جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

CS 280 – High Performance Computing / Architecture

Spring 2014

Assignment 2: Accelerators

SMC GPU cluster

- Managed by IT research computing
- For access, request a NOOR account online at http://rcweb.kaust.edu.sa/group/rc/IT_Forms/acct_req.html if you don’t have one already
- Much more information about the system specification and use in the file “SMC_user_guide.pdf” attached with lecture 14
  - Slides presented by Mohammed Naseemuddin at the GPU training offered by KSL in October 2013

MIC system

- Managed by KAUST Supercomputing Lab
- Accounts have been created together with Neser accounts
  - Passwords need resetting
- ssh <uid>@mic.hpc.kaust.edu.sa
- Single node system with two Intel Xeon Phi (KNC) attached
- Read /etc/info.txt for quick guide to run natively on the coprocessors

MIC system

- No scheduler installed, so please share the use of the system
  - Before launching any execution, make sure nobody else is running another application
    - Use the command `top`; you have to be logged to the device to check if the device is used
    - Since there are two accelerators, two users can run their codes each on a different device at the same time
  - Please communicate between each other to schedule or reserve time slots for execution on the system
  - **Most important, start early so you don't have to do your measurements at the last moment**

Tasks

- Task 1:
  - Annotate the rtm_kernel code (original, uploaded for the first assignment) with openMP directives to get a multithreaded code
    - Apply changes to the code if needed
  - Compile your openMP code using the Intel compiler on the MIC system for the Intel Xeon CPU (Sandy bridge)
  - Run the code with 1, 2, 4, 8 and 16 threads on the CPU and report the corresponding speedups in a graph
  - Compile the code for the coprocessor, run it using 60, 120, 180 and 240 threads natively on the coprocessor and report the corresponding speedups in a graph

Tasks

- Note: to run your code on the Phi follow these steps:
  - On `mic.hpc.kaust.edu.sa` compile your code for the target device using –mmic
  - Copy the directory `/opt/intel/composer_xe_2013/lib/mic` in your home directory
  - Login to the device `ssh mic0` or `ssh mic1`
  - Add the directory you copied to the environment varibale `LD_LIBRARY_PATH`:

```
export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:~/mic
```

  - Now you just launch your executable

Tasks

- Task 2:
  - Annotate the rtm_kernel code (original, uploaded for the first assignment) with openACC directives
  - compile it using the PGI compiler on the SMC system
  - Run it using a fermi GPU and report the corresponding speedup
  - Run it using a K20 GPU and report the corresponding speedup

Submission guidelines

- Deliverables:
  - Source code
  - Report including explanations to the code (directives used and eventually why) and results (execution times, speedups, graphs, along with reference CPU information, …)
- Upload to blackboard in the corresponding assignment section
- Deadline: Thursday, 8th May, 2014
- In case of questions, email or ask for appointment