



Concordia Institute for Information Systems Engineering (**CIISE**)

Team Noble

# Software Quality Assurance Report

Project – Electrification of STM bus route 211 from Terminal McDonalds to Lionel-Groulx

Prepared By – Yu Jin ( 23753034) , Gurpreet Kaur (40106011), Daniel Zakerifar (40054453)

Date of Issue – April 28<sup>th</sup>, 2020

## Table of Content

1.	Introduction	2
2.	Purpose	2
3.	Review Report of Software Requirement Specifications	3
4.	Review Report of Software Development Plan	3
5.	Review Report of Software Design Specification	4
6.	Review Report of Test Cases	5
7.	Review Report of Final Product	15
8.	Conclusion	16

# 1. Introduction

This document consists of report of Software Quality Assurance activities for electrification of STM bus route 211 from terminus McDonalds to Terminal Lionel-Groulx.

The document is organized in the following sections:

1. Purpose
2. Review Report of Software Requirement Specifications (SRS)
3. Review Report of Software Development Plan
4. Review Report of Software Design Specifications
5. Review Report of Test Cases
6. Review Report of Final Product
7. Conclusion

# 2. Purpose

We have developed the software that will help the STM Team of Montreal to plan the electrification of bus route 211 in their system i.e. from Lionel-Groulx to Sainte-Anne/Terminus McDonalds. The software provides the optimal number of buses and chargers to be obtained in order to electrify the bus route 211. Therefore, in order to develop this software with good quality certain quality assurance planned as describe in software quality assurance plan document so, this document contain the report of activities involved to ensure the quality of developed software.

### 3.Review Report of Software Requirement Specifications

Details of Review Meeting	
Date of Meeting	January 28 <sup>th</sup> 2020
Meeting Organized by	Manager
Attendees	Gurpreet Kaur, Daniel, Manager, Fellow classmates

Review Record				
Name of Activity for which review meeting is planned for.	Date of meeting	Date Approved	Comment	Signature
For reviewing the SRS document	28 <sup>th</sup> Jan, 2020		1) There was no option through which user can select the manufacture of chargers.  2) There was no option for users to enter the price for both chargers (slow speed, high speed).  3) Design of charging schedule, bus schedule was missing	

### 4. Review Report of Software Development Plan

Details of Review Meeting	
Date of Meeting	February 3 <sup>rd</sup> 2020
Meeting Organized by	Noble Team (Yu, Gurpreet, Daniel)
Attendee	Noble Team, Manager

Review Record				
Name of Activity for which review meeting is planned for.	Date of meeting	Date Approved	Comment	Signature
For reviewing the SDP document	3 <sup>rd</sup> Feb, 2020		1) details under product and deliverables needs to be update because final deadline is postponed.	

## 5. Review Report of Software Design Specification

Details of Review Meeting	
Date of Meeting	February 15 <sup>th</sup> 2020, February 30 <sup>th</sup> 2020
Meeting Organized by	Noble Team (Yu, Gurpreet, Daniel)
Attendee	Noble Team

Review Record				
Name of Activity for which review meeting is planned for.	Date of meeting	Date Approved	Comment	Signature
For reviewing the preliminary design document	15 <sup>th</sup> Feb, 2020		1) Policies for algorithm were missing.	
For reviewing the detail design document	30 <sup>th</sup> Feb, 2020		2) Algorithm missed certain criteria like utilization of battery	

## 6. Review Report of Test Cases

Test case Name	Unit case Bus	
Name of state class	Battery	
Name of the states	stateOfCharging	
Scenario	We create one bus That has a battery with capacity of 300Kwh. Then we do the following methods:	
Expected results		StateOfCharging
	Taveling	260Kwh
	TravelingEmpty	220Kwh
	FastCharging	227
	overNightCharging	300
Review Commands	For three times it has problems with chargers and travelling empty. then it is solved	
Test Case Status	Pass	

Test case	Integration Test																																																																																																																																																																																																																																																																																																																																																																																																																						
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Scenario	<p>For integrated Testing we are using the random testing. The way is that we put one simple symmetric schedule in the software and then the we see the results. Because it is symmetric, we can calculate the everything with hand.</p> <p>This is the schedule for west and east 05,00,00 05,30,00 08,30,00 10,30,00 12,30,00 14,00,00 16,00,00 18,00,00 19,30,00 21,30,00</p>																																																																																																																																																																																																																																																																																																																																																																																																																						
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Review Commands	We used this testing as a smoke testing since all information in this are important. So we used this one daily.																																																																																																																																																																																																																																																																																																																																																																																																																						
Test Case status	Pass																																																																																																																																																																																																																																																																																																																																																																																																																						

Use Case Name	Normal Usage
Use case ID	UC – 1
Description	In this test will check the output of the software when user provides all the necessary inputs as mentioned in precondition.
Precondition	User should provide inputs like manufacture for charger, price for both slow speed and high-speed charger, Please input the kind of battery, Please input the price of bus
Expected Result	Software should display number of buses, number of both types of charger at both terminuses, and total price and generate three files (bus schedule, charging schedule, state of chargers along with bus schedule)
Review Comments	Software showed the expected result, it displays number of buses, number of both types of charger at each terminus needs to buy and total price needs to be invested by system. Also generated three files showing the details of charging schedule, bus schedule.
Test Case Status	Pass

Use Case Name	Validate Allotment of Buses (charger type is ABB and Battery size is small)
Use case ID	UC – 2
Description	In this test will validate the allotment of buses by validating the bus schedule file generated by software when battery size is small and charger type is ABB
Precondition	User should provide inputs like manufacture for charger, price for both slow speed and high-speed charger, Please input the kind of battery, Please input the price of bus
Expected Result	Bus schedule file should show allotment of 19 buses
Expected Result	Verify the file generated for the allotment of buses. After every trip utilization battery gets reduced by 40 and then time between next trip is less than 20 and battery remaining is greater than 90 then, there is no need of charging. If battery remaining is less than 90 and next trip is within 10 minutes, then new bus will get added to the system. And if, waiting time is greater than 20 minutes and battery remaining is greater than 90 then, bus will charge with high speed charger. And ABB charger charge the battery up to 7 units in 1 minute.
Test Case Status	Pass



Use Case Name	Validate Allotment of Buses (charger type is ABB and Battery size is big)
Use case ID	UC – 3
Description	In this test will validate the allotment of buses by validating the bus schedule file generated by software when battery size is big and charger type is ABB
Precondition	User should provide inputs like manufacture for charger, price for both slow speed and high-speed charger, Please input the kind of battery, Please input the price of bus
Expected Result	Bus schedule file should show allotment of 24 buses
Review Comments	Verify the file generated for the allotment of buses. After every trip utilization battery gets reduced by 40 and then time between next trip is less than 20 and battery remaining is greater than 90 then, there is no need of charging. If battery remaining is less than 90 and next trip is within 10 minutes, then new bus will get added to the system. And if, waiting time is greater than 20 minutes and battery remaining is greater than 90 then, bus will charge with high speed charger. And ABB charger charge the battery up to 7 units in 1 minute.
Test Case Status	Pass

Use Case Name	Validate Allotment of Buses (charger type is HELIOX and Battery size is small)
Use case ID	UC - 4
Description	In this test will validate the allotment of buses by validating the bus schedule file generated by software when battery size is small and charger type is HELIOX
Precondition	User should provide inputs like manufacture for charger, price for both slow speed and high-speed charger, Please input the kind of battery, Please input the price of bus
Expected Result	Bus schedule file should show allotment of 23 buses
Review Comments	Verify the file generated for the allotment of buses. After every trip utilization battery gets reduced by 40 and then time between next trip is less than 20 and battery remaining is greater than 90 then, there is no need of charging. If battery remaining is less than 90 and next trip is within 10 minutes, then new bus will get added to the system. And if, waiting time is greater than 20 minutes and battery remaining is greater than 90 then, bus will charge with high speed charger. And HELIOX charger charge the battery up to 5 units in 1 minute.
Test Case Status	Pass

Use Case Name	Validate Allotment of Buses (charger type is HELIOX and Battery size is small)
Use case ID	UC - 5
Description	In this test will validate the allotment of buses by validating the bus schedule file generated by software when battery size is small and charger type is HELIOX
Precondition	User should provide inputs like manufacture for charger, price for both slow speed and high-speed charger, Please input the kind of battery, Please input the price of bus
Expected Result	Bus schedule file should show allotment of 17 buses
Review Comments	Verify the file generated for the allotment of buses. After every trip utilization battery gets reduced by 40 and then time between next trip is less than 20 and battery remaining is greater than 90 then, there is no need of charging. If battery remaining is less than 90 and next trip is within 10 minutes, then new bus will get added to the system. And if, waiting time is greater than 20 minutes and battery remaining is greater than 90 then, bus will charge with high speed charger. And HELIOX charger charge the battery up to 5 units in 1 minute.
Test Case Status	Pass

Use Case Name	Validate input format for first input
Use case ID	UC - 6
Description	In this test will validate the input format for first input of our software which is “please enter the manufacture of charger (ABB/HELIOX)”. This field should accept only these two values.
Precondition	User should provide input either ABB or HELIOX
Expected Result	Upon provided the input, which is either ABB or HELIOX only then, software should accept the input else give error message and stop the flow.
Review Comments	Software has certain validation applied while taking input from user. Here if user provides any other input (other than ABB/HELIOX). It will display the message saying that please provide valid input.
Test Case Status	Pass

Use Case Name	Validate input format for second input
Use case ID	UC - 7
Description	In this test will validate the input format for second input of our software which is “please input the price of over-night charger”. This field should accept only numeric values.
Precondition	User should provide input only in numerical format
Expected Result	Upon provided the input, which is number value only then, software should accept the input else give error message and stop the flow.
Review Comment	Software has certain validation applied while taking input from user. Here if user provides any other input (other than number). It will display the message saying that please provide valid input.
Test Case Status	Pass

Use Case Name	Validate input format for third input
Use case ID	UC - 8
Description	In this test will validate the input format for third input of our software which is “please input the price of fast charger”. This field should accept only numeric values.
Precondition	User should provide input only in numerical format
Expected Result	Upon provided the input, which is number value only then, software should accept the input else give error message and stop the flow.
Review Comment	Software has certain validation applied while taking input from user. Here if user provides any other input (other than number). It will display the message saying that please provide valid input.
Test Case Status	Pass

Use Case Name	Validate input format for fourth input
Use case ID	UC - 9
Description	In this test will validate the input format for fourth input of our software which is “please input the “kind of battery: small(294kwh), big(394kwh)”. This field should accept either small or big.
Precondition	User should provide string input which should be either small or big.
Expected Result	Upon provided the input, which is either ABB or HELIOX only then, software should accept the input else give error message and stop the flow.
Review Comment	Software has certain validation applied while taking input from user. Here if user provides any other input (other than small/big). It will display the message saying that please provide valid input.
Test Case Status	Pass

Use Case Name	Validate input format for fifth input
Use case ID	UC - 10
Description	In this test will validate the input format for fifth input of our software which is “please input the price of bus”. This field should accept only numeric values.
Precondition	User should provide input only in numerical format
Expected Result	Upon provided the input, which is number value only then, software should accept the input else give error message and stop the flow.
Test Case Status	Software has certain validation applied while taking input from user. Here if user provides any other input (other than number). It will display the message saying that please provide valid input.
Test Case Status	Pass

Use Case Name	Validate input format for second, third and fifth input should not be too large nor zero
Use case ID	UC - 11
Description	In this test will validate the input format for second, third and fifth input of our software which is “please input the price of over-night charger, fast charger and price of bus. This field should accept only numeric values that should be neither too long nor zero.
Precondition	User should provide input only in numerical format
Expected Result	Upon provided the input, which is number value greater than zero, non-negative number, number not too large only then, software should accept the input else give error message and stop the flow.
Review Comment	Software has certain validation applied while taking input from user. Here if user provides inputs which will be zero or too large (greater than 50000) or negative number. It will display the message saying that please provide valid input.
Test Case Status	Pass

## 7. Review Report of Final Product

Details of Review Meeting	
Date of Meeting	April 21 <sup>st</sup> 2020
Meeting Organized by	Manager
Attendee	Noble Team (Yu, Gurpreet, Daniel), manager, Fellow classmates

Review Record				
Name of Activity for which review meeting is planned for.	Date of meeting	Date Approved	Comment	Signature
For reviewing the final product	21 <sup>st</sup> Apr, 2020		1) Algorithm for software was good. 2) it was console based, display should have GUI	

## 8. Conclusion

This document review report of all the work did in the project to create simulation software for electrifying the STM bus route 211 from Lionel-Groulx to McDonalds. All the review comments noted for each document referred to create final documents. For example, there was comment while reviewing the final product that GUI for software display was missing initially software, we developed was console based. So, we update the code and added GUI for displays. Snippet of display was there in requirement specification document. Also, we have used earn value technique for tracking the schedule (details are in software development plan document, already submitted), at first, we spent less time for modelling, and we did not have technical review for the design so we were ahead of schedule. Then in the coding we spent a lot of time for construction and we became behind the schedule. So, we found that if we spent more time on review and designing, our results is going be so much better.

For the future works we can use JavaScript to make it as a Web application. We also can extend this software for the several schedule in same time.