

I. IDENTIFICATION DATA

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| Thesis title: | Model of CAN FD Communication Controller for QEMU Emulator |
| Author's name: | Jan Charvát |
| Type of thesis : | bachelor |
| Faculty/Institute: | Faculty of Electrical Engineering (FEE) |
| Department: | Department of Measurement – K13138 |
| Thesis reviewer: | Ing. Pavel Píša, Ph.D. |
| Reviewer's department: | Department of Control Engineering - K13135 |

II. EVALUATION OF INDIVIDUAL CRITERIA

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| Assignment | challenging |
| <i>How demanding was the assigned project?</i> | |
| <p>The main thesis goal is implementation of the emulation of CTU CAN FD IP core for worldwide used QEMU system level and multiple CPU architectures emulator. The task requires to study documentation of CTU CAN FD IP core, its registers structure and behavior to the bit level. Integration to QEMU as PCI express card required to understand how this bus works and is integrated into emulator and interacts with Linux kernel driver on SW side and internals of QEMU infrastructure and SocketCAN interface to the host system on the other hand. QEMU driver model is not well documented and it is complex system which emulates PCIe, MSI, CPU interrupts, CPU memory mapped peripherals access.</p> | |

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| Fulfilment of assignment | fulfilled with minor objections |
| <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> | |
| <p>Study task 1. was fulfilled. It required a significant amount of consultations, but the task is really complex and requires guidance. Approach expected in task 2. (extend pyXact_generator to convert IPXACT register file to QEMU QOM C object) has been classified as more work than the reward for the actual project, so it was skipped, partially to time budget as well. Task 3. to update QEMU CAN for CAN FD standard was fully solved. Task 4. (CTU CAN FD IP core model for QEMU) has been solved and tested to work. Task 5. (documentation in thesis text) has been fulfilled, but even due to time pressure caused by external events, there are substantial compromises in quality. QEMU mainlining effort is ongoing.</p> | |

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| Activity and independence when creating final thesis | B - very good. |
| <i>Assess whether the student had a positive approach, whether the time limits were met, whether the conception was regularly consulted and whether the student was well prepared for the consultations. Assess the student's ability to work independently.</i> | |
| <p>The student started the work on the project with enough time reserve, has been active and motivated to work. The objective conditions for the second half of the work have not been ideal, and there has been a lag in work and communication for some period. Even after this delay, the student decided to submit work in the first term and worked hard to get back on the track last month.</p> | |

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| Technical level | B - very good. |
| <i>Is the thesis technically sound? How well did the student employ expertise in his/her field of study? Does the student explain clearly what he/she has done?</i> | |
| <p>Student proved to have expected knowledge in computer systems area, programming and code version control work. On the other hand the task has been on edge of his actual knowledge.</p> | |

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| Formal level and language level, scope of thesis | C - 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> | |

The English language is at appropriate level for technical writing. The student has stepped into complex project which required non-trivial setup and need help in this area (which was intended approach), but it was expected that he reserves enough time to document setup for newcomers (even thanks to his newcomer experience). But there was not enough time to recreate complete testbed by himself.

Selection of sources, citation correctness

B - very good.

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?

References (28 items) provide valuable list of pointers for documentation and projects required for start and continuation of work in the area.

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.

The project results are valuable and we hope to move forward with QEMU mainlining process and hope that work would be accepted after review process.

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

The project of CTU CAN FD core emulation for QEMU is part of larger set of projects to provide CAN FD communication bus open-source components for open-source systems, GNU/Linux in particular. We are in touch with CAN in Automation (CiA)/Controller Area Network (CAN) stewards who are interested in the projects as well as with Open Source Automation Development Lab (OSADL) representatives and Open Source experts at Volkswagen. All are interested in our project and provide us positive feedback to continue demanding work forward.

More about CTU FEE CAN bus related projects components can be found on the guidepost page

<http://canbus.pages.fel.cvut.cz/>

Jan Charvát's thesis is one of the building bricks of the effort. It helps to run tests of the CTU CAN FD Linux driver tests in continuous integration manner to catch possible major regressions. It can help when support is ported to more operating systems. On the other hand, it will not replace need to test the core VHLD implementation and drier on real hardware.

The QEMU CAN bus support with added FD functionality can be valuable for other higher level project. Original standard CAN emulation started as RTEMS backed GSoC slot is reported to be used by companies for CAN related development already.

The grade that I award for the thesis is

Date: 3.6.2020

Signature: