

Parallel Architectures - Assignment 1

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due: Friday 29 January 2016 at 4pm (hardcopy, at the ITO)

0.1 Introduction

This is the first of 2 assignments for the Parallel Architectures module of CS4/MSc. This assignment will contribute 5% of the final mark for the module. This assignment consists of a literature review. Assessment of this practical will be based mainly on your ability to understand, summarize, and make a reasonable and critical assessment of published research papers. It will also be assessed based on the clarity, completeness, and succinctness of your review. This assignment is to be solved individually to assess your competence on the subject. Please bear in mind the School of Informatics guidelines on plagiarism. You must return your solutions to the ITO before the due date and time shown above.

0.2 Objectives

Some 19 years ago some of the leading researchers in computer architecture were invited to submit their vision for the future “billion transistor” chip. After some competitive selection process 6 submissions with very different “visions” were accepted and appeared in the IEEE Computer magazine in September 1997. We are now already in the “billion transistor” chip era (e.g., IBM Power 8 has around 4 billion transistors) and one can argue that we now know what “vision” “won”.

Your task in this practical is to read and discuss some of those papers, as follows:

0.2.1 Choice of papers

- **Paper A:** “Guest Editors’ Introduction: Billion-Transistor Architectures”, D. Burger and J. R. Goodman.
- **Paper B:** “A Single-Chip Multiprocessor”, L. Hammond, B. A. Nayfeh, and K. Olukotun.
- **Paper C:** Choice of:
 - “One Billion Transistors, One Uniprocessor, One Chip”, Y. N. Patt, S. J. Patel, M. Evers, D. H. Friendly, and J. Stark.
 - “Superspeculative Microarchitecture for Beyond AD 2000”, M. H. Lipasti and J. P. Shen.

- “Trace Processors: Moving to Fourth-Generation Microarchitectures”, J. E. Smith and S. Vajapeyam.
- “Scalable Processors in the Billion-Transistor Era: IRAM”, C. E. Kozyrakis, S. Perissakis, D. Patterson, T. Anderson, K. Asanovic, N. Cardwell, R. Fromm, J. Golbus, B. Gribstad, K. Keeton, R. Thomas, N. Treuhaft, and K. Yelick.
- “Baring It All to Software: Raw Machines”, E. Waingold, M. Taylor, D. Srikrishna, V. Sarkar, W. Lee, V. Lee, J. Kim, M. Frank, P. Finch, R. Barua, J. Babb, S. Amarasinghe, A. Agarwal.

You must read Paper A, Paper B, and *one of* Paper C. The papers are available from the course web site at <http://www.inf.ed.ac.uk/teaching/courses/pa/>.

0.3 Guidelines

You should read carefully the papers and *critically* review their contents, i.e., you should *not* simply summarize the papers. In particular, when assessing your choice of Paper C, you should attempt to answer the following questions: *Why did the approach proposed did not succeed? What was the main “flaws” in the authors’ reasoning and expectations that led to the demise of the approach? What were the main factors driving commercial designs away from the proposed approach? Are these factors still valid today? Are the quantitative results presented still sound? If not, then why are they not sound today and if yes then why are they not compelling?* When assessing Paper B, you should consider the authors’ arguments and assumptions in a similar way. Paper A simply sets the context for the various papers and you do not have to assess it.

Your submission should be *no longer than 6 pages in single column, double space, and 12 point font*. This includes any diagrams you may want to include.

The structure of your review should include the following the following parts:

- Header. Please write your name and the name of the paper C you have chosen.
- Description - Paper C (10 marks). Here you should *briefly* describe the main approach proposed by the authors, as well as their reasoning and assumptions.
- Results - Paper C (10 marks). Here you should *briefly* summarize the important results of the paper.
- Discussion - Paper C (40 marks). Here you should write your own assessment of the paper, focusing on issues and questions outlined above.
- Description - Paper B (10 marks). Here you should *briefly* describe the main approach proposed by the authors, as well as their reasoning and assumptions.

- Results - Paper B (10 marks). Here you should *briefly* summarize the important results of the paper.
- Discussion - Paper B (20 marks). Here you should write your own assessment of the paper, focusing on issues and questions outlined above.

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