Advance Computer Architecture

2010 Semester 1

Lecture Notes
5Mar10
Multicores & Multiprocessing

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of
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Assignment 1 for Thursday (yesterday)

E-mail to goodman@cs.auckland.ac.nz before class

- What previous courses have you taken that prepared you for this paper? (Computer organization, operating systems, database, etc.)
- What are you hoping to get out of this paper? (Knowledge about multiprocessors/multicore architectures? Transactional memory? Traditional advanced architecture topics?)
- Other topics you would like to see covered

This assignment is not optional!

For Next Week

- Read Chapter 2 of Patterson & Hennessy (available online)

Claims from last time (and paper)

- Multiple, simpler cores make sense on a single chip because of power limitations
- Memory is a key limitation of speed

Development in Processors

- Simple processors can have very high clock speeds
- Complex, out-of-order processors that speculate and can only be fast if they burn lots of power
- Power is the predominant limitation today
- This has led to multicores, though many environments are not able to exploit them.

The last word in processor performance has not yet been spoken. Improvements (even big ones) are likely yet to be discovered!

Claim: Any application that runs slow enough that performance is an issue must have massive parallelism

Matching Applications with Processors

Many very large applications exhibit natural parallelism

- Web servers handle large numbers of requests where latency is not critical, but throughput is.
- Graphics problems have parallelism, but communications can be a limit.

Challenging Applications

Many applications running on a personal computer are not easily parallelised

- Classic problem: Sorting

Coming Lectures

- Today: Multiprocessing concepts
- Next Week: Quick study of traditional advanced computer architecture topics (P&H)

Multiprocessors, Multithreading & Multicores

This is a "chalk talk"— no slides provided

Multiprocessors, Multi-Cores, Multi-threading, and Hyperthreading

Terminology

- Multiprocessors: multiple processors sharing a common memory (SMP, tightly-coupled MP)
- Multi-cores: multiple processors sharing a common silicon die and memory system (CMP)
- Multithreading: a single processor capable of maintaining the state of multiple threads or processes while executing
- Hyperthreading: Intel's term for a certain type of multithreading (SMT)
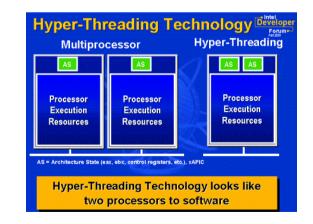- Chip Multithreading (CMT): a multi-core die with multithreaded processors