Universität Rostock

Traditio et Innovatio

FAKULTÄT FÜR INFORMATIK UND ELEKTROTECHNIK

Student Job: Extending a Test Environment for Routing and Scheduling

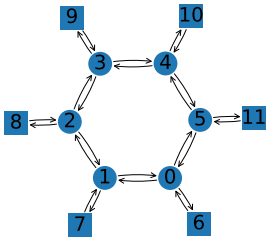
M.Sc. Eike Björn Schweißguth

Fon +49(0)381 498-7276
Mail eike.schweissguth@uni-rostock.de

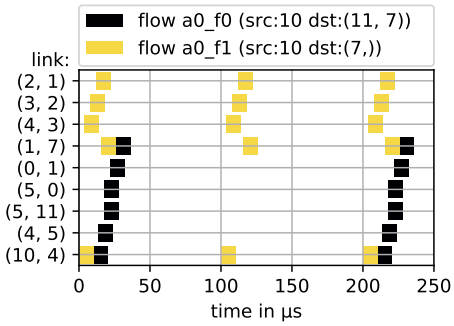
Lehrstuhl für Rechner in Technischen Systemen

Prof. Dr. Dirk Timmermann

Fon +49(0)381 498-7250
Mail dirk.timmermann@uni-rostock.de



In todays smart factories and vehicles (cars, airplanes), the communication network has become an essential infrastructure to connect distributed systems. In factories and vehicles, several of the distributed systems have to transmit critical messages over the communication network, i.e., the respective message must be transmitted with high reliability and within a certain time span. If the deadline of a critical message is violated, this may cause damage to the whole system (i.e., vehicle or production facility). With Time-Sensitive Networking (TSN), which refers to the latest extensions of the IEEE 802.1 standard, Ethernet technology allows the reliable and timely message delivery by the application of a time-triggered communication principle. Here, critical messages are transmitted over the different links in the network according to a given schedule, which is computed before the system is taken into operation (so-called offline scheduling). For example, consider the network of 6 switches and 6 end devices, given in the figure above, and two critical messages *a0_f0* and *a0_f1* which have to be transmitted every 100 µs and 200 µs, respectively, from a predefined source node *src* to one or more destinations given as *dst*. A possible transmission schedule is shown below. The computation of such schedules is an NP-hard mathematical problem and the TSN standards do not suggest any solution to this problem. Therefore, the development of efficient routing and scheduling algorithms has become an important research question.



Task: Extensions to the test environment for routing and scheduling algorithms

For the evaluation of new routing and scheduling algorithms developed at the Institute of Applied Microelectronics and Computer Engineering, an elaborate test environment is required. Specifically, the test environment must provide a variety of different network topologies and communication patterns to ensure that developed algorithms perform well indepent of the topology or pattern.

Therefore, the following tasks have to be adressed within this student job:

- Literature study about topologies and communication patterns used
  - by other research groups for testing of routing and scheduling algorithms
  - in real world applications of real-time networks
- Implementation of new topologies and communication patterns in the existing test environment
- Definition of command line interfaces and configuration files for the selection of topologies, patterns and their parameters (e.g., number of nodes, number of messages)

Prerequisites:

- Must Have
  - Basic programming skills (any language)
  - Ability for self-sufficient and independent working
- Should Have
  - Advanced programming skills and basic Python skills
  - Basic understanding of Ethernet technology

Supervisor and contact for further information: Eike Schweißguth