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HIP Lecture Series

Introduction to HIP Exercises

For the HIP Lecture Series, the examples can be retrieved from this repository.

```
git clone https://github.com/olcf/hip-training-series
```

This markdown document is located at 'Lecture1/01 Exercises for HIP Introduction.md' contains the instructions to run the examples. You can view it in github for better readability or download the pdf file 'Lecture1/01 Exercises for HIP Introduction.pdf' which has been generated from the markdown document.

For the first interactive example, get an slurm interactive session

```
salloc -N 1 -p batch --gpus=1 -t 10:00 -A <project>
```

Use your project id in the project field. If you do not remember it, run the command without the -A option and it should report your valid projects.

```
module load PrgEnv-amd
module load amd
module load cmake
```

Basic examples

```
cd hip-training-series/Lecture1/HIP/vectorAdd
```

Examine files here – README, Makefile, CMakeLists.txt and vectoradd.hip. Notice that the Makefile requires ROCM_PATH to be set. Check with module show rocm or echo \$ROCM_PATH. Also, the Makefile builds and runs the code. We'll do the steps separately. Check also the HIPFLAGS in the Makefile. There is also a CMakeLists.txt file to use for a cmake build.

For the portable Makefile system

```
make vectoradd
srun ./vectoradd
```

This example also runs with the cmake system

```
mkdir build && cd build
cmake ..
make
srun ./vectoradd
```

Now clean up from these exercises before the next part.

```
cd ..
make clean
rm -rf build
module unload PrgEnv-amd
module unload amd
module unload cmake
```

We can use a SLURM submission script, let's call it `hip_batch.sh`. There is a sample script for some systems in the example directory.

```
#!/bin/bash
#SBATCH -p batch
#SBATCH -N 1
#SBATCH --gpus=1
#SBATCH -t 10:00
#SBATCH -A <your project id>

module load PrgEnv-amd
module load amd
module load cmake
cd $HOME/hip-training-series/Lecture1/HIP/vectorAdd
```

```
make vectoradd
srun ./vectoradd
```

Submit the script `sbatch hip_batch.sh`

Check for output in `slurm-<job-id>.out` or error in `slurm-<job-id>.err`

To use the cmake option in the batch file, change the build commands in the batch file to

```
mkdir build && cd build
cmake ..
make
srun ./vectoradd
```

Compile and run with Cray compiler

```
module load PrgEnv-cray
module load amd-mixed
module load cmake
CXX=CC CRAY_CPU_TARGET=x86-64 make vectoradd
srun ./vectoradd
```

And with the cmake build system.

```
module load PrgEnv-cray
module load amd-mixed
module load cmake
mkdir build && cd build
CXX=CC CRAY_CPU_TARGET=x86-64 cmake ..
make
srun ./vectoradd
```

Before moving onto another example, first clean up from the previous work.

```
cd ..
make clean
rm -rf build
module unload PrgEnv-cray
module unload amd-mixed
module unload cmake
```

Now let's try the hip-stream example. This example is from the original McCalpin code as ported to CUDA by Nvidia. This version has been ported to use HIP.

```
module load PrgEnv-amd
```

```

module load amd
module load cmake
cd $HOME/HPCTrainingExamples/HIP/hip-stream
make
srun ./stream

```

Note that it builds with the hipcc compiler. You should get a report of the Copy, Scale, Add, and Triad cases.

On your own:

1. Check out the saxpy example in `hip-training-series/Lecture1/HIP`
2. Write your own kernel and run it
3. Test the code on an Nvidia system – Add `HIPCC=nvcc` before the make command or `-DCMAKE_GPU_RUNTIME=CUDA` to the cmake command. (See README file)

More advanced HIP makefile

The jacobi example has a more complex build that incorporates MPI. The original Makefile has not been modified, but a CMakeLists.txt has been added to demonstrate a portable cmake build. From an interactive session, try the following steps

```

cd $HOME/hip-training-series/Lecture1/HIP/jacobi

module load PrgEnv-amd
module load amd
module load cray-mpich
module load cmake

mkdir build && cd build
cmake ..
make
srun -n 1 ./Jacobi_hip

```