E-Vehicles Charging Management Platform

Software Requirements Specification

Version 1

Revision History

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Software Requirements Specification

# Introduction

The platform is required to monitor the performance of the Batteries and the chargers and control these assets operating based on the business operations requirements.

## Purpose

The purpose of the document is to collect and analyze all assorted ideas that have come up to define the system, its requirements with respect to consumers. Also, we shall predict and sort out how we hope this product will be used in order to gain a better understanding of the project, outline concepts that may be developed later, and document ideas that are being considered, but may be discarded as the product develops.

In short, the purpose of this SRS document is to provide a detailed overview of our software product, its parameters and goals. This document describes the project's target audience and its user interface, hardware and software requirements. It defines how our client, team and audience see the product and its functionality. Nonetheless, it helps any designer and developer to assist in software delivery lifecycle (SDLC) processes.

## Scope

Primarily, the scope pertains to the software’s features.

## Definitions, Acronyms, and Abbreviations

|  |  |
| --- | --- |
| FAQ | Frequently Asked Questions |
| CRM | Customer Relationship Management |
| .. | .. |
|  |  |

## References

1. WEB Module PRD
2. WEB Module PRD Platform

# Specific Requirements

The specific requirements are –

## Battery Monitoring – Following are the field that comes under battery monitoring and control –

1. **Battery Parameters –** (a to g – fixed data, h --- variable parameters )
   1. Battery number / identifier
   2. Battery board number/identifier
   3. BMS Identifier
   4. BMS firmware versions
   5. Battery board firmware version
   6. Battery information – Batch of manufacturing, Date of installation, Battery voltage, Capacity, Any other specific feature, Battery rated voltage and capacity
   7. BMS Protections – List of protection features of BMS with specifications
   8. Battery Status – On/Off
   9. Battery Health – Good / Problem
   10. Battery Voltage
   11. Battery Available Charge (in %)
   12. Battery Temperature
   13. Battery Charge Cycle
   14. Total number of charge cycles
   15. Total Battery life percentage use
2. **Battery Monitoring Parameters** –
   1. Battery Live Location
   2. Distance travelled during current day
   3. Distance travelled in certain time frame
   4. Distance travelled since beginning
   5. Current speed
   6. Speed data in certain time frame
   7. Maximum and minimum speed in certain time frame
   8. Battery Voltage Variation in the given timeframe
   9. Battery Capacity variation in the given timeframe
   10. Battery Temperature Variation
   11. Maximum & minimum temperature in given time frame
3. **Battery Control & Security** – Battery control & security will require certain measures to protect battery against theft, operating abuse & hazards. Following are the measures that can be set for warning and based on operator, subsequent actions can be taken.
   1. Warning in case Vehicle there is change of city
   2. If the change in the cities is frequent then other parameters should be considered (For Border areas)
   3. If the vehicle moves outside of 40km radius of base station
   4. If Battery has been opened
   5. If Battery has been plugged in an unauthorized charger
   6. If there is sudden change in Battery temperature of entire battery or part of battery
   7. Temperature rise above a limit inside battery box
   8. If battery charge drops below 5%
   9. If battery health status suddenly changes to Bad

In any of the above cases, Battery flag warning will come to operator dashboard after which operator can chose to disable the battery. Disabling battery will be two user process on two different hierarchy levels.

1. **Authentication –** Before charging, The Battery has to authenticate the charger, if the charger is not authenticated then charging shouldn’t start. This should come with second degree over-ride in case system malfunction.

## Reliability & Availability Charger Monitoring

Charger is going to facilitate several functions other than charging. Following are the primary parameters need to be tracked –

1. Charger Parameters –

a. Charger make & model

b. Rating & Specification (A linked datasheet to be stored somewhere)

c. Date & Batch of purchase

d. Date of Commencement of Operations

e. Location

f. Premise/Partner Owner

g. Charger Board Identifier

h. Charger Board Firmware version

i. Servicing/Repair/maintenance history

j. Charger Status – On/Off

k. Charger Voltage

l. Charger Current

m. Mode of Charging – CC/CV/Trickle

n. Total Operating Hours

o. Total Charge Delivered (in % )

p. Total energy consumed

q. Current battery under charging

r. Past Battery Charges – Battery identifier/Battery Operator/Date/time/ % charge delivered

s. Total revenue made in given time frame

t. Unauthorized battery plugging – Date/time

1. Charger Control & Security – Charger is going to function several functions which includes Battery authentication, User Authentication, Balance Check in User account, Battery Parameter recording, Communicating Battery real-time information etc. Charger control & security will require certain measures to charger against theft, operating abuse & hazards. Following are the measures that can be set for warning and based on operator, subsequent actions can be taken.

a. Proximity sensor – The charger has been fixed then it will let us know in case there is any movement in location.

b. Pin authentication will be required and in case wrong pin is put three times then it should lock the user profile for an hour.

c. In case low user account balance, charger should show & limit maximum deliverable charge.

d. Charging should only start once user authentication is successful and amount of charge to be transferred has been provided by the user.

e. In case unauthorized battery has been plugged-in then system operator should be informed with warning and it should be recorded in logs

f. In case unauthorized battery has been plugged-in more than twice then system operator should be informed along local mother hub operator with warning

g. In case of power loss, both local as well as mother hub operator should be informed with warning messages

h. In case of power loss, acknowledgement of power loss should become enforceable so that it can be assessed that this power loss has not been caused because of theft etc.

i. In case of charger theft or loss, it should be removed from the list of authorized chargers

j. By default the charger would be off and it will only charge as long as there is signal coming in from the control & communication board of the charger which at the same time is also able to communicate with the battery in real time

k. As long as battery and charger are able to establish a local communication, charging should continue

l. In case of charger theft or loss, the charger should be permanently deactivated

1. Communication – Communication between charger and the server is required for most of the times. In idle condition, it will indicate the status of availability of the charger. Before starting of the charging, during authentication the data communication has to be very fast and secure. During authentication and charging charger will have to transmit battery data including battery identifier, battery SoC (state of charge) status, and percentage of charge delivered. Charging will terminate based on the SoC change as per input given by the user.
2. Authentication – The process of authentication should begin as soon as the charger is plugged into the battery. The charger should retrieve the information regarding the battery immediately which includes Battery identifier, Battery SoC, Battery voltage from the battery. At the same time, charger should retrieve the battery information from the servers as well which includes battery owner/operator profile, authentication parameter (password), Available balance in user account and any other relevant parameters needed. This will avoid the latency in authentication and further starting of charging.

## Account Types

There will be several accounts type and each will have different kinds of privileges and overriding power. Following are some of them –

1- User/Customer Account – User/customer account will be for the battery user. This will be one of the most exhaustive account. Following are the primary fields that the user account will have –

a. User name

b. Registration number (Reg no. will be user ID)

c. User Phone no.

d. User Email Address

e. User Residential Address

f. ID type (any of the govt. ID/PAN/Aadhaar/Driving license etc) (a copy of ID has to be stored)

g. ID number

h. Battery Assigned (with linked battery profile)

i. Available Balance in the account

j. Payment History

k. Password

l. Guarantor Name \* 2

m. Guarantor ID Type

n. Guarantor ID

o. Base Station

p. City of Assignment

q. City of Operation

r. Initial Payment Amount

s. User agreement copy to be stored

t. Date of User onboarding

2- Partner Account – Partner account will be for the charging point operators. Charging point operator will have certain over ride permission. Following are some of the information points associated with Partner Account –

a. Partner Name

b. Partner ID

c. Partner phone number

d. Partner Email Address

e. Partner Residential Address

f. Partner Bank Details

g. ID Type (any of the govt. ID/PAN/Aadhaar/Driving license etc)

h. ID number

i. Charging point address

j. Charging point location

k. Serial number of chargers assigned (with linked charger profile)

l. Total Charging happened (cumulative of all the chargers)

m. Total charging of individual chargers

n. Total charging happened in certain time frame (cumulative & individual chargers)

o. Total Cumulative Revenue (daily and in certain time frame with all time as option)

p. individual charger Revenue (daily and in certain time frame with all time as option)

q. Total cumulative earning (daily and in certain time frame with all time as option)

r. Individual charger earning (daily and in certain time frame with all time as option)

s. Earning transferred into bank account

t. Remaining Earning / Available Balance

u.

2.1 Partner Account Permissions and Roles – Partner account will have several roles and permission which can include override permission.

• If a battery is not being recognized then there should be an option to manually put the battery identifier. If the communication is established between the battery and charger then the operations will resume normally.

• If the battery communications cannot be established even after manually put battery Identifier then Partner can choose to recharge from his/her account and money will be deducted from their account. The only input option will be amount of money not battery percentage as charge value.

• If the user doesn’t have balance in his account then the partner can choose to directly deduct money from his/her (partner prepaid account) account.

• Partner should be able to recharge user account from his/her prepaid account which has to maintain a certain balance.

• User account recharge through partner account will be done through app or web and will be based on two step authentication.

3- Operator Account – Operator account will have several permissions, and over-riding powers. Following are some of the information points associated with the operator account:

• Operator Name

• Operator ID

• Operator ID type

• Operator Phone No

• Operator Residential Address

• Operator Station Name

• Operator Station ID

• Partners assigned to operators

• Assigned Partner’s ID

• Cumulative performance of partners

• Individual performance of partner

• Individual performance of chargers

• Total Charging happened (cumulative of all the chargers)

• Total Charging of Individual chargers

• Total Cumulative Revenue (daily and in certain time frame with all time as option)

• individual charger Revenue (daily and in certain time frame with all time as option)

• Total cumulative earning (daily and in certain time frame with all time as option)

• Individual charger earning (daily and in certain time frame with all time as option)

• Total Batteries Assigned to this Station

• Batteries deployed in certain time frame

• Revenue from these batteries in certain time frame

• Cash Collected

# A notification dashboard has to be built which will display critical information including problems with any products (batteries, chargers etc)

3.1 Operator Account Permissions and Roles – Operator account will have the following roles with overriding permissions:

• If a battery is not being recognized then there should be an option to manually put the battery identifier. If the communication is established between the battery and charger then the operations will resume normally

• If the battery communications cannot be established even after manually put battery Identifier then Operator can choose to recharge from his/her account and money will be deducted from operator account. The only input option will be amount of money not battery percentage as charge value

• If the user doesn’t have balance in his account then the operator can choose to directly deduct money from his/her account. The daily recharge limit from the operator account is capped at 10000INR. In case there is a higher recharge requirement, supervisor intervention is required

• The operator will/can recharge the user pre-paid wallets against cash.

• The operator would be the First Point of Contact for the partners assigned to him. Performance of these partners & devices would show up on his profile & dashboard.

• The operator would have over riding authority over the partners in his territory, over suspicious vehicle activity

• The operator would remotely manage/visualize/analyze the partner accounts in his territory

. The operator should see all the batteries in a list assigned to him/her

4- Supervisor/Admin/Super User Account – This account will have access to all the information & control. Login to this account should be based on password and Email OTP and Phone OTP.

## No data ever created in the system should ever be deleted/removed.