



NSIGHT COMPUTE COMMAND LINE INTERFACE

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User Manual



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Chapter 1.

INTRODUCTION

NVIDIA Nsight Compute CLI (`nv-nsight-cu-cli`) provides a non-interactive way to profile applications from the command line. It can print the results directly on the command line or store them in a report file. It can also be used to simply launch the target application (see [General](#) for details) and later attach with NVIDIA Nsight Compute or another `nv-nsight-cu-cli` instance.

For users migrating from `nvprof` to NVIDIA Nsight Compute, please additionally see the [Nvprof Transition Guide](#) for comparison of features and workflows.

Chapter 2.

QUICKSTART

1. Launch the target application with the command line profiler

The command line profiler launches the target application, instruments the target API, and collects profile results for the specified kernels. The CLI executable is called `nv-nsight-cu-cli`. A shortcut with this name is located in the base directory of the NVIDIA Nsight Compute installation. The actual executable is located in the folder `target\windows-desktop-win7-x64` on Windows or `target/linux-desktop-glibc_2_11_3-x64` on Linux. By default, NVIDIA Nsight Compute is installed in `/usr/local/cuda-<cuda-version>/NsightCompute-<version>` on Linux and in `C:\Program Files\NVIDIA Corporation\Nsight Compute <version>` on Windows.

To collect the default set of data for all kernel launches in the target application, launch:

```
$ nv-nsight-cu-cli -o profile CuVectorAddMulti.exe
```

The application runs in instrumented mode and for each kernel launch, a profile result is created. The results are written by default to `profile.nsignt-cuprof`. Each output from the compute profiler starts with `==PROF==`. The other lines are output from the application itself. For each profiled kernel, the name of the kernel function and the progress of data collection is shown. To collect all requested profile information it may be required to replay the kernels multiple times. The total number of relay passes per kernel is shown after profiling has completed (see [Overhead](#) for more details).

```
[Vector addition of 1144477 elements]
==PROF== Connected to process 5268
Copy input data from the host memory to the CUDA device
CUDA kernel launch A with 4471 blocks of 256 threads
==PROF== Profiling "vectorAdd_A" - 1: 0%...50%...100% - 46 passes
CUDA kernel launch B with 4471 blocks of 256 threads
==PROF== Profiling "vectorAdd_B" - 2: 0%...50%...100% - 46 passes
Copy output data from the CUDA device to the host memory
Done
==PROF== Disconnected from process 5268
==PROF== Report: profile.nsignt-cuprof-report
```

2. Customizing data collection

Options are available to specify for which kernels data should be collected. `-c` limits the number of kernel launches collected. `-s` skips the given number of kernels before data collection starts. `-k` allows you to filter the kernels by a regex match of their names. `--kernel-id` allows you to filter kernels by context, stream, name and invocation, similar to `nvprof`.

To limit what should be collected for each kernel launch, specify the exact *.section (files) by their identifier using `--section`. Each section file defines a set of metrics to be collected, grouped logically to solve a specific performance question. By default, all available sections are selected. Use `--list-sections` to see the list of currently available sections. The default search directory and location of pre-defined section files is also called `sections/`.

Alternatively, you can collect a set of individual metrics using `--metrics`. The available metrics can be queried using `--query-metrics`. For an explanation of the naming conventions and structuring of metrics used on Volta and newer architectures, see [Perfworks Metrics API](#).

By default, a temporary file is used to store profiling results, and data is printed to the command line. To permanently store the profiler report, use `-o` to specify the output filename.

3. Changing command line output

Besides storing results in a report file, the command line profiler can print results using different pages. Those pages correspond to the respective pages in the UI's report. By default, the [Details page](#) is printed, if no explicit output file is specified. To select a different page or print in addition to storing in an explicit file, use the `--page=<Page>` command. Currently, the following pages are supported: `details`, `raw`.

4. Open the report in the UI

The UI executable is called `nv-nsight-cu`. A shortcut with this name is located in the base directory of the NVIDIA Nsight Compute installation. The actual executable is located in the folder `host\windows-desktop-win7-x64` on Windows or `host/linux-desktop-glibc_2_11_3-x64` on Linux. In the UI window, close the *Connection* dialog and open the report file through *File > Open*, by dragging the report file into NVIDIA Nsight Compute.

You can also specify the report file as a command line parameter to the executable, i.e. as `nv-nsight-cu <MyReport.naight-cuprof-report>`. Alternatively, when using NVIDIA Nsight Compute CLI on a platform with host support, `--open-in-ui` can be used directly with `nv-nsight-cu-cli` to open a collected report in the user interface.

The report opens in a new document window. For more information about the report, see the *Profiler Report* paragraph in the user guide for collecting profile information through NVIDIA Nsight Compute.

Chapter 3.

USAGE

3.1. Modes

Modes change the fundamental behavior of the command line profiler. Depending on which mode is chosen, different [Command Line Options](#) become available. For example, [Launch](#) is invalid if the *Attach* mode is selected.

- ▶ **Launch-and-attach:** The target application is launched on the local system with the tool's injection libraries. Depending on which profiling options are chosen, selected kernels in the application are profiled and the results printed to the console or stored in a report file. The tool exits once the target application finishes or crashes, and once all results are processed.

This is the default, and the only mode that supports profiling of child processes on selected platforms.

- ▶ **Launch:** The target application is launched on the local system with the tool's injection libraries. As soon as the first intercepted API call is reached (commonly `cuInit()`), all application threads are suspended. The application now expects a tool to attach for profiling. You can attach using NVIDIA Nsight Compute or using the command line profiler's *Attach* mode.
- ▶ **Attach:** The tool tries to connect to a target application previously launched using NVIDIA Nsight Compute or using the command line profiler's *Launch* mode. The tool can attach to a target on the local system or using a remote connection. You can choose to connect to a specific process by its process ID or to the first attachable process on the specified system.

3.2. Multi-Process Support

NVIDIA Nsight Compute CLI supports profiling multi-process applications on the following platforms: x86_64 Windows, x86_64 Linux, DRIVE OS Linux. See the [Launch](#) options on how to enable this feature.

On x86_64 Windows, NVIDIA Nsight Compute CLI by default supports profiling 64-bit processes launched from 32-bit applications. On x86_64 Linux, launching from 32-bit applications requires to enable the **support-32bit** option, and the required 32-bit libraries must be installed on your system. On DRIVE OS Linux, tracking of 32-bit applications is not supported. *Profiling* of 32-bit processes is not supported on any platform.

3.3. Output Pages

The command line profiler supports printing results to the console using various pages. Each page has an equivalent in NVIDIA Nsight Compute's *Profiler Report*. In the command line profiler, they are slightly adapted to fit console output. To select a page, use the **--page** option. By default, the details page is used. Note that if **--page** is not used but **--export** is, no results will be printed to the console.

- ▶ **Details:** This page represents NVIDIA Nsight Compute's *Details* page. For every profiled kernel launch, each collected is printed as section as a three-column table, followed by any rule results applied to this section. Rule results not associated with any section are printed after the kernel's sections.

The first section table column shows the metric name. If the metric was given a label in the section, it is used instead. The second column shows the metric unit, if available. The third column shows the unit value. Both metric unit and value are automatically adjusted to the most fitting order of magnitude. By default, only metrics defined in section headers are shown. This can be changed by passing the **--details-all** option on the command line.

Some metrics will show multiple values, separated by ";", e.g. `memory_l2_transactions_global Kbytes 240; 240; 240; 240`. Those are instanced metrics, which have one value per represented instance. An instance can be a streaming multiprocessor, an assembly source line, etc.

- ▶ **Raw:** This page represents NVIDIA Nsight Compute's *Raw* page. For every profiled kernel launch, each collected metric is printed as a three-column table. Besides metrics from sections, this includes automatically collected metrics such as device attributes and kernel launch information.

The first column shows the metric name. The second and third columns show the metric unit and value, respectively. Both metric unit and value are automatically adjusted to the most fitting order of magnitude. No unresolved regex: or group: metrics are included.

3.4. Profile Import

Using the **--import** option, saved reports can be imported into the command line profiler. When using this flag, most other options except [File](#) are not available.

3.5. Metrics and Units

When available and applicable, metrics are shown along with their unit. This is to make it apparent if a metric represents cycles, threads, bytes/s, and so on.

By default, units are scaled automatically so that metric values are shown with a reasonable order of magnitude. Units are scaled using their SI-factors, i.e. byte-based units are scaled using a factor of 1000 and the prefixes K, M, G, etc. Time-based units are also scaled using a factor of 1000, with the prefixes n, u and m. This scaling can be changed using a command line option, see [Console Output](#) options for details.

3.6. Overhead

As with most measurements, collecting performance data using NVIDIA Nsight Compute CLI incurs some runtime overhead on the application. The overhead does depend on a number of different factors:

- ▶ **Number and type of collected metrics**

Depending on the selected metric, data is collected either through a hardware performance monitor on the GPU, through software patching of the kernel instructions or via a launch or device attribute. The overhead between these mechanisms varies greatly, with launch and device attributes being "statically" available and requiring no kernel runtime overhead.

Furthermore, only a limited number of metrics can be collected in a single *pass* of the kernel execution. If more metrics are requested, the kernel launch is *replayed* multiple times, with its accessible memory being saved and restored between subsequent passes to guarantee deterministic execution. Therefore, collecting more metrics can significantly increase overhead by requiring more replay passes and increasing the total amount of memory that needs to be restored during replay.

- ▶ **Number of collected sections**

Since each section specifies a set metrics to be collected, selecting fewer sections can improve runtime overhead. See the `--section` command in the [Profile](#) options.

- ▶ **Number of profiled kernels**

By default, all selected metrics are collected for all launched kernels. To reduce the impact on the application, you can try to limit performance data collection to as few kernel functions and instances as makes sense for your analysis. See the filtering commands in the [Profile](#) options.

- ▶ **GPU Architecture**

NVIDIA Nsight Compute uses different data collection libraries for GPUs of compute capability 7.2 and higher and for those of compute capability 7.0 and below. For 7.2+, there is a relatively high one-time overhead for the first profiled kernel to generate the metric configuration. This overhead does not occur for subsequent kernels in the same context, as long as the list of collected metrics remains unchanged.

3.7. NVTX Filtering

`--nvtx-include <configuration> --nvtx-exclude <configuration>`

These options are used to profile only those kernels which satisfy the conditions mentioned in the configuration. Through these options you can choose kernel which fall into a specific or collection of ranges of your choice.

You can use both options multiple times, mentioning all the `--nvtx-include` configurations followed by all `--nvtx-exclude` configurations. Nvtx filtering requires `--nvtx` option.

NVTX ranges are of two types: NvtxRangeStart/End and NvtxRangePush/Pop. The configuration syntax for both the types are briefly described below.

► Start-End Ranges

Quantifier	Description	Example
,	Delimiter between range names	Range A,Range B Range B,Range A,Range C
@	Specify domain name. If not mentioned, assuming <default domain>	Domain A@Range A Domain B@Range B,Range Z

```
nv-nsight-cu-cli --nvtx --nvtx-include "Domain A@Range A" CuNvtx.exe
```

The kernels wrapped inside 'Range A' of 'Domain A' in the application are profiled.

```
nv-nsight-cu-cli --nvtx --nvtx-include "Range A,Range B" CuNvtx.exe
```

The kernels wrapped inside both ranges, 'Range A' and 'Range B' of '<default domain>' in the application are profiled.

```
nv-nsight-cu-cli --nvtx --nvtx-include "Range A" --nvtx-include "Range B" CuNvtx.exe
```

The kernels wrapped inside ranges, 'Range A' or 'Range B' of '<default domain>' in the application are profiled.

```
nv-nsight-cu-cli --nvtx --nvtx-exclude "Range A" CuNvtx.exe
```

All the kernels in the application are profiled except those which are wrapped inside 'Range A' of '<default domain>'

```
nv-nsight-cu-cli --nvtx --nvtx-include "Range B"--nvtx-exclude "Range A"
CuNvtx.exe
```

The kernels wrapped inside only 'Range B' and not 'Range A' of '<default domain>' in the application are profiled.

► Push-Pop Ranges

Quantifier	Description	Example
/	Delimiter between range names	Range A/Range B Range A/*/Range B Range A/
[Range is at the bottom of the stack	[Range A [Range A+/Range Z
]	Range is at the top of the stack	Range Z] Range C/*/Range Z]
+	Only one range between the two other ranges	Range B+/Range D
*	Zero or more range(s) between the two other ranges	Range B/*/Range Z
@	Specify domain name. If not mentioned, assuming <default domain>	Domain A@Range A Domain B@Range A/*/Range Z]

```
nv-nsight-cu-cli --nvtx --nvtx-include "Domain A@Range A/" CuNvtx.exe
```

The kernels wrapped inside 'Range A' of 'Domain A' in the application are profiled.

```
nv-nsight-cu-cli --nvtx --nvtx-include "[Range A" CuNvtx.exe
```

The kernels wrapped inside 'Range A' of '<default domain>' where 'Range A' is at the bottom of the stack in the application are profiled.

```
nv-nsight-cu-cli --nvtx --nvtx-include "Range A/*/Range B" CuNvtx.exe
```

The kernels wrapped inside 'Range A' and 'Range B' of '<default domain>' with zero or many ranges between them in the application are profiled.

```
nv-nsight-cu-cli --nvtx --nvtx-exclude "Range A/*/Range B" CuNvtx.exe
```

All the kernels in the application are profiled except those which are wrapped inside 'Range A' and 'Range B' of '<default domain>' with zero or many ranges between them.

```
nv-nsight-cu-cli --nvtx --nvtx-include "Range A/" --nvtx-exclude "Range B]"
CuNvtx.exe
```

The kernels wrapped inside only 'Range A' of '<default domain>' but not inside 'Range B' at the top of the stack in the application are profiled.

► Additional Information

```
--nvtx-include DomainA@RangeA,DomainB@RangeB //Not a valid config
```

In a single nvtx config, multiple ranges w. r. t. a single domain can be specified. Mentioning ranges from different domains inside a single nvtx config is not supported.

```
--nvtx-include "Range A\[i\]"
```

Quantifiers '@', '[', ']' or '*' '+' can be used in range names using prefix '\'. The kernels wrapped inside 'Range A[i]' of '<default domain>' in the application are profiled.

```
--nvtx-include "Range A" //Start/End configuration
--nvtx-inlcude "Range A/" //Push/Pop configuration
--nvtx-inlcude "Range A]" //Push/Pop configuration
```

Including/Excluding only single range for Push/Pop configuration without specifying stack frame position '[' or ']', use '/' quantifier at the end.

```
--nvtx-include "Range A/*/RangeB"
```

The order in which you mention Push/Pop configurations is important. In the above example, 'Range A' should be below 'Range B' in the stack of ranges so that the kernel is profiled.

Nvtx filtering honors cudaProfilerStart() and cudaProfilerStop(). There is no support for ranges with no name.

Chapter 4.

COMMAND LINE OPTIONS

4.1. General

Table 1 General Command Line Options

Option	Description	Default
h,help	Show help message	
v,version	Show version information	
mode	Select the mode of interaction with the target application <ul style="list-style-type: none">▶ launch-and-attach: Launch the target application and immediately attach for profiling.▶ launch: Launch the target application and suspend in the first intercepted API call, wait for tool to attach.▶ attach: Attach to a previously launched application to which no other tool is attached.	launch-and-attach

4.2. Launch

Table 2 Launch Command Line Options

Option	Description	Default
injection-path-64	Override the default path for the injection libraries. The injection libraries are used by the tools	

Option	Description	Default
	to intercept relevant APIs (like CUDA or NVTX).	
nvtx	Enable NVTX support for tools.	
target-processes	<p>Select the processes you want to profile. Available modes are:</p> <ul style="list-style-type: none"> ▶ application-only Profile only the root application process. ▶ all Profile the application and all its child processes. <p>This option is only available for Linux and Windows targets.</p>	application-only
support-32bit	Support profiling processes launched from 32-bit applications. This option is only available on x86_64 Linux. On Windows, tracking 32-bit applications is enabled by default.	

4.3. Attach

Table 3 Attach Command Line Options

Option	Description	Default
hostname	Set the hostname or IP address for connecting to the machine on which the target application is running. When attaching to a local target application, use localhost.	localhost

4.4. Profile

Table 4 Profile Command Line Options

Option	Description	Default
devices	List the GPU devices to enable profiling on, separated by comma.	All devices
kernel-id	Set the identifier to use for matching kernels. If the kernel does not match the identifier, it will be ignored for profiling. The identifier	

Option	Description	Default
	must be of the following format: "<context> : <stream> : <kernel> : <invocation>" where <context> is the CUDA context ID or NVTX name <stream> is the CUDA stream ID or NVTX name <kernel> is the kernel name <invocation> is the N'th invocation of this kernel function.	
k, kernel-regex	Set the regular expression to use when matching kernel names. If the kernel name does not match the expression, it will be ignored for profiling. If this option is not given, no filtering on kernel names will occur.	
kernel-regex-base	Set the basis for --kernel-regex. Options are: <ul style="list-style-type: none"> ▶ function: Function name without parameters, templates etc. ▶ demangled: Demangled function name, including parameters, templates, etc. ▶ mangled: Mangled function name. 	
c, launch-count	Limit the number of collected profile results. The count is only incremented for launches that match the kernel filters.	
s, launch-skip	Set the number of kernel launches to skip before starting to profile kernels.	0
launch-skip-before-match	Set the number of profile launches to skip before starting to profile. The count is incremented for all launches.	0
list-sections	List all sections found in the searched section folders and exit.	
section	Add a section identifier to collect.	If no --section options are given, all section files in the search paths are collected.
section-folder	Add a non-recursive search path for .section files. Section files in this folder will be made available to the --section option.	If no --section-folder options are given, the sections folder is added by default.

Option	Description	Default
section-folder-recursive	Add a recursive search path for .section files. Section files in this folder and all folders below will be made available to the --section option.	If no --section-folder options are given, the sections folder is added by default.
list-rules	List all rules found in the searched section folders and exit.	
apply-rules	Apply active and applicable rules to each profiling result. Use --rule to limit which rules to apply.	All rules
rule	Add a rule identifier to apply. Implies --apply-rules.	If no --rule options are given, all applicable rules in the sections folder are applied.
list-metrics	List all metrics collected from active sections. If the list of active sections is restricted using the --section option, only metrics from those sections will be listed.	
query-metrics	Query available metrics for the devices on system. Use --devices and --chips to filter which devices to query.	
metrics	Specify all metrics to be profiled, separated by comma. If no --section options are given, only the temporary section containing all metrics listed using this option is collected. If --section options are given in addition to --metrics, all metrics from those sections and from --metrics are collected.	
chips	Specify the chips for querying metrics, separated by comma.	
profile-from-start	Set if application should be profiled from its start. Allowed values: <ul style="list-style-type: none"> ▶ on/off ▶ yes/no 	yes
disable-profiler-start-stop	Disable profiler start/stop. When enabled, cu(da)ProfilerStart/Stop API calls are ignored.	
quiet	Suppress all profiling output.	

Option	Description	Default
clock-control	Control the behavior of the GPU clocks during profiling. Allowed values: <ul style="list-style-type: none"> ▶ base: GPC and memory clocks are locked to their respective base frequency during profiling. This has no impact on thermal throttling. ▶ none: No GPC or memory frequencies are changed during profiling. 	yes
nvtx-include	Adds an include statement to the NVTX filter, which allows selecting kernels to profile based on NVTX ranges.	
nvtx-exclude	Adds an exclude statement to the NVTX filter, which allows selecting kernels to profile based on NVTX ranges.	

4.5. File

Table 5 File Command Line Options

Option	Description	Default
o,export	Set the output file for writing the profile report. If not set, a temporary file will be used which is removed afterwards.	If <code>--export</code> is set and no <code>--page</code> option is given, no profile results will be printed on the console.
f,force-overwrite	Force overwriting all output files.	By default, the profiler won't overwrite existing output files and show an error instead.
i,import	Set the input file for reading the profile results.	
open-in-ui	Open report in UI instead of showing result on terminal. (Only available on host platforms)	

4.6. Console Output

Table 6 Console Output Command Line Options

Option	Description	Default
csv	Use comma-separated values as console output. Implies --units base by default.	
page	Select the report page to print console output for. Available pages are: <ul style="list-style-type: none"> ▶ details Show results grouped as sections, include rule results. Some metrics that are collected by default (e.g. device attributes) are omitted if not specified explicitly in any section or using --metrics. ▶ raw Show all collected metrics by kernel launch. 	details . If no --page option is given and --export is set, no results are printed to the console output.
details-all	Include all section metrics on details page.	
units	Select the mode for scaling of metric units. Available modes are: <ul style="list-style-type: none"> ▶ auto Show all metrics automatically scaled to the most fitting order of magnitude. ▶ base Show all metrics in their base unit. 	auto
summary	Select the summary output mode. Available modes are: <ul style="list-style-type: none"> ▶ none No summary. ▶ per-gpu Summary for each GPU. ▶ per-kernel Summary for each kernel type. ▶ per-nvtx Summary for each NVTX context. 	none

Chapter 5.

NVPROF TRANSITION GUIDE

This guide provides tips for moving from nvprof to NVIDIA Nsight Compute CLI. NVIDIA Nsight Compute CLI tries to provide as much feature and usage parity as possible with nvprof, but some features are now covered by different tools and some command line options have changed their name or meaning.

5.1. Trace

- ▶ **GPU and API trace**

NVIDIA Nsight Compute CLI does not support any form of tracing GPU or API activities. This functionality is covered by [NVIDIA Nsight Systems](#).

5.2. Metric Collection

- ▶ **Finding available metrics**

For nvprof, you can use `--query-metrics` to see the list of metrics available for the current devices on your machine. You can also use `--devices` to filter which local devices to query. For NVIDIA Nsight Compute CLI, this functionality is the same. However, in addition, you can combine `--query-metrics` with `--chip [chipname]` to query the available metrics for any chip, not only the ones in your present CUDA devices.

Note that metric names have changed between nvprof and NVIDIA Nsight Compute CLI and metric names also differ between chips after (and including) GV100 and those before. See [Metric Comparison](#) for a comparison of nvprof and NVIDIA Nsight Compute metric names.

- ▶ **Selecting which metrics to collect**

In both nvprof and NVIDIA Nsight Compute CLI, you can specify a comma-separated list of metric names to the `--metrics` option. While nvprof would allow you to collect either a list or all metrics, in NVIDIA Nsight Compute CLI you can use regular expressions to select a more fine-granular subset of all available metrics. For

example, you can use `--metrics "regex:.*"` to collect all metrics, or `--metrics "regex:smsp_cycles_elapsed"` to collect all "smsp_cycles_elapsed" metrics.

- ▶ **Selecting which events to collect**

You cannot collect any events in NVIDIA Nsight Compute CLI.

- ▶ **Selecting which section to collect**

In nvprof, you can either collect individual metrics or events or a pre-configured set (all, analysis-metrics). NVIDIA Nsight Compute CLI adds the concept of a *section*. A section is a file that describes which metrics to collect for which GPU architecture, or architecture range. Furthermore, it defines how those metrics will be shown in both the command line output or the user interface. This includes structuring in tables, charts, histograms etc.

NVIDIA Nsight Compute CLI comes with a set of pre-defined sections, located in the `sections` directory. You can inspect, modify or extend those, as well as add new ones, e.g. to easily collect recurring metric sets. Each section specifies a unique *section identifier*, and there must not be two sections with the same identifier in the search path.

By default, all available sections are collected. You can select a subset using the `--section [section identifier]` option one or more times. If no `--section` option is given, but `--metrics` is used, no sections will be collected.

5.3. Metric Comparison

NVIDIA Nsight Compute uses two groups of metrics, depending on which GPU architecture is profiled. For nvprof metrics, the following table lists the equivalent metrics in NVIDIA Nsight Compute, if available. For a detailed explanation of the structuring of Perfworks metrics for \geq SM 7.0, see the [Perfworks Metrics API](#) documentation.

Table 7 Metrics Mapping Table from CUPTI to Perfworks for Compute Capability 7.0

nvprof Metric	Perfworks Metric or Formula (< SM 7.0)	Perfworks Metric or Formula (\geq SM 7.0)
achieved_occupancy	sm_active_warps_avg_per_active_cycle_pct	sm_warps_active.avg.pct_of_peak_sustained_active
atomic_transactions	n/a	l1tex__t_set_accesses_pipe_lsu_mem_global_op_atom.sum + l1tex__t_set_accesses_pipe_lsu_mem_global_op_red.sum + l1tex__t_set_accesses_pipe_tex_mem_surface_op_atom.sum + l1tex__t_set_accesses_pipe_tex_mem_surface_op_red.sum
atomic_transactions_per_request	n/a	n/a

nvprof Metric	Perfworks Metric or Formula (< SM 7.0)	Perfworks Metric or Formula (>= SM 7.0)
branch_efficiency	n/a	n/a
cf_executed	n/a	smsp__inst_executed_pipe_cbu.sum + smsp__inst_executed_pipe_adu.sum
cf_fu_utilization	n/a	n/a
cf_issued	n/a	n/a
double_precision_fu_utilization	n/a	smsp__inst_executed_pipe_fp64.avg.pct_of_peak_sustained_active
dram_read_bytes	dram__read_bytes	dram__bytes_read.sum
dram_read_throughput	dram__read_bytes_per_sec	dram__bytes_read.sum.per_second
dram_read_transactions	dram__read_sectors	dram__sectors_read.sum
dram_utilization	n/a	dram__throughput.avg.pct_of_peak_sustained_elapsed
dram_write_bytes	dram__write_bytes	dram__bytes_write.sum
dram_write_throughput	dram__write_bytes_per_sec	dram__bytes_write.sum.per_second
dram_write_transactions	dram__write_sectors	dram__sectors_write.sum
eligible_warps_per_cycle	n/a	smsp__warps_eligible.sum.per_cycle_active
flop_count_dp	n/a	smsp__sass_thread_inst_executed_op_dadd_pred_on.sum + smsp__sass_thread_inst_executed_op_dmul_pred_on.sum + smsp__sass_thread_inst_executed_op_dfma_pred_on.sum
flop_count_dp_add	n/a	smsp__sass_thread_inst_executed_op_dadd_pred_on.sum
flop_count_dp_fma	n/a	smsp__sass_thread_inst_executed_op_dfma_pred_on.sum
flop_count_dp_mul	n/a	smsp__sass_thread_inst_executed_op_dmul_pred_on.sum
flop_count_hp	n/a	smsp__sass_thread_inst_executed_op_hadd_pred_on.sum + smsp__sass_thread_inst_executed_op_hmul_pred_on.sum + smsp__sass_thread_inst_executed_op_hfma_pred_on.sum
flop_count_hp_add	n/a	smsp__sass_thread_inst_executed_op_hadd_pred_on.sum
flop_count_hp_fma	n/a	smsp__sass_thread_inst_executed_op_hfma_pred_on.sum
flop_count_hp_mul	n/a	smsp__sass_thread_inst_executed_op_hmul_pred_on.sum

nvprof Metric	Perfworks Metric or Formula (< SM 7.0)	Perfworks Metric or Formula (>= SM 7.0)
flop_count_sp	n/a	smsp__sass_thread_inst_executed_op_fadd_pred_on.sum + smsp__sass_thread_inst_executed_op_fmul_pred_on.sum + smsp__sass_thread_inst_executed_op_ffma_pred_on.sum
flop_count_sp_add	n/a	smsp__sass_thread_inst_executed_op_fadd_pred_on.sum
flop_count_sp_fma	n/a	smsp__sass_thread_inst_executed_op_ffma_pred_on.sum
flop_count_sp_mul	n/a	smsp__sass_thread_inst_executed_op_fmul_pred_on.sum
flop_count_sp_special	n/a	smsp__sass_thread_inst_executed_op_mufu_pred_on.sum
flop_dp_efficiency	n/a	n/a
flop_hp_efficiency	n/a	n/a
flop_sp_efficiency	n/a	n/a
gld_efficiency	n/a	n/a
gld_requested_throughput	n/a	n/a
gld_throughput	n/a	l1tex__t_bytes_pipe_lsu_mem_global_op_ld.sum.per_second
gld_transactions	n/a	l1tex__t_sectors_pipe_lsu_mem_global_op_ld.sum
gld_transactions_per_request	n/a	n/a
global_atomic_requests	tex__texin_requests_global_atom	l1tex__t_requests_pipe_lsu_mem_global_op_atom.sum
global_hit_rate	n/a	l1tex__t_sectors_pipe_lsu_mem_global_op_{op}_lookup_hit.sum / l1tex__t_sectors_pipe_lsu_mem_global_op_{op}.sum
global_load_requests	n/a	l1tex__t_requests_pipe_lsu_mem_global_op_ld.sum
global_reduction_requests	tex__texin_requests_global_red	l1tex__t_requests_pipe_lsu_mem_global_op_red.sum
global_store_requests	tex__texin_requests_global_st	l1tex__t_requests_pipe_lsu_mem_global_op_st.sum
gst_efficiency	n/a	n/a
gst_requested_throughput	n/a	n/a
gst_throughput	n/a	l1tex__t_bytes_pipe_lsu_mem_global_op_st.sum.per_second

nvprof Metric	Perfworks Metric or Formula (< SM 7.0)	Perfworks Metric or Formula (>= SM 7.0)
gst_transactions	n/a	l1tex__t_bytes_pipe_lsu_mem_global_op_st.sum
gst_transactions_per_request	n/a	n/a
half_precision_fu_utilization	n/a	smsp__inst_executed_pipe_fp16.sum
inst_bit_convert	n/a	smsp__sass_thread_inst_executed_op_conversion_pred_on.sum
inst_compute_ld_st	n/a	smsp__sass_thread_inst_executed_op_memory_pred_on.sum
inst_control	n/a	smsp__sass_thread_inst_executed_op_control_pred_on.sum
inst_executed	smsp__inst_executed_sum	smsp__inst_executed.sum
inst_executed_global_atomics	smsp__inst_executed_global_atomics_sum	smsp__inst_executed_op_global_atom.sum
inst_executed_global_loads	smsp__inst_executed_global_loads_sum	smsp__inst_executed_op_global_ld.sum
inst_executed_global_reductions	smsp__inst_executed_global_reductions_sum	smsp__inst_executed_op_global_red.sum
inst_executed_global_stores	smsp__inst_executed_generic_stores_sum	smsp__inst_executed_op_global_st.sum
inst_executed_local_loads	smsp__inst_executed_local_loads_sum	smsp__inst_executed_op_local_ld.sum
inst_executed_local_stores	smsp__inst_executed_local_stores_sum	smsp__inst_executed_op_local_st.sum
inst_executed_shared_atomics	smsp__inst_executed_shared_atomics_sum	smsp__inst_executed_op_shared_atom.sum + smsp__inst_executed_op_shared_atom_dot_alu.sum + smsp__inst_executed_op_shared_atom_dot_cas.sum
inst_executed_shared_loads	smsp__inst_executed_shared_loads_sum	smsp__inst_executed_op_shared_ld.sum
inst_executed_shared_stores	smsp__inst_executed_shared_stores_sum	smsp__inst_executed_op_shared_st.sum
inst_executed_surface_atomics	smsp__inst_executed_surface_atomics_sum	smsp__inst_executed_op_surface_atom.sum
inst_executed_surface_loads	smsp__inst_executed_surface_loads_sum	smsp__inst_executed_op_surface_ld.sum + smsp__inst_executed_op_shared_atom_dot_alu.sum + smsp__inst_executed_op_shared_atom_dot_cas.sum
inst_executed_surface_reductions	smsp__inst_executed_surface_reductions_sum	smsp__inst_executed_op_surface_red.sum

nvprof Metric	Perfworks Metric or Formula (< SM 7.0)	Perfworks Metric or Formula (>= SM 7.0)
inst_executed_surface_stores	smsp__inst_executed_surface_stores_sum	smsp__inst_executed_op_surface_st.sum
inst_executed_tex_ops	n/a	smsp__inst_executed_op_texture.sum
inst_fp_16	n/a	smsp__sass_thread_inst_executed_op_fp16_pred_on.sum
inst_fp_32	n/a	smsp__sass_thread_inst_executed_op_fp32_pred_on.sum
inst_fp_64	n/a	smsp__sass_thread_inst_executed_op_fp64_pred_on.sum
inst_integer	n/a	smsp__sass_thread_inst_executed_op_integer_pred_on.sum
inst_inter_thread_communication	n/a	smsp__sass_thread_inst_executed_op_inter_thread_communication_pred_on.sum
inst_issued	smsp__inst_issued_sum	smsp__inst_issued.sum
inst_misc	n/a	smsp__sass_thread_inst_executed_op_misc_pred_on.sum
inst_per_warp	n/a	smsp__average_inst_executed_per_warp.ratio
inst_replay_overhead	n/a	n/a
ipc	smsp__inst_executed_avg_per_active_cycle	smsp__inst_executed.avg.per_cycle_active
issue_slot_utilization	n/a	smsp__issue_active.avg.pct_of_peak_sustained_active
issue_slots	smsp__inst_issued_sum	smsp__inst_issued.sum
issued_ipc	smsp__inst_issued_avg_per_active_cycle	smsp__inst_issued.avg.per_cycle_active
l1_sm_lg_utilization	n/a	l1tex__lsu_writeback_active.sum
l2_atomic_throughput	n/a	lts__t_sectors_srcunit_l1_op_atom.sum.per_second
l2_atomic_transactions	n/a	lts__t_sectors_srcunit_l1_op_atom.sum
l2_global_atomic_store_bytes	n/a	lts__t_bytes_equiv_l1sectormiss_pipe_lsu_mem_global_op_atom.sum
l2_global_load_bytes	n/a	lts__t_bytes_equiv_l1sectormiss_pipe_lsu_mem_global_op_ld.sum
l2_local_global_store_bytes	n/a	lts__t_bytes_equiv_l1sectormiss_pipe_lsu_mem_global_op_st.sum
l2_local_load_bytes	n/a	lts__t_bytes_equiv_l1sectormiss_pipe_lsu_mem_global_op_ld.sum

nvprof Metric	Perfworks Metric or Formula (< SM 7.0)	Perfworks Metric or Formula (>= SM 7.0)
l2_read_throughput	n/a	lts__t_sectors_op_read.sum.per_second
l2_read_transactions	n/a	lts__t_sectors_op_read.sum
l2_surface_load_bytes	n/a	lts__t_bytes_equiv_l1sectormiss_pipe_tex_mem_surface_op_ld.sum
l2_surface_store_bytes	n/a	lts__t_bytes_equiv_l1sectormiss_pipe_lsu_mem_surface_op_st.sum
l2_tex_hit_rate	n/a	lts__t_sector_hit_rate.pct
l2_tex_read_hit_rate	n/a	lts__t_sector_op_read_hit_rate.pct
l2_tex_read_throughput	n/a	lts__t_sectors_srcunit_tex_op_read.sum.per_second
l2_tex_read_transactions	n/a	lts__t_sectors_srcunit_tex_op_read.sum
l2_tex_write_hit_rate	n/a	lts__t_sector_op_write_hit_rate.pct
l2_tex_write_throughput	n/a	lts__t_sectors_srcunit_tex_op_read.sum.per_second
l2_tex_write_transactions	n/a	lts__t_sectors_srcunit_tex_op_read.sum
l2_utilization	n/a	lts__t_sectors.avg.pct_of_peak_sustained_elapsed
l2_write_throughput	n/a	lts__t_sectors_op_write.sum.per_second
l2_write_transactions	n/a	lts__t_sectors_op_write.sum
ldst_executed	n/a	n/a
ldst_fu_utilization	n/a	smsp__inst_executed_pipe_lsu.avg.pct_of_peak_sustained_active
ldst_issued	n/a	n/a
local_hit_rate	n/a	n/a
local_load_requests	n/a	l1tex__t_requests_pipe_lsu_mem_local_op_ld.sum
local_load_throughput	n/a	l1tex__t_bytes_pipe_lsu_mem_local_op_ld.sum.per_second
local_load_transactions	n/a	l1tex__t_sectors_pipe_lsu_mem_local_op_ld.sum
local_load_transactions_per_request	n/a	n/a

nvprof Metric	Perfworks Metric or Formula (< SM 7.0)	Perfworks Metric or Formula (>= SM 7.0)
local_memory_overhead	n/a	n/a
local_store_requests	n/a	l1tex__t_requests_pipe_lsu_mem_local_op_st.sum
local_store_throughput	n/a	l1tex__t_sectors_pipe_lsu_mem_local_op_st.sum.per_second
local_store_transactions	n/a	l1tex__t_sectors_pipe_lsu_mem_local_op_st.sum
local_store_transactions_per_request	n/a	n/a
nvlink_data_receive_efficiency	n/a	n/a
nvlink_data_transmission_efficiency	n/a	n/a
nvlink_overhead_data_received	n/a	n/a
nvlink_overhead_data_transmitted	n/a	n/a
nvlink_receive_throughput	n/a	n/a
nvlink_total_data_received	n/a	n/a
nvlink_total_data_transmitted	n/a	n/a
nvlink_total_nratom_data_transmitted	n/a	n/a
nvlink_total_ratom_data_transmitted	n/a	n/a
nvlink_total_response_data_received	n/a	n/a
nvlink_total_write_data_transmitted	n/a	n/a
nvlink_transmit_throughput	n/a	n/a
nvlink_user_data_received	n/a	n/a
nvlink_user_data_transmitted	n/a	n/a

nvprof Metric	Perfworks Metric or Formula (< SM 7.0)	Perfworks Metric or Formula (>= SM 7.0)
nvlink_user_nratom_data_transmitted	n/a	n/a
nvlink_user_ratom_data_transmitted	n/a	n/a
nvlink_user_response_data_received	n/a	n/a
nvlink_user_write_data_transmitted	n/a	n/a
pcie_total_data_received	n/a	n/a
pcie_total_data_transmitted	n/a	n/a
shared_efficiency	n/a	n/a
shared_load_throughput	n/a	smsp__inst_executed_op_shared_ld.sum.per_second
shared_load_transactions	n/a	smsp__inst_executed_op_shared_ld.sum
shared_load_transactions_per_request	n/a	n/a
shared_store_throughput	n/a	smsp__inst_executed_op_shared_st.sum.per_second
shared_store_transactions	n/a	smsp__inst_executed_op_shared_st.sum
shared_store_transactions_per_request	n/a	n/a
shared_utilization	n/a	smsp__inst_executed_op_shared_ld.avg.pct_of_peak_sustained_elapsed + smsp__inst_executed_op_shared_st.avg.pct_of_peak_sustained_elapsed
single_precision_fu_utilization	n/a	smsp__pipe_fma_cycles_active.avg.pct_of_peak_sustained_active
sm_efficiency	n/a	smsp__cycles_active.avg.pct_of_peak_sustained_elapsed
sm_tex_utilization	n/a	l1tex__texin_sm2tex_req_cycles_active.avg.pct_of_peak_sustained_elapsed
special_fu_utilization	n/a	smsp__inst_executed_pipe_xu.avg.pct_of_peak_sustained_active

nvprof Metric	Perfworks Metric or Formula (< SM 7.0)	Perfworks Metric or Formula (>= SM 7.0)
stall_constant_memory_dependency	n/a	smsp__warp_issue_stalled_imc_miss_per_warp_active.pct
stall_exec_dependency	n/a	smsp__warp_issue_stalled_short_scoreboard_miss_per_warp_active.pct
stall_inst_fetch	n/a	smsp__warp_issue_stalled_no_instruction_miss_per_warp_active.pct
stall_memory_dependency	n/a	smsp__warp_issue_stalled_long_scoreboard_miss_per_warp_active.pct
stall_memory_throttle	n/a	smsp__warp_issue_stalled_drain_miss_per_warp_active.pct
stall_not_selected	n/a	smsp__warp_issue_stalled_not_selected_miss_per_warp_active.pct
stall_other	n/a	smsp__warp_issue_stalled_misc_miss_per_warp_active.pct
stall_pipe_busy	n/a	smsp__warp_issue_stalled_misc_mio_throttle_per_warp_active.pct
stall_sleeping	n/a	smsp__warp_issue_stalled_misc_sleeping_per_warp_active.pct
stall_sync	n/a	smsp__warp_issue_stalled_misc_membar_per_warp_active.pct
stall_texture	n/a	smsp__warp_issue_stalled_misc_tex_throttle_per_warp_active.pct
surface_atomic_requests	n/a	l1tex__t_requests_pipe_tex_mem_surface_op_atom.sum
surface_load_requests	n/a	l1tex__t_requests_pipe_tex_mem_surface_op_ld.sum
surface_reduction_requests	n/a	l1tex__t_requests_pipe_tex_mem_surface_op_red.sum
surface_store_requests	n/a	l1tex__t_requests_pipe_tex_mem_surface_op_st.sum
systemem_read_bytes	n/a	n/a
systemem_read_throughput	n/a	lts__t_sectors_aperture_systemem_op_read.sum.per_second
systemem_read_transactions	n/a	lts__t_sectors_aperture_systemem_op_read.sum
systemem_read_utilization	n/a	n/a
systemem_utilization	n/a	n/a
systemem_write_bytes	n/a	n/a

nvprof Metric	Perfworks Metric or Formula (< SM 7.0)	Perfworks Metric or Formula (>= SM 7.0)
systemem_write_throughput	n/a	lts__t_sectors_aperture_systemem_op_write.sum.per_second
systemem_write_transactions	n/a	lts__t_sectors_aperture_systemem_op_write.sum
systemem_write_utilization	n/a	n/a
tensor_precision_fu_utilization	n/a	sm__pipe_tensor_cycles_active.avg.pct_of_peak_sustained_active
tex_cache_hit_rate	n/a	l1tex__t_sector_hit_rate.pct
tex_cache_throughput	n/a	n/a
tex_cache_transactions	n/a	l1tex__lsu_writeback_active.avg.pct_of_peak_sustained_active + l1tex__tex_writeback_active.avg.pct_of_peak_sustained_active
tex_fu_utilization	n/a	smsp__inst_executed_pipe_tex.avg.pct_of_peak_sustained_active
tex_sm_tex_utilization	n/a	l1tex__f_tex2sm_cycles_active.avg.pct_of_peak_sustained_elapsed
tex_sm_utilization	n/a	sm__mio2rf_writeback_active.avg.pct_of_peak_sustained_elapsed
tex_utilization	n/a	n/a
texture_load_requests	n/a	l1tex__t_requests_pipe_tex_mem_texture.sum
warp_execution_efficiency	smsp__thread_inst_executed_per_inst_executed.pct	smsp__thread_inst_executed_per_inst_executed.ratio
warp_nonpred_execution_efficiency	smsp__thread_inst_executed_not_pred_off_per_inst_executed.pct	smsp__thread_inst_executed_per_inst_executed.pct

5.4. Filtering

► Filtering by kernel name

Both nvprof and NVIDIA Nsight Compute CLI support filtering for which kernels data should be collected. In nvprof, the option is `--kernels` and applies to following metric collection options. In NVIDIA Nsight Compute CLI, the option is named `--kernel-regex` and applies to the complete application execution, i.e. NVIDIA Nsight Compute CLI does not currently support collecting different metrics for different kernels, unless they execute on different GPU architectures.

► Filtering by kernel ID

Nvprof allows users to specify which kernels to profile using a kernel ID description, using the same `--kernels` option. In NVIDIA Nsight Compute CLI, the syntax for this kernel ID is identical, but the option is named `--kernel-id`.

- ▶ **Filtering by device**

Both nvprof and NVIDIA Nsight Compute CLI use `--devices` to filter the devices for which to profile. In contrast to nvprof, in NVIDIA Nsight Compute CLI to option applies globally, not only to following options.

5.5. Output

- ▶ **API trace and summary**

NVIDIA Nsight Compute CLI does not support any form of API-usage related output. No API data is captured during profiling.

- ▶ **Dependency analysis**

NVIDIA Nsight Compute CLI does not support any dependency analysis. No API data is captured during profiling.

- ▶ **GPU trace**

NVIDIA Nsight Compute CLI does not support any GPU trace output. Due to kernel replay during profiling, kernel executions are serialized, and start and end timestamps do not necessarily match those during application execution. In addition, no records for memory activities are recorded.

- ▶ **Print summary**

While nvprof has several command line options to specify which summary information to print, NVIDIA Nsight Compute CLI uses further arguments to the `--summary` options. Profiling data can be summarized `per-gpu`, `per-kernel` or `per-nvtx` context.

- ▶ **Kernel name demangling**

Nvprof allows users to decide between name demangling on or off using the `--demangling` options. NVIDIA Nsight Compute CLI currently always demangles kernel names in the output. In addition, the option `--kernel-regex-base` can be used to decide which name format should be used when matching kernel names during filtering.

- ▶ **Pages**

Nvprof has no concept of output pages, all data is shown as a list or summarized. NVIDIA Nsight Compute CLI uses *pages* to define how data should be structured and printed. Those correspond to the report pages used in the GUI variant. The option `--page` can be used to select which page to show, and `details` is selected by default. All pages also support printing in CSV format for easier post-processing, using the `--csv` option.

5.6. Launch and Attach

▶ **Launching a process for profiling**

In `nvprof`, the application to profile is passed to the tool as a command line argument. The application must be a local executable. Alternatively, you can choose to use the tool in a *daemon mode* and profile all applicable processes on the local machine.

NVIDIA Nsight Compute CLI has several modes to determine which application to collect data for. By default, the executable passed via the command line to the tool is started, connected to, and profiled. This mode is called **launch-and-attach**.

▶ **Launching a process for attach**

In contrast to `nvprof`, you can choose to only launch a local executable. In this mode (`--mode launch`), the process is started, connected to, but then suspended at the first CUDA API call. Subsequently, there is a third mode (`--mode attach`) to attach to any process launched using the aforementioned mode. In this case, all profiling and output options would be passed to the attaching instance of NVIDIA Nsight Compute CLI.

▶ **Remote profiling**

Finally, using **launch** and **attach**, you can also connect to a launched process on a remote machine, which could even run a different operating system than the local host. Use `--hostname` to select which remote host to connect to.

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