

Term Project Description

EEC 581 Computer Architecture, Fall 2007

Title: Survey on multicore architecture

Goal: This project is designed to help understand the benefits, issues, and solutions of multi-core architectures.

Overview: This project is on multicore architecture, which is also called chip multiprocessors or CMPs. Each group of three to four students read papers from prestigious conference proceedings and journals and summarizes and analyzes them (Project #1). Each team chooses a specific topic for further study and identifies issues and existing solutions for the problem (Project #2). Next, each team surveys further on the chosen topic to understand the solutions as well as their disadvantages (Project #3). Finally, each team will suggest its own solution (Project #4).

Due to the limited time, it is unlikely that any of the project teams offer a reasonable performance study comparing the proposed solution against the existing ones. However, you must provide convincing arguments why it works better than existing solutions.

Brief history of multicore architecture: As a brief introduction to multicore architecture, it is a multiprocessor system on a single chip. In the 80s and 90s, parallel architecture was a big issue in computing society. Combining multiple microprocessors seemed to be a good idea to realize a high performance computer. Many research initiatives were tried and many start-up companies have been established to commercialize research results into products. Most of them, unfortunately, turned out to be a failure, one of the reasons being the performance improvement of microprocessors outpaced the development time of parallel systems. Now, people believe that microprocessors reach their physical speed limit due to reasons like power dissipation, etc. And, semiconductor technology has been improved enough to accommodate multiple CPU cores in a single chip.

Project #1: Initial survey, Due Sep. 13 (R)

- In this project, each team reads at least 5 papers and turn in one-page summary for each paper.
- Each summary is one page long and must be written in an essay form. It should include
 - What is the problem this paper addresses and why is it important?
 - What has and has not been done before?
 - How is this paper different from the previous research?
 - What is the approach and why is it innovative?
 - What is the evaluation technique(s) used in this paper and how does the new approach perform compared to previous approaches?
- High-quality papers in this area can be found from ISCA (International Symposium on Computer Architecture), HPCA (High Performance Computer Architecture) or Micro conference proceedings, IEEE journals (Transactions on Computers, Transactions on Parallel and Distributed Computing) or IEEE magazines (Computer). Some of those links are
 - <http://www.cse.ucsd.edu/isca2007/>
 - <http://www.ece.neu.edu/conf/isca2006/>
 - <http://www.ece.arizona.edu/~hpcaprogram.html>
 - <http://www.cse.psu.edu/conf/hpca/>
 - <http://www.microarch.org/micro39/>
 - <http://www.microarch.org/micro37/>
 - <http://csdl2.computer.org/persagen/DLAbstoc.jsp?resourcePath=/dl/trans/td/&toc=comp/trans/td/2007/08/l8toc.xml>
 - <http://csdl2.computer.org/persagen/DLAbstoc.jsp?resourcePath=/dl/mags/co/&toc=comp/mags/co/2007/06/r6toc.xml>

Project #2: Identification of topic, Due Oct. 9 (T)

- In this project, each team reads at least another 5 papers and turn in one-page summary for each paper.
- High-quality papers in this area can be found from ISCA (International Symposium on Computer Architecture), HPCA (High Performance Computer Architecture) or Micro conference proceedings, IEEE journals (Transactions on Computers, Transactions on Parallel and Distributed Computing) or IEEE magazines (Computer).
- In addition, write a report on issues, problems and solutions, leading to the identification of the topic for further study. It should not be a simple accumulation of the summaries. Rather, it must categorize, compare, or analyze the solutions proposed in the 10 papers you have summarized. Make your report no more than 3 pages.
- The report must follow the formal paper structure, which consists of title, author names, Introduction, Related Work, Your_Topic and Reference. Your_Topic section presents the topic of your team's focus: what is it and why is it important but difficult to achieve, etc. The reference section includes the list of papers you refer in the report.
- Each team makes a 15-minute powerpoint presentation on Oct. 9 (T) or Oct. 11 (R) to discuss the project. Make sure each team member presents at least once during the two project presentations (another one is scheduled on Dec. 4 and Dec. 6).

Project #3: Idea development, Due Nov. 8 (R)

- In this project, each team reads at least another 5 papers and turn in one-page summary for each paper.
- Again, high-quality papers in this area can be found from ISCA (International Symposium on Computer Architecture), HPCA (High Performance Computer Architecture) or Micro conference proceedings, IEEE journals (Transactions on Computers, Transactions on Parallel and Distributed Computing) or IEEE magazines (Computer).
- In addition, write an expanded report on the chosen topic based on 15 papers you have summarized as well as Project #2 report. It must include overview of existing solutions and corresponding demerits and demerits. Make your report no more than 5 pages.
- The report must follow the formal paper structure, which consists of title, author names, Introduction, Related Work, Your_Topic and Reference.

Project #4: Proposal, Due Dec. 4 (T)

- Write an expanded report on the chosen topic based on at least 15 papers you have summarized as well as Project #3 report. You must present a novel idea and explain why it should perform better than existing solutions. Make your report no more than 7 pages.
- The report must follow the formal paper structure, which consists of title, author names, Introduction, Related Work, Your_Topic and Reference. In case you have any evaluation methodology you wish to perform if time permits, explain it in the report with expected results.
- Each team makes a 15-minute powerpoint presentation on Dec. 4 (T) or Dec. 6 (R) to discuss the project. Make sure each team member presents at least once during the two project presentations (another one was on Oct. 9 and Oct. 11).