Multicore Architecture and Parallel Programming
Reading Assignment
Due: October. 19th 23:59

Part I:

Each one of you will be assigned with one of the below eight topics. Read the related chapters listed below your topic in the book [Computer Architecture: A Quantitative Approach-Fifth Edition], and write a report in **English**. Please contact TA for acquiring the text book, if necessary. You can write your own understandings after reading. You are also encouraged to read the academic papers to know the recent advances and challenges related to your topic. You should write at least **two pages (Font Size: 12pt)** for this report.

1. Cache Optimization

Chapter 2.2: Ten Advanced Optimizations of Cache Performance
Appendix B.3: Six Basic Cache Optimizations

2. Cache Coherence

Chapter 5.2 Centralized Shared-Memory Architectures
Chapter 5.4 Distributed Shared-Memory and Directory-Based Coherence

3. Virtual Memory

Chapter 2.4 Protection: Virtual Memory and Virtual Machines
Appendix B.4 Virtual Memory
Appendix B.5 Protection and Examples of Virtual Memory

4. Instruction-Level Parallelism

Chapter 3.1 Instruction-Level Parallelism: Concepts and Challenges
Chapter 3.2 Basic Compiler Techniques for Exposing ILP
Chapter 3.7 Exploiting ILP Using Multiple Issue and Static Scheduling

5. Dynamic Scheduling

Chapter 3.4 Overcoming Data Hazards with Dynamic Scheduling
Chapter 3.5 Dynamic Scheduling: Examples and the Algorithm

6. Pipelining

Appendix C.1 Introduction
Appendix C.2 The Major Hurdle of Pipelining—Pipeline Hazards
Appendix C.3 How Is Pipelining Implemented?
Appendix C.4 What Makes Pipelining Hard to Implement?

7. Vector Architecture

Chapter 4.1 Introduction
Chapter 4.2 Vector Architecture
Chapter 4.5 Detecting and Enhancing Loop-Level Parallelism

8. Speculation

Chapter 3.3 Reducing Branch Costs with Advanced Branch Prediction

Chapter 3.9 Advanced Techniques for Instruction Delivery and Speculation

The topic assigned to you is based on the following rule:

[Your Topic ID]= ([Last Three Digits of Student ID] Mod 8) +1.

For example, if your id is 1130249098, then [Your Topic ID] = (098 % 8) +1=3. So your topic is [3.Virtual Memory].

Part II:

Everyone should read the paper [**An Overview of Cache Optimization Techniques and Cache-Aware Numerical Algorithms**], wherein six optimization techniques for improving cache efficiency are presented in chapter 3. After reading this paper, you should validate one of the optimization techniques by writing C/CPP-based test cases and comparing the execution time between the optimized and non-optimized code.

Similarly, we assign the algorithm to you by following rule: **[Your Algorithm ID]=([Last Three Digits of Student ID] Mod 6)+1**. For example, if [Your Algorithm ID] = 3, then you should write the test case for [Algorithm 3.3: Loop blocking for matrix transposition]).

Submission:

Your report should look like this:

1130249098 张三 ReadingAssinment1

Topic: [3.Virtual Memory]

[…At least two pages in First Part]

Algorithm:[Algorithm 3.3 Loop blocking for matrix transposition]

[…Your C or CPP Code and test result.]

Finally, convert your report to pdf format file named like this:

StudentID_Name_ReadingAssinment1.pdf

(Example:1130249098_张三_ReadingAssinment1.pdf) and send to TA before the due date.

Warning

No cheating! Please refer to [上海交通大学学生学业诚信守则], it is your responsibility to take the consequences if you violate the rule.