

## Assignment 3: Advanced MPI

### 1. Matrix Multiplication MPI+ OpenMP

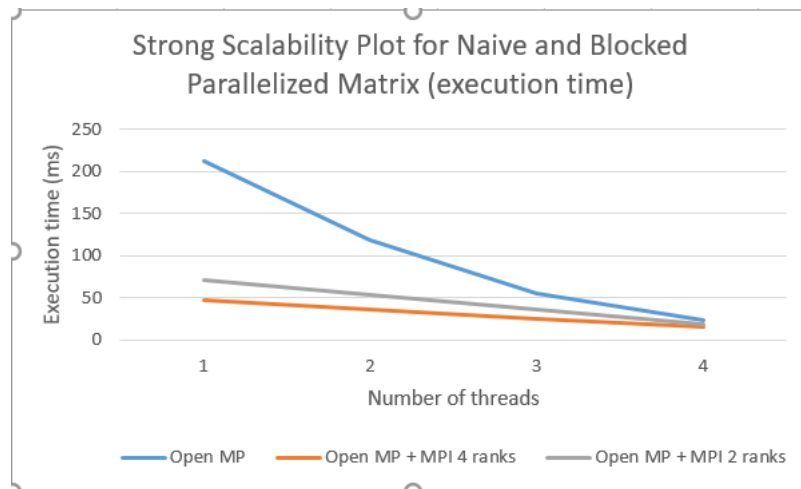


Figure 1: It is clear that MPI version is much faster, especially if enhanced with OpenMP constructs. It is due to the combined MPI process level and OpenMP thread level parallelization.

### 2. Load balancing in MPI

b) Block cyclic scheduling (uniform) MATRIX SIZE: 4000, GFLOPS: 4.877902, Execution time: 24.438638s

d) Block cyclic scheduling (finer block size) BLOCK SIZE: 10 MATRIX SIZE: 4000, Execution time: 3.289238

It is clear that the fine tuned version is nearly 10 times faster. It is due to the fact that for the first version, part of processes, processing zero entries, have to wait for processes processing actual non-zero values to finish.

### **3. One Sided Communication**

c) Execution time: 47.090377s. It is apparent that using traditional, non memory sharing MPI strategies yields faster results.