Technical University of Munich

Tutorial 7: Profiling with Nsight

Informatik elective: GPU Computing

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Profiling on GPUs

- Studying the performance of your implementation.
- Nvidia provides two tools to measure profile:
  - Nsight Compute (ncu) : For individual kernel performance study
  - Nsight systems (nsys) : For complete application study with timelines
- Requirement: The version needs to be atleast as high as the one on the remote cluster.
  - Our cluster has ncu version: 2024.3 and nsys version: 2024.5
- Two main ways to profile on remote cluster:
  - Connect your local instance via ssh reverse tunnelling.
  - Profile on the remote cluster using the command line and transfer the output files yourself.

Some profiling basics

- Profiling overhead can be significant: Always know what metrics you are measuring.
  - First measurement will have a high overhead, but subsequent kernel profiles will be more reasonable.
- Measuring metrics → hardware/software counters.
- We will look in more detail on how profiling works in a upcoming lecture.
- For now, some commands:
  - To profile individual kernels use Nsight compute (`ncu`)
  - See documentation: https://docs.nvidia.com/nsight-compute/NsightComputeCli/index.html#profile

Profiling with ncu

```
$ ncu --clock-control none --kernel-name <kernel> --set full -o out -f <executable and args>
```

- `--clock-control` : Enable locking the clocks. Usually necessary for deterministic profiling.
- `-k` / `--kernel-name` : Only profile a certain kernel
- `-o` : Specify the output file
- `-f` / `--force-overwrite` : Overwrite existing output.
- `--set` : Section of sets of metrics to profile. `full` or `basic`
- Just running `ncu` gives you the list of options you have.

Profiling with nsys

```
$ nsys profile -f true -n true -o out <executable and args>
```

- `profile:` Specify that you want profiling. Other options available for example are `launch`, `analyze`
- `-o` : Specify the output file
- `-f` / `--force-overwrite` : Overwrite existing output.
- `-n` : Inherit environment
- Just running `nsys --help profile` gives you the various options you have.