

Abstract

Nowadays, a modern automobile contains several communication buses connecting the electronic control units (ECUs) providing an easy way to also test the ECUs. In order to achieve an efficient testing environment special switches are required to implement a run-time dynamic re-configurable connection between units under test.

Modifying connections within a car's communication network is generally never a demand, therefore the market offers no off-the-self solutions for this task. Furthermore, the test environment itself sets numerous technical requirements against such a switch. As a part of this diploma work a switch instrument for CAN network has been implemented which not only fulfills the mentioned special requirements but also provides a set of useful functions.

The first part of the thesis covers the theoretical knowledge required for the task. A short overview is initially given about the layered structure of the network software, discussing also the data link layer tasks where the switches are usually operating. Thereafter, the most frequently used switching algorithms are detailed, touching on their basic concepts, performance metrics and aspects of analysis. This part concludes in the in-depth analysis and even comparison of the algorithms based on aspects of efficiency and used resources.

The second part is dedicated to describing the particular steps of my solution for the task and the decisions behind them. After summarizing the requirements and demands against the switch the hardware block diagram is presented, elaborating on the problems and solutions related to the designing of each component. The architecture and structure of the developed software is then explained, focusing on the main software module. Eventually, the test methods of the CAN switch are described along with the results of the performed measurements and tests. The thesis is sealed with an outlook on possibilities for future further-development.

The result of the process is an actually manufactured instance of the intelligent CAN switch – capable of switching CAN network data packets with desired speed and delay while providing all required functions as well.