

INFO-F-410 Embedded Systems Design

SCADE

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1 Introduction

The aim of this practical is to get yourself familiar with the SCADE software from Esterel Technologies. To this aim, we will rely on the excellent *Getting started with SCADE* guide from Esterel Technologies. You should have received a copy of this document during the practical.

The *Getting started* document will guide you to create a new project in Scade, that models a simplified version of an embedded controller in a plane. This controller must :

1. Compute the roll rate of the plane, given the position of the yoke, and compute the pressure of the air on the wings. This is the aim of the *RollRateCalculate* node.
2. Raise alarms when the roll rate exceeds 15 degrees per second in absolute value (node *RollRateWarning*).
3. Implement a running mode (*RollMode*) that can be either *OFF* or *Nominal* or *FailSoft*. Moving from *Nominal* to *FailSoft* occurs iff the roll rate is larger than or equal to 20, in absolute value. This mode must command a safety subsystem to avoid reaching unsafe roll rate (the safety subsystem is not modelled, though).

2 Exercises

The exercises are found in the *getting started* guide. Here is the list of the exercises you should do :

1. Chapter 1 : *Introduction*
 - Start reading at page 1 – 9 *Introducing the RollControl Specification*.
 - Start with exercise 1.3, page 1 – 14, and do all the exercises of the chapter.
2. Chapter 2 : *Model Capture*. This chapter explains how to model with SCADE, starting with flows, and ending with state machines.
 - On page 2 – 23, check that the *Simulation* config uses GNU C compiler in the *Compiler* tab.
 - Exercises 2.20 à 2.22 (included) from section *Managing SCADE models* (page 2 – 52 onwards) can be skipped.
 - You should do exercise 2.23.
 - The last exercises of the chapter (sections *Producing a model report*, pp. 2 – 68 à 2 – 73 and *Modeling functional design with control flow*, pp. 2 – 74 à 2 – 93) can be skipped.

- To be able to do the exercises from chapter 3, you need to load the complete model from the `examples` directory, which should be `C:\ProgramFiles\Esterel Technologies\SCADE\examples\GettingStarted\exercise3.31\RollControl` **First, copy this directory to your home directory**, then open the workspace file and observe the state machine.
3. Chapter 3 : *Model Debugging*. This chapter show how to use the simulator in SCADE
- On page 3 – 105, check again for the GNU C compiler in the *compiler* tab.
 - Exercises 3.38 and 3.39 can be skipped.