High-Performance Computing

Laboratory 4:

Performance measurements

Objective:

- benchmark of the processor and the memory-processor system

Tasks:

1) Obtain information about the theoretical processor performance in GFLOPS (from the Internet - manufacturers' websites e.g. https://ark.intel.com/ and others) and RAM (in MB/s).
2) Run the STREAM test (in the stream_d.c code there is a commented fragment, which should be changed, the Makefile contains compilation instructions - in Linux it is enough to run the make command to compile everything) and perform the performance measurement - attention to the calculation of the result in the STREAM test, i.e. calculation of the number of bytes transferred from the memory to the processor (double arrays).
    a) Measurements for different sizes in the range 1000-10000000 (min. 10 measurements), results on a graph (x-axis - size (scale can be logarithmic), y-axis - throughput) - we are interested in throughput for all four instructions (times don't matter - important MB/s)
    b) Comparison of achieved results with theoretical estimates.
3) Run the LINPACK test
    a) You can use the code from https://www.netlib.org/benchmark/hpl/, the compiled version from https://intel.ly/31E6bU1, the Linpack Extreme distribution or the code linpack.tgz
    b) Perform the performance measurement
        i) Test the various options available (minimum of two) for each version of the LINPACK benchmark.
        ii) If the last code is chosen, test the DP and SP options, and UNROLL and ROLL (4 combinations) for tasks between 20 and 100 unknowns with a step of 20, between 100 and 400 with a step of 50, and above 400 with a step of 100 up to 1000 unknowns - to change the compilation options modify the Makefile or use the switches -DDP -DROLL, -DDP -DUNROLL, -DSP -DROLL, -DSP -DUNROLL.
    c) Create tables with the results and graphs - performance in GFLOPS or MFLOPS for different cases
    d) Comparison of test results and theoretical estimates.

Assessment:

- The report should include the characteristics of the hardware tested and the results from each benchmark in the form of tables and graphs.