Abstract

In the automotive industry electronic solutions play a significant role nowadays. A modern and high-end car can use up to 150 electronic control units (ECUs). These control units are responsible for implementing various functions, such as entertainment services, emission-related functionalities and safety-critical tasks. The ECUs communicate with one another, and complex, distributed software runs on them. Reliable and autonomous operation is expected from these control units during the use of the vehicles.

To manage complexity, various standards have been created, such as the CAN and FlexRay buses for ensuring reliable communication, the OSEK operation system for real-time task execution and the UDS standard for diagnostic communication.

In 2003 the major participants of the automotive industry have established the AUTomotive Open System ARchitecture (AUTOSAR) consortium. Its goal is to specify an open, standardized software architecture for the automotive industry in order to abstract hardware specifics, thus providing the possibility to develop portable application software.

As part of my thesis, I studied the UDS standard responsible for diagnostic communication. In the thesis, I present the UDS standard and outline the main innovations in the new 2020 version. Additionally, I demonstrate the implementation of diagnostic services in collaboration between application software components and AUTOSAR Basic Software modules. Through an example, I illustrate the communication process that takes place in a vehicle during the request and response of a diagnostic service.

Furthermore, I analysed the innovations introduced in the 2020 version of the UDS standard in details. I chose to implement the new Authentication UDS service, which I considered a challenging and interesting task. I implemented the Authentication service and integrated it into the company's AUTOSAR Basic Software product. Moreover, I verified the operation of the service through module test cases. The steps of the implementation and the test cases created are detailed in the thesis.