
High Performance
Computing &
Big Data Services

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# Uni.lu HPC School 2020

## PS7: Introduction to GPU programming with CUDA (Part I)

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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/

PS7 tutorial sources: ulhpc-tutorials.rtfd.io/en/latest/cuda/

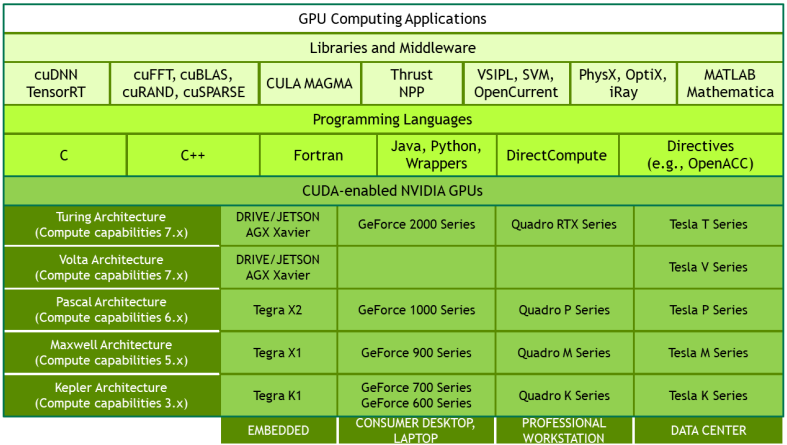
# Objectives

- Minimum CUDA knowledge to start development
  - ↪ Single GPU, Unified Memory
- On the **iris** cluster
  - ↪ interactive and passive jobs
- Error handling
- Profiling

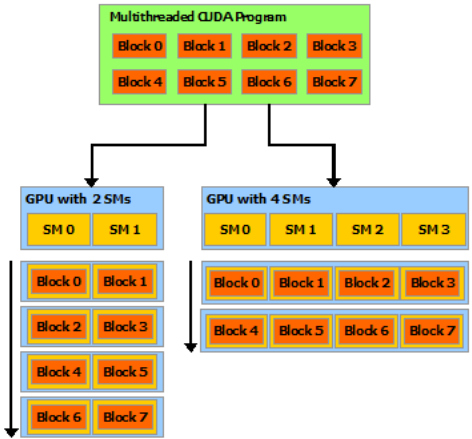
# Out of scope (but useful)

- Streams
- Multi-GPU
- Profiling for performance improvement (information available)
- Fine-tuning memory access

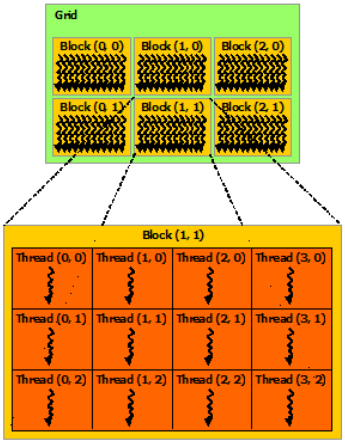
# Software overview

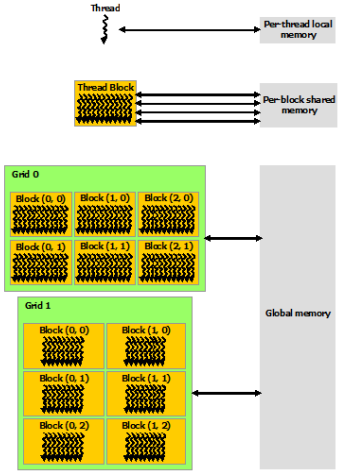


# Hardware/Software overview



# Thread Hierarchy and Memory overview



Your Turn!

## Hands-on GPU programming with CUDA

► url ◄ | github | src

- **Access to a GPU-equipped node** of the Iris cluster `si-gpu`
  - ↪ Load the CUDA development kit
- **Writing** and **compile** GPU application `nvcc`
  - ↪ Launch parallel kernels
- Understanding **CUDA thread hierarchy**
  - ↪ Accelerating for loops
- Understanding **Memory allocation**
  - ↪ application to array manipulation on both the host and device
  - ↪ management of data sets larger than the grid
- **Performance evaluation** and **Profiling** of your GPU application.

Thank you for your attention...

# Questions?

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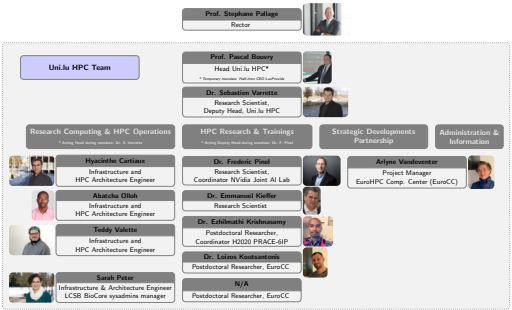


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