TRANSIT DROID

Software Requirements

Transit Droid Team

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REVISION HISTORY

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2012-10-26	1.0	Identifying the actors
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CONTENTS

1 Introduction 4

1.1 Purpose of this Document 4

1.2 Definitions, Acronyms and Abbreviations 4

1.3 Overview of the Document 4

1.4 References 4

2 General Descriptions 5

2.1 User Personas and Scenarios 5

2.1.1 User Personas 5

2.1.2 Scenarios 8

2.2 Product Perspective 9

2.2.1 System Interfaces 9

2.2.2 User Interfaces 10

2.2.3 Hardware interfaces 10

2.2.4 Communication Interfaces 10

2.2.5 Memory Constraints 10

2.2.6 Adaptation Requirements 11

2.3 Overview of System Behavior 11

2.3.1 Android System Behavior 11

2.3.2 Linking System Behavior 11

2.3.3 Web App/Service Behavior 11

2.4 Overview of Data Requirements 12

2.4.1 NFC Communication Data 12

2.5 General Constraints, Assumptions, Dependencies, Guidelines 12

2.5.1 General Constraints 12

2.5.2 Assumptions 12

2.5.3 Dependencies 13

2.6 General User View of Product Use 13

3 Actor-Goal List 14

4 Use Cases 15

4.1 Use Case Diagram 15

4.2 Detailed Use Cases 16

4.2.1 Logon 16

4.2.2 Purchase Tickets 17
4.2.3 Add Device To Account 18
4.2.4 View Schedule 19
4.2.5 Account CRUD 20
4.2.6 Enter Metro/Bus 21
~~4.2.7 Disable Mobile Device Remotely – [Out Of Scope]~~ 22
4.2.8 View Usage 23
4.2.9 Register Phone 24
5 Use Case Prioritization 26
5.1 ahp 26

Liste of Figures

Figure 1: USER PERSONA 1 5
Figure 2: USER PERSONA 2 6
Figure 3: USER PERSONA 3 6
Figure 4: USER PERSONA 4 7
Figure 5: USER PERSONA 5 7
Figure 6: USER PERSONA 6 7
Figure 7: USER PERSONA 7 8
Figure 8: NFC Communication Data Protocol 12
Figure 9: Actor-goal list 14
Figure 10: Use Case Diagram 15
Figure 11: ahp table 26
Figure 12: ahp graph 26

1 INTRODUCTION

1.1 PURPOSE OF THIS DOCUMENT

The purpose of this document is to outline the functional requirements of the Transit Droid system. These requirements will serve as a baseline in measuring the system's performance, by comparing actual work done against work planned. They will also serve as guidance during the implementation phase.

1.2 DEFINITIONS, ACRONYMS AND ABBREVIATIONS

Transit Droid System	This refers to the entire system under development, which includes the Android App, the NFC reader interface and the Web Application.
Transit System	This refers to the stakeholder who owns a transportation facility (e.g. STM in Montreal) and who will be using the Transit Droid system.
Transit User	A regular user of a transit system.
Purchase tickets	This refers to purchasing transit (transport) plans, which varies in types (monthly, weekly, daily, one-time, etc.).
Milfare Card	Card issued by the transit system providers in order to access the transit system

1.3 OVERVIEW OF THE DOCUMENT

The requirement document is divided into five different sections, which all describe the functional requirements of the project. The document starts with a general description which covers the overview of the various requirement types together with the user personas and characteristics. The next section describes certain features required and included in the project to ensure a proper functioning of the entire system. Then, the document states the various actors and their respective goals within the scope of the project, and closely followed by the detailed use cases and a use case diagram. A brief prioritization is made on the use cases in order to address the most important first.

1.4 REFERENCES

1 Brief description of
NFC: http://developer.android.com/guide/topics/connectivity/nfc/index.html
2 NFC technologies: http://www.nearfieldcommunication.org/nfc-signaling.html
3 Emulating a smart card with CyanogenMod (an Android
OS): http://nelenkov.blogspot.ca/2012/10/emulating-pki-smart-card-with-cm91.html

2 General Descriptions

2.1 User Personas and Scenarios

2.1.1 User Personas

UP1
Steven Scott

- "…I love my family, my job and my friends…"

Demographics

- 30, Degree in Urban Development, married with two children, has a car

Occupation

- Consultant at the Urban development department of the city of Montreal

Work Location

- His work is located about 30km away from his home

Computer Experience

- Average computer user, and experienced in research. Uses the internet every day on his computer or mobile devices for work and personal use

Mobile Experience

- Has an Android smart phone which he uses to check/send his emails and browse through the internet

Goals and tasks

- Maximize time and money when dropping his kids at the day care every morning before getting to work

FIGURE 1: USER PERSONA 1

UP2
Helen Segara

- "…I love singing, and partying with my friends…"

Demographics

- 22, Student at Concordia University

Occupation

- Student
- Works part time as a bar attendant in a club downtown

School Location

- The university is located a few kilometers away from her home

Computer Experience

- Average computer user. Uses the internet every day on her computer or mobile devices for school and personal use

Mobile Experience

- Has an Android smart phone which she uses to check/send her emails and browse through the internet, especially on Facebook and Twitter

Goals and tasks

- Get to school on time, and have fun during the weekends and holidays

FIGURE 2: USER PERSONA 2

UP3

Paula Maurine

- "…I don't have time for myself, I need a vacation…"

Demographics

- 58, Degrees in Political Science, Administration and Finance

Occupation

- Works for the federal as a manager of a division

Work Location

- Her work is located about 20km away from her home, and prefers to drive to work

Computer Experience

- Average computer user. Uses the internet every day on her computer or mobile devices for work and personal use

Mobile Experience

- Has mobile cellular device but has an Android Tablet which she uses to read her books and listen to music

Goals and tasks

- Eventually retire, so as to visit friends and family in and out of the city

FIGURE 3: USER PERSONA 3

UP4

Nelson Melvin

- "…This world is rapidly evolving, I can't keep track anymore…"

Demographics

- 94, Retired, had a degree in computer science

Occupation

- None

Computer Experience

- None

Mobile Experience

- None

Goals and tasks

- Rest and go for his regular health checkups

FIGURE 4: USER PERSONA 4

UP5

Darren Smith

- "…I can't wait to be an adult… "

Demographics

- 12, student at a primary school in the city

Occupation

- Student

Computer Experience

- Uses the computer to play offline as well as online games

Mobile Experience

- Has an Android mobile phone mainly to communicate with his parents

Goals and tasks

- Play, Study

FIGURE 5: USER PERSONA 5

UP6

Richard's Family

- "…I have the best wife in the world… "

Demographics

- Richard 39, wife 35, married with two children

Occupation

- Richard; Engineer at Ubisoft
- Wife; Architect

Computer Experience

- Average computer user. Uses the internet every day on his/her computer or mobile devices for work and personal use

Mobile Experience

- Each has an Android smart phone which they use to check/send emails and browse through the internet

Goals and tasks

- Richard; take care of his family, and make money saving decisions

FIGURE 6: USER PERSONA 6

UP7
Cynthia Roberts

- "…I love visiting new cities…"

Demographics

- 27, Degree in Geography

Occupation

- Research student an her university

Computer Experience

- Average computer user. Uses the internet every day on his/her computer or mobile devices for work/school and personal use. Experience in internet research and discovery

Mobile Experience

- Each has an Android smart phone which they use to check/send emails and browse through the internet

Goals and tasks

- Visit every main cities in the world

FIGURE 7: USER PERSONA 7

2.1.2 SCENARIOS

1. Steven Scott as described in UP1 wishes to compare between using his car in the morning versus using the public transit. Given the fact that he has to drop his two children at the day care, he realizes that when he uses his car, he always gets caught up in traffic during the rush morning hours. Though the traffic, he succeeds to get to work on time. When he uses the public transit, he does not have to worry about the traffic and still gets to work on time, but this time without any rush. He thus buys a transit pass, and becomes a potential user of the Transit Droid system.

2. Helen Segara as described in UP2 is a student and lives close to downtown where her university is situated. Given the traffic congestion situation downtown, it's therefore not a good idea for her to own a car, and so she uses the public transit system to move about. The thus becomes a potential user of the Transit Droid system.

3. Paula Maurine as described in UP3 will soon retire on may want to use her free time to visit friends and family in and out of the city. She thus considers using the public transit system once in a while if her destination is easily accessible. She thus automatically becomes a potential user of the Transit Droid system.

4. Nelson Melvin as described in UP4 is retired and rarely moves about. He has certain health issues, so is bound to go to the hospital every once in a while for his regular checkup. He can't drive any longer so he uses the public transit system, and this becomes a potential user of the Transit Droid system. He may require some training.

5. Darren Smith as described in UP5 is a secondary school student. His parents used to take him to school every morning, but since they transferred to the city, his parents figured out that the public transit system is well adapted, and that Darren could go to school on his own. He then became a potential user of the Transit Droid system.

6. Richard as described in UP6 loves his family and likes taking decisions for the entire family. He thus decides to move to the city with his family. To facilitate transportation, he decides that the main means of transport will be the public transit system though he has a car. Each member of the family thus becomes a potential user of the Transit Droid system.

7. Cynthia Roberts as described in UP7 loves travelling, and decides to visit a new city which implements the Transit Droid system within their public transit system. She thus becomes a potential user of the Transit Droid system.

2.2 Product Perspective

2.2.1 System Interfaces

There are three main interfaces which linked together in two different ways. The interfaces are Android Mobile Application, Web Application and a linking interface in-between the Android App and the Web Application.

The Android Mobile Application runs on an Android NFC Mobile device and could be used to accomplish various tasks. Its main function is to emulate a Milfare Card in order to provide access to the transit system by communicating with the linking interface which transmits information to the Web Application and channels the respond back to the Android App, granting or rejecting access. Other functions of this interface are limited to purchasing tickets and viewing account details, which communicate to the Web Application directly.

The linking interface makes use of an external NFC reader connected with a machine which runs a Java application. The role of this interface is mainly to enable a connection between the Android App and the Web Application.

The Web Application handles all the significant domain logic operations for the entire Transit Droid system.

2.2.2 User Interfaces

Two user interfaces involved within the Transit Droid system. A web-based client which serves to manage every account information, and every other domain operations except for using entering/accessing the transit system. The other user interface is mobile based in order to help manage the Android App. Please refer to the User Interface Document for a detailed description on the user interfaces

2.2.3 Hardware interfaces

The three different System Interfaces each run on a separate hardware, and make use of other hardware as well.

The Web App runs within a server which is a physical machine setup to support the App.

The linking interface runs on a separate machine to which an NFC reader is attached to. For the purpose of this project, the reader attached is “ACS-ACR”.

The Android App runs on an NFC-enabled Android device such as an Android Smart-hone or tablet.

2.2.4 Communication Interfaces

2.2.4.1 NFC Communication

[Near Field Communication (NFC) is a set of short-range wireless technologies, typically requiring a distance of 4cm or less to initiate a connection. NFC allows you to share small payloads of data between an NFC tag and an Android-powered device, or between two Android-powered devices.] 1

[Three signaling technologies exist for NFC devices to talk to each other] 2; NFC-A, NFC-B and NFC-F.

The communication between the mobile device and the linking interface is done with the help of the NFC communication. For this communication to be effective, the device has to make use of its NFC chip type A only. This is because NFC-B in Android NFC devices does not qualify for the needs of this project (amplitude modulation is not 100%).

2.2.4.2 HTTP Communication

The Android system interface together with the linking interface communicates with the Web App/Service interface using asynchronous web service calls over HTTP requests.

2.2.5 Memory Constraints

Given that the domain logic is handled by the Web App, the data layer is also accessed by the Web App. For the purpose of this project, this data layer is located on the same machine as the

Web App. The memory constraints this depends on the memory capacity of the machine on which the data layer is found.

2.2.6 Adaptation Requirements

This project serves as a proof of concept to illustrate the possibility of using an NFC-enabled device to emulate a Milfare card, so can be used to access the transit system which support Milfare cards. As such, the mobile devices need to be able to transmit data similarly as the cards, thus need to use the NFC-A technology only.

Given the fact that both NFC-A and NFC-B are enabled on NFC-Android devices, it is important that the NFC-B is disabled. To be able to achieve this, the Android device has to run on a different version of its operating system. For the purpose of this project, the Android devices used to test the Transit Droid system run on CyanogenMod 10.0. The steps in emulating such a card could be found [online] 3 (The Android operating system used online is a later version but the steps remain the same).

2.3 Overview of System Behavior

2.3.1 Android System Behavior

The android system responds to calls according to the request it receives.

- When in contact with the reader, data is exchanged accordingly
- On request to view the user profile, the android system fetches required information from the web service through http request
- On request to purchase tickets, the android system dedicates the task to the web service which sends an acknowledgement back to the android system.
- The android system logs usage details whenever it gets in contact with an external reader. So a request for the usage details is an internal call.
- All requests to the external web service needs to be authenticated. As such, the authentication is centralized within the settings of the android system. Other settings specific to just the android system is also centralized in this part of the system.

2.3.2 Linking System Behavior

The linking system on its own does not initiate any request or calls, but responds to requests made from the android system. It gets the access request from the android system, sends it to the web service for validation and channels the response back to the phone.

2.3.3 Web App/Service Behavior

The web app/service handles the domain logic of all the use cases described below (section 4) except for UC8 (View Usage).

Special attention is taken when a new mobile device is registered to an account. This links Transit Users with their Card data and mobile devices. The contract satisfies by allowing a Transit User to be linked to multiple Cards and/or multiple mobile devices.

Also, purchasing tickets could be referred to as purchasing passes within the web app/service. A Pass contains fare amount details. Six types of transit fares are required in Transit Droid, Daily, Monthly, Nightly, Yearly, Three Day, and Single.

Card: Has multiple passes. Each pass may have valid fares available. (see more on how the card and passes are linked to the users in the SAD)

2.4 Overview of Data Requirements

2.4.1 NFC Communication Data

The NFC communication uses a protocol to transmit data from the mobile device to the reader and vice versa.

Command	Device	Cmd Byte	Dummy	P1 …	Transmit size	Response
READ	0x80	0xB0	0x00	Page #	4	Bytes read
UPDATE	0x80	0xD6	0x00	Byte[]	Remaining Length	4F4B
COMPLETE	0x80	0xD0	0x00	0x00	0x00	4F4B

FIGURE 8: NFC COMMUNICATION DATA PROTOCOL

At the beginning of the communication, the NFC reader sends a command to the mobile device requesting to read from the 'card' (phone's NFC chip).

Once the data is read and validated, the NFC reader sends another command to update information in the 'card' together with the updated data.

At the end, the NFS reader indicates to the phone that the communication is completed by sending another command to the 'card' and waits for an acknowledgement.

2.5 General Constraints, Assumptions, Dependencies, Guidelines

2.5.1 General Constraints

- The system functions only with Android enabled mobile devices.
- Access to Android device secure elements is restricted and special permission from the device manufacturers need to be requested.

2.5.2 Assumptions

- Browsers running the web interface have JavaScript enabled.
- Transit users have basic computer knowledge and basic internet usage knowledge.

- A Transit user has an Android mobile device.

2.5.3 Dependencies

- The system is completely dependent of internet connection.
- All android mobile devices need to be NFC enabled devices.
- All android mobile devices should support card emulation by having either access to the secure elements or by running the CyanogenMod operating system.

2.6 General User View of Product Use

TBD (Survey analysis)

3 ACTOR-GOAL LIST

Actor	Goal
Transit System User *A regular user of a transit system* *User accesses the system either through the wen interface or the mobile interface*	Uses the Transit Droid system to access the transit system, to purchase tickets for the transit system and to view other information concerning the transit system.
Transit Droid Hub *Web application which handles all domain logic*	• Handles authentication • Handles the various transactions • Handles account managing • Handles connections to external servers

FIGURE 9: ACTOR-GOAL LIST

4 USE CASES

4.1 USE CASE DIAGRAM

The Transit Droid system is a multi-platform system however, the core of the system must be centralized. Primarily, this is for security reasons.

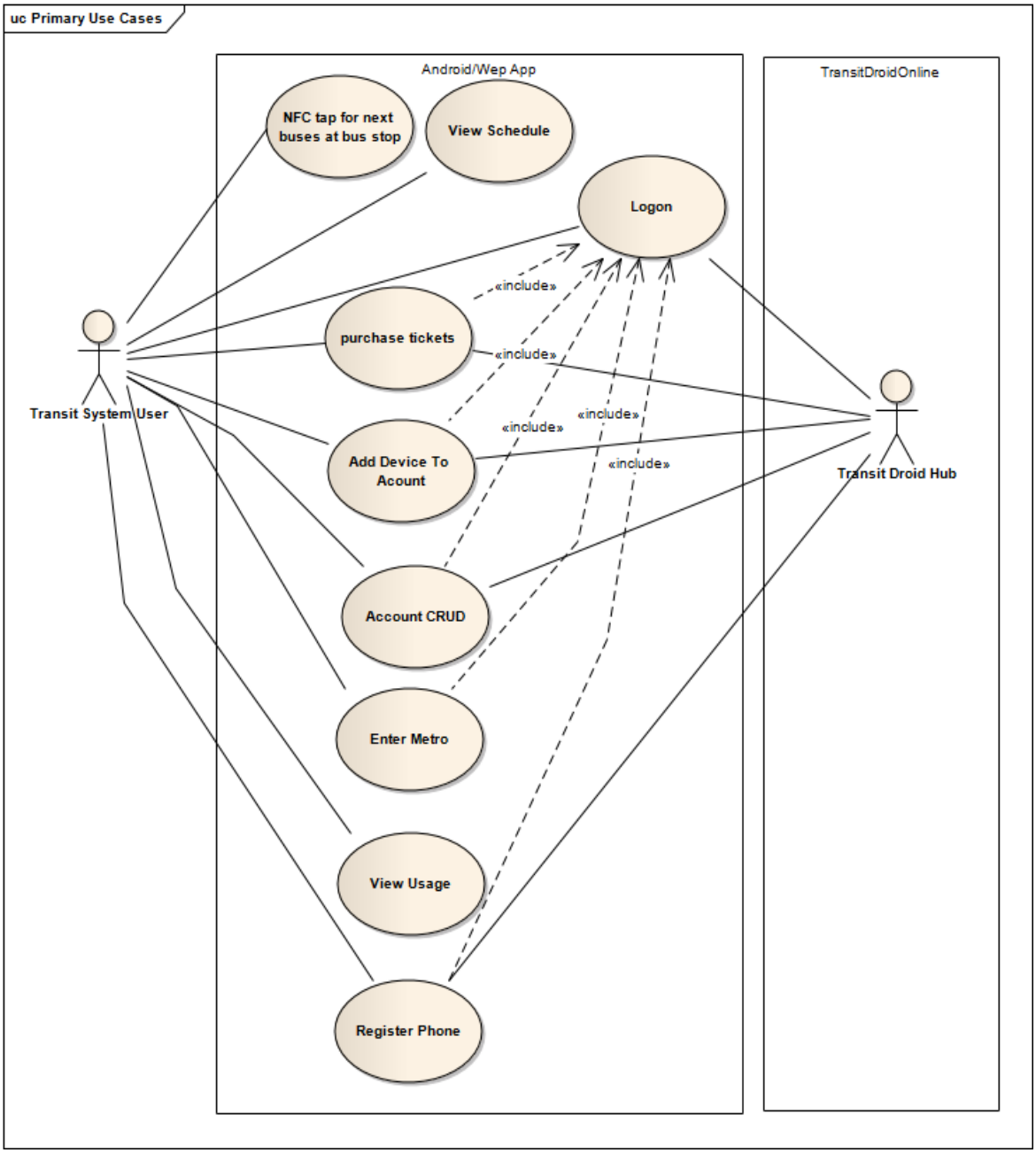

FIGURE 10: USE CASE DIAGRAM

4.2 Detailed Use Cases

4.2.1 Logon

Id: UC1.0
Use Case: Logon
Description:
Transit user wishes to register or login into the system

Level: User-goal
Primary Actor
Transit User
Stakeholders and Interests
Transit User: Get authenticated and ready to use the transit system.
Transit System Company: Keep track of all users of the system.
Developer: Ensures the logon operation is carried out correctly.
Pre-Conditions
For Mobile: The Transit Droid android application has to be downloaded and installed.
Post Conditions
Success end condition
Transit user successfully registers and/or is logged-in into the system.
Failure end condition
System notifies user in case of failure or error occurring during the logon process.
Minimal Guarantee
The transit user would be notified on the status of the operation.

Main Success Scenario

1. Registration (Web Interface)
   1.1. New transit user request to register into the system
   1.2. System request all initial user credentials from transit user
   1.3. Transit user enters the requested credentials by respecting the mandatory fields
   1.4. System ensures no duplication within the transit system database
   1.5. System notifies to the transit user success in registration
   1.6. System redirects the transit user to the home page of the web interface
2. Login (Web Interface)
   2.1. System request only the login credentials from the transit user
   2.2. Transit user enters login credentials
   2.3. System verifies authentication of the transit user within the database
   2.4. System notifies success in login by redirecting the transit user to the home page of the web interface
3. Login (Mobile)
   3.1. Transit user request to edit the application settings
   3.2. Mobile system displays settings option including the login fields
   3.3. Transit user enters login information and saves the settings

3.4. Mobile system authenticates user credentials from the same database as above through Web Application
3.5. Mobile system notifies transit user on success in authentication

Extensions

1.3
a) Transit user enters the requested credentials by respecting the mandatory fields
b) In case certain mandatory fields are omitted, system will highlight them and requesting the transit user to enter information in the highlighted fields

1.4
a) System ensures no duplication within the transit system database
b) In case of duplication, system notifies the user to change certain information which duplicates are not allowed

2.3
a) System verifies authentication of the transit user within the database
b) If the credentials do not match, system notifies the transit user by asking to re-enter login credentials

3.4
a) Mobile system authenticates user credentials from the same database as above through Web Application
b) If the credentials do not match, system notifies the transit user by asking to re-enter login credentials

Special Requirements

N/A

4.2.2 PURCHASE TICKETS

Id: UC2.0
Use Case: Purchase Tickets
Description:
Transit user wishes to purchase tickets in order to access the transit system

Level: User-goal
Primary Actor
Transit User
Stakeholders and Interests
Transit User: Successfully purchases a ticket or tickets in order to have access to the transit system.
Transit System Company: Make profit out of the ticketing system.
Developer: Ensures the purchase ticket operation is carried out correctly.
Pre-Conditions
The transit user needs to be registered and logged in into the Transit Droid system.
For Mobile: The Transit Droid android application has to be downloaded and installed.

Post Conditions

Success end condition

Transit user successfully purchases valid ticket(s).

Failure end condition

System notifies user in case of failure or error occurring during the purchase process.

Minimal Guarantee

The transit user would be notified on the status of the operation.

Main Success Scenario

1. Transit user requests to purchase tickets
2. System requests user to specify the number of tickets to purchase
3. Transit user enters the number of tickets to purchase
4. System requests payment from user
5. Transit user enters payment method and details
6. System validates the payment and return a confirmation method

Extensions

6

a) System validates the payment and returns a confirmation method
b) If the validation is unsuccessful, system notifies the user and repeats step 4

Special Requirements

N/A

4.2.3 ADD DEVICE TO ACCOUNT

Id: UC3.0

Use Case: Add Device to Account

Description:

Transit user wishes to add a sub account in order to manage several accounts in one.

Level: User-goal

Primary Actor

Transit User

Stakeholders and Interests

Transit User: Successfully add an account in order to manage several accounts in one.

Transit System Company: Help transit users are easily manage their accounts.

Developer: Ensures the account management system works correctly.

Pre-Conditions

The transit user needs to be registered and logged in into the Transit Droid system.

For Mobile: The Transit Droid android application has to be downloaded and installed.

Post Conditions

Success end condition

Transit user successfully adds an account.

Failure end condition
System notifies user in case of failure or error occurring during the adding process.
Minimal Guarantee
The transit user would be notified on the status of the operation.

Main Success Scenario

1. Transit user requests to add an account
2. System requests user to specify the new account details
3. Transit user enters the details of the new account (Steps of Scenario of UC1.0)
4. System validates the new account and returns a confirmation message

Extensions

3

a) Transit user enters the details of the new account
b) If the validation is unsuccessful, system notifies the user and repeats step 2

Special Requirements

N/A

4.2.4 VIEW SCHEDULE

Id: UC4.0
Use Case: View Schedule
Description:
Transit user wishes to view the metro/bus schedule of the transit system.

Level: User-goal
Primary Actor
Transit User
Stakeholders and Interests
Transit User: Have knowledge about the transit system's schedule.
Transit System Company: Provide schedules for the transit system to avoid user frustration.
Developer: Ensures the schedule is properly displayed.
Pre-Conditions
For Mobile: The Transit Droid android application has to be downloaded and installed.
Post Conditions
Success end condition
Transit user successfully views the requested schedule.
Failure end condition
System notifies user in case of failure or error occurring while displaying the schedule .
Minimal Guarantee
The transit user would be notified on the status of the operation.

Main Success Scenario

1. Transit user requests to view a schedule
2. System redirects the user to an existing external system which handles this use case

Extensions

N/A

Special Requirements

N/A

4.2.5 ACCOUNT CRUD

Id: UC5.0
Use Case: Account CRUD
Description:
Transit user wishes to entirely manage his/her account

Level: User-goal
Primary Actor
Transit User
Stakeholders and Interests
Transit User: Have full control of his/her account.
Transit System Company: Allow users to manage their own accounts.
Developer: Ensures the account management system works correctly.
Pre-Conditions
For Mobile: The Transit Droid android application has to be downloaded and installed.
Post Conditions
Success end condition
Transit user successfully creates, view, update and/or delete his/her account.
Failure end condition
System notifies user in case of failure or error occurring during the account management process.
Minimal Guarantee
The transit user would be notified on the status of the operation.

Main Success Scenario

1. Create
   1.1. See UC1.0 (Logon), Scenario 1 (Registration)
2. Read (View Account)
   2.1. Transit user request to view account details
   2.2. System displays account details
3. Update
   3.1. User requests to update/edit account details
   3.2. System displays account details in edit mode
   3.3. User updates information as required

3.4. System saves the newly added information and returns a confirmation message

4. Delete
   4.1. User request to delete his/her account or sub-accounts
   4.2. System requests for user's additional authorization
   4.3. User authorizes account deletion
   4.4. System deletes the account and return a confirmation message

Extensions

2.2

a) System saves the newly added information and returns a confirmation message
b) If the account details can't be found, the system displays an appropriate message to notify the user

3.4

a) System displays account details
b) If saving the account details encounters a problem, the user is notified by the system and the user is redirected to step 3.2

4.4

a) System deletes the account and return a confirmation message
b) If deleting the account encounters a problem, the user is notified by the system

Special Requirements

N/A

4.2.6 ENTER METRO/BUS

Id: UC6.0
Use Case: Enter Metro/Bus
Description:
Transit user wishes to enter the metro/bus (use the transit system)

Level: User-goal
Primary Actor
Transit User
Stakeholders and Interests
Transit User: Use the Transit Droid app to access the transit system.
Transit System Company: Facilitate the usage of their transit system with the use of an alternative way of entering the metro/bus.
Developer: Ensures the Transit Droid android app works correctly for accessing the transit system.
Pre-Conditions
For Mobile: The Transit Droid android application has to be downloaded and installed.
Post Conditions
Success end condition
Transit user successfully accesses the transit system (metro/bus).

Failure end condition
System notifies user in case of failure or error occurring during the access process.
Minimal Guarantee
The transit user would be notified on the status of the operation.

Main Success Scenario

1. User opens the mobile app and keeps the mobile screen on from an NFC-enabled device
2. User places the mobile on the reader at the transit system access gate
3. System reads information from the mobile device with the help of the NFC technology
4. System validates the mobile device and provides access to the user
5. User removes the mobile device from the reader

Extensions

4

a) System validates the mobile device and provides access to the user
b) In case the system does not validate the mobile device, access will be denied to the user

Special Requirements

- *Device used has to be an Android NFC-enabled device*

~~4.2.7 Disable Mobile Device Remotely – [Out Of Scope]~~

Id: UC7.0
Use Case: Disable Mobile Device Remotely
Description:
Transit user wishes to remotely disable his/her mobile device

Level: User-goal
Primary Actor
Transit User
Stakeholders and Interests
Transit User: Disables mobile device in case of loss or theft
Transit System Company: Track devices in use within the system
Developer: Ensures the user successfully disables his/her mobile device remotely
Pre-Conditions
-The transit user needs to be registered, and have at least one device attached to his/her account.
-The transit user needs to be signed in into his/her on the web interface
Post Conditions
Success end condition
Transit user successfully disables his/her mobile device.
Failure end condition
System notifies user in case of failure or error occurring during the disabling process.

Minimal Guarantee
The transit user would be notified on the status of the operation.

Main Success Scenario

1. User request to a mobile device
2. System asks user to choose the mobile device to be disabled
3. User chooses mobile device to disable
4. System disables mobile device an return a confirmation message

Extensions

4

a) System disables mobile device an return a confirmation message
b) In case the system does not disable the mobile device, the user will be notified accordingly

Special Requirements

N/A

4.2.8 VIEW USAGE

Id: UC8.0
Use Case: View Usage
Description:
Transit user wishes to view the transit usage within the last 30 days.

Level: User-goal
Primary Actor
Transit User
Stakeholders and Interests
Transit User: Have a view of the last 30 days transit usage details.
Developer: Ensures the Transit Droid android app shows the right details of the usage.
Pre-Conditions
For Mobile: The Transit Droid android application has to be downloaded and installed.
The mobile device has to be registered to an existing account.
Post Conditions
Success end condition
Transit user successfully views the usage details of the last 30 days.
Failure end condition
System notifies user in case of failure or error occurring during the display of the usage details.
Minimal Guarantee
The transit user would be notified on the status of the operation.

Main Success Scenario

1. User request to view the details of his/her usage

2. System displays the usage details of the last 30 days

Extensions

2

a) System displays the usage details of the last 30 days
b) In case the system does not have any usage details to display, the user is notified accordingly

Special Requirements

N/A

4.2.9 REGISTER PHONE

Id: UC8.0
Use Case: Register Phone
Description:
Transit user wishes to register a mobile device into an existing account.

Level: User-goal
Primary Actor
Transit User
Stakeholders and Interests
Transit User: Has his/her mobile device registered and ready for use.
Developer: Keep track of all the devices in use with the Transit Droid system.
Pre-Conditions
For Mobile: The Transit Droid android application has to be downloaded and installed.
Post Conditions
Success end condition
Transit user successfully registers his/her phone to his/her account.
Failure end condition
System notifies user in case of failure or error occurring during the registering process.
Minimal Guarantee
The transit user would be notified on the status of the operation.

Main Success Scenario

1. User request to register his/her mobile device to his/her account in the Transit Droid system
2. System request user credentials
3. User enters username and password (credentials)
4. System authenticates the user and registers the phone
5. System return success message to the user

Extensions

4

a) System authenticates the user and registers the phone
b) - In case the phone is already registered to the given user, the same success message is returned to the user
   - In case the phone is already registered to another user, the new user gets his phone registered in his/her account, and the previous user gets the phone deregistered from his/her account
   - In case the user is not authenticated properly, the user is notified accordingly

Special Requirements

The mobile devices have to be Android NFC enabled devices.

5 USE CASE PRIORITIZATION

5.1 AHP

Use Case	Value	Cost
UC1.0	9	3
UC2.0	8	7
UC3.0	6	7
UC4.0	2	2
UC5.0	8	8
UC6.0	10	6
UC7.0	2	5
UC8.0	8	5

FIGURE 11: AHP TABLE

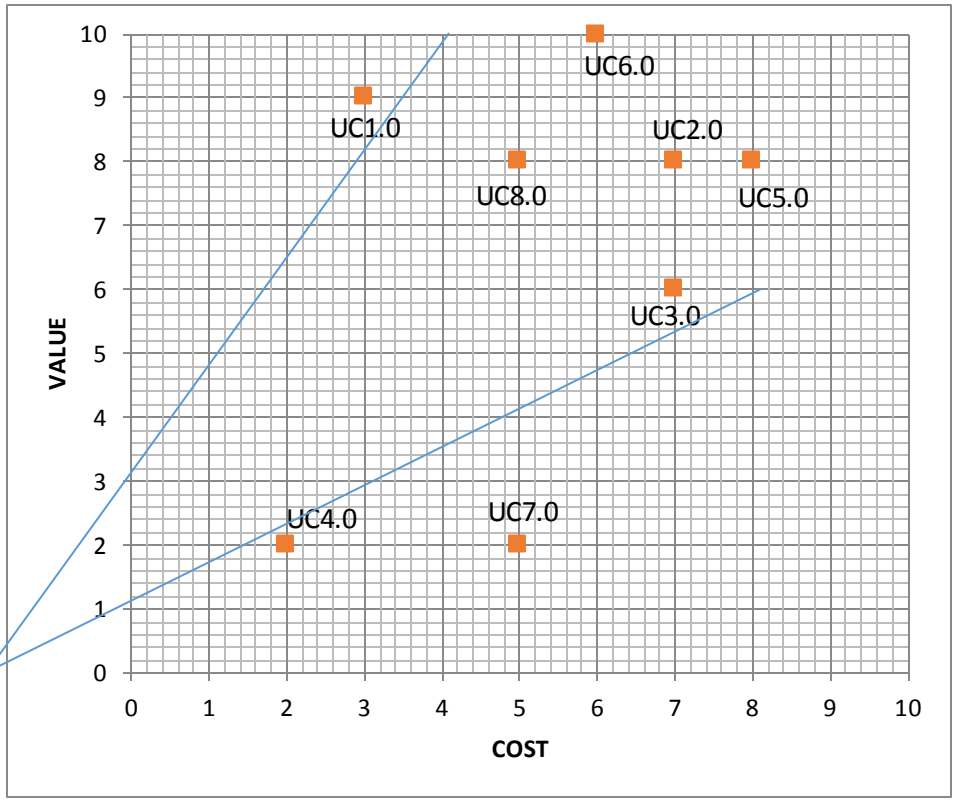

FIGURE 12: AHP GRAPH