CSC 591c Project Update – HW5

Project: Testing hyperthreading on Intel Xeon Processor

Nik installed 2.5.68 kernel, done. Verified 1 processor enabled with hyperthread. Test code designed and implemented and currently debugging.

Installation of the kernel required working around bugs in current versions of the kernel. New version of kernel just released (4/19) solved most of these problems after prior work accomplished.

Acquired a machine with a single processor as the bios did not allow disabling of single processors, just hyperthreading.

The test code was designed and written. We have a single hyperthread that spin-locks on a variable until our main thread finishes processing. The main thread outputs the value into a result variable and then spin-locks until a new value is given by the hyperthread. The hyperthread then does a network read/write to acquire a new value. The process repeats and we report timings. There is a serial and parallel version and we are working on reporting the timings as soon as we confirm the threads are not being switched out by the scheduler.

Tool: sPPM

Frank installed sPPM onto the cluster and tested the cluster. Had to port the fortran code onto the Intel architecture. The code was previously run only on Power/R10K/Ultrasparc processors.

Currently the test requires that we have a YxYxY setup and the maximum our cluster will support is $2x2x2 = 8$ cpu's .

Initial results for a few sample runs are:

1 task with no threads.

 TOTAL-HYD cpu, wall, ratio: 528.305   528.306   1.000

1 task with 4 openmp threads as a test. (wall is time in seconds)

 TOTAL-HYD cpu, wall, ratio: 528.787   528.802   1.000

8 MPI tasks and 2 openmp threads each:

TOTAL-HYD cpu, wall, ratio: 536.820   536.845   1.000

8 MPI tasks and 2 pthreads each:

TOTAL-HYD cpu, wall, ratio: 273.160   275.005   0.993

A makefile was created for Intel/Linux pointing to the MPI fortran and C compilers. Needed to link special libraries into the compile for fortan 2 C support since the application uses both C and fortran. (C for I/O and native thread support) currently the makefile supports several builds: MPI w/ OpenMP, MPI w/ pthreads, MPI w/o threads, OpenMP only, and pthreads only. All have been tested and are working.

The fortran code was modified not to use complex (intrinsic) functions in the parameter definitions, since icc and gcc do not support this, this code was added as well as a constant that you define in the makefile to enable this code called GNU.

The POSIX pthread code was modified to use constant definitions for several functions which appear to have been added after the original code was written and did not have constants, which was causing compile errors since the C function names have different values depending on the f2C definition of the target platform.

The last obstacle was coming up with the correct linker and compiler options for f2C support and so forth.

Next steps:

all: 5/02 final report and demo

test hyperthreading code, come up with practical scenarios
Kernel scheduler modifications.
At risk: Adapting MPI to new kernel and the test code.