

CSSE3001/7000 Computer Architecture

Review Lecture

What have we learned?

- Very quick summary of content
- Tutorial Questions
 - ♦ These are similar to what you will find in the exam
 - ♦ If you can do these, you should understand the material!

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Performance Measurement

- Amdahl's Law – speedup parts that take the most time
- Speedup ultimately limited by parts that can't be sped up.
- Speedup (1.5x) vs Percentage Improvement (50%)
- Need to do the numbers – many counter-intuitive examples.

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Microprocessors

- Range of architectures designed for a range of needs...
- A few details about:
 - ♦ x86
 - ♦ SPARC
 - ♦ ARM
 - ♦ TI DSP
 - ♦ GPUs

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MIPS

- RISC vs CISC
- MIPS used as the example architecture
- Understand MIPS instruction set, instruction format, example CPUs
- NO exam questions on details of SPARC or Intel instruction sets or architectures.

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Arithmetic and Datapath

- How is arithmetic implemented in microprocessors?
- How data and control flow within the processor:
 - ♦ Single-cycle datapath
 - ♦ Multiple-cycle datapath
 - ♦ Control signals
 - Microprogrammed v Finite State Machines

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Pipelining

- Pipeline stages
- Data Hazards, and ways to deal with them, such as stalls, forwarding, register renaming
- Branches – branch predictions, delayed branch slots

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Memory Hierarchy

- Why is a hierarchy needed?
- Memory technologies – range of cost, speed and capacity
- Spatial and Temporal Locality
- Caches – how they work
 - Direct Map, Fully Assoc, set Assoc.
 - Replacement policy
- Multi-level caches
- Virtual memory and segmentation

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More memory...

- Cache performance – measuring and improving performance
- Real memory hierarchies
- Disk storage
 - RAID

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IO

- Device characteristics...
 - Latency
 - Bandwidth
- One example - Increasing disk performance
 - RAID – what does it improve?

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Multiprocessors

- Memory architectures
 - Shared v distributed
- Trend towards networks of cheaper computers
- Issues:
 - Cache coherence (and false sharing)
 - Snooping
 - Synchronisation
- Single-chip multiprocessors

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Exam

- Open Book, 2 hours + 10 minutes perusal
- 6 questions out of 8, (best 6 marks count)
- Some easier ones – do them first!
- All problem-based, no multiple choice
- Answer in spaces provided on exam paper

GOOD LUCK!

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