

ComS 425: Homework # 4 — 60 points

Due Thursday March 1, 2007, in class

1. For a problem size of interest, 6 percent of the operation of a parallel program are inside I/O functions that are executed on a single processor. What is the minimum number of processors needed in order for the parallel program to exhibit a speedup of 10?
2. What is the maximum fraction of execution time that can be spent performing inherently sequential operations if a parallel application is to achieve a speedup of 50 over its sequential counterpart?
3. Brandon's parallel program executes in 242 seconds on 16 processors. Through benchmarking he determines that 9 seconds is spent performing initializations and cleanup on one processor. During the remaining 233 seconds all 16 processors are active. What is the scaled speedup achieved by Brandon's program?
4. Courtney benchmarks one of her parallel programs executing on 40 processors. She discovers that it spends 99 percent of its time inside parallel code. What is the scaled speedup of her program?
5. Install the latest version of NetPIPE, `NetPIPE.3.6.2.tar.gz`, Run NetPIPE with the MPI protocol (NPmpi program) between *two* sets of processors—(1) between any two processors on the same node and (2) between any two processors on two different nodes— of the `hpc-class` and `borges.scl.ameslab.gov` computers. (Note that you should use *non-interactive* nodes on the `hpc-class`).
 - (a) Prepare two plots for *each* run as follows: One plot showing **throughput** vs **elapsed time**, another showing **throughput** vs **message size**. Note that you should have eight plots total.
 - (b) What latency (t_{start}) and what unit transfer time (t_{data}) did you find in each case?
 - (c) Compare the results of the
 - i. Same plots for `hpc-class` vs `borges`. State which network has been used in each computer. Which network is performing better? Why do you think this performance is observed?
 - ii. Single-node runs (SN) vs different-node runs (DN) for each computer. Which one, SN or DN, performs better for each computer?