Usual stuff

- Project 2 back today
  - Average: 66.8/80
- Today:
  - Project 3
  - A few project 2 comments

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Project 3

- Out now and due next Friday
- Given: vmtrace
  - Simulates virtual memory on a memory trace file
    - Tracefile = a list of all VA references during execution
  - Takes in:
    - a memory trace file (given, netscape.exe.et.gz)
    - physical memory size
    - page size
  - Outputs:
    - # of memory references
    - # of page faults
    - compulsory faults
    - page evictions
    - pageouts

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P3 Goals

- Implement some page replacement algorithms
- Design and perform an experiment on some aspect of virtual memory
  - Important to pick a good topic, ask us if not sure!

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Replacement Algorithms

- Given:
  - random
- You need to write:
  - FIFO
  - LRU Clock
  - One of your choice
    - A few possibilities:
      - True LRU (e.g. via storing full timestamp)
      - Variations on LRU Clock (enhanced second-chance, etc)
      - LFU/MFU
      - Your own!
- You can write more than 3 if your experiment focuses on replacement algorithms.

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Project 3 experiment

- Have a hypothesis
  - "Algorithm y is better than algorithm x"
  - "Big pages are better"
  - "Prefetching will reduce the number of page faults"
  - "If we understand why x happens, we can fix it"
- Explain why you think it will turn out that way
- Two steps
  - Determine baseline behavior
  - New test
    - Change one aspect of the system, observe differences

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Good experiment ideas

- What is the ideal page size for this trace under different amounts of main memory?
- Compare performance of various replacement algorithms. How much better/worse is page replacement algorithm X than Y?
  - Compare "real" LRU and LRU clock, FIFO, 2Q, ARC, etc
- How close can we come to LRU without doing any work between page faults?
  - No scanning, constant work per page fault
- How important is recency vs. frequency in predicting page re-use?

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Not so good ideas

- What kind of music is made when I convert the address trace to notes?
- Can I make a fractal out of this data?

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Tips

- vmtrace is not an execution simulation
- You control what happens on a page fault
- You control what happens on a memory access
- You can modify formats for PTE, page, etc
- Refresh your scripting skills
- vmtrace is very CPU-intensive
  - spinlock/coredump: PIII-800/256MB
  - Find faster machines (such as Linux boxes in the lab)
    - Copy the trace file to local machine

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