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

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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
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, $2 \times 146$ 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!