The OSU College of Engineering DGX System
for Advanced GPU Computing

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DGX System

OSU’s College of Engineering has six Nvidia DGX-2 systems

Each DGX server:
- Has 16 NVIDIA Tesla V100 GPUs
- Has 28TB of disk, all SSD
- Has two 24-core Intel Xeon 8168 Platinum 2.7GHz CPUs
- Has 1.5TB of DDR4-2666 System Memory
- Runs the CentOS 7 Linux operating system

Overall compute power:
- Each V100 NVIDIA Tesla card has 5,120 CUDA Cores and 640 Tensor Cores
- This gives each 16-V100 DGX server a total of 81,920 CUDA cores and 10,240 Tensor cores
- This gives the entire 6-DGX package a total of 491,520 CUDA Cores and 61,440 Tensor Cores

Performance Comparison with one of our previous Systems

BTW, you can also use the rabbit machine:

ssh rabbit.engr.oregonstate.edu

It is a good place to write your code and get it to compile.

It is not a good place to do the final run of your code.

How to SSH to the DGX Systems

submit-c 142%

module load slurm

ssh over to a DGX submission machine --

submit-a and submit-b will also work

Type this right away to set your path correctly

How to Check on the DGX Systems

submit-c 143%

squeue

PARTITION NODELIST

Submit a CUDA job to the DGX Systems using Slurm

Create a bash shell file that looks like this

submit.bash:

#!/bin/bash

#SBATCH -J ArrayMul

#SBATCH -A cs475-575

#SBATCH -p class

#SBATCH --constraint=v100

#SBATCH --gres=gpu:1

#SBATCH -o arraymul.out

#SBATCH -e arraymul.err

#SBATCH --mail-type=BEGIN,END,FAIL

#SBATCH --mail-user=joeparallel@oregonstate.edu

/usr/local/apps/cuda/cuda-10.1/bin/nvcc -o arrayMul arrayMul.cu

./arrayMul

Submit the job described in your shell file

Check the output

(I like sending my output to standard error, not standard output)
Auto-Notifications via Email

```bash
#SBATCH --mail-user=joeparallel@oregonstate.edu
```

You don't have to do this, but if you do, please be sure you get your own email address right!

Our IT people are getting real tired of fielding the bounced emails when people spell their own email address wrong.

What Showed up in my Email (which I spelled correctly)

From:
Subject:

Slurm workload manager: Slurm_job_id=4890/name=submitloop/End: Run time:01/02/12:00:00
Slurm workload manager: Slurm_job_id=4880/name=submitloop/Begin: Queued time 00:00

Submiting a Loop

```bash
#!/bin/bash
#SBATCH -J ArrayMul
#SBATCH -A cs475-575
#SBATCH -p class
#SBATCH --constraint=v100
#SBATCH --gres=gpu:1
#SBATCH -o arraymul.out
#SBATCH -e arraymul.err
#SBATCH --mail-type=BEGIN,END,FAIL
#SBATCH --mail-user=joeparallel@oregonstate.edu
```

```bash
for t in 1 2 4 8 16 32
do
/usr/local/apps/cuda/cuda-10.1/bin/nvcc -DNUMT=$t -o arrayMul arrayMul.cu
./arrayMul
done
```

```
submit-c 153%
sbatch submitloop.bash
Submitted batch job 475
submit-c 154%
scancel 476
```

Use slurm's scancel if your Job Needs to Be Killed

Here's what printinfo got on one graphics card on the DGX System

Number of Platforms = 1
```
Platform #0:
Name = 'NVIDIA CUDA'
Vendor = 'NVIDIA Corporation'
Version = 'OpenCL 1.2 CUDA 11.2.153' 
Profile = 'FULL_PROFILE'
```
Number of Devices = 1
```
Device #0:
Type = 0x0004 = CL_DEVICE_TYPE_GPU
Device Vendor ID = 0x10de (NVIDIA)
Device Maximum Compute Units = 80
Device Maximum Work Item Dimensions = 3
Device Maximum Work Item Sizes = 1024 x 1024 x 64
Device Maximum Work Group Size = 1024
Device Maximum Clock Frequency = 1530 MHz
Device Extensions:
`cl_khr_global_int32_base_atomics`
`cl_khr_global_int32_extended_atomics`
`cl_khr_local_int32_base_atomics`
`cl_khr_local_int32_extended_atomics`
`cl_khr_fp64`
`cl_khr_byte_addressable_store`
`cl_khr_icd`
`cl_khr_gl_sharing`
`cl_nv_compiler_options`
`cl_nv_device_attribute_query`
`cl_nv_pragma_unroll`
`cl_nv_copy_opts`
`cl_nv_create_buffer`
```
For reference, rabbit's graphics card has 15 Compute Units