

MSIM 715/815: Homework # 2 — [Pass/Fail]

Due Oct. 10 2025, by 11:59pm via Canvas

Download the provided `omp_hello2.c` program to your ODU HPC account. Compile the source code there to get the executable. You may use any compiler, just make sure you compile with the OpenMP capability.¹ Run the executable *interactively* on a cluster compute node² at least three times for *each* number of threads N_t specified as follows:

N_t is unique, where $t = 1, \dots, n$, $n \geq 6$, $N_1 = 1$, $N_n = M$, and M is the maximum number of cores on the node that you execute the program. All the runs are to be done with one thread per core.

In your submission:

1. State the `salloc` command line with arguments that you've used.
2. State the maximum number M of cores on the given node and state how you've determined it.
3. State how you set different N_t 's for your program executions.
4. Record the program execution time that is output by the program, calculate the average over the runs you've conducted for each N_t and plot the averages. (The plot will have n data points.)
5. Provide the speedup value for each chosen number of threads with respect to the N_1 execution.
6. Answer the following questions:
 - (a) Given N_t , why the order of the printed messages may be different in each of runs with that N_t ?
 - (b) Why the execution times may be larger for larger N_t 's?
 - (c) How would you modify the source code of the program to obtain a speedup greater than one for all the chosen thread numbers with respect to the N_1 execution? Justify your answer.
 - (d) What type of parallelism—'data' or 'task'—is exploited in `omp_hello2.c`? Justify your answer.
 - (e) Modify the code to avoid the `if (tid == 0)` statement while leaving the same meaning: Only does master thread print this message. Provide the listing of your modified `omp_hello.c` file.

¹For example, to compile with the `gcc` compiler use the compiler option `-fopenmp` and `-lm` to link with OpenMP and math libraries.

²Use `salloc` slurm command to obtain a compute node for interactive use.