

# HPCDen

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## How to run CUDA in Emulation Mode

Some beginners feel a little bit dejected when they find that their systems do not contain GPUs to learn and work with CUDA. In this blog post, I shall include the step by step process of installing and executing CUDA programs in emulation mode on a system with no GPU installed in it.

It is mentioned here that you will not be able to gain any performance advantage expected out of a GPU (obviously). Instead, the performance will be worse than a CPU implementation. However, emulation mode provides an excellent tool to compile and debug your CUDA codes for more advanced purposes.

Please note that I performed the following steps for a Dell Xeon with Windows 7 (32-bit) system.

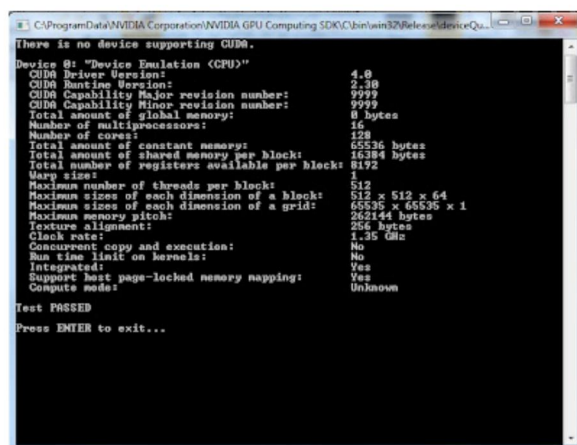
1. Acquire and install Microsoft Visual Studio 2008 on your system.
2. Access the [CUDA Toolkit Archives](#) page and select [CUDA Toolkit 2.3 \(June 2009\)](#) version. (It is the last version that came with emulation mode. Emulation mode was discontinued in later versions.)
3. Download and install the following on your machine:-
  - Developer Drivers for WinVista (190.38) - (Select the one as required for your machine.)
  - CUDA Toolkit
  - CUDA SDK Code Samples
  - CUBLAS and CUFFT (If required)

4. The next step is to check whether the sample codes run properly on the system or not. This will ensure that there is nothing missing from the required installations. Browse the nVIDIA GPU Computing SDK using the windows start bar or by using the following path in your My Computer address bar:-

"C:\ProgramData\NVIDIA Corporation\NVIDIA GPU Computing SDK\bin\win32\Release"

(Also note that the ProgramData folder is by default set to "Hidden" attribute. It will be good if you unhide this folder as it will be frequently utilized later on as you progress with your CUDA learning spells.)

5. Run the "deviceQuery" program and it should output something similar as shown in Fig. 1. Upon visual inspection of the output data, it can be seen that "there is no GPU device found" however the test has PASSED. This means that all the required installations for CUDA in emulation mode has been completed and now we can proceed with writing, compiling and executing CUDA programs in emulation mode.



```
C:\ProgramData\NVIDIA Corporation\NVIDIA GPU Computing SDK\bin\win32\Release\deviceQuery.exe
There is no device supporting CUDA.

Device 0: "Device Emulation (CPU)"
  CUDA Driver Version:            4.0
  CUDA Runtime Version:          2.3.8
  CUDA Capability Major revision number:  9999
  CUDA Capability Minor revision number:  9999
  Total amount of global memory: 0 bytes
  Number of multiprocessors: 16
  Number of cores: 128
  Total amount of constant memory: 65536 bytes
  Total amount of shared memory per block: 16384 bytes
  Total number of registers available per block: 8192
  Warp size: 1
  Maximum number of threads per block: 512
  Maximum size of each dimension of a block: 512 x 512 x 64
  Maximum size of each dimension of a grid: 65535 x 65535 x 1
  Maximum memory pitch: 262144 bytes
  Texture alignment: 256 bytes
  Clock rate: 1.35 GHz
  Concurrent copy and execution: No
  Run time limit on kernels: No
  Integrated: Yes
  Support host page-locked memory mapping: Yes
  Compute mode: Unknown

Test PASSED
Press ENTER to exit...
```

Figure 1. Successful Rxecution of deviceQuery.exe

6. Open Visual Studio and create a new Win32 console project. Let's name it "HelloCUDAEmuWorld". Remember to select the "EMPTY PROJECT" option in Application Settings. Now Right Click on "Source Files" in the project tree and add new C++ code item. Remember to include the extension ".cu" instead of ".cpp". Let's name this item as "HelloCUDAEmuWorld.cu". (If

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## About Me



### Eisenhiem

Islamabad, Pakistan

I fell in love with Computing while I was undertaking UG studies in Computational Physics at PU, Lahore, Pakistan. During PG studies at RCMS NUST in Computational Sc. & Engg., I realized the potential of parallel programming & High Performance Computing for CFD & other application. Here I managed to hone my skills in MPI, CUDA for GPUs and learn all the basic strategies of Parallel Programming. My research interests include High Performance and High Productive Computing, GPU Programming, CFD, Driven Cavity Flows etc...

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you forget the file extension, it can always be renamed via the project tree on the left).

7. Include the CUDA include, lib and bin paths to MS Visual Studio. They were located at "C:\CUDA" in my system.

The next steps need to be performed for every new CUDA project when created.

8. Right Click on the project and select **Custom Build Rules**. Check the **Custom Build Rules v2.3.0** option if available. Otherwise, click on **Find Existing...** and navigate to "C:\ProgramData\NVIDIA Corporation\NVIDIA GPU Computing SDK\1C\common" and select **Cuda.rules**. This will add the build rules for CUDA v2.3 to VS 2008.

9. Right click on the project and select Properties. Navigate to Configuration Properties --> Linker --> Input. Type in **cuda.lib** in the **Additional Dependencies** text bar and click **Okay**. Now we are ready to compile and run our first ever CUDA program in emulation mode. But first we need to activate the emulation mode for .cu files.

10. Once again Right click on the project and select Properties. Navigate to Configuration Properties --> CUDA Build Rule v2.3.0 --> General. Set **Emulation Mode** from **No** to **Yes** in the right hand column of the opened window. Click **Okay**.

11. Type in the following in the code editor and build and compile the project. And there it is. Your first ever CUDA program, in Emulation Mode. Something to brag about among friends.

```
int main(void)
{
    return 0;
}
```

I hope this effort would not go in vain and offer some help to anyone who is tied up regarding this issue. Do contact if there is any query regarding the above procedure.

Posted by Eisenhiem at Monday, June 11, 2012

Labels: CUDA, Emulation Mode, GPU, Visual Studio 2008

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