**Chapter 6 Problem Set**

6.1. Suppose I have a problem solution that on one machine such that 95% of the solution can be made parallel and 5% of which inherently serial in nature.

6.1.1. What is the maximum parallel speedup for this fixed problem size?

6.1.2. Suppose the processing time for the part of the problem that can be done in parallel grows as 4n2 while the serial time grows as 8n where n is the problem ‘size’. What is the percentage of the time for the serial part for problem sizes: 10, 15, 20, n.

6.1.3. Suppose we can get (perfect) N-fold speed up of the parallel part by using N processors. What is the run time as a function of both n and N?

6.1.4 how does this help us beat Amdahl’s law?

6.2. Suppose you are the contractor for the task of building a suburb of identical houses.

6.2.1. Describe a SIMD style solution to the problem.

6.2.2 Describe a MIMD style solution to the problem.

6.2.3 Describe a SISD style solution to the problem.

6.2.4 What would be the pros and cons of each approach?

6.3. Draw a diagram showing the connections in a …

6.3.1. … fully connected network of 8 nodes (N=8)

6.3.2. … 8 node ring (N=8)

6.3.3. … 16 node mesh (with wrap around edges) (N = n2)

6.3.4. … 16 node hypercube (N = 2k)

6.3.5. … 8 node butterfly(omega/shuffle) network (N = 2k)

6.4. Construct a table that has columns for ‘diameter’, ‘connections’ and ‘bisection bandwidth’(defined on p537). It should have rows for each of the topologies in the previous question. Complete the table in terms of n, k, or N. (big-Oh is good enough)

6.5 Use the table in the previous problem to discuss ‘scalability’ for the various network topologies.