

# nvprof and nvvp with mpi applications on Blue Waters (cuda or openacc )

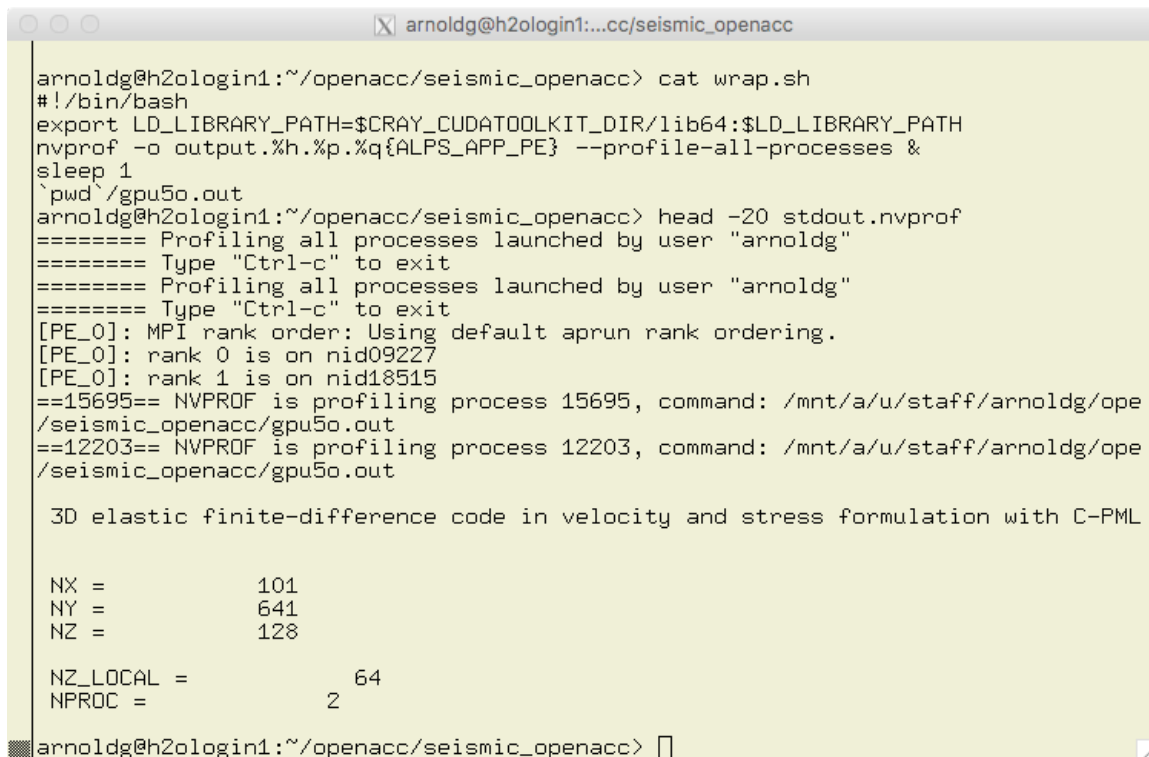
Profiling cuda or OpenACC codes with nvprof requires some extra syntax on Blue Waters (and probably on other linux cluster instances).

The following was gleaned from : <http://docs.nvidia.com/cuda/profiler-users-guide/index.html#mpi-nvprof> , and <https://bluewaters.ncsa.illinois.edu/openacc-and-cuda-profiling>.

1. Construct a wrapper that will be executed by mpirun/mpiexec/aprun or your local MPI launch mechanism
  - a. aprun -N 1 -n 2 ./wrap.sh # for the example below
2. The wrapper should invoke nvprof with appropriate options and then start your MPI executable
3. Use Nvidia's nvvp ( <https://developer.nvidia.com/nvidia-visual-profiler> ) to analyse the resultant profiles.

This example was built on Blue Waters based on the PGI tutorial at: <http://www.pgroup.com/lit/articles/insider/v4n1a3.htm>

PrgEnv-pgi and cudatoolkit modules were loaded for the build and at runtime.



```
arnoldg@h2ologin1:~/openacc/seismic_openacc> cat wrap.sh
#!/bin/bash
export LD_LIBRARY_PATH=$CRAY_CUDAToolKIT_DIR/lib64:$LD_LIBRARY_PATH
nvprof -o output.%h.%p.%q{ALPS_APP_PE} --profile-all-processes &
sleep 1
`pwd`/gpu5o.out
arnoldg@h2ologin1:~/openacc/seismic_openacc> head -20 stdout.nvprof
===== Profiling all processes launched by user "arnoldg"
===== Type "Ctrl-c" to exit
===== Profiling all processes launched by user "arnoldg"
===== Type "Ctrl-c" to exit
[PE_0]: MPI rank order: Using default aprun rank ordering.
[PE_0]: rank 0 is on nid09227
[PE_0]: rank 1 is on nid18515
==15695== NVPROF is profiling process 15695, command: /mnt/a/u/staff/arnoldg/ope
/seismic_openacc/gpu5o.out
==12203== NVPROF is profiling process 12203, command: /mnt/a/u/staff/arnoldg/ope
/seismic_openacc/gpu5o.out

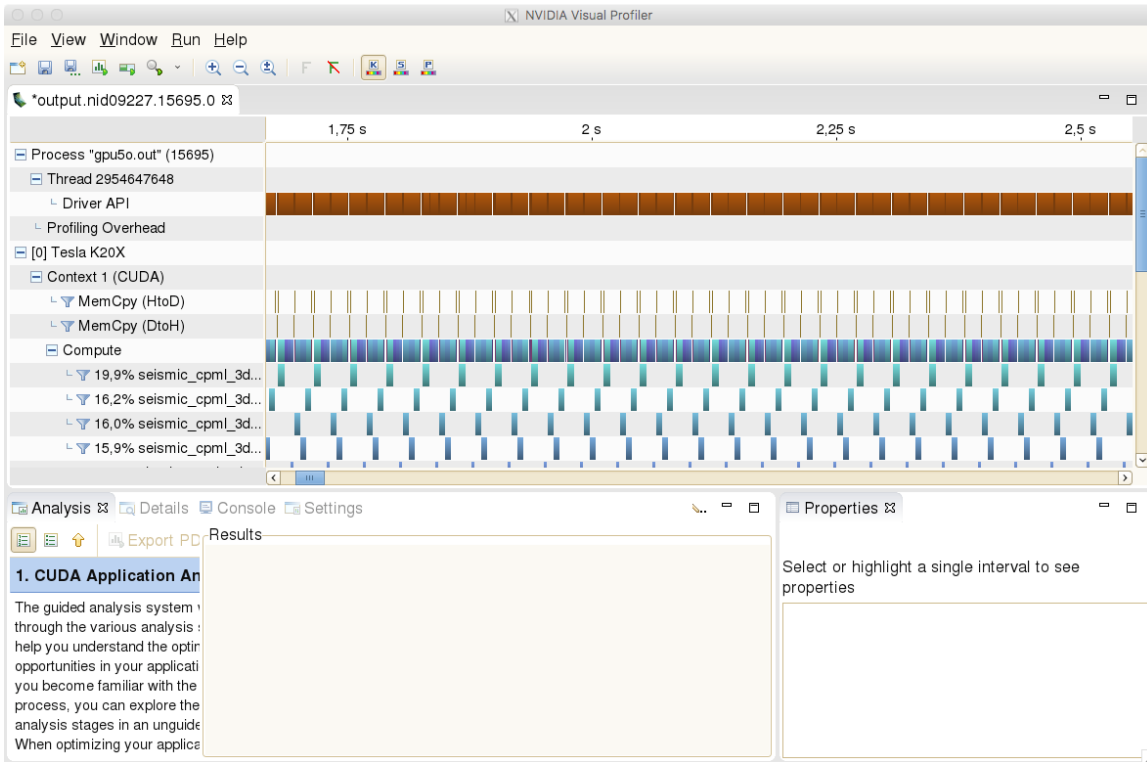
 3D elastic finite-difference code in velocity and stress formulation with C-PML

NX =          101
NY =          641
NZ =          128

NZ_LOCAL =          64
NPROC =           2
arnoldg@h2ologin1:~/openacc/seismic_openacc> █
```

After successfully generating the output files , the nvvp profiler is run from a login node (or a local machine if you have cudatoolkit installed and have copied the files):

```
arnoldg@h2ologin1:~/openacc/seismic_openacc> nvvp output.nid09227.15695.0
```



Select a kernel to drill down into performance details from the GPU for that kernel.

