Parallel Progrmg: Sci & Engrg

Machine Problem 6

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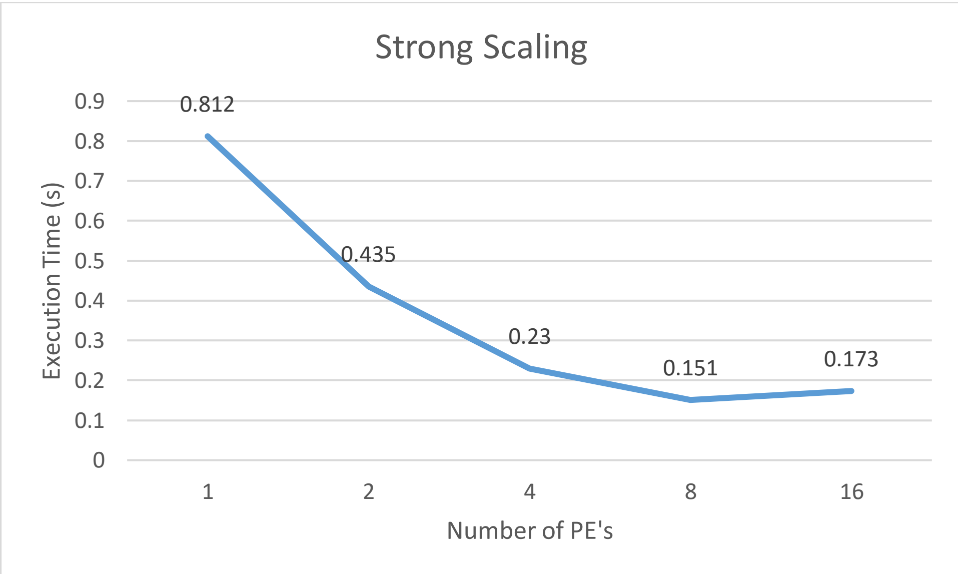
A. Q: Strong scaling refers to how the execution time varies with the number of PE's for a fixed, overall problem size. For a single-node run and an 8192 by 8192 workload with 16 iterations, plot Execution Time vs. Number of PE's for PE counts: 1, 2, 4, 8, and 16. Briefly comment on your program's strong scaling.

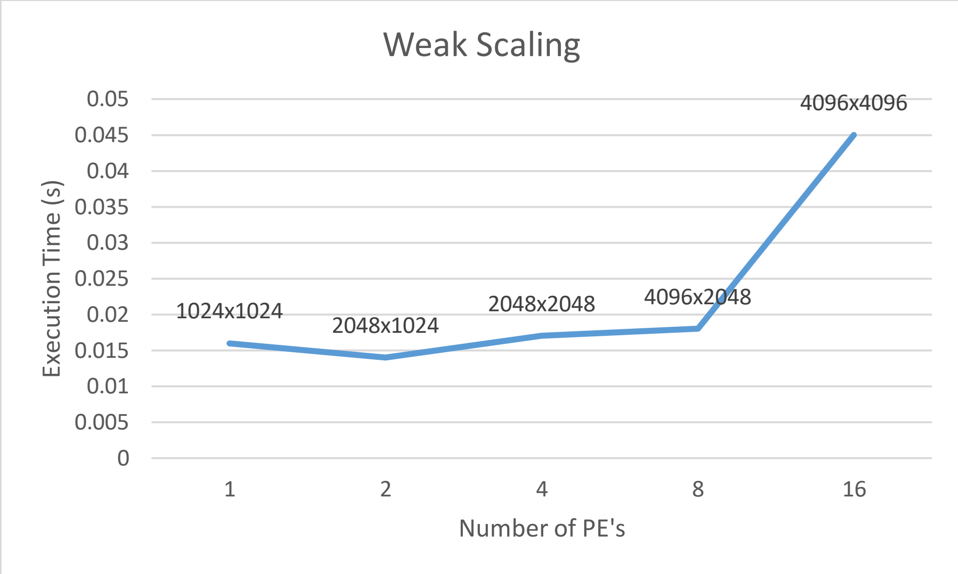
   A:



   From the graph above, performance will be greater as PE counts increases, but when PE counts is more than 8, performance stops increasing.

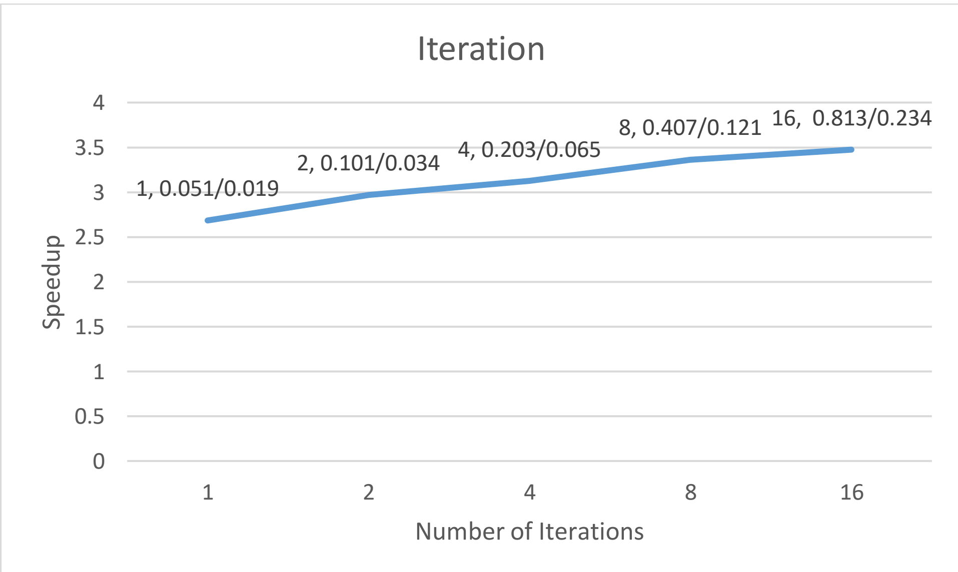
B. Q: Weak scaling refers to how the execution time varies with the number of PE's for a fixed problem size per PE. Plot Execution Time vs. Number of PE's for a fixed tile size of 1024 by 1024 per PE for PE counts: 1, 2, 4, 8, and 16; include data labels for each point indicating the overall workload size. Brifly comment on your program's weak scaling.

   A:



From the graph above, performance stays almost the same when PE counts is less than 8, but performance becomes worse as PE counts is greater than 8.

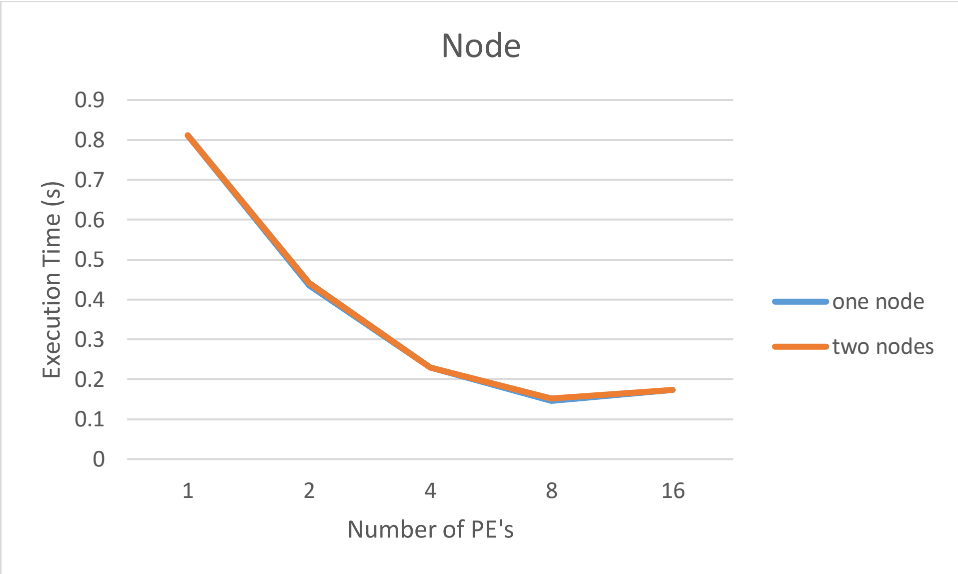
C. Q: As you increase the amount of computation relative to the amount of communication, the cost of communication will be attenuated. For our stencil program, we can increase the amount of computation by running for more iterations. Run your program with one PE and four PE's for an 8192 by 8192 workload for iteration counts: 1, 2, 4, 8, and 16. Plot Speedup vs. Number of Iterations using these results, with each point's value being (nits; timenp=1/timenp=4). Briefly comment on these results.
A:



From the graph above, as the interation is higher, speedup becomes more apparent.

D. Q: For an 8192 by 8192 workload with 16 iterations, how did running your program with multiple nodes affect its parallel performance?

A:



From the graph above, multiple nodes didn't affect performance.