

# Supervisor's statement of a final thesis

Czech Technical University in Prague

Faculty of Information Technology

**Student:** Bc. Oleg Gul  
**Supervisor:** Ing. Jan Vraný, Ph.D.  
**Thesis title:** Garbage Collector for Multi-threaded Scheme using Native Threads  
**Branch of the study:** System Programming (Master)

**Date:** 28. 5. 2015

<p><i>Evaluation criterion:</i></p> <p><b>1. Difficulty and other comments on the assignment</b></p> <p><i>Criteria description:</i> Characterize this final thesis in detail and its relationships to previous or current projects. Comment what is difficult about this thesis (in case of a more difficult thesis, you may overlook some shortcomings that you would not in case of an easy assignment, and on the contrary, with an easy assignment those shortcomings should be evaluated more strictly.)</p> <p><i>Comments:</i> Implementation of an efficient garbage collector in a truly multithreaded environment is not an easy task, on the contrary. Many tried, few succeeded. A lot of aspects influences an efficient implementation - object format, particularities of the interpreter, and so on. Correct implementation requires a deep knowledge of these, of an operating system internals, implementation language spec and it's compiler internals,</p>	<p><i>The evaluation scale: 1 to 5.</i></p> <p><b>1 = extremely challenging assignment,</b> <b>2 = rather difficult assignment,</b> 3 = assignment of average difficulty, 4 = easier, but still sufficient assignment, 5 = insufficient assignment</p>
<p><i>Evaluation criterion:</i></p> <p><b>2. Fulfilment of the assignment</b></p> <p><i>Criteria description:</i> Assess whether the thesis meets the assignment statement. In Comments indicate parts of the assignment that have not been fulfilled, completely or partially, or extensions of the thesis beyond the original assignment. If the assignment was not completely fulfilled, try to assess the importance, impact, and possibly also the reason of the insufficiencies.</p> <p><i>Comments:</i> All aspects of the assignment have been fully addressed. The TinyScheme scheme implementation has been extended to support native threads and it's original garbage collector has been replaced by a new one, suitable for operating in multi-threaded environment.</p>	<p><i>The evaluation scale: 1 to 4.</i></p> <p><b>1 = assignment fulfilled,</b> 2 = assignment fulfilled with minor objections, 3 = assignment fulfilled with major objections, 4 = assignment not fulfilled</p>
<p><i>Evaluation criterion:</i></p> <p><b>3. Size of the main written part</b></p> <p><i>Criteria description:</i> Compare the size of the written part with the expected size (without appendices), see the Dean's Directive No. 9/2011, Article 3. To evaluate the thesis it is also important that all parts of the written part are rich on information and necessary for a final thesis. The text should not contain unnecessary parts.</p> <p><i>Comments:</i> The text of the thesis covers all aspects of the work in a clear and concise way.</p>	<p><i>The evaluation scale: 1 to 4.</i></p> <p><b>1 = meets the criteria,</b> 2 = meets the criteria with minor objections, 3 = meets the criteria with major objections, 4 = does not meet the criteria</p>
<p><i>Evaluation criterion:</i></p> <p><b>4. Factual and logical level of the thesis</b></p> <p><i>Criteria description:</i> Assess whether the thesis is correct as to the facts or if there are factual errors and inaccuracies. Evaluate further the logical structure of the thesis, links among the chapters, and the comprehensibility of the text for a reader.</p> <p><i>Comments:</i> The text of the thesis is logical and reads easily.</p>	<p><i>The evaluation scale: 0 to 100 points (grade A to F).</i></p> <p>100 (A)</p>
<p><i>Evaluation criterion:</i></p> <p><b>5. Formal level of the thesis</b></p> <p><i>Criteria description:</i> Assess the correctness of formalisms used in the thesis, the typographical and linguistic aspects, see Dean's Directive No. 9/2011, Article 3.</p> <p><i>Comments:</i> I have no comments regarding formal aspects of the thesis.</p>	<p><i>The evaluation scale: 0 to 100 points (grade A to F).</i></p> <p>100 (A)</p>
<p><i>Evaluation criterion:</i></p> <p><b>6. Bibliography</b></p>	<p><i>The evaluation scale: 0 to 100 points (grade A to F).</i></p> <p>70 (C)</p>

*Criteria description:*

Evaluate the student's activity in acquisition and use of studying materials in his thesis. Characterize the choice of the sources. Discuss whether the student used all relevant sources, or whether he tried to solve problems that were already solved. Verify that all elements taken from other sources are properly differentiated from his own results and contributions. Comment if there was a possible violation of the citation ethics and if the bibliographical references are complete and in compliance with citation standards.

*Comments:*

The list of relevant literature related to garbage collection is virtually endless nowadays. All cited sources are relevant, though I found references to various debugging and profiling tools in the Bibliography section a little inappropriate. Also, a reference to a classic book - The Garbage Collection Handbook: The Art of Automatic Memory Management - should be mentioned.

*Evaluation criterion:*

*The evaluation scale: 0 to 100 points (grade A to F).*

**7. Evaluation of results, publication outputs and awards**

**80 (B)**

*Criteria description:*

Comment on the achieved level of major results of the thesis and indicate whether the main results of the thesis extend published state-of-the-art results and/or bring completely new findings. Assess the quality and functionality of hardware or software solutions. Alternatively, evaluate whether the software or source code that was not created by the student himself was used in accordance with the license terms and copyright. Comment on possible publication output or awards related to the thesis.

*Comments:*

The resulting code is of a high quality, well commented and modern C using good practices of a C programming. The performance analysis is good enough to make reliable conclusions.

*Evaluation criterion:*

*No evaluation scale.*

**8. Applicability of the results**

*Criteria description:*

Indicate the potential of using the results of the thesis in practice.

*Comments:*

Performance of the resulting garbage collector is not exactly breath-taking, so the result of the work probably cannot be taken and used "as it is". However the results of this experiment are important to deeply understand the problem and thus is important and very useful.

*Evaluation criterion:*

*The evaluation scale: 1 to 5.*

**9. Activity and self-reliance of the student**

**9a:**  
**1 = excellent activity,**  
**2 = very good activity,**  
**3 = average activity,**  
**4 = weaker, but still sufficient activity,**  
**5 = insufficient activity**  
**9b:**  
**1 = excellent self-reliance,**  
**2 = very good self-reliance,**  
**3 = average self-reliance,**  
**4 = weaker, but still sufficient self-reliance,**  
**5 = insufficient self-reliance.**

*Criteria description:*

Review student's activity while working on this final thesis, student's punctuality when meeting the deadlines and consulting continuously and also, student's preparedness for these consultations. Furthermore, review student's independency.

*Comments:*

The author of the thesis is skillful, independent. During the work, my comments has been promptly addressed. Mr. Gul's knowledge of C programming language and profiling skills are certainly above the standard of CTU FIT master students.

*Evaluation criterion:*

*The evaluation scale: 0 to 100 points (grade A to F).*

**10. The overall evaluation**

**90 (A)**

*Criteria description:*

Summarize the parts of the thesis that had major impact on your evaluation. The overall evaluation **does not** have to be the arithmetic mean or any other formula with the values from the previous evaluation criteria 1 to 9.

*Comments:*

To wrap it up, the author of the thesis did a very good job. The performance characteristics is not great and I think making one or two more iterations over the design and the code could yield a much better result. One iteration is clearly not enough. Or maybe the whole idea of using hardware memory protection features is a dead end and could not be improved. I has to be said that it was my (i.e., supervisors's) idea to go this way and that I suggested Mr. Gul to try that approach. It's also true that, given the short time frame, to try a different approach or making more iterations is hardly possible. In any case, the author did his best and deserves A.

Signature of the supervisor: