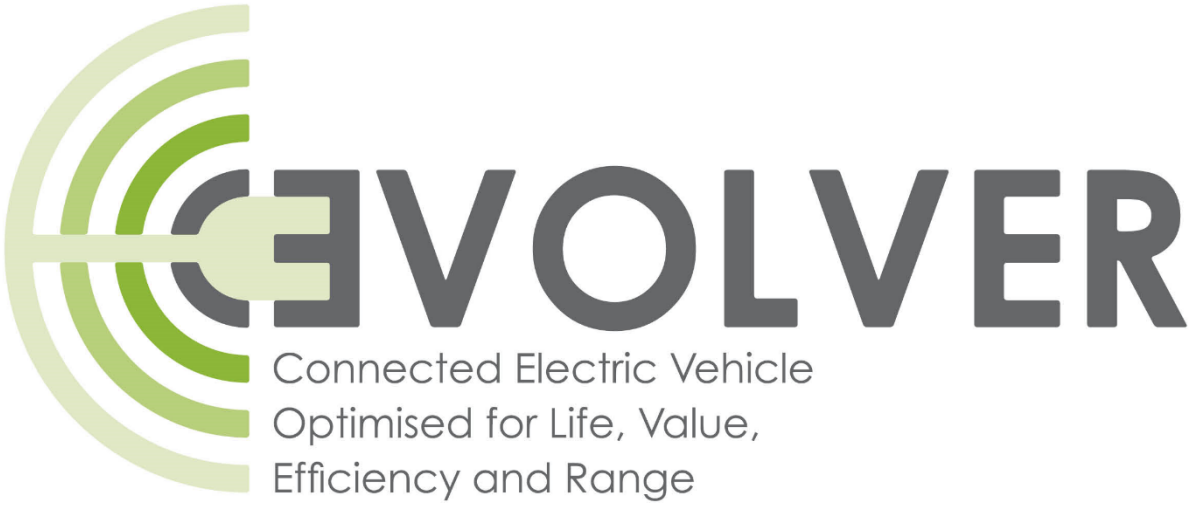
EUROPEAN COMMISSION

HORIZON 2020 PROGRAMME - TOPIC H2020-LC-GV-01-2018
Connected Electric Vehicle Optimized for Life, Value, Efficiency and Range

GRANT AGREEMENT No. 824295



CEVOLVER – Deliverable Report

D1.4 Report on brand independent system level and controls requirements

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Publishable summary

This report D1.4 covers the key outputs from task 1.4 of the CEVOLVER project. This includes deriving brand-independent (or general) stakeholder requirements and system level requirements for realizing the control features. Additionally, the VCU-to-cloud interfaces are also further detailed from the initial proposal in D1.2.

A system engineering process and user-centric development approach, as mentioned in the previous report D1.1, are followed in the function development activity. The stakeholder requirements are derived from the stakeholder analysis. This along with the mind-map (functional decomposition) and various use cases defined in report D1.3 serve as inputs to obtain the system level requirements. The functional decomposition activity is performed parallel to the activity of requirements definition in order to identify the functional architecture for realizing the control features. Functional architecture and the system level requirement are cross-linked and checked, to ensure the completeness.

The brand independent requirements and functional architecture derived from this task will be realized with function development activities in WP 3, 4, and 5, where specific demonstrator requirements will be additionally taken into consideration.

Contents

1 Introduction

1.1 Objectives

1.1.1 CEVOLVER

The CEVOLVER objectives have been presented in the project first deliverable D1.1. This project aims at meeting the expectations of the user with respect to usability, improving the user's confidence in adopting electric vehicles by introducing enhanced connectivity functionalities, improved energy efficiency and at the same time ensuring affordability. To achieve these objectives a user centric approach is adopted in the development of electric vehicles. This approach places the vehicle user and his needs at the centre of the development process with respect to use of electric vehicles. The development process starts with analysing the users and their needs and ends with 'features' tailored to the needs of the users.

CEVOLVER project aims to introduce novel connectivity features like reliable range prediction, eco-routing, eco-driving, Smart Fast Charging and Assured Charging to improve user confidence and meet the user's performance expectations. In addition, cost efficient solutions are targeted by optimizing the vehicle architecture and right sizing of the components to ensure affordability.

In this project, it is planned to demonstrate the long drive trip capability that can be achieved by electric vehicles with the various connected services without further increasing the battery capacity and at the same time within acceptable time limits. When a charging stop is required to complete the long distance trip, the connected services will take this into consideration while planning the route, book the charging station in advance and also condition the vehicle before reaching the charging station in such a way that fast charging is actually possible. This also applies to logistics that may cover significant distance in a day with interim stops. In this case, the charging stops can be planned along with the drivers preferred break (eg. for lunch) during the day saving time.

1.1.2 Current task and Deliverables T1.4 / D1.4

The major objective of T1.4 is to develop brand-independent stakeholder requirements and system level requirements. Furthermore, system level requirements are analysed and decomposed and support the development of a functional architecture. In addition, key-performance-indicators (KPI) for evaluating the outcome of the CEVOLVER project are also defined within this task and are submitted as a separate output. These KPI's would serve as a criterion for defining the test cases in WP6.

1.2 Interfaces and interactions within the project

The stakeholder and system level requirements are defined based on the user[1] centric development approach and take into consideration the analysis of the use cases defined in T1.3. System engineering process described in T1.1 is also followed. The functional architecture will initially be implemented in the simulation environment in Work Package 2 and ultimately be ported to the target demonstrators planned in work packages 3, 4 and 5, wherever possible. In addition, OEM specific requirements will be defined in these work packages. The KPIs defined in T1.4 will be used as the criteria in WP6, where the test cases are defined and established.

[1] User here includes not only the end user, but also other stakeholders.

2 Methodology for Function Development

2.1 Function Development Workflow for CEVOLVER

For the function development process, a system engineering process and a user centric development approach as defined and established in the previous tasks T1.1 and T1.3 were followed. The function development process in CEVOLVER follows a parallel approach as shown in Figure 1 with the right side depicting the Systems Engineering approach and the left side depicting the user-centric approach.

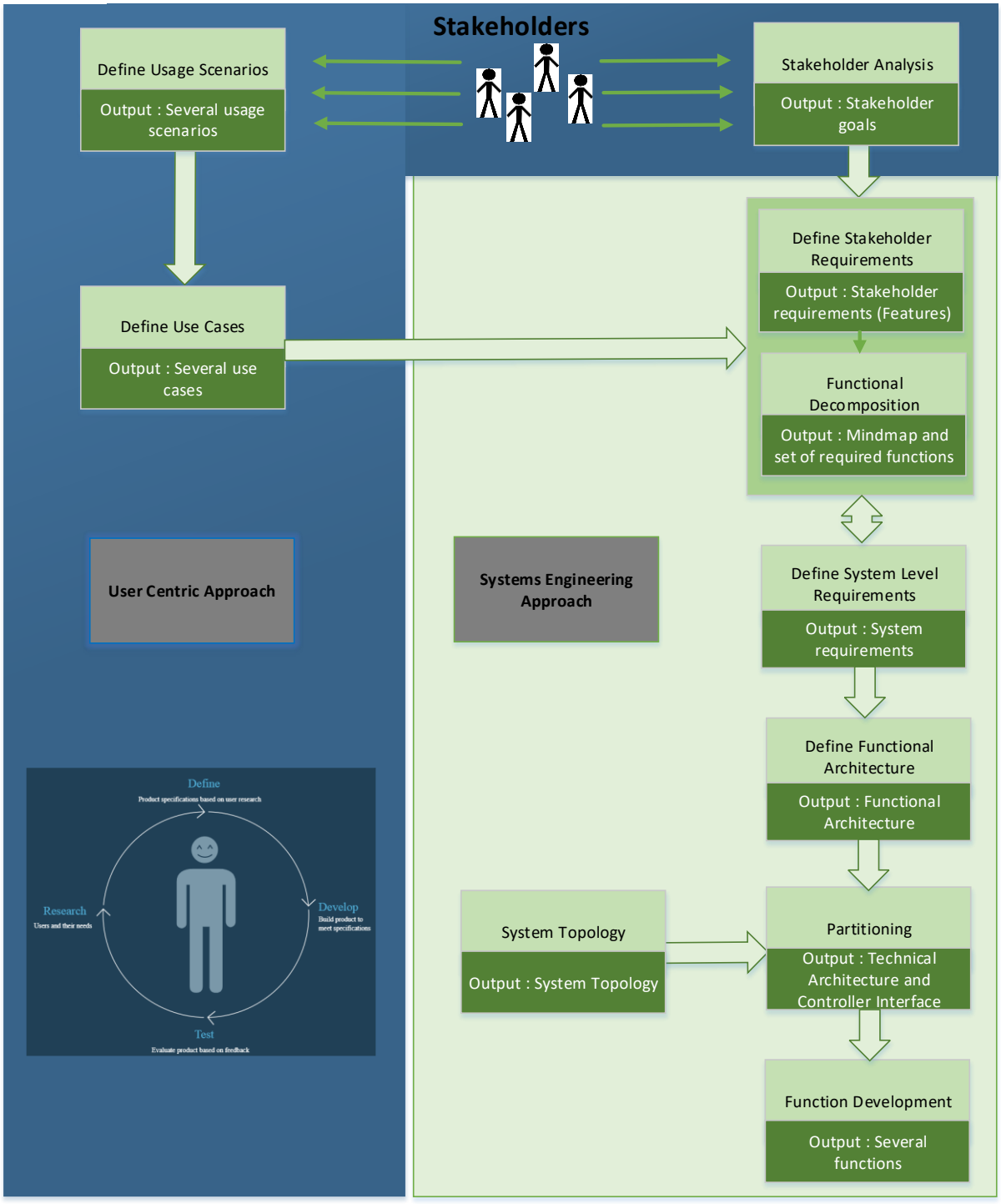

Figure 1: Function Development Workflow

Both the approaches begin at the stakeholder/user level. In the user-centric approach, typical **usage scenarios** were analysed using the fleet data from different vehicle classes. These usage scenarios were

broken down and defined as several **use cases** to describe the interactions between the user, system and environment to achieve the goals as defined in the usage scenarios. The procedure and outcome of this activity is described in detail in D1.3.

Parallel to this activity, the systems engineering approach starts with the **Stakeholder Analysis** which consists of analysing the needs, goals, expectations and desires of the **stakeholders**. For example, a driver (**stakeholder**) would have a need or an expectation to have a shorter charging time (**stakeholder analysis**) in order to arrive at the destination earlier (**stakeholder goal**). The stakeholder analysis activity would result in a list of stakeholder goals which may contain vague and ambiguous statements like "*deliver all the packages on time, pick up all the children and drive them safely, transport all the family safely on time etc*." These statements are then transformed into a clear and concise list of statements (goals) in order to be used as a starting point for system definition. However, these statements are difficult to be used in the Systems Engineering (SE) Activities. In order to enable proper architecture definition and requirement activities, the various stakeholder goals need to be transformed into a more engineering-oriented language. This results in a set of **stakeholder requirements**. For example, the need to shorten the charging time would translate to a set of stakeholder requirements like to optimize the charging stops and charging current profiles, etc. [1].

In CEVOLVER project, each stakeholder requirement is provided in the form of a **feature** as an end product to the stakeholder. Examples of already existing features are the "Engine start-stop, Cruise control, etc."

Stakeholder requirements, together with the detailed defined use cases from T1.3 both serve as the reference for **functional decomposition**, where the potential **functions** which can fulfill the stakeholder requirements and satisfy the goals of the usage scenarios are brainstormed. This activity results in a set of required functions also represented graphically as a mind map. This mind map supports the development of the **functional architecture**, where the logical functions are further described with their interactions between each other (a function generates a result. It requires an input and can gather information in order to do this.

The **system level requirements** are defined as a set of requirements at the system level that the system satisfies the stakeholder's requirements. These are expressed in technical language that is useful for the architecture and design [2]. The functions in the functional architecture are allocated to the optimum control units or servers, according the to the **system topology** from T1.1 with the **partitioning** activity, and the individual choice of different OEMs. Once the allocation of the functions is confirmed, the **technical architecture** can be confirmed, together with the **interface** of different control units and servers. All of the above-mentioned information serves as input for the **function development** activity.

This report focuses on the derivation of the stakeholder and system level requirements.

2.2 Stakeholder Analysis and Stakeholder Requirements

2.2.1 Stakeholder Analysis

CEVOLVER project aims to make the EV's more acceptable in spite of their known shortcomings (high battery cost, range anxiety, etc.), and thus support wide market uptake. This is planned to be achieved by:

i) Optimization of effective operating range while battery size is reduced.
ii) Increasing affordability (by tackling cost drivers such as large batteries)
iii) Convenient charging times also suited to accommodate longer trips

From the stakeholder and usage scenarios analysis, the various stakeholder needs were collected and expressed as a clear and concise list of stakeholder goals which was used as a starting point for system definition. These goals are defined below.

i) Reliable range prediction - The limited range of EVs result in perceived range anxiety for the stakeholders [3]. Reliable range prediction gives us more flexibility in planning the trip and

choosing charging stations in a more efficient manner as we know exactly how far we can actually go with the available energy on board.

ii) Maintaining enough long-distance driving capability and affordability at the same time – The cost of EVs can be reduced by reducing the battery size. However, this would compromise the distance that can be driven without charging. In order to reduce the battery costs and at the same time maintain enough long-distance capabilities energy efficient eco-features (including energy efficient route planning), smart thermal management, smart fast charging and assured charging features are explored. Driving energy efficiently can be achieved by optimizing the speed profile. Further, the advancements in the connectivity technology and the computational capabilities in the cloud can be exploited to plan an energy efficient route beforehand, resulting in improved range. Additionally, the route planning can also plan the charging stops in an optimized way based on the driver preference for breaks during a long-distance trip. The future predictive information with respect to vehicle speed and route can also be used for optimizing the thermal management for better efficiencies.

iii) Reduced charging times – This can be achieved by optimizing the charging pattern and ensuring the availability of charging stations before the arrival at the charging station for charging. The charging pattern can be optimized by making use of the available predictive route information, driving characteristics, battery system and fast charging infrastructure data to pretreat the on-board systems for optimized fast charging. For example, the thermal management system can pre-condition the battery to optimize the battery temperature to ensure fast charging at maximum power for longer durations thus reducing charging time. Also, the cloud-based infrastructure services and maps can be used to check the availability of charging slots and pre-book a charging slot to ensure no time is lost waiting for a slot.

The summarization of the stakeholder analysis is shown in **Error! Reference source not found.**.

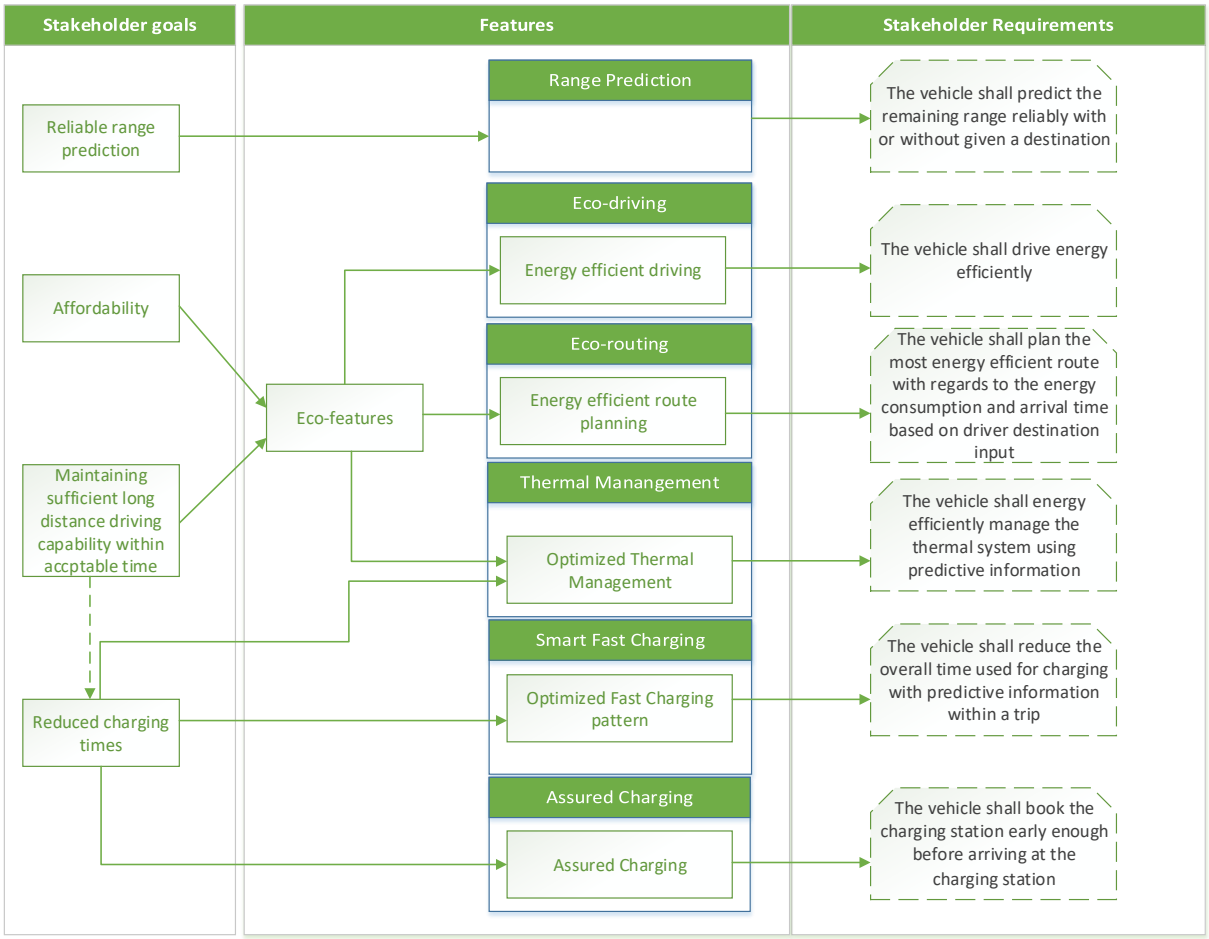

Figure 2 : Stakeholder Analysis for CEVOLVER Project

2.2.2 Stakeholder Requirements

Based on the Stakeholder analysis, a set of stakeholder requirements were identified. Several features were planned to be introduced to meet the needs, expectations and goals of the stakeholders as listed below.

i) Eco-driving - The vehicle shall drive energy efficiently
ii) Eco-routing - The vehicle shall plan the most energy efficient route with regards to the energy consumption and arrival time based on driver destination input
iii) Smart Fast Charging - The vehicle shall reduce the overall time used for charging with predictive information within a trip
iv) Thermal Management - The vehicle shall energy efficiently manage the thermal system using predictive information
v) Range prediction - The vehicle shall predict the remaining range reliably with or without given a destination
vi) Assured Charging - The vehicle shall book the charging station early enough before arriving at the charging station

The stakeholder requirements are attached in Appendix B.

2.3 System Level Requirements

Based on the stakeholder requirements, each System-of-Interest (SoI) needs to be described in detail to satisfy the identified stakeholder needs. This includes defining all the requirements at the system level that

best describes the functionality which the system as a whole should fulfil in order to fulfil the stakeholder requirements [4]. The system level requirement shall have bi-directional traceability to the stakeholder requirement. In addition, the use cases which are defined in T1.3 are cross checked with the system level requirements, to ensure the completeness of the requirement definition.

The system level requirements are attached in Appendix C.

2.4 Functional Decomposition and Functional Architecture

In order to proceed with the development of SoI that satisfy the stakeholder requirements, it is essential to know what the system is supposed to do, to what extent and what are the constraints limiting its functionality [5]. To achieve this, stakeholder requirements are analyzed in functional decomposition to derive a list of function. The list for function is interactively maintained by the system level requirement definition, to ensure that all the system level requirements can be covered.

As an example, a few functions and the system level requirements these functions need to satisfy are shown below.

Function Title	Function	System Level Requirements
CFR_SpeedAdvisory	Generate advice to driver	the system shall give the driver advised speed set point according to the optimized speed profile via HMI
CFR_SpeedLimitFusion	Compute the vehicle's physical speed limit	the system shall consider the speed limit caused by the following influence: speed limit shield road topology traffic, traffic light preceding vehicle minimum speed of the road
CFR_ArrivalTimeUpdate	Compute optimal energy trajectory given applied constraints	the system shall calculate and update the arrival time to the destination after each triggering of the routing function
CFR_RouteChargerLocate		the system shall locate and select the potential charging stations along the route when planning the trip
CFR_RouteChargeStop		the system shall plan the charging stops in an optimized way, and include the charging stations in the route planning
CFR_RouteEconomic		the system shall determine the optimum route from the actual position of the vehicle to a given destination, via the specified POIs, considering the tradeoff between overall energy consumption and arrival time
CFR_TargetSOC		the system shall define the target SOC of the HV battery before the charging event
CFR_SocChargerArrival		the system shall plan a charging stop before the SoC reaches a specified minimum number
CFR_targetEndSoc		the system shall consider the target SOC when planning the route
CFR_ChargerFree		The system shall consider the availability of free charging systems from the booking system while selecting the route

Table 1: List of functions and corresponding system level requirements

Since the major features of CEVOLVER project were defined in the beginning of the project, a mind-map based functional decomposition was also started in an earlier stage in T1.1.

The functional decomposition activity results in various functions that would interact with each other to realize the stakeholder requirements. A functional architecture defines how the various functions and sub-functions operate together and transforms a set of inputs flows into output flows in order to fulfil the stakeholder requirements. A general version of the functional architecture is shown in Figure 3. Due to confidentiality concerns, the detailed defined functional architecture is not included in this public report.

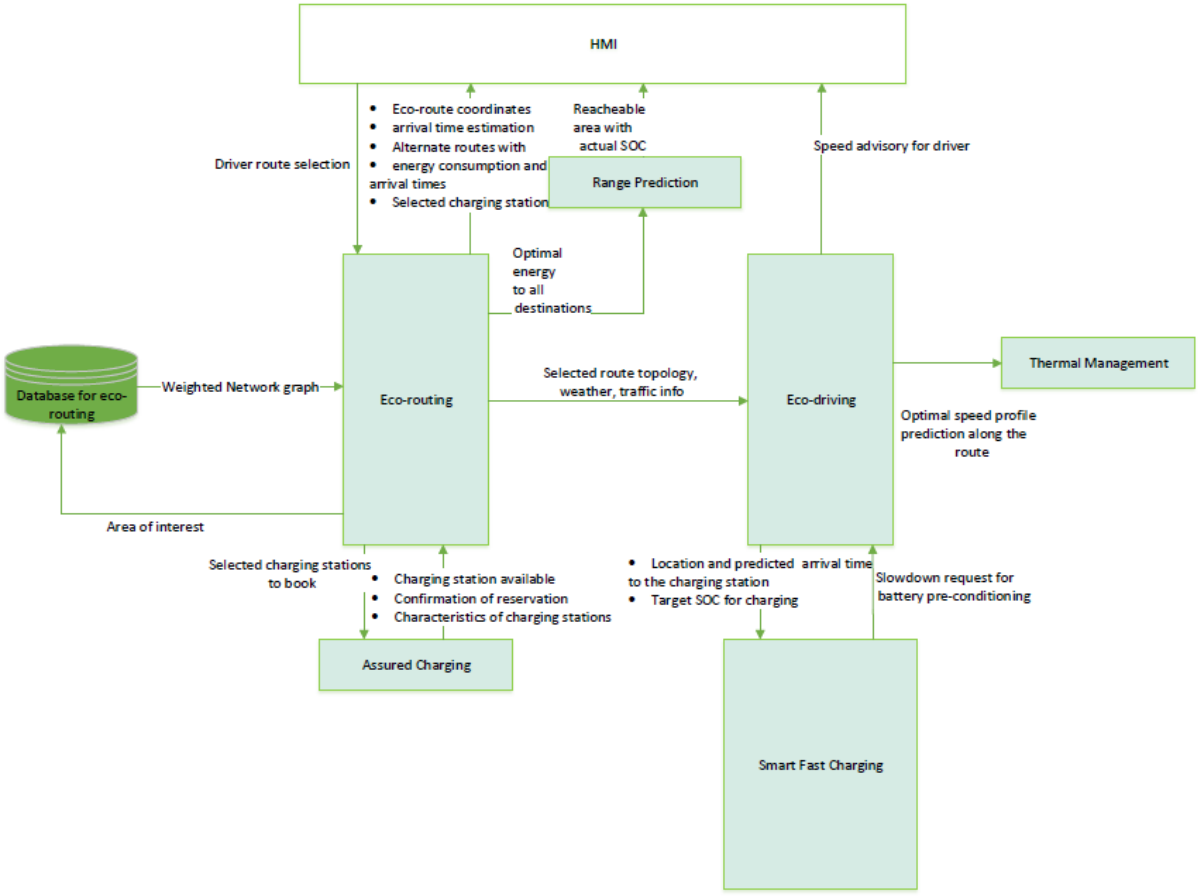

Figure 3: Schematic overview of Functional Architecture

2.5 VCU to Cloud Interface

Communication between VCU-side and cloud-side will be facilitated by a Connectivity Module (CM).

The CM covers topics like the actual transfer of contents (payloads) between the two sides, but also encryption, authorization, authentication, handling package loss or connectivity issues and choosing the transfer protocol. The specific requirements of the CM (e.g. timeouts or latency) need to be defined by as part of the project.
In the end, any CM that fulfills those requirements can be "plugged in" between the software components of VCU and cloud (probably using an adapter on both sides to connect to the specific CM) – it is even possible for different companies to use different CMs or their own.

Apart from the communication, the development of the functional software (e.g. eco-routing) has several advantages:

- Functionality is decoupled from infrastructure and thus allows for a quicker prototyping. First drafts of the prototype can run on a minimal version of the VCU-to-cloud interface as a proof of concept, while possible fully-fledged CMs are being evaluated in parallel.
- The initial development can be completely virtual (local), moving the apps to the target systems as they become available.
- The development of software is completely independent from target systems – the apps don't "mind", whether they are run on a company internal or external cloud if the CM is also present and takes care of the connection to the VCU.
- If multiple apps are being developed, they can all use the same CM. This avoids having to develop the communication (and authorization, authentication, encryption, etc.) repeatedly, making the overall system less error prone.
- The CM does not unpack or parse the payload, nor does it need any content of the payload to route the messages between the two sides of the same app. This means, that each app can use its own specific data structure for communication while still using the same CM.

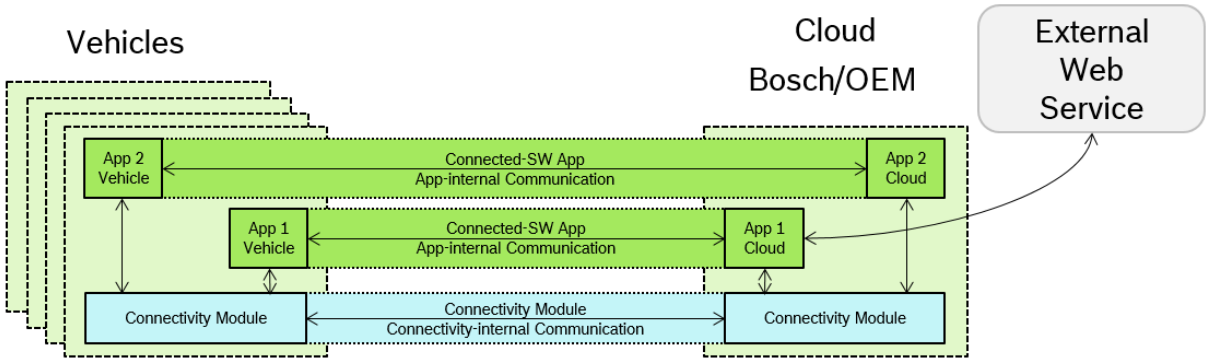

Figure 4 Vehicle-to-Cloud communication

Figure 4 shows the communication paths between VCU and cloud. In this example, two different apps (App1, App2) are running on the same vehicle. Both send their payloads to the CM on vehicle side, which sends it to the CM on cloud side (as shown by the light blue bar "connectivity-internal communication"). As the last step, the CM sends the payload to the correct app on cloud side. The apps themselves practically interact by an app-internal communication (as shown by the green bar "app-internal communication"). The apps use the CM as a means to communicate, much like an internal utility covering the transport layer.

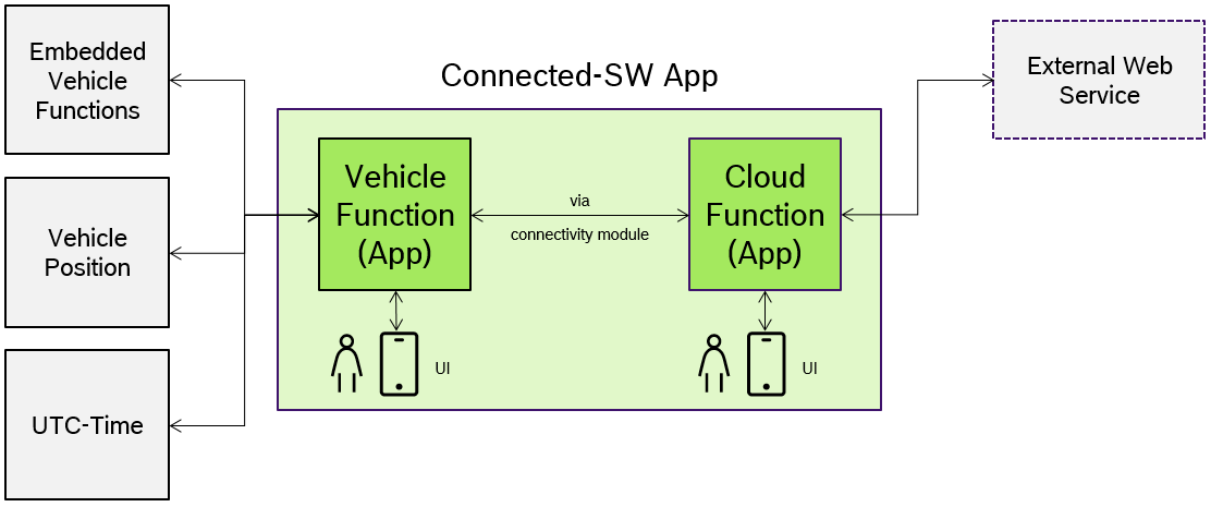

Figure 5 Connected-SW App

*Figure 5*5 shows the holistic view of the connected-SW App. The vehicle function and the cloud function together form the whole product. The vehicle side app can access the embedded vehicle functions (like sensor data, vehicle position or utc-time), while the cloud side app can access external web services. Both sides are accessible for an external user interface (UI).

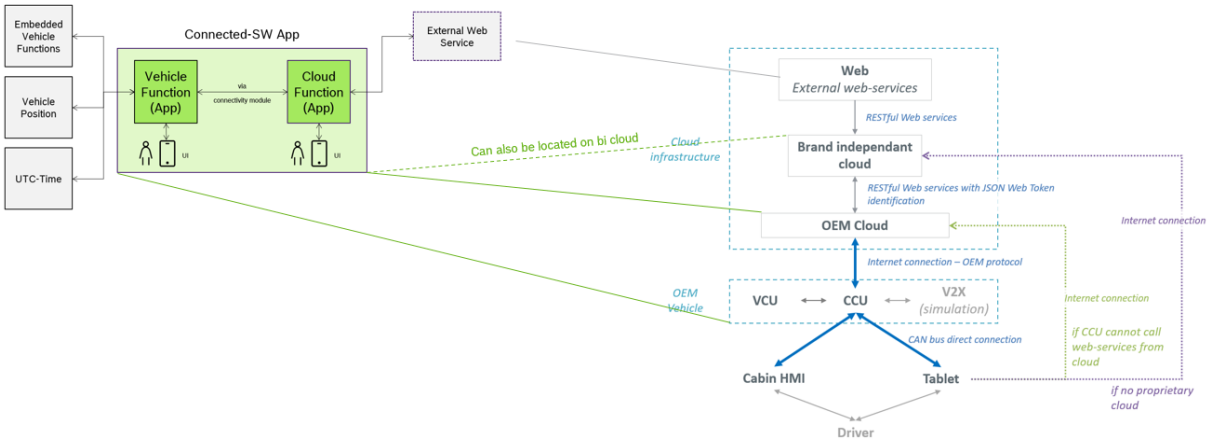

Figure 6 Mapping of Connected-SW App to infrastructure model

*Figure 6*6 shows the mapping of *Figure 5* to the infrastructure planned in D1.2. The connected-SW App spans from the OEM vehicle to the cloud. The cloud function can run on an OEM Cloud or a brand independent cloud – as long as the connectivity module is present on the target cloud.
The advantage of this approach is the independence from any target systems (backend ecosystem).

3 Summary

This report D1.4 covers the key outputs from Task 1.4 of the CEVOLVER project. This includes deriving brand-independent (or general) stakeholder requirements and system level requirements. Additionally, the VCU-to-cloud interfaces are also further detailed from the initial proposal in D1.2.

A system engineering process and user-centric development approach as mentioned in the previous report D1.1 are followed in the function development activity. The stakeholder requirements are gathered from the stakeholder analysis. This along with the various use cases defined in report D1.3 serve as inputs, to obtain the system level requirements. Parallel to the activity of requirements definition, a functional decomposition activity is performed to identify the functional architecture for realizing the control features. Functional architecture and the system level requirement are cross linked and checked, to ensure the completeness.

The brand independent requirements and functional architecture derived from this task will be realized with function development activities in WP 3, 4, and 5, where brand specific requirement will be additionally taken into consideration.

4 Risk register

Risk No.	What is the risk	Probability of risk occurrence[2]	Effect of risk[3]	Solutions to overcome the risk
WP1.4	Currently, there are very few charging stations that provide booking information. This would be essential for implementation of Assured Charging	1	1	Assume that all available charging stations can be booked
WP1.4	The maximum charging capacity of the charging station would go down based on the number of vehicles that would be charging simultaneously. This data may not be always available.	1	1	Assume that maximum charge capacity is available always
WP1.4	Function implementation might take place at multiple spots and quality of interface at this moment is still on going.	1	1	Quality of interface and functional architecture to be iterated in multiple loops based on simulation results
WP1.4	KPI's are defined in WP1.4 based on assumptions and outcomes of other H2020 projects. However, simulation models are not available at D1.4 timing. More representative target values will be available after simulation.	2	2	KPI's will be updated after simulation results are available.
WP1/WP2	Functional architecture (FA) has to be developed somewhere between WP1 and WP2 but hasn't been clearly specified. However, to develop the FA is an important task as an input for following WP's	1	1	Budget shift to WP 2 in order to cover the FA development activities.

[2] Probability risk will occur: 1 = high, 2 = medium, 3 = Low

[3] Effect when risk occurs: 1 = high, 2 = medium, 3 = Low

5 References

[1] IEEE Computer Society, International Council on Systems Engineering, Systems Engineering Research Center, (SERC, Stevens Institute of Technology), *https://www.sebokwiki.org/wiki/Stakeholder_Needs_and_Requirements,* 2019.

[2] IEEE Computer Society, International Council on Systems Engineering, Systems Engineering Research Center, (SERC, Stevens Institute of Technology), *https://www.sebokwiki.org/wiki/System_Requirements,* 2019.

[3] IEA, "Global EV Outlook 2017, Beyond one million electric cars," 2017. [Online]. Available: https://www.iea.org/publications/freepublications/publication/GlobalEVOutlook2017.pdf.

[4] R. Cloutier, "https://sebokwiki.org/wiki/System_Requirement_(glossary)," 1 June 2019. [Online].

[5] D. A. UNIVERSITY, Systems Engineering Fundamentals, Virginia: DEFENSE ACQUISITION UNIVERSITY PRESS, 2001.

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Project partners:

#	Partner	Partner Full Name
1	FEV	FEV Europe GmbH
2	BOSCH	Robert Bosch GmbH
3	FORD	Ford-Werke GmbH
5	IFPEN	IFP Energies Nouvelles
6	RWTH	Rheinish-Westfaelische Technische Hochschule Aachen
7	VUB	Vrije Universiteit Brussel
8	UNR	Uniresearch BV
9	I2M	I2M Unternehmensentwicklung GmbH
10	RBOS	Robert Bosch AG
11	CRF	Centre Richerche Fiat

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7 Appendix B – Stakeholder Requirements

7.1 SHR_RangePrediction

Requirement ID:	REQ_000021	**Created on:**	06.08.2019
Version:	0.3	**Created by:**	Ye, Ziqi
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Derived Requirement(s):			
KPI_DrivingRangeAccuracy, CFR_RangeCalculation, CFR_ReachDestination, CFR_RangeCircle, CFR_RangeNumber, CFR_SOCCalculation, CFR_RangeNumberCyclic, CFR_FleetData, CFR_Weather, CFR_GetTargetSOC, CFR_RouteEnergyPredict			
Change Request(s):			

Requirement Description:

The vehicle shall predict the remaining range with or without given a destination

7.2 SHR_EcoDriving

Requirement ID:	REQ_000017	**Created on:**	06.08.2019
Version:	0.3	**Created by:**	Ye, Ziqi
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Derived Requirement(s):			
KPI_EcoDrivingHighwaySaving, KPI_EcoDrivingCitySaving, CFR_OptimumSpeedComputation, CFR_ComfortAdvisory, CFR_EcoDrivingCyclic, CFR_SpeedLimitFusion, CFR_SpeedAdvisory, CFR_ACC, KPI_LongDistanceDemo			
Change Request(s):			

Requirement Description:

The vehicle shall drive with an optimized speed profile with regard to travel time and energy consumption.

7.3 SHR_EcoRouting

Requirement ID:	REQ_000018	**Created on:**	06.08.2019
Version:	0.3	**Created by:**	Ye, Ziqi
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Derived Requirement(s):			
KPI_ArrivalTimeAccuracy, KPI_EcoRoutingSaving, CFR_ArrivalTimePriority, CFR_RouteEnergyAC, CFR_RouteWeight, CFR_RoutePreference, CFR_RouteChargerLocate, CFR_RouteChargeStop, CFR_RerouteNoCharger, CFR_RoadTopology, CFR_targetEndSoc, CFR_ChargerFree, CFR_ChargingStatusMonitoring, CFR_LunchBreakCharge, CFR_WeightChangeUpdate, CFR_SocChargerArrival, CFR_UserChargerSelection, CFR_AvailableCharger, CFR_RouteDisplayOverview, CFR_DestinationPoiInput, CFR_RouteSelection, CFR_RouteOptions, CFR_InitializeRouting, CFR_nPassengers, CFR_Weather, CFR_RerouteOffroute, CFR_ArrivalTimeUpdate, CFR_ChargerCompatible, CFR_TargetSOC, CFR_RouteEconomic, CFR_RerouteCycle, CFR_RerouteChange, CFR_RouteEnergyPredict, CFR_RouteTraffic, CFR_RouteHistory, KPI_LongDistanceDemo			
Change Request(s):			

Requirement Description:

The vehicle shall plan the optimum route with regard to the energy consumption and arrival time based on driver destination input

7.4 SHR_ThermalManagement

Requirement ID:	REQ_000020	**Created on:**	06.08.2019
Version:	0.3	**Created by:**	Ye, Ziqi
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Derived Requirement(s):			
KPI_RangeImprovementLowTemp, CFR_ThermalAdjust, CFR_CabinDehumid, CFR_TemperatureControlPassenger, CFR_TemperatureControlComponents, CFR_OfflineThermal, CFR_ThermalTempLeave, CFR_PredictedInfo, CFR_HeatLoss, CFR_CabinTemp, CFR_PowerAdjust, CFR_RouteEnergyPredict, KPI_LongDistanceDemo			
Change Request(s):			

Requirement Description:

The vehicle shall manage the thermal system using predictive information

7.5 SHR_SmartFastCharging

Requirement ID:	REQ_000019	**Created on:**	06.08.2019
Version:	0.3	**Created by:**	Ye, Ziqi
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Derived Requirement(s):			
CFR_ChargingTime, CFR_ThermalAdjust, CFR_ChargingCurrentProfile, CFR_UserChargingExtension, CFR_CtrlBatTempCharging, CFR_IncEgy, CFR_ChargingTermination, CFR_ChargerInfo, CFR_BatteryAging, CFR_BatteryAgingState, CFR_PowerAdjust, KPI_LongDistanceDemo			
Change Request(s):			

Requirement Description:

The vehicle shall reduce the overall time used for charging with predictive information of the trip

7.6 SHR_AssuredCharging (optional)

Requirement ID:	REQ_000022	**Created on:**	06.08.2019
Version:	0.3	**Created by:**	Ye, Ziqi
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Derived Requirement(s):			
CFR_RerouteNoCharger, CFR_RouteChargerInfoPlan, CFR_ChargerCompatible, CFR_ChargerBookingConfirmation, CFR_ChargingStationDetails, CFR_CurrentLocation, CFR_RouteChargerInfo, CFR_ChargerBooking			
Change Request(s):			

Requirement Description:

The vehicle shall book the charging station early enough before arriving at the charging station

8 Appendix C – System Level Requirements

8.1 CFR_ACC

Requirement ID: **Version:**	REQ_000027 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	13.08.2019 Scholl, Tobias 13.08.2019 Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_EcoDriving			
Change Request(s):			

Requirement Description:

The system shall realize the speed set point with ACC function (optional)

8.2 CFR_ArrivalTimePriority

Requirement ID: **Version:**	REQ_000025 0.3	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	13.08.2019 Scholl, Tobias 21.10.2019 Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

When the SOC is sufficient to reach the planned charging station, the system shall consider arrival time request with higher priority than the energy consumption

8.3 CFR_ArrivalTimeUpdate

Requirement ID:	REQ_000046	**Created on:**	13.08.2019
Version:	0.2	**Created by:**	Scholl, Tobias
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall calculate and update the arrival time to the destination after each triggering of the routing function

8.4 CFR_AvailableCharger

Requirement ID:	REQ_000090	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall show the available charging stations along the route, even if they are not selected by the routing function

8.5 CFR_BatteryAging

Requirement ID: **Version:**	REQ_000029 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	13.08.2019 Scholl, Tobias 13.08.2019 Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_SmartFastCharging			
Change Request(s):			

Requirement Description:

the system shall consider reducing HV battery aging while charging

8.6 CFR_BatteryAgingState

Requirement ID: **Version:**	REQ_000030 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	13.08.2019 Scholl, Tobias 13.08.2019 Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_SmartFastCharging			
Change Request(s):			

Requirement Description:

the system shall monitor HV battery aging status

8.7 CFR_CabinDehumid

Requirement ID: **Version:**	REQ_000060 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	13.08.2019 Scholl, Tobias 13.08.2019 Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_ThermalManagement			
Change Request(s):			

Requirement Description:

the system shall dehumidify the cabin

8.8 CFR_CabinTemp

Requirement ID: **Version:**	REQ_000114 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	21.10.2019 Hegener, Reinhold 21.10.2019 Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_ThermalManagement			
Change Request(s):			

Requirement Description:

the system shall heat or cool the cabin

8.9 CFR_CabinTemperaturePrecondition

Requirement ID:	REQ_000096	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
Change Request(s):			

Requirement Description:

the system shall use the energy from the charger to pre-condition the cabin and components temperature to a specific temperature at certain time before the charging process is ended.

8.10 CFR_ChargerBooking

Requirement ID:	REQ_000062	**Created on:**	14.08.2019
Version:	0.3	**Created by:**	Scholl, Tobias
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_AssuredCharging (optional)			
Change Request(s):			

Requirement Description:

after deciding the charging point, the system shall book and pay for (in case required) the planned charging station with the information of:
estimated arrival time to the charging station
estimated charging time
required charging power
required energy

8.11 CFR_ChargerBookingConfirmation

Requirement ID:	REQ_000098	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_AssuredCharging (optional)			
Change Request(s):			

Requirement Description:

the system shall receive from the booked charging station a confirmation, if the booking was successful

8.12 CFR_ChargerCompatible

Requirement ID:	REQ_000034	**Created on:**	13.08.2019
Version:	0.3	**Created by:**	Scholl, Tobias
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_AssuredCharging (optional), SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall only provide the information of the chargers which are compatible to the vehicle, to the routing function

8.13 CFR_ChargerFree

Requirement ID: **Version:**	REQ_000120 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	21.10.2019 Hegener, Reinhold 21.10.2019 Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

The system shall consider the availability of free charging systems from the booking system while selecting the route

8.14 CFR_ChargerInfo

Requirement ID: **Version:**	REQ_000028 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	13.08.2019 Scholl, Tobias 13.08.2019 Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_SmartFastCharging			
Change Request(s):			

Requirement Description:

the system shall communicate and consider the charger characteristics before a charging event

8.15 CFR_ChargingCurrentProfile

Requirement ID:	REQ_000033	**Created on:**	13.08.2019
Version:	0.3	**Created by:**	Scholl, Tobias
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_SmartFastCharging			
Change Request(s):			

Requirement Description:

the system shall determine the charging current profile based on the following factors:
actual SOC
target SOC
target charging time
component constraints
charger characteristics
battery SOH

8.16 CFR_ChargingStationDetails

Requirement ID:	REQ_000113	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_AssuredCharging (optional)			
Change Request(s):			

Requirement Description:

After deciding the charging point, the system shall convey the:
booked charging station GPS
charging characteristics
assumed charging time depending on available power and required energy

8.17 CFR_ChargingStatusMonitoring

Requirement ID:	REQ_000093	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall let the user monitor the charging progress with a hand-held device (e.g. smart phone), and inform the user with a message a certain time (e.g. 5 min) before the charging was ended. There shall be another message to the user when the charging process is ended.

8.18 CFR_ChargingTermination

Requirement ID:	REQ_000095	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_SmartFastCharging			
Change Request(s):			

Requirement Description:

the system shall stop charging when the battery reaches the target SoC, or when the user stops charging manually

8.19 CFR_ChargingTime

Requirement ID: **Version:**	REQ_000031 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	13.08.2019 Scholl, Tobias 13.08.2019 Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_SmartFastCharging			
Change Request(s):			

Requirement Description:

the system shall estimate the charging time according to the target SOC and charger characteristics

8.20 CFR_ComfortAdvisory

Requirement ID: **Version:**	REQ_000119 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	21.10.2019 Hegener, Reinhold 21.10.2019 Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoDriving			
Change Request(s):			

Requirement Description:

the system shall give the driver cabin comfort advices according to the optimized speed profile via HMI

8.21 CFR_CtrlBatTempCharging

Requirement ID: **Version:**	REQ_000118 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	21.10.2019 Hegener, Reinhold 21.10.2019 Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_SmartFastCharging			
Change Request(s):			

Requirement Description:

the system shall adjust the battery temperature while charging

8.22 CFR_CurrentLocation

Requirement ID: **Version:**	REQ_000112 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	21.10.2019 Hegener, Reinhold 21.10.2019 Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_AssuredCharging (optional)			
Change Request(s):			

Requirement Description:

The system shall transmit the current GPS position while communicating with Assured Charging

8.23 CFR_DestinationPoiInput

Requirement ID:	REQ_000097	**Created on:**	21.10.2019
Version:	0.3	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall let the driver to input the overall trip timing, destination and a specific number (e.g. 5) of POI as stopping points before reaching the destination

8.24 CFR_EcoDrivingCyclic

Requirement ID:	REQ_000101	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoDriving			
Change Request(s):			

Requirement Description:

the systems shall trigger the speed optimization in a cyclic manner, and triggered by events such as traffic situation change

8.25 CFR_FleetData

Requirement ID:	REQ_000111	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_RangePrediction			
Change Request(s):			

Requirement Description:

The system shall use the fleet data to correct the energy consumption estimation to predict the range

8.26 CFR_GetTargetSOC

Requirement ID:	REQ_000051	**Created on:**	13.08.2019
Version:	0.2	**Created by:**	Scholl, Tobias
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_RangePrediction			
Change Request(s):			

Requirement Description:

the system shall get the target SoC from the passenger input, or use the physical minimum SoC by default driving range prediction

8.27 CFR_HeatLoss

Requirement ID:	REQ_000115	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_ThermalManagement			
Change Request(s):			

Requirement Description:

the system should reduce the losses by transporting heat from pump coolant and control valves

8.28 CFR_IncEgy

Requirement ID:	REQ_000117	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_SmartFastCharging			
Change Request(s):			

Requirement Description:

The system shall increase the energy in the battery

8.29 CFR_InitializeRouting

Requirement ID: **Version:**	REQ_000085 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	21.10.2019 Hegener, Reinhold 21.10.2019 Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall initialize the eco-routing function after user inputs the destination

8.30 CFR_LunchBreakCharge

Requirement ID: **Version:**	REQ_000105 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	21.10.2019 Hegener, Reinhold 21.10.2019 Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

During the route planning, the system shall consider a longer charging activity at around lunch time, after confirmation from the user, that a lunch break is preferred

8.31 CFR_NaviationView

Requirement ID: **Version:**	REQ_000100 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	21.10.2019 Hegener, Reinhold 21.10.2019 Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
Change Request(s):			

Requirement Description:

while driving, the system shall display beside the navigation view via HMI additional information incl. Remaining range as a number
remaining time and distance till the next charging stop or POI

8.32 CFR_nPassengers

Requirement ID: **Version:**	REQ_000110 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	21.10.2019 Hegener, Reinhold 21.10.2019 Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

The system shall use the data of no of passengers in computing the cabin heating consumption

8.33 CFR_OfflineThermal

Requirement ID: **Version:**	REQ_000106 0.3	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	21.10.2019 Hegener, Reinhold 21.10.2019 Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_ThermalManagement			
Change Request(s):			

Requirement Description:

when connection to the server is lost, the system shall have an offline mode for the thermal control

8.34 CFR_OptimumSpeedComputation

Requirement ID: **Version:**	REQ_000023 0.4	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	06.08.2019 Ye, Ziqi 13.08.2019 Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_EcoDriving			
Change Request(s):			

Requirement Description:

The system shall compute the optimum speed profile with a tradeoff minimization of energy driving energy consumption and target arrival time, based on the following inputs:

Upcoming route
Speed limit along the given route
System and components constraints
Weather information
road type
wind (optional?)
target arrival time
power request from thermal system
actual vehicle weight incl. load

8.35 CFR_PowerAdjust

Requirement ID:	REQ_000036	**Created on:**	13.08.2019
Version:	0.2	**Created by:**	Scholl, Tobias
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_SmartFastCharging, SHR_ThermalManagement			
Change Request(s):			

Requirement Description:

the system shall adjust the power consumption to limit the HV battery temperature before arriving a charging station to start a charging event

8.36 CFR_PredictedInfo

Requirement ID:	REQ_000116	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_ThermalManagement			
Change Request(s):			

Requirement Description:

the system shall acquire the future information like predicted eco-driving energy consumption, no of passengers, weather and charging point information for Thermal Management

8.37 CFR_RangeCalculation

Requirement ID:	REQ_000049	**Created on:**	13.08.2019
Version:	0.2	**Created by:**	Scholl, Tobias
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_RangePrediction			
Change Request(s):			

Requirement Description:

the system shall estimate complete system energy consumption when predicting the driving range

8.38 CFR_RangeCircle

Requirement ID:	REQ_000053	**Created on:**	13.08.2019
Version:	0.2	**Created by:**	Scholl, Tobias
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_RangePrediction			
Change Request(s):			

Requirement Description:

the system shall, in case the destination is not given and triggered by the passenger, show a max. range in form of a circle on the digital map, centered with the current position of the vehicle.

8.39 CFR_RangeCircleCyclic

Requirement ID: **Version:**	REQ_000089 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	21.10.2019 Hegener, Reinhold 21.10.2019 Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
Change Request(s):			

Requirement Description:

the system shall update the range estimation circle by user trigger

8.40 CFR_RangeNumber

Requirement ID: **Version:**	REQ_000054 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	13.08.2019 Scholl, Tobias 13.08.2019 Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_RangePrediction			
Change Request(s):			

Requirement Description:

the system shall, in case the destination is not given, show the max. range as a number

8.41 CFR_RangeNumberCyclic

Requirement ID: **Version:**	REQ_000088 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	21.10.2019 Hegener, Reinhold 21.10.2019 Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_RangePrediction			
Change Request(s):			

Requirement Description:

the system shall update the range estimation number in a cyclic frequency

8.42 CFR_ReachDestination

Requirement ID: **Version:**	REQ_000052 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	13.08.2019 Scholl, Tobias 13.08.2019 Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_RangePrediction			
Change Request(s):			

Requirement Description:

the system shall indicate whether or not it is possible to reach the given destination. And if not, the max. range along the planned route to the given destination

8.43 CFR_RerouteChange

Requirement ID: **Version:**	REQ_000045 0.3	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	13.08.2019 Scholl, Tobias 21.10.2019 Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall immediately trigger the routing function after detecting that a significant boundary condition change, such as traffic jam and inform the user via HMI

8.44 CFR_RerouteCycle

Requirement ID: **Version:**	REQ_000043 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	13.08.2019 Scholl, Tobias 13.08.2019 Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall cyclically trigger the routing function with a calibratable frequency after the destination is input

8.45 CFR_RerouteNoCharger

Requirement ID:	REQ_000057	**Created on:**	13.08.2019
Version:	0.3	**Created by:**	Scholl, Tobias
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting, SHR_AssuredCharging (optional)			
Change Request(s):			

Requirement Description:

the system shall trigger the routing function when charging station is not available and inform the user via HMI

8.46 CFR_RerouteOffroute

Requirement ID:	REQ_000044	**Created on:**	13.08.2019
Version:	0.2	**Created by:**	Scholl, Tobias
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall immediately trigger the routing function after detecting that the vehicle is not on the planned route

8.47 CFR_RoadTopology

Requirement ID:	REQ_000108	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

The system shall acquire the road network topology from the cloud

8.48 CFR_RouteChargerInfo

Requirement ID:	REQ_000055	**Created on:**	13.08.2019
Version:	0.3	**Created by:**	Scholl, Tobias
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_AssuredCharging (optional)			
Change Request(s):			

Requirement Description:

the system shall receive info from the potential charging station when planning the route. Received info shall include:
availability by arrival
power level
charging type
price
connector type
ambient conditions

8.49 CFR_RouteChargerInfoPlan

Requirement ID: **Version:**	REQ_000056 0.3	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	13.08.2019 Scholl, Tobias 21.10.2019 Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_AssuredCharging (optional)			
Change Request(s):			

Requirement Description:

the system shall estimate the arrival time to the planned charging station

8.50 CFR_RouteChargerLocate

Requirement ID: **Version:**	REQ_000047 0.3	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	13.08.2019 Scholl, Tobias 21.10.2019 Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall locate the potential charging stations along the route when planning the trip

8.51 CFR_RouteChargeStop

Requirement ID:	REQ_000048	**Created on:**	13.08.2019
Version:	0.2	**Created by:**	Scholl, Tobias
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall plan the charging stops in an optimized way, and include the charging stations in the route planning

8.52 CFR_RouteDisplayOverview

Requirement ID:	REQ_000099	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall display the overview about the selected route via HMI, incl.
Route
charging stops
planed charging time
estimated arrival time
estimated SoC at arrival

8.53 CFR_RouteEconomic

Requirement ID:	REQ_000037	**Created on:**	13.08.2019
Version:	0.3	**Created by:**	Scholl, Tobias
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall determine the optimum route from the actual position of the vehicle to a given destination, via the specified POIs, considering the tradeoff between overall energy consumption and arrival time

8.54 CFR_RouteEnergyAC

Requirement ID:	REQ_000041	**Created on:**	13.08.2019
Version:	0.2	**Created by:**	Scholl, Tobias
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall consider the overall energy for cabin temperature conditioning when selecting the route

8.55 CFR_RouteEnergyPredict

Requirement ID:	REQ_000061	**Created on:**	13.08.2019
Version:	0.2	**Created by:**	Scholl, Tobias
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_ThermalManagement, SHR_EcoRouting, SHR_RangePrediction			
Change Request(s):			

Requirement Description:

the system shall predict the future energy demand along the selected route for eco-routing and range prediction

8.56 CFR_RouteHistory

Requirement ID:	REQ_000039	**Created on:**	13.08.2019
Version:	0.2	**Created by:**	Scholl, Tobias
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall consider historical driving profile when selecting the route

8.57 CFR_RouteOptions

Requirement ID:	REQ_000086	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall generate a few optional routes via HMI, and indicates the energy consumption and arrival time.

8.58 CFR_RoutePreference

Requirement ID:	REQ_000042	**Created on:**	13.08.2019
Version:	0.2	**Created by:**	Scholl, Tobias
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall consider the user preferences when selecting the route

8.59 CFR_RouteSelection

Requirement ID: **Version:**	REQ_000087 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	21.10.2019 Hegener, Reinhold 21.10.2019 Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall execute the route which the user selects from the options

8.60 CFR_RouteTraffic

Requirement ID: **Version:**	REQ_000038 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	13.08.2019 Scholl, Tobias 13.08.2019 Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall consider the traffic situation when selecting the route

8.61 CFR_RouteWeight

Requirement ID:	REQ_000040	**Created on:**	13.08.2019
Version:	0.2	**Created by:**	Scholl, Tobias
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall consider the change of actual vehicle weight / load along the route when selecting the route

8.62 CFR_ServerConnectionUpdate

Requirement ID:	REQ_000102	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
Change Request(s):			

Requirement Description:

the system shall update the connection between the vehicle and the server in a cyclic manner, in case connection lost, vehicle shall be informed

8.63 CFR_SOCCalculation

Requirement ID:	REQ_000050	**Created on:**	13.08.2019
Version:	0.2	**Created by:**	Scholl, Tobias
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_RangePrediction			
Change Request(s):			

Requirement Description:

the system shall estimate the SoC trajectory according to the actual SoC and the target SoC when predicting the driving range without a charging activity in between

8.64 CFR_SocChargerArrival

Requirement ID:	REQ_000092	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall plan a charging stop before the SoC reaches a specified minimum number

8.65 CFR_SpeedAdvisory

Requirement ID:	REQ_000026	**Created on:**	13.08.2019
Version:	0.2	**Created by:**	Scholl, Tobias
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_EcoDriving			
Change Request(s):			

Requirement Description:

the system shall give the driver adviced speed set point according to the optimized speed profile via HMI

8.66 CFR_SpeedLimitFusion

Requirement ID:	REQ_000024	**Created on:**	13.08.2019
Version:	0.2	**Created by:**	Scholl, Tobias
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_EcoDriving			
Change Request(s):			

Requirement Description:

the system shall consider the speed limit caused by the following influence:
speed limit shield
road topology
traffic
preceding vehicle
minimum speed of the road
traffic light

8.67 CFR_targetEndSoc

Requirement ID: **Version:**	REQ_000107 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	21.10.2019 Hegener, Reinhold 21.10.2019 Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall consider the target SOC when planning the route

8.68 CFR_TargetSOC

Requirement ID: **Version:**	REQ_000032 0.2	**Created on:** **Created by:** **Last Change on:** **Last Change by:**	13.08.2019 Scholl, Tobias 13.08.2019 Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall define the target SOC of the HV battery before the charging event

8.69 CFR_TemperatureControlComponents

Requirement ID:	REQ_000059	**Created on:**	13.08.2019
Version:	0.2	**Created by:**	Scholl, Tobias
		Last Change on:	13.08.2019
		Last Change by:	Scholl, Tobias
Traceability References			
Basic Requirement(s):			
SHR_ThermalManagement			
Change Request(s):			

Requirement Description:

the system shall control the components temperature by means of heating up the components at low temperature and cool down the components at high temperature to ensure overall system efficiency and component temperature range for operation

8.70 CFR_TemperatureControlPassenger

Requirement ID:	REQ_000058	**Created on:**	13.08.2019
Version:	0.3	**Created by:**	Scholl, Tobias
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_ThermalManagement			
Change Request(s):			

Requirement Description:

the system shall control the feeling temperature of the passenger according to
climate setpoint
actual cabin temperature
external ambient temperature
weather information such as wind, solar radiance, rain, ambient temperature

8.71 CFR_ThermalAdjust

Requirement ID:	REQ_000035	**Created on:**	13.08.2019
Version:	0.3	**Created by:**	Scholl, Tobias
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_ThermalManagement, SHR_SmartFastCharging			
Change Request(s):			

Requirement Description:

the system shall monitor and adjust the thermal management to limit the HV battery temperature before arriving a charging station to start a charging event

8.72 CFR_ThermalTempLeave

Requirement ID:	REQ_000103	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_ThermalManagement			
Change Request(s):			

Requirement Description:

FORD specific: the system shall detect the temporary leave of the driver (especially for good delivery) at standing still, and adjust the cabin temperature control in an energy efficient way

8.73 CFR_UserChargerSelection

Requirement ID:	REQ_000091	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

the system shall let the user to specify preferred charging station, if it is not the same as the one selected by the system

8.74 CFR_UserChargingExtension

Requirement ID:	REQ_000094	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_SmartFastCharging			
Change Request(s):			

Requirement Description:

the system shall let the user decide when receiving the message about charging ending, if the user prefers to continue charging after the target SoC (if not 100%) is reached. If yes, increase the target SoC in case the charger will still be available (not booked by others).

8.75 CFR_Weather

Requirement ID:	REQ_000109	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting, SHR_RangePrediction			
Change Request(s):			

Requirement Description:

The system shall consider the weather including the info about solar radiance in computing the cabin heating consumption and estimating the energy consumption to compute range

8.76 CFR_WeightChangeUpdate

Requirement ID:	REQ_000104	**Created on:**	21.10.2019
Version:	0.2	**Created by:**	Hegener, Reinhold
		Last Change on:	21.10.2019
		Last Change by:	Hegener, Reinhold
Traceability References			
Basic Requirement(s):			
SHR_EcoRouting			
Change Request(s):			

Requirement Description:

FORD specific: the system shall detect the change of vehicle weight by analysing parcel delivery status