CMSC 411
Computer Systems Architecture
Project
Cache Simulator

Cache Simulator
• Goals
  – Build a cache simulator
  – Validate correctness
  – Use cache simulator to study
    » Cache organizations
    » Cache management policies

Simulation Approach
• Trace-driven
  – Sequence of memory accesses
    » Taken from actual execution on machine
• Cache model
  – Maintain cache in software
• Software
  – C code
  – Text files listing application traces
    » spice, cc, tex

Cache Parameters
• Total cache size
• Block size
• Unified vs. split I- and D-caches
• Associativity
• Write back vs. write through
• Write allocate vs. write no allocate

Simulation Statistics
• Number of instruction references
• Number of data references
• Number of instruction misses
• Number of data misses
• Number of words fetched from memory
• Number of words copied back to memory

Project Milestones
1. Basic cache
   – 8K direct mapped, unified cache
   – Block size = 16, write back, write allocate
2. Vary cache parameters
   – Size, associativity, etc...
3. Performance evaluation
   – Working set
   – Impact of
     » Block size
     » Associativity
     » Memory bandwidth (writeback vs writethrough, etc.)