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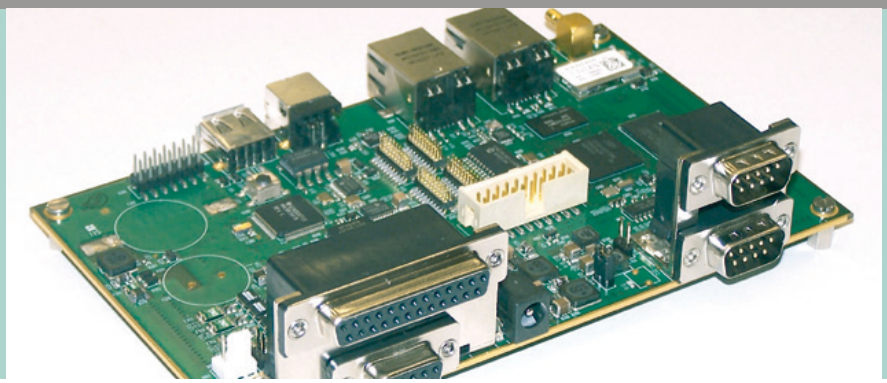

E-CAR COMMUNICATION MANAGER

COMMUNICATION AND CHARGING MANAGEMENT PLATFORM FOR E-MOBILITY APPLICATIONS

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Motivation and Context

To ensure that electric vehicles can function as intelligent components in the future power grid, flexible charging or feedback procedures are necessary. They must be attuned with the time-dependent load on the grid as well as the renewable sources of energy available during the charging process.

ECM – Key features

- Central communication platform for demand side management and billing preparation
- Gateway to coordinate all relevant communication interfaces in different charging scenarios
- Monitoring device for charging cable connection and communication with charging station

Technical Details

- ARM9 processor for all communication links and control processes
- Embedded System based on eCos and Java
- System software complemented by an OSGi framework developed at Fraunhofer IIS and a flash file system
- Interfaces: two Ethernet, Bluetooth, two CAN, charging cable control interface, mobile phone
- 512 MByte Flash, 128MByte low power SDR-SDRAM

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Application: Charging Process

Integration of E-Car Communication Manager into a vehicle environment can support two different charging scenarios:
- Charging using an onboard charger
- By means of an external charging station

The calculation for determining the charging strategy in the vehicle can be carried out on the ECM.

Possible application flow:
- Acquire supply conditions after plugging in the charging cable
- Determine a charging strategy considering the availability requests of the user, terms of energy supply and a simple model of the battery
- Transfer the charging process guidance data to the energy management system
- Revise the charging strategy in case of changed input parameters

Demand Side Management Integrated

Due to safety reasons the actual control of the charging process is handled by the energy/battery management system. The energy flow is also measured and recorded while using the on-board charger. The ECM also functions as a gateway between CAN buses, a Bluetooth interface and an Ethernet port. This establishes communication between the automobile's CAN bus an external charging device, an available in-house demand side management system and a personalized digital assistant like a mobile phone.

The charging strategy is determined based on the time dependent energy supply terms available. This means that the charging strategies are controlled by an incentive driven demand side management. It must be ensured that these energy supply terms communicated to the user are recorded periodically. These supply terms represent a commercially binding offer to the consumer.

Modular Software Architecture

- Easy adaption or transfer of parts of the software to the charging station
- Enables implementation of new regulatory requirements like data signature and encryption
- Reliable safety monitoring of the charging cable due the close functional link with the communication interfaces.Safety-critical functions are implemented on a separate processor so that they can be easily validated.

One Platform – Many Options

All functions necessary for the demand side management and bill process can be provided on the ECM. Also available are communication interfaces for all components required in the vehicle and its surroundings during the charging process.

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