

## **COMP6009 Individual Research Project: Peer Review Form**

You are asked to provide feedback as detailed below on another student's submitted interim report and poster presentation, and rate their work. Your feedback will be made available to the student, so you should be polite and sensitive when making any negative remarks. You yourself will be assessed on the feedback you provide, and this assessment will contribute 10% overall to your mark for this double unit.

Report Title: Research on and Comparison of the Java and C++ Memory Models

Report Author: Nathan C. Padoin

Your Name: Thomas Smith

Say how long you spent reading the report, how well you feel you understood it, and how confident you are in your judgements.

I spent roughly 45 minutes initially reading and absorbing the contents of the report, and then a further two hours considering the questions, checking spelling, grammar, layout and references, and formulating reasonable and hopefully justified answers. Beyond the grounding given by required modules, it is not a field that I was particularly familiar with beforehand, but I now feel that I understand the position of the report and its context, and have a new understanding of the memory models of Java, C++ and the differences between the two.

I believe that I have a reasonably good grasp of spelling and grammar, and so feel confident in my judgements of this paper on those areas. My opinions of other aspects are perhaps more subjective, and influenced by advice I have been given and my own impressions of how I would approach the topic. For example, I have remarked on the lack of experimental or rigorous justification of the comparison given, and the lack of comment on the usability differences of features between the languages, as I feel that these would be important considerations were I to write the paper myself.

Briefly summarise, in your own words, the main points of the report.

With the rise of multicore processors, stable multithreading approaches are necessary in order to make efficient use of processor availability. Out-of-order execution and other optimisations can result in code that does not behave as expected, and there are a number of ordering concepts that may be applied in order to provide sequentially correct code and avoid the negative effects of data races. The Java language implemented an initial memory model that was possibly incorrect or unintuitive in a number of cases, and so research was done into possible improvements. These have since been implemented, and

a small amount of further discussion continues. C++ in contrast originally had no memory model, and so support was only available via libraries, which led to a number of issues. For C++11, a memory model was specified based upon the research done for Java and existing libraries. The model is stricter than Java's, which rules out a number of possible optimisations, however it is also possible to deliberately weaken the model and allow for low-level-atomics - it is not entirely clear how this is used. A comparison is given of the main strengths and weaknesses of the two approaches, and then it is made clear that research in these areas is still continuing as a result of advances in hardware and compiler demands.

Comment on the format and writing of the report, and give it a mark on a scale from 0–10. Questions you should consider in making this judgement include:

Is a professional format/style in use (headings, paragraphs, contents list, etc)?

Are the pages correctly numbered (roman numerals for front matter, etc.)?

Is the writing succinct and clear? Are the spelling and grammar correct?

Are figures/diagrams/formulas used as and where appropriate. Are they clear?

Are references properly cited? Is there a professionally bibliography?

Can the abstract be read separately from the report?

Do the introduction, summary, and conclusion introduce, summarise, and conclude?

Is there material in the main body that should be in an appendix, or vice versa?

The style and layout of the report follows a professional style, with correct numbering and heading format. However the general quality of the writing is not to a professional standard. At times the tone becomes conversational, and there are occasional spelling errors and fragmented sentences throughout. Additionally, there is evidence of incomplete preparation - both "(citation needed)!" and "[find example]" may be found within the text. In general however the language used is appropriate, and most concepts are explained to a sufficient degree.

The use of code samples to illustrate certain points is effective, however their presentation is not always most suitable. In many cases, individual snippets would be most logically presented as part of the main flow of the text rather than as separate figures, as some of the figures are out of order with their reference in the main text (e.g. Fig. 3 is the first used). Some illustrative examples, such as the Assembly in Fig. 1, could do with further explanation. Citations for the source of certain snippets is not always obvious, as when present these are given in the main text rather than as part of the figure's caption.

The citation style and bibliography format are good, however the use of citations and the nature of references is not always appropriate. Occasionally a single source is over-cited: e.g. once per sentence in a given paragraph, and a number of sources are only referenced once, as part of a large group supporting a single point: "[7, 8, 9, 10]".

The abstract is minimal and gives an idea of the intent of the paper, but could not be read separately. It has a relevantly informal tone and contains a sentence fragment that does not stand alone. The introduction presents an extensive introduction to the topic, background and glossary, but is not laid out clearly and there is no mention of memory models until the fifth paragraph - it is not initially clear why a background in parallel

architectures and multicore processors is relevant. The conclusion is again minimal and at times conversational, and introduces concepts that are not explicitly mentioned through the rest of the paper (disallowed compiler optimisations). Overall the format is decent, with a mix of introduction, explanation and example, but the writing is of a lower quality than would usually be found in a paper of this style. A less conversational tone, and greater attention to sentence format, spelling and punctuation would improve the academic impression of the report.

Format and Writing: 5/ 10

Comment on how well the report sets itself in context and give it a mark on a scale from 0–10. Questions you should consider include:

- Is the research background adequately explained?
- Is the research problem/issue adequately explained?
- Is the proposed solution/approach explained and justified?
- Are alternative and competitive approaches considered?
- Is there an appropriate range of references (variety of sources, dates, etc.)?

Useful context is given for the background of the paper, however the majority of the references given are to industry work and comments without a clear research background. Only about a third of the references appear to have been published in peer-reviewed locations, and half of these are mentioned only in an aggregate group in support of a single item. The 'problem' at the centre of the paper (memory models in the context of multi-processor, multi-threading execution) is reasonably explained, with reference to historical approaches to solutions, however research approaches to a solution are only lightly touched upon in favour of documenting implemented industry solutions. The nature of the paper means that no new approach is attempted, and the presentation is more of the form of a comparison between existing approaches. The research backgrounds to these approaches are mentioned, but not critiqued in the form of a literature review. The implementations are directly compared in terms of their strictness, however other potentially relevant factors, such as ease of use by developers, are mentioned but not compared. There is also no context provided in terms of comparison to the memory models of other languages (or libraries within C++).

There is a great variety of sources used, including online commentary, technical documents and a number of peer-reviewed references. Though a small number of references have no obvious dates, the majority are contemporary and appear highly relevant to the paper. Due to the nature of the topic, a large number are online-only resources and technical documents, and some additional contemporary research sources would have been useful to cement the academic angle of the paper.

Context: 6/ 10

Comment on the technical research contribution of the report and give it a mark on a

scale from 0–10. Questions you should consider include:

Does the report provide new and/or useful insight into the area?

Does the report pose new and interesting research questions/hypotheses?

Is the research question/hypothesis/area a significant one?

Is the research method/approach a sensible and appropriate one?

Does the report provide new results?

Does the report highlight its contributions?

Would these contributions be of interest to a) other Masters level students, b) researchers within the department, c) researchers in other UK departments, or d) the international research community?

The report is largely positioned as a comparison of existing approaches, and as such does not provide much new insight into the area, though it is informative to someone unfamiliar with the field. It makes a small number of comments about driving forces for further progress in the area, and some speculation as to the short-term future, but no specifically research-oriented questions. There is significant evidence given for the value of progress in this area, but few suggestions as to how such progress might occur. The comparison and explanation of the two memory models is useful but feels incomplete in a research sense as there is no experimental or research basis given in the comparison itself - it consists primarily of further observations on features of the two models. No new results are presented, but the contribution in the form of explanation, example and comparison is useful, and would certainly be of interest to other Masters level students - though its relevance to researchers at other levels is probably more limited.

Contribution: 5/ 10

Give any final comments and rate the report overall. This should combine your previous marks in the ratio 2:2:1 (1:2:3 will be used for the final report).

Given the limited research background, and strong focus on the technical and historical details of implementation, this report does not read like a typical research paper. It provides a useful contribution regardless, but not a research-focussed one.

Overall: 5.4/ 10