Lecture 00: Notes to Lecturers of CS 252

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Retrospective on Course

- Balance this time was fairly good
  - » 3 on CPU
  - » 2 on Vector Processors
  - » 2 on DSP/Multimedia
  - » 2 on Memory Hiearchy
  - » 3 on I/O
  - » 1.5 on networks
  - » 2.5 on parallel processing
  - – Perhaps less on Vector/DSP (I was particularly interested in the topic this time)
  - – One exception: need 1 more lecture for parallel processing, as just made it through snooping and directories; need another on consistency models, example machines?
  - – Guest lectures important to expose to other projects, faculty in the department

Organization of the Course

- Things went pretty well, not much to change
  - – Collecting project ideas early, having them up on home page before class was a good idea
  - – Might want to move up Prequisite Quiz on 2nd lecture to save a lecture; depends if want them to study over the weekend or not
  - – Limiting enrollment to 35 was a very good idea, as 18 projects is plenty to supervise
  - – Consider tossing out more than you need to get to to 35, as some will surely petition to get back in, and its probably wise to let them, provided they promise to work hard
  - – Having quizes later in semester gave more time to create quizes, which take time to debug
  - – One question of Quiz 2 was based on a quantitative research paper; gave students 3 pages of machine description, asked them to derive results; I liked this alot. Made for an educational, interesting test.

Organization of the Course

- Model of Lecture Preparation encouraged
  - – Review video of lecture from last offering before class to remember the material, also to see students questions during the old lecture, inspiring changes
    - » (If you're not at Berkeley, contact Pam Atkinson Cal VIEW director 510-642-5776 atkins@hera.eecs.berkeley.EDU , to see if she will sell videos of the CS252 lectures)
  - – Putting up slides in postscript (4/page, black and white), PDF (1/page, in color), and PowerPoint (to let other lecturers use the ideas) seemed like a good thing to do; needed to do it at least 2 hours before class so students could print copies; life was better when done 1 day in advance of lecture vs. morning of lecture
    - » Note: At least on the Mac, when I generated postscript for slides with drawings from other programs, it would insert %%EOF in the middle of the postscript, which stops viewing on ghostscript. Hence I deleted those EOF lines manually with an editor before putting the postscript on the web

Organization of the Course

- **End of course went well**
  - Slowed down lectures to allow them to work on projects (also for lecturer to recover)
  - Made them give Oral presentation early, since its good for them to give presentations; also in time to give feedback on the project so can correct things
  - Poster session let everyone in class (and in department) see what they've done; paper posters, enticing email, and free refreshments were important to get people to show up during last week of classes
  - Goodbye to architecture theme of last lecture was fun
- **1062 slides total in 23 lectures! More than pages in textbook!**
- **One concern; not enough discussion in class in this format. Ideally, should have one thoughtful question and then short discussion, or have them go through an example, in each class**

Things to Fix

- **Postscript Printing problem with some of the slides that have spreadsheets inside them**
  - Although they look good on the screen in powerpoint and in PDF, postscript will drop some text
  - Next slide (directory example) has problem in Bus Action column; try printing ps version to see
  - I suspect that all that needs to be done is expand the width of the column in Excel, so that the words don't overlap the boder, but its worth figuring out (I couldn't try this since my Excel is wedged on my Mac)
  - Might also try bolder font so can see on screen
  - I was told it was a problem with Tomasulo slide (Lecture 4) as well

Example

	Processor 1			Processor 2			Interconnect				Directory			Memory
	P1			P2			Bus				Directory			Memor
step		Addr	Value	State	Addr	Value	Action	Proc	Addr	Value	Addr	State	{Procs}	Value
P1: Write 10 to A1								P1	A1		A1	Ex	{P1}	
	Excl.	A1	10					P1	A1	0				
P1: Read A1	Excl.	A1	10											
P2: Read A1					A1			P2	A1					
	Shar.	A1	10				Ftch	P1	A1	10			A1	10
				Shar.	A1	10		P2	A1	10	A1		P1,P2}	10
P2: Write 20 to A1				Excl.	A1	20		P2	A1					10
	Inv.							P1	A1		A1		{P2}	10
P2: Write 40 to A2								P2	A2		A2		{P2}	0
							WrBk	P2	A1	20	A1		{}	20
				Excl.	A2	40		P2	A2	0	A2	Excl.	{P2}	0

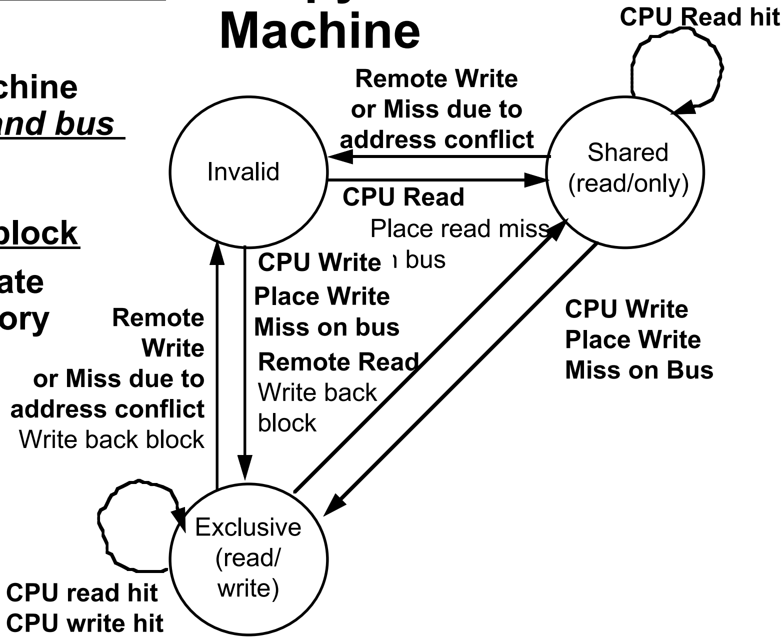
A1 and A2 map to the same cache block

Things to Fix

- **Lectures on Multiprocessors and Coherency**
  - I tried limiting it to cache blocks only, as in the textbook in the first lecture, but very confused
  - Following a suggestion by Kubiatowicz, I changed it to be from perspective of an individual memory block address
  - Changed snopping protocol is next slide
  - Its much easier to follow
  - Need to change lecture slides in Multiprocessor #1 to match new format

Revised Snoopy-Cache State Machine

- **State machine for *CPU and bus* requests for each memory block**
- **Invalid state if in memory**



Things to Fix

- **Tomasulo Lecture (#4)**
  - **Vol. 31, No. 4, April 1998 has the article "Computer Engineering 30 Years After the IBM Model 91" by Michael J. Flynn; its available online via http://computer.org/computer/**
  - **Read and update slides; it apparently had limited branch prediction, which I didn't realize; may be other things to mention**
- **Queueing Theory Lecture (#14)**
  - **I've got the graphs wrong on what an exponential distribution looks like**
  - **Might want to change to use probablility notation on distribution too**

New Ideas

- **One thing missing from a textbook course is having students read research papers so that they can get used to understanding the good and bad of publications**
- **One model is to take 3 papers submitted to conferences (with authors permission) and ask students to review them**
- **Another model is to add a few classic papers**
  - **Dr. Gurindar S. Sohi (sohi@cs.wisc.edu) of University of Wisconsin - Madison has selected 40 papers from the first 25 International Symposiums on Computer Architecture; an ideal source for this**
  - **They will be put online, including a modern intro to each paper by the authors; intros are done**
  - **The 40 papers + intros will be up summer 1998; see http://www.cs.wisc.edu/~arch/www/**

New Ideas

- **Dr. Ed Gehringer (efg@ncsu.edu) at North Carolina State University has developed a database of Computer Architecture course materials on the World Wide Web**
- **It contains approximately two hundred questions from Computer Architecture course assignments at different universities**
- **It wasn't available in time to use, but might want to try using it to get ideas for quizzes, homeworks; also to contribute problems to keep such a noble effort alive**