

Abstract

Today's modern vehicles have several extended services, which requires the incorporations of more and more electronic control units. In case of safety critical features, it is indispensable to provide reliable communication between the units. To ensure that, the AUTOSAR Layered Software Architecture was developed, which became already basic requirement in the automotive environment for today. It's aim to make the communication unified between units and transparent for the applications running on them.

The FlexRay protocol with its redundancy and high transfer rate is getting the most commonly applied communication protocol of safety critical systems.

My task is to implement two software modules – defined in the AUTOSAR standard – in C programming language. The modules are the FlexRay Interface and the FlexRay ISO Transport Layer.

The first part of my thesis is about the theoretical background of FlexRay and AUTOSAR. In case of AUTOSAR I pay special attention to the details of the communication defined in the standard. Cooperation between software modules are also presented through an example.

Next chapters are – after the summary of the related standard – about the implementation of the modules. After the overview of the FlexRay Interface's main tasks, I present the configuration and runtime data structures designed by me. I examine the optimization possibilities depending on configuration, and present the algorithms and functions realizing the modules functionality. Ending of the chapter I estimate the memory and runtime overhead of the software.

In case of the FlexRay ISO Transport Layer the ISO standard – which defines the protocol realized by the module – is also introduced, then similarly to the Interface I present the configuration and runtime data structures. The operation of the implemented software – because of the complexity of the protocol – will be presented through the method of sending data. This chapter will be again closed by estimation of resource demands.

In the last chapter I write about the theory and the method of software testing. The first step of it is to define some important expression in connection with testing, then I explain some simple test cases on a function of the FlexRay Interface.

I close the thesis with the achieved results and the summary of future actions to be carried out.