# Lec 5 CUDA Debugging and Profiling

Dong Li, Tonghua Su

School of Software Harbin Institute of Technology

- Introduction to Nsight
- Summary of CUDA Projects
- Case Study: Debugging
- **4** Case Study: Profiling

- Introduction to Nsight
- Overview of the Projects
- Case Study: Debugging
- **4) Case Study: Profiling**

### **About Nsight**

#### •NVIDIA Nsight

- **✓** Visual Studio Edition
  - Brings GPU Computing into Microsoft Visual Studio.
  - Build, Debug, Profile and Trace heterogeneous compute and graphics applications using CUDA C/C++, OpenCL, DirectCompute, Direct3D, and OpenGL.
- **✓** Eclipse Edition
  - ✓ nsight

- Introduction to Nsight
- 2 Summary of CUDA Projects
- Case Study: Debugging
- **4) Case Study: Profiling**

## **Projects**

#### • Five Projects

- √ vecadd
  - Significance of occupancy
- **√** occupancy
  - SFU
- **√** branch
  - Divergence
  - shared memory
- **√** stride
  - coalescing
- **√** matmul
  - memory hierarchy

#### vecadd

#### occupancy

#### branch

### stride

# matmul

- Introduction to Nsight
- Summary of CUDA Projects
- 3 Case Study: Debugging
- **4** Case Study: Profiling

# **Debugging**

#### **Practice**

- ●根据本节所学调试技术,对vecadd进行排错(故意让addKernel\_thd中索引有误)
  - ✓ 请使用back-to-back方法
  - ✓ 给出过程

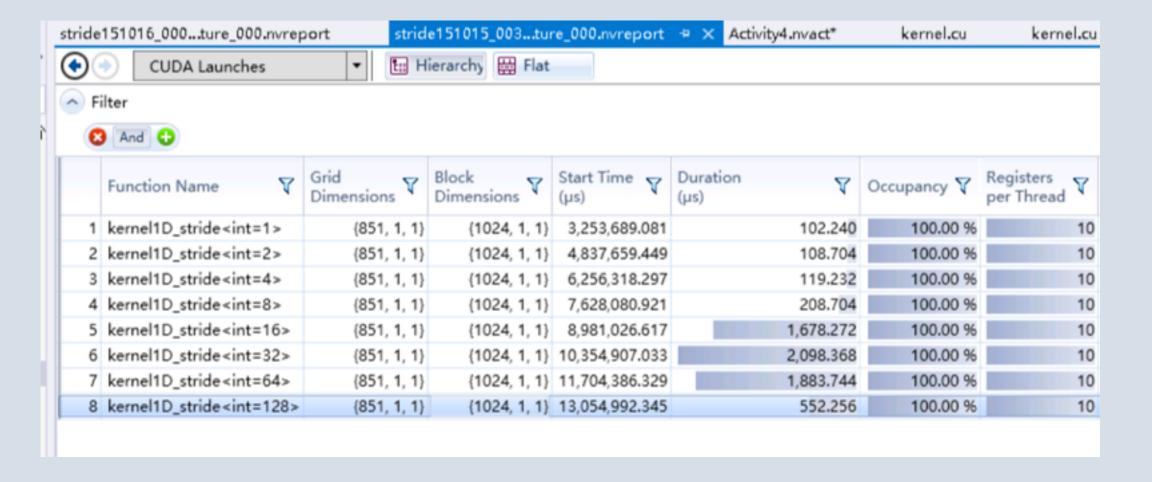
- Introduction to Nsight
- Summary of CUDA Projects
- Case Study: Debugging
- 4 Case Study: Profiling

# Profiling vecadd

# **Profiling** occupancy

# **Profiling** branch

## **Profiling** stride



#### Hands-on

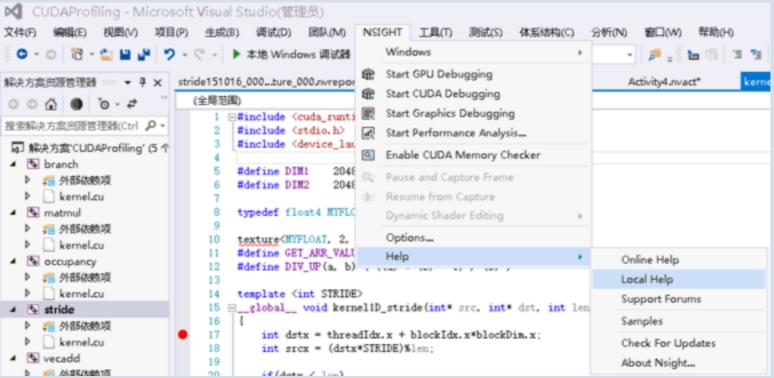
- 本专题特意留了matmul工程
  - ✓ 请使用nsight分析
  - ✓ 阅读代码,解释不同方法得到不同结果的原因所在

#### **Summary**

```
Lec5 CUDA Debugging & Profiling
why Debugging?
                 85ms X 2048
   1) back-to-back
why profiling?
   1) Hotspot & CUDA: Kernel.
  2) bottlereeks: Sinstruction
3) Nsight (memory)
```

## **Additional Reading**

- •Nsight User Manual (version 4.7)
  - √ "NVIDIA Nsight Visual Studio Edition 4.7 User Guide", 2015
  - ✓ http://docs.nvidia.com/nsight-visual-studio-edition/4.7/ Nsight\_Visual\_Studio\_Edition\_User\_Guide.htm



Tonghua Su, School of Software, Harbin Institute of Technology, China