Uni.lu HPC School 2019

PS5c: Scalable Science III: GPU programming

Uni.lu High Performance Computing (HPC) Team

Dr. F. Pinel

University of Luxembourg (UL), Luxembourg

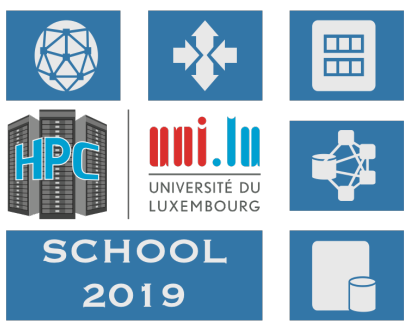
http://hpc.uni.lu

Latest versions available on Github:

UL HPC tutorials: https://github.com/ULHPC/tutorials

UL HPC School: http://hpc.uni.lu/hpc-school/

PS5c tutorial sources: ulhpc-tutorials.rtfd.io/en/latest/gpu/



Objectives of this session

- Minimum CUDA knowledge to start development
  - ↪ Unified Memory, single GPU
- Performance improvement
  - ↪ profiling
- On the **iris** cluster
  - ↪ interactive and passive jobs

Out of scope (but useful)

- Error handling
- Streams
- Multi-GPU
- Fine-tuning memory access

Software overview

GPU Computing Applications						
Libraries and Middleware						
cuDNN TensorRT	cuFFT, cuBLAS, cuRAND, cuSPARSE	CULA MAGMA	Thrust NPP	VSIPL, SVM, OpenCurrent	PhysX, OptiX, iRay	MATLAB Mathematica
Programming Languages						
C	C++	Fortran	Java, Python, Wrappers	DirectCompute	Directives (e.g., OpenACC)	
CUDA-enabled NVIDIA GPUs						
Turing Architecture (Compute capabilities 7.x)	DRIVE/JETSON AGX Xavier	GeForce 2000 Series	Quadro RTX Series	Tesla T Series		
Volta Architecture (Compute capabilities 7.x)	DRIVE/JETSON AGX Xavier			Tesla V Series		
Pascal Architecture (Compute capabilities 6.x)	Tegra X2	GeForce 1000 Series	Quadro P Series	Tesla P Series		
Maxwell Architecture (Compute capabilities 5.x)	Tegra X1	GeForce 900 Series	Quadro M Series	Tesla M Series		
Kepler Architecture (Compute capabilities 3.x)	Tegra K1	GeForce 700 Series GeForce 600 Series	Quadro K Series	Tesla K Series		
	EMBEDDED	CONSUMER DESKTOP, LAPTOP	PROFESSIONAL WORKSTATION	DATA CENTER		

Figure: Nvidia Programming guide

Hardware/Software overview

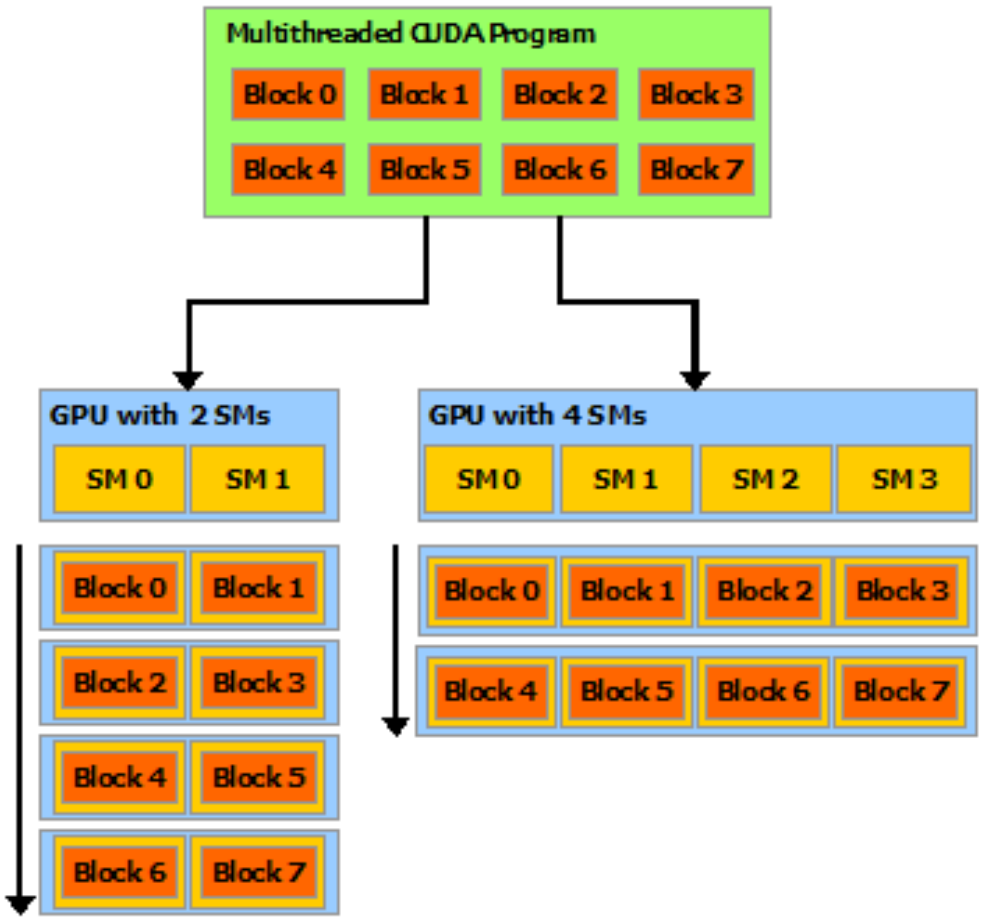


Figure: Nvidia Programming guide

Questions?

http://hpc.uni.lu

High Performance Computing @ uni.lu

Prof. Pascal Bouvry
Dr. Sebastien Varrette
Valentin Plugaru
Sarah Peter
Hyacinthe Cartiaux
Clement Parisot
Dr. Fréderic Pinel
Dr. Emmanuel Kieffer

University of Luxembourg, Belval Campus
Maison du Nombre, 4th floor
2, avenue de l'Université
L-4365 Esch-sur-Alzette
mail: hpc@uni.lu