

**CSE 569M**  
**Parallel Architectures and Algorithms**  
**Assignment #3**

Due: March 6, 2009.

- For each of the following three reference streams, compare the cost of executing it on a bus-based machine that supports (a) the Illinois MESI protocol and (b) the Dragon protocol. Explain the observed performance differences in terms of the characteristics of the streams and the coherence protocols.

Stream 1: r1 w1 r1 w1 r2 w2 r2 w2 r3 w3 r3 w3  
 Stream 2: r1 r2 r3 w1 w2 w3 r1 r2 r3 w3 w1  
 Stream 3: r1 r2 r3 r3 w1 w1 w1 w1 w2 w3

All of the references in the streams are to the same location: r/w indicates read or write, and the digit refers to the processor issuing the reference. Assume that all caches are initially empty, and use the following cost model: read/write cache hit – 1 cycle; misses requiring simple transaction on the bus (BusUpgr, BusUpd) – 60 cycles; and misses requiring whole cache block transfer – 90 cycles. Assume all caches are write allocated.

- Given the following code segments, say what results are possible (or not possible) under sequential consistency. Assume that all variables are initialized to 0 before this code is reached.

(a)

<b>P1</b>	<b>P2</b>	<b>P3</b>
A = 1	u = A B = 1	v = B w = A

(b)

<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>
A = 1	u = A v = B	B = 1	w = B x = A