OpenACC 2 with CUDA 7.0 and GCC 5.2.1

(Some of my notes on using OpenACC with CUDA 7.0 and GCC 5.2.1 for Discovery Cluster Users on the GPU nodes – email n.roy@neu.edu if you have questions or need more clarifications. Nilay K. Roy, Ph.D.)

To use OpenACC (2.0) with NVIDIA CUDA 7.0 toolkit you will need the GCC 5.2 compiler. Please note that this is to be run only on the GPU nodes that have at least one NVIDIA Tesla GPU. One can add OpenMP and MPI too in the code base but the example below is a simple OpenACC based GPU accelerated run compared with a CPU only run.

First load the correct modules in your .bashrc. This is shown below:

```bash
module load gnu-4.4-compilers
module load cuda-3.3
module load gnu-4.6.1-compilers
module load cuda-7.0
module load OpenACC-2.0
module load cuda-7.0
```

Put these module load commands in your .bashrc file that is found in your /home/noner-job directory.

The code that is being compiled with OpenACC and Cuda drivers using gcc 5.2.1 is shown below:

```bash
gcc pi.c -openacc -ooffload=nvptx-none -offload="-03" -03 -o gpu.x
```

Two versions are compiled using the commands shown below. “gpu.x” is the OpenACC 2.0 accelerated version that can be run on the GPU and “cpu.x” is the CPU only version.

```bash
[nroy@compute-2-128 test_openacc]$ time ./gpu.x
real    0m4.940s
user    0m2.131s
sys     0m0.965s
[nroy@compute-2-128 test_openacc]$ time ./cpu.x
real    0m37.947s
user    0m37.243s
sys     0m0.004s
```

Details of the compile flags used including Cuda Toolkit 7.0 drivers are shown below:

Finally the runs for “gpu.x” and “cpu.x” are shown below: note the speedup ...

```bash
[nroy@compute-2-128 test_openacc]$ cat pi.c
```