Chapter 4.2: Converting CUDA CNN to HIP
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Chapter 4.2: Converting CUDA CNN to HIP

This hands-on tutorial shows how we can convert a publicly available Convolutional Neural Network which is written in CUDA to HIP.

Preparation

1. Install the hipblas and rocsolver library which is required by this application:

   ```bash
   sudo apt update && sudo apt install hipblas && sudo apt install rocsolver
   ```

2. Add ROCM library paths:

   ```bash
   export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/opt/rocm/lib/
   ``

   Alternatively, you can also add this line to your bashrc for future use

3. Now move to the working directory:

   ```bash
   cd 02_Cuda_To_HIP_CNN/
   ```

   Copy the files in CUDA_CNN to HIP_CNN

   ```bash
   cp -r CUDA_CNN/ HIP_CNN/
   ```

Scanning

1. Run the following command:

   ```bash
   hipexamine-perl.sh .
   ``

   where "." refers to the current directory

   You will see the scanned output in Figure 1
2. From Figure 1:
   ○ We see what are the APIs that can be converted to HIP for the different files in the project

```
  warn@LOC:C11 in 'main.c'
  warn@LOC:C9B6 in 'layer.c'
  warn@LOC:C445 in 'layer.h'
  warn@LOC:C3B4 in 'main.c'

hipLaunchKernelGLSL 23
hipMalloc 7
hipFree 7
hipMemcpy 5
hipster 5
hipster 9
hipster 3
hipster 1
hipster 1
hipster 1
hipster 1
hipster 1

Figure 1: Output of HIP scanning tool

Porting

1. Run “hipconvertinplace-perl.sh .” where “.” refers to the current directory.

2. The script will traverse all the files and hipify the CUDA code to HIP.

3. You will observe the output as shown in Figure 2 from the conversion process
Figure 2: Output of HIP porting tool

Makefile Change

1. We will need to now manually change the Makefile to support building for HIP.

2. The updated Makefile is provided in the “02_Cuda_To_HIP_CNN” folder.
   - Copy this Makefile to the “HIP_CNN” folder.

3. You can also compare the CUDA based original Makefile and the HIP Makefile to see the differences in the compilation commands.

4. Basically, the major differences are:
   - Converting CUDA specific libraries and compiler invocations to HIP based invocation
   - Added HIP specific paths

Compiling and Executing

1. Run make
2. This will build your application
3. To execute:
- Run ./CNN
- You will observe the training process of the CNN

4. Note: If you get a cannot find library error, ensure that your LD_LIBRARY_PATH is correctly updated:
   - export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/opt/rocm/lib