

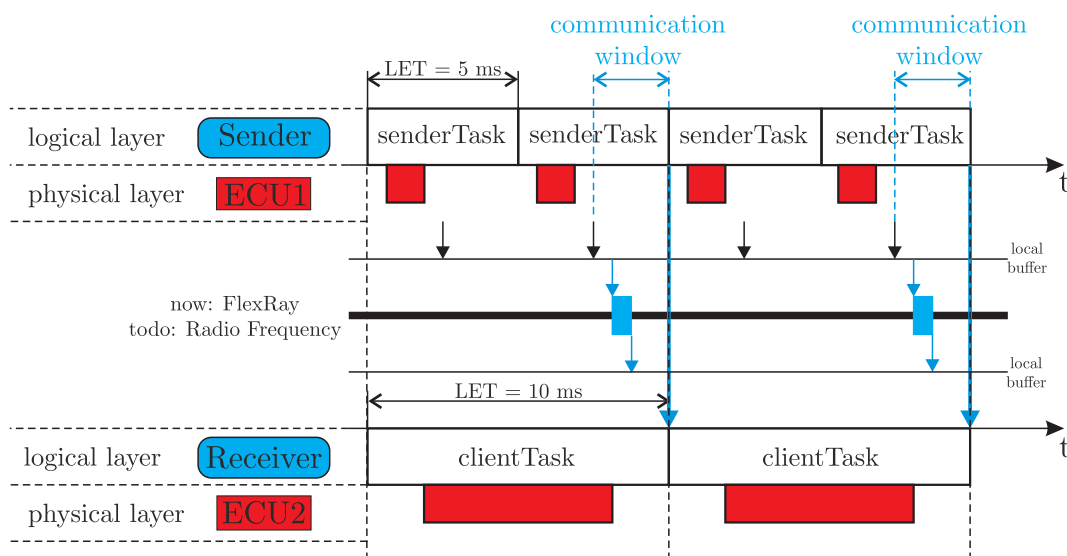
Topic:

A platform-specific plug-in to use the Timing Definition Language for Wireless Sensor/Actuator Networks

Motivation and goal:

Most distributed real-time systems use a wired medium to communicate between their components (e.g. up to 60 electronic computation units (ECUs) in a premium car do so). Using wireless communications would have large benefits. E.g. the substitution of heavy, and costly cable harnesses has advantages, like the reduction of the gas consumption of a vehicle or lowering manufacturing costs. But using wireless communications in the real-time domain poses also a lot of challenges, like e.g. ensuring a reliable link quality or introduction of fault tolerant mechanisms.

The Timing Definition Language (TDL), developed at the embedded Software & Systems Research Center (Univ.-Prof. Dr. W. Pree)¹ allows platform-independent development of time-triggered applications by introducing the so-called logical execution time (LET). As one example, this approach is used to model distributed electronic systems which communicate via FlexRay². The goal of this master thesis is to develop platform-specific plug-ins. With the help of these plug-ins and the TDL-tool-chain³ source code for a wireless real-time systems can be automatically generated.



Communication scenario among one sender and one receiver

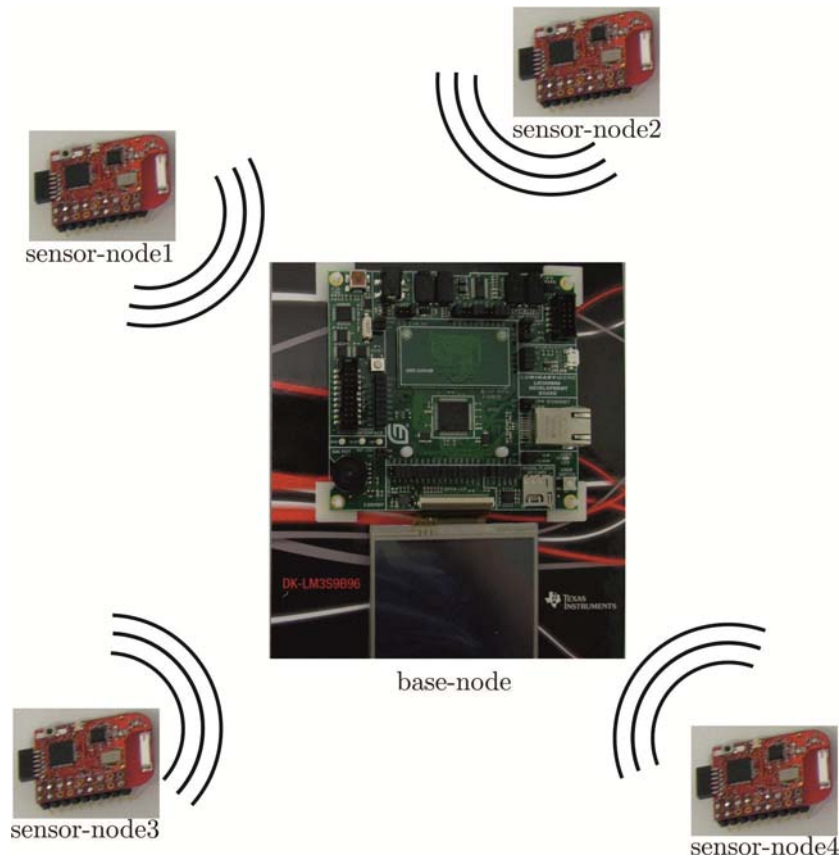
The TDL-workflow uses the top-down principle. The user starts the system modelling process without relying on a specific platform by using the concept of the Logical Execution Time. Using this approach the user is able to model the functional and the timing behaviour of the system. The modelling process can be done in a textual way by implementing TDL-source code or in a graphically way using the tools "VisualCreator" or "Matlab-Simulink". After this design step one can simulate the system in Matlab-Simulink shows the same behaviour as on a hardware platform.

¹ SRC: <http://www.softwareresearch.net/>

² Fault-tolerant fieldbus in the automotive industry: <http://www.flexray.com/>

³ TDL-tool-chain: <http://www.chrona.com/en/products/creation-suite/tool-chain/>

To port the system model to a specific hardware platform, so-called platform-specific plug-ins are used as part of the TDL-tool-chain.



Wireless network consisting of up to ten sensor nodes (MSP430-family) and one base node (Stellaris ARM Cortex M3)

Task:

The task of this master thesis is to develop platform-specific plug-ins for a wireless communication network, which consists of several sensor nodes (all using the same hardware) and one base node. A sensor node consists of a microcontroller of the MSP430-family⁴ without any operating system, while the base node consists of a Stellaris ARM Cortex-M3⁵ based microcontroller using FreeRTOS. Both node types use the wireless transceiver CC2500 to communicate among each other using the 2.4 GHz ISM-band.

Place of work: It is possible to do this master thesis at the embedded Software & Systems Research Center (University of Salzburg) or at the Institute for System Software at the Johannes Kepler University of Linz in cooperation with the Institute of Communications Engineering and RF-Systems (JKU-Linz).

Start: now

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⁴ MSP430-family: <http://www.ti.com/msp430>

⁵ Stellaris family: <http://www.ti.com/stellaris>