Universität des Saarlandes
FR 6.2 - Informatik
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Exercise Sheet 11
Computer Architecture II
(Due: Jan 31st, 2012)

This is the final exercise sheet of this lecture. To be admitted to the oral exam on March 5th you need to have obtained at least 188 Points from the exercises and presented solutions two times in the tutorial. Moreover, please register with the assistant (baumann@wjpserver.cs.uni-saarland.de) to get a time slot reserved for the examination. Up to two persons will be examined at the same time.

Exercise 1: (Receiver *rdone* Signal) (5 Points)

In the control automaton of the receiver in our FlexRay-like bus interface the signal *rdone* denotes whether message transmission is complete. In this case state FES is entered. Otherwise the receiver loop is run again. Give a formal definition of *rdone*!

Exercise 2: (Timer Specification) (10 Points)

In the lecture we have developed an implementation for the timer F_v which counts slots and cycles in each ECU v. Let $send : [0 : ns - 1] \rightarrow [0 : ne - 1]$ be the schedule for message transfer, mapping each of the ns transmission slots per round to one sender ECU. Here ne is the number of ECUs. Moreover we know that in the first slot ECU 0 is always scheduled to send.

Give a specification for the value of the timer of ECU v in cycle t.

$$|F_v^t| \;=\; \dots$$

Exercise 3: (Protocol Optimization) (3+5+3+4 Points)

In class we noticed that there are actually superfluous states in the message protocol as given by the FlexRay standard. Thus sender and receiver can be optimized by reducing redundancy.

a) Design new control automata reducing the number of states as much as possible. Which values should be sent in each particular states? The principle idea of the message protocol should be preserved. We still send every bit 8 times and we synchronize on falling bus values before every byte transmission. The protocol starts and ends in the *idle* state which is never visited during message transfer.

b) Which constructions must be modified if we want to change the bus protocol and what has to be altered? Which lemmas are affected by the changes? Write down updated versions of these lemmas.

c) Estimate an accurate upper bound for the new transmission time when sending a message of L bytes.

d) What is the maximal relative clockdrift δ we can allow so that within one synchronization window at most one bit is lost, or sampled twice respectively?