 System Security

- The ELP system shall restrict viewing access of the customer information to only the customer and system manager.
- The ELP system shall keep a record of the history of the customer information up to 3 years.
- The ELP system shall keep one backup of all the information registered in the system.
- The ELP system shall encrypt the information stored in the system.
- The ELP system shall operate on a private network only.
- The ELP system shall keep a log history of each customer accessing their account.
- The ELP system shall force a logout after 10 minutes of inactivity.
- The ELP system shall perform vulnerability scans at least monthly.
- The ELP system shall protect and not lose data during power outages.
- The ELP system shall not share customer information with other applications on the customer's phone.

5 Appendices

5.1 Acronyms and Abbreviations

MECDP	*Montreal Eaton Center Development Project*
ELP	*Eatoncentive Loyalty Program*
ELPMA	*Eatoncentive Loyalty Program Mobile Application*
TBR	*Time Behaviour Requirement*
TR	*Throughput Requirement*

5.2 Traceability Matrix

Topic	Functional Requirement	Performance Requirement	Domain Model
ELPMA			ELPMA State Machine
Account registration	Register to the Loyalty Program Use Case	TBR6 TBR7 TR19	Account
User Profile	View Profile Use Case	TBR1 TBR2 TR16	Customer Account
Point System	Receiving Points Use Case View Current Points Use Case	TBR3 TBR5 TR17 TBR3 TBR4 TR18	Account Item
Participating stores	View Participating Stores Use Case	TBR8 TBR9 TBR10 TR20	Store
Discounts	View Available Discounts Use Case	TBR11 TBR12 TBR13 TBR14 TR21	Discount