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CEVOLVER – Deliverable Report

D3.3 - Implementation of basic and advanced functions into component carriers

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Written By	James Girard (RBOS) Stefanie Kopka (RBOS) Engelbert Trunner (RBOS) Patrik Winkler (RBOS) Holger Denz (Robert Bosch GmbH) Dominik Kronenbitter (Robert Bosch GmbH)	2021-01-07 2021-01-07 2021-03-10 2021-03-10 2021-01-07 2021-01-07
Checked by	Roman Hedl (RBOS) Dieter Schwarzmann (Robert Bosch GmbH) Henrick Brandes (Robert Bosch GmbH)	2021-02-15
Reviewed by (if applicable)	Lynzi Menne-Robb (FEV EUROPE GmbH) Dieter Schwarzmann (Robert Bosch GmbH)	2021-03-22
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Publishable summary

This report D3.3 covers the key outputs from task 3.2 of the CEVOLVER project. This task focuses on the implementation of basic and advanced functions into the vehicle control unit.

It is important to note that the delivered software has been partially taken over from existing platform features, and partially newly developed in the framework of the CEVOLVER project. Also, some of the features being developed within the CEVOLVER project are still under development and scheduled to be implemented, as identified in the description of the features.

The software described in this report includes the following: thermal system, drivetrain control functionality, BMS coordination and control in the VCU, fast charging, connectivity to VCU backend server, range prediction, eco driving and itinerary planner.

In the thermal system description, the general control software for the thermal system is described, as well as the implementation of several advanced features as described in task 2.4, including battery preconditioning.

The drivetrain control functionality description gives details of the control algorithms for interpreting propulsion requests from the driver via accelerator pedal, as well as from an adaptive cruise control system. Likewise, the coordination of propulsion relevant limitations and interventions such as from the stability control system are described. In addition, the two different modes for an optimized distribution of the driver requested propulsion over two electrical drive units are supported.

The coordination and control of the BMS in the VCU also considers error handling, ensuring that the battery limits are upheld and coordinated start-up and shutdown of the electrical system and battery, among others.

The section covering fast charging, describes the implemented control of DC and AC charging for the combined charging system (CCS) standard.

Implementation has also been initiated to establish connectivity from the VCU to the backend server. This enables complex, computationally expensive functions such as predictive optimization to be calculated and used on the VCU. The communication here is done via Ethernet.

The range prediction feature describes in detail the determination of a reliable range estimation based on the combination of heuristic and predictive data. This feature is differentiated from the range estimation implemented on the server as part of the eco-routing feature in that it uses real-time data for consumption from the vehicle.

The section on eco driving describes the Bosch eco manoeuvre optimizer, which uses a dynamic programming algorithm to optimize the velocity profile for comfort, travel time and energy consumption while staying within the safety limitations of the system. This feature can also consider the behaviour of a preceding vehicle, i.e. vehicle in front, such that it can provide energy efficiency improvements over a wide range of driving conditions.

The trip itinerary is a newly developed feature that compares the data from the eco routing feature and the actual driving data. The feature determines whether the driver is following the recommended route and itinerary or not. In case the deviation between the data from eco-routing and real date exceeds certain defined limits, the calculation of a new route is triggered.