Modern Computer Systems: the Multicore Computing course at the Masters Level

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(slides available from http://cs.anu.edu.au/~Peter.Strazdins/seminars)

1   Masters-Level Teaching in Computer Systems

- COMP6300 Introduction to Computer Systems

- COMP6310 Concurrent and Distributed Systems

- COMP6331 Computer Networks

- COMP6330* Operating Systems: inside the kernel!

- COMP6464* High Performance Scientific Computation

- COMP6433* Real-Time and Embedded Systems

- COMP6430* Parallel Systems

- COMP8320* Multicore Computing

- COMP8750* Computer Systems Project

- *: counts towards Computer Systems specialization for Master of Computing

THE AUSTRALIAN NATIONAL UNIVERSITY
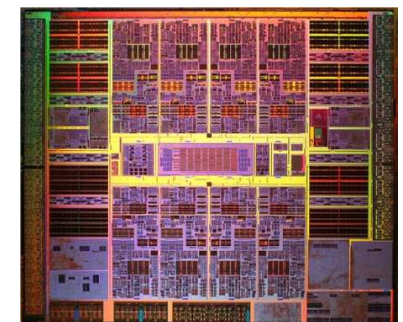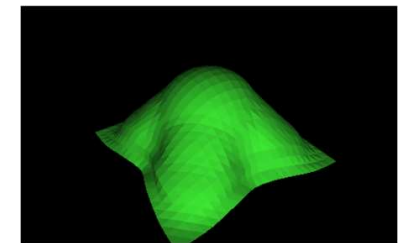
## 2   COMP8320: Multicore Computing- Principles and Practice

- Software engineers who do not understand parallel [multicore] processing will become obsolete! – Professor Rudolph Eigenmann, keynote address at ISPA'06

- but why isn't a parallel programming course enough?

- multicore computing has unique issues:

  - energy considerations, hardware threading, 'destructive sharing' of caches etc, (non-coherent) network-on a chip, operating system issues, synergies with virtualization, transactional memory, speculative threading, heterogeneous multicore and Graphics processing units

  These will become greater now we are entering the 'manycore' era!

- COMP8320 also looks at software engineering aspects:

  - design patterns, methodologies, code refactoring, use of state-of-the-art tools for detecting races and performance analysis

3   ANU's UltraSPARC T2

- mavericks, a T5120 UltraSPARC T2 processor, was donated by Sun MicroSystems, July 2008
- details: a T5120 with 32GB RAM, 2 XAUI network interfaces, 2×146 GB disks

- student interface is `wallaman`: a logical domain exported from `mavericks`. 2009 configuration:

  - 8GB RAM, 56 vCPUs, virtual console on port 5000
  - 30GB virtual disk
  - network interface (`vnet1`) has direct access to physical interface `mavericks:e1000g1`

- use of virtualization for security and education !

- also used in Introduction to Computer Systems and Concurrency courses
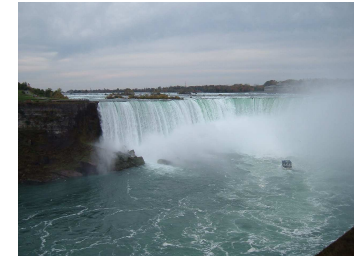
4   Summary and Outlook

- course web page http://cs.anu.edu.au/student/comp8320 (currently as for 2009)

- for 2011, ANU will have a Single Chip Cloud Computer (SCC), donated from Intel

  - 48 P54C cores with non-coherent network

- a course making accessible state-of-the-art technology with state-of-the-art hardware and tools, training software engineers of the future!