

Model Driven Engineering of Embedded Software (MDE)

Homework (first part)

We want to develop an Eclipse-based, model driven environment for a domain specific language (called TCL, Tiny Component Language) for handling small component-based, communicating embedded systems.

TCL is based on the notion of **component**. A component has a name, and features any number of named input and output **ports**. An output port is typed by an **interface**, and may be connected to an input port having a compatible interface. An interface is a set of **messages**, each message having a unique name.

The behaviour of a component is given by a (potentially non deterministic) **finite state machine (FSM)**. The same FSM can be used to describe the behaviour of several components. An FSM has a unique name, and features a set of **states**, one of them being the initial state. States are linked through **transitions**. A transition has one source state and one target state. A transition may either be spontaneous, or have a **guard**, which consist of a port name and a message. It has an optional **action** part that also consists of a port name and a message.

A transition can be triggered when the guard is valid, meaning the right message is proposed on the named input port. Then the action part consists in synchronously sending the message to the named output port (communication is thus by *rendez-vous* only).

Goal of the first part of this homework:

- 1) Propose a meta-model for TCL
- 2) Specify its static semantics (well formedness rules) using OCL
- 3) As an example, describe with (an instance diagram of) TCL the car indicators, with a configuration of 5 components: the control lever, the warning button (optional), the right and left lights, and a controller (with its internal clock).



In the second part of this homework, we will focus on validation and verification of such models: simulation (by defining a virtual machine) and model checking (by defining a transformation to a formalism supported by a model-checker).

This homework will be realized by group of two students. Each part will be evaluated by an oral (10min per group). The first part will be evaluated the week 43 and the second part will be evaluated the week 47.