Let one element of the array be updated by each process, i.e. the processor labeled Pi,j updates a[i][j] in the iteration space.

for (i=0; i < n; i++) {

for (j=0; j < n; j++) {

a[i][j] = a[i-1][j] + a[i][j-1];

}

}

**Question A:**

What is the work for the entire computation?

**Question B:**

What is the work at each node?

**Question C:**

What is the average degree of concurrency in the algorithm, i.e. how many processors can be executing in parallel performing the computation of the loop? You can assume a square matrix.

**Question D:**

Assume communication takes 1 unit of time, an iteration of the loop takes one unit of time, and a node can send two messages at once. Give an estimate of the sequential overhead, and an estimate of the maximum speedup predicted by Amdahl’s law. What is the parallel overhead?

1 unit of time for communication (2 at the same time)

1 unit of time for computation (1 per node)

= 2 units of time per node, 1 of which would be done in parallel. (The computation. The communication would overlap)

so f = .5

The maximum found when looking in the range of 1 to infinity is when p = 1. Computation that occurs so quickly that it is faster in serial. The overhead is 50%