

I. IDENTIFICATION DATA

Thesis title:	Integrace iLLD ovladačů do RTOS Erika Enterprise pro Infineon TC387
Author's name:	Bc. Danylo Begim
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Control Engineering
Thesis reviewer:	Ing. Štefan Knotek, Ph.D.
Reviewer's department:	Garrett Motion Czech Republic s.r.o.

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	extraordinarily challenging
<i>How demanding was the assigned project?</i>	
<p>The assignment of the master's thesis was challenging and significantly difficult for a master's student. The tasks in the assignment require a thorough understanding of the Infineon TriCore TC3xx microcontroller (MCU) family architecture. The student must learn the functionality of microcontroller peripherals, handling of interrupts, configuration of the MCU clocks, its distribution among modules and other MCU related features. The familiarity with the real-time operating system (RTOS), in particular, Erika Enterprise (EE) RTOS is required. Furthermore, the knowledge of CAN, CAN-FD, and SPI communication interfaces is needed for their implementation and validation on MCU and integration to Erika. Last but not least, the application part of the assignment requires skills in embedded C programming, knowledge of communication interfaces and latency measurements.</p>	

Fulfilment of assignment	fulfilled
<i>How well does the thesis fulfil the assigned task? Have the primary goals been achieved? Which assigned tasks have been incompletely covered, and which parts of the thesis are overextended? Justify your answer.</i>	
All task of the thesis were fulfilled according to the assignment and the set goals have been achieved.	

Methodology	correct
<i>Comment on the correctness of the approach and/or the solution methods.</i>	
I consider the methodology and the approaches used in the thesis as valid. The functional examples and benchmarking results speak for themselves.	

Technical level	A - excellent.
<i>Is the thesis technically sound? How well did the student employ expertise in the field of his/her field of study? Does the student explain clearly what he/she has done?</i>	
<p>The thesis is technically sound and sufficiently challenging. The work done by the student required application of the embedded C programming skills as well as knowledge of CAN, CAN-FD and SPI communication interfaces together with their latency measurements. The student provided sufficient expertise in all these fields. The thesis clearly states what has been done by the student and which parts were provided by a third party or available from open sources.</p>	

Formal and language level, scope of thesis	B - very good.
<i>Are formalisms and notations used properly? Is the thesis organized in a logical way? Is the thesis sufficiently extensive? Is the thesis well-presented? Is the language clear and understandable? Is the English satisfactory?</i>	
<p>The master's thesis is written in English language. The language level is excellent and technical. The organization of content is also good, and the thesis is sufficiently extensive. To the formal part of the thesis, the references to the pictures in the thesis are sometimes missing which brings a little bit of confusion. Also, no references to the pictures in the attachment can be found in the thesis. Some parts of the thesis are harder to understand as, for example, the semaphore example or the SPI benchmarking which is rather brief. On contrary, other parts of the thesis were nicely and thoroughly explained, as for example, configuration of OIL files for Erika and CAN benchmarking.</p>	

Selection of sources, citation correctness**A - excellent.**

Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?

The selection of sources for the thesis are adequate and sufficient to the required technical level. The work done by the student is clearly distinguished and it has a significant contribution to the Erika Enterprise RTOS community as it ports the Erika RTOS to the currently unsupported microcontroller. Also, the work provides implementation examples that prove the functionality. The bibliographic citations meet the standards of a master's thesis.

Additional commentary and evaluation (optional)

Comment on the overall quality of the thesis, its novelty and its impact on the field, its strengths and weaknesses, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.

I consider the thesis as excellent, and the work done by the student as very good with a significant impact to the Erika Enterprise RTOS community. I only minor issues I can point out concern the formal part of the thesis like the few missing references and some hard-understandable sections.

III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE

The thesis has an adequate technical quality, and the work done has an obvious contribution and novelty; therefore, I evaluate the thesis with the grade A – excellent.

I would like to ask the student to answer some of my questions which were raised during the thesis review:

- 1. Why there is a restriction in Erika that ISR1 interrupts must all have higher priority than ISR2 interrupts?*
- 2. How were data for the benchmarking collected and how was the canping program created?*
- 3. Why is the CAN data transmission latency measured by an oscilloscope only 12us (for a single transmission) but for the burst test of 40000 transmissions it is around 380us? Why the USB-CAN converter latency is not visible in the single transition measurement?*
- 4. How was the interrupt duration of 33.33ns measured in the SPI example? According to my estimates @ 300MHz clock frequency this would consider 11 clock ticks, i.e. roughly 11 assembler instructions (when we consider that one instruction takes one clock). Is this reasonable value for the SPI interrupt content?*
- 5. What compiler configuration was used for the benchmarking in terms of code and execution time optimization?*

Thank you.

The grade that I award for the thesis is **A - excellent**.

Date: **10.6.2024**

Signature: