System Management Interface

User Guide

v1.02 | 2025-01-14

Document History

Version	Date	Authors	Description of Change
v1.00	2024-09-06	Neuchips	Initial release
v1.01	2024-12-05	Neuchips	Update for Windows support
v1.02	2025-01-14	Neuchips	Add get PID on windows

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1 Overview

Neuchips System Management Interface (NEUSMI) provides monitoring information for Raptor devices. The data is presented in a plain text format, via stdout or a file. NEUSMI also provides several management operations for changing the device state. And then, this tool also provided monitor product temperature at any time.

1.1 Synopsis

The neuchips-smi tool is operated via the command line, allowing users to combine commands based on their needs. Users only need to input neuchips-smi followed by the desired commands. Examples of commands are as follows:

```
neuchips-smi [Option1 [ARG 1]] [Option2 [ARG 1]] ….
```

2 Installation

To use the neuchips smi tool, you first need to verify the operating environment and install the provided neuchips-smi-Vx.x.x.run file. Below are the environment requirements and installation steps:

2.1 Environment

First, you must install the Neuchips's SDK package and ensure that the SDK version is 0.0.1 or higher. If you need the latest driver, please contact us first. Additionally, since the installation process requires network access, please ensure that the network is functioning properly.

2.2 Installation

Linux version:

It is recommended to first create a folder named neuchips and place the installation package (neuchips-smi-Vx.x.x.run file) inside it. Then, use the command line to enter `sudo ./neuchips-smi-V0.0.1.run` to complete the installation.

```
user@neuchips:~/neuchips-smi/neuchips-smi$ sudo ./neuchips-smi-V0.0.1.run
neuchips-smi
libumd.so
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
lsof is already the newest version (4.93.2+dfsg-1.1build2).
0 upgraded, 0 newly installed, 0 to remove and 119 not upgraded.
[Done] Neuchips-smi Install Done
```

Figure 1 Linux version of neuchips-smi installation

Windows version:

It is recommended to first create a folder named **neuchips** and place the installation package (neuchips-smi-Vx.x.x.zip file) inside it. Extract the package, then use the command line to execute smi_install.bat (**please run with administrator privileges**) to complete the installation.

.

Figure 2 Windows version of neuchips-smi installation

3 Options

The neuchips-smi is a command tool that uses command line to operate. It provides four types of operations, including general option, summary option, dmon option and query option. The following describes how to use these three modes:

3.1 General Options

`-h, --help`

Print usage information and exit.

`-L, --list`

List each of the Neuchips Viper in the system, along with their module identification.

```
user@neuchips:~$ neuchips-smi -L
GAP 0: NEUCHIPS VIPER (ID: 845483575552-4856-4852-4857)
GAP 1: NEUCHIPS VIPER (ID: 845483575552-4856-4849-4856)
```

Figure 3 Chip ID options.

3.2 Summary Options

Summary options is default with no arguments on neuchips-smi. When you want to use summary options, you need to enter `neuchips-smi` on the command-line.

In summary mode, you can get driver version, temperature, utilization, memory usage, power consumption and more information. In addition, when the system and module start running AI workload, the currently used PID and process name will be listed in the Process section as below.

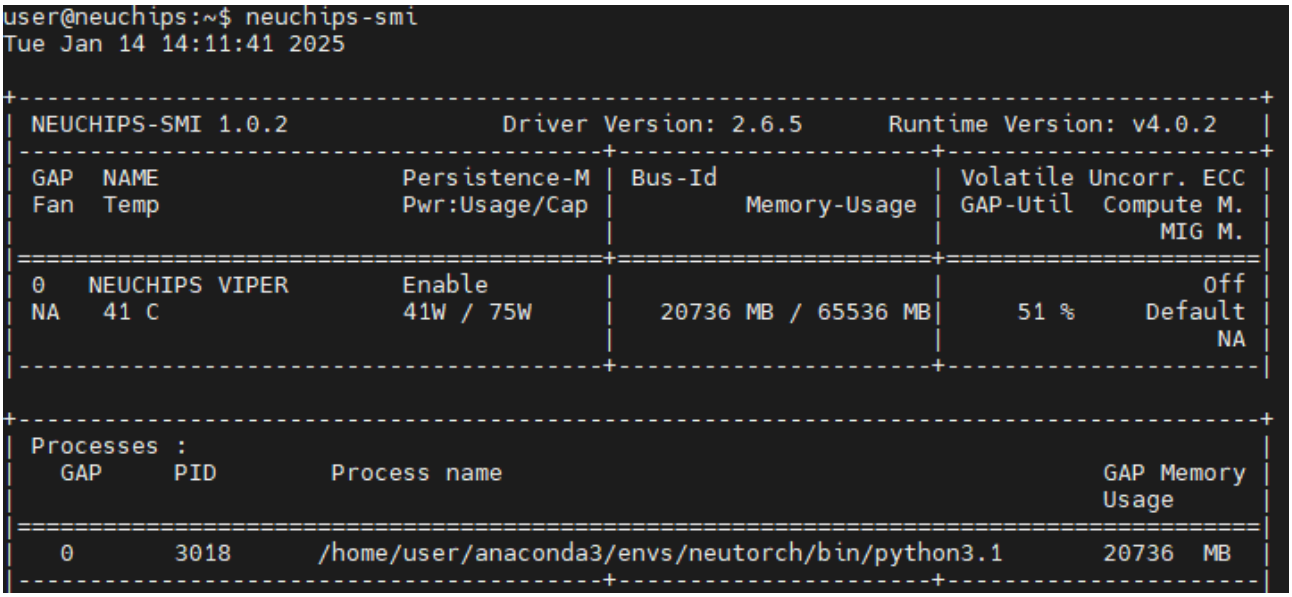

Figure 4 Linux version summary options.

If you are using the Windows operating system, you can also use the Summary mode to obtain more information, such as the driver version, temperature, utilization, memory usage, and power consumption, as shown in the figure below.

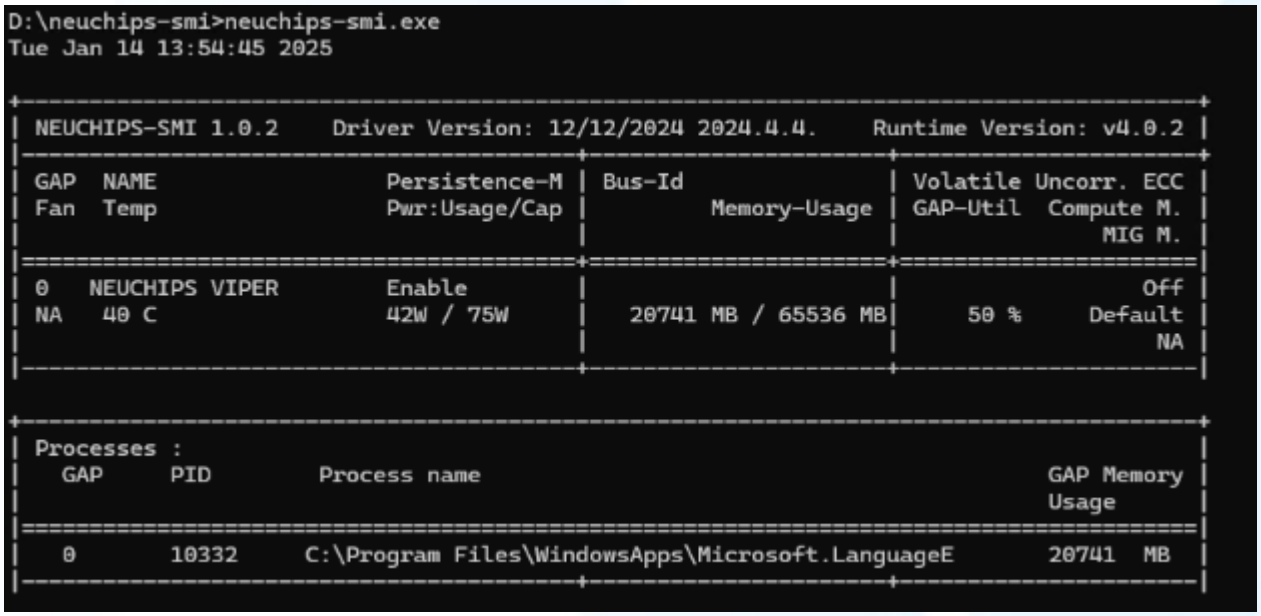

Figure 5 Windows version summary options.

In summary mode, the following commands can be used:

`-i, --id=ID`

Display data for a single specified device. The ID entered corresponds to the device number under /dev/neuchips_ai_epr*.

```
user@neuchips:~$ ll /dev/neuchips_ai_epr-*
crwxrwxrwx 1 root root 236, 0 Sep  4 11:24 /dev/neuchips_ai_epr-0
crwxrwxrwx 1 root root 234, 1 Sep  4 11:24 /dev/neuchips_ai_epr-1
```

Figure 6 Device ID

```
user@neuchips:~$ neuchips-smi -i 0
Tue Jan 14 13:56:53 2025

+-----------------------------------------------------------------------------------------+
| NEUCHIPS-SMI 1.0.2              Driver Version: 2.6.5      Runtime Version: v5.0.2      |
|-----------------------------------------+----------------------+----------------------+
| GAP  NAME                Persistence-M | Bus-Id               | Volatile Uncorr. ECC |
| Fan  Temp                Pwr:Usage/Cap |         Memory-Usage | GAP-Util  Compute M. |
|                                        |                      |                MIG M. |
|=========================================+======================+======================|
| 0   NEUCHIPS VIPER       Enable        | 0000:04:00.0         |                  Off |
| NA   44 C                27W / 75W     |     220 MB / 65536 MB|     0  %     Default |
|                                        |                      |                   NA |
|-----------------------------------------+----------------------+----------------------|
```

Figure 7 Display target device information.

`-f FILE, --filename=FILE`

If users need to save the log, they can use the -f option followed by the file name. For example, by entering `neuchips-smi -f summary.log`, the summary content will be saved into summary.log, and the file will be in the same folder where the command was executed.

```
user@neuchips:~/neuchips-smi/neuchips-smi_v22/neuchips-smi/output$ neuchips-smi -i 0 -f summary.log
user@neuchips:~/neuchips-smi/neuchips-smi_v22/neuchips-smi/output$ ls
neuchips-smi-V1.0.2.run  summary.log
```

Figure 8 Save log

`-l SEC, --loop=SEC`

Continuously report query data at the specified interval, rather than the default of just once. The application will sleep in-between summary. Pressing Ctrl+C at any time will abort the loop, which will otherwise run indefinitely.

If no argument is specified for the -l form a default interval of 5 seconds is used.

[Field Description]

The fields are explained from top to bottom on Table 1.

Table 1 Summary Field Description

Field	Description
NEUCHIPS-SMI	Neuchips-smi monitor tool version.
Driver Version	Neuchips host driver version
Runtime Version	Neuchips SDK version
GAP	Gen AI Processor This section displays the number of devices on the system
NAME	Device Neme
Persistence-M	This indicates whether the Neuchips driver is continuously running. Value is either "Enabled" or "Disabled".
Bus-Id	PCIe bus id
Volatile Uncorr. ECC	ECC memory mode Whether the memory ECC mode is enabled.
Fan	Whether to support controlling system fans
Temp	Display N3000 internal max temperature.
Pwr: Usage/Cap	Power consumption, Includes the current power consumption and the wattage being used by the system
Memory-Usage	The current memory usage of GAP.
GAP-Util	The current GAP utilization.
Compute M	The compute mode flag indicates whether individual or multiple compute applications may run on the GAP. "Default" mean single contexts are allowed per device.
MIG M	Whether to support Multi-Instance GAP
PID (Linux only)	The Process ID (PID) of the currently running processes on the device.
Process name (Linux only)	The Process name of the currently running processes local on the device.
GAP Memory usage	The current memory usage of the device in operation.

3.3 Query Options

`-q, --query`

Display GAP (Gen AI Processor) more detailed info. Some devices and/or

environments don't support all possible information. Any unsupported data is indicated by a "NA" in the output. By default, information for all available GAPs is displayed. Use the -i option to restrict the output to a single GAP.

In query mode, the following commands can be used:

`-i, --id=ID`

Display data for target device. The ID entered corresponds to the device number under /dev/neuchips_ai_epr*.

`-f FILE, --filename=FILE`

If the user needs to save the log, they can use the -f option followed by the file name. For example, by entering `neuchips-smi -q -d TEMPERATURE -f query.log`, the query content will be saved into query.log, and the file will be located in the same folder where the command was executed.

`-d TYPE, --display=TYPE`

Display only selected information: MEMORY, TEMPERATURE, POWER, CLOCK, can be combined with comma e.g. " TEMPERATURE ". Current temperature, temperature of working limit, temperature of shutdown limit and temperature of slowdown limit. It is important to note that currently, these four commands only support uppercase letters.

`TEMPERATURE: neuchips-smi -q -d TEMPERATURE`

For example, if you need detailed temperature information of all devices on the system. The content includes information such as current temperature, temperature of working limit, temperature of shutdown limit and temperature of slowdown limit.

```
user@neuchips:~$ neuchips-smi -q -d TEMPERATURE
====================NEUCHIPS SMI LOG==================
Timestamp                                 : Tue Jan 14 11:28:03 2025

Driver Version                            : 2.6.5
Runtime Version                           : v5.0.2
Attached GAPs                             : 1
GAP 0000:04:00.0
    Temperature
        GAP Current Temp                  : 47  C
        GAP Shutdown T.limit Temp         : 110 C
        GAP Slowdown T.limit Temp         : 85  C
```

Figure 9 Query temperature information

`MEMORY`: `neuchips-smi -q -d MEMORY`

If you need detailed memory information of all devices on the system. The content includes information such as total available memory, current memory usage, and remaining memory, among other details.

```
user@neuchips:~$ neuchips-smi -q -d MEMORY
====================NEUCHIPS SMI LOG==================
Timestamp                                 : Tue Jan 14 11:30:32 2025

Driver Version                            : 2.6.5
Runtime Version                           : v5.0.2
Attached GAPs                             : 1
GAP 0000:04:00.0
  Memory Usage
        Total               : 65536  MB
        Reserved            : 188    MB
        Used                : 220    MB
        Free                : 65128  MB

  Memory Status : SUCCESS
```

Figure 10 Query memory information

`POWER`: `neuchips-smi -q -d POWER`

Power readings help to shed light on the current power usage of the GAP, and the factors that affect that usage. This feature allows you to obtain the current power consumption of the GAP (+/- 2 watt), as well as the minimum and maximum power limits. See below for limits of availability.

```
user@neuchips:~$ neuchips-smi -q -d POWER
====================NEUCHIPS SMI LOG==================
Timestamp                                 : Tue Jan 14 11:31:07 2025

Driver Version                            : 2.6.5
Runtime Version                           : v5.0.2
Attached GAPs                             : 1
GAP 0000:04:00.0
   GAP Power Readings
       Power Draw                                 : 25  W
       Power Limit                                : 75  W
       Min Power Limit                            : 25  W
       Max Power Limit                            : 75  W
```

Figure 11 Query power information

`CLOCK`: `neuchips-smi -q -d CLOCK`

When users want to know the current device's frequency information, they can use this command. The content includes system frequency, memory frequency, and other related information.

```
user@neuchips:~$ neuchips-smi -q -d CLOCK
====================NEUCHIPS SMI LOG==================
Timestamp                                 : Tue Jan 14 11:31:40 2025

Driver Version                            : 2.6.5
Runtime Version                           : v5.0.2
Attached GAPs                             : 1
GAP 0000:04:00.0
   Clocks
      CPU0                                : 800  MHz
      CPU1                                : 1000  MHz
      MLP3                                : 400  MHz
      MLP4                                : 400  MHz
      MLP5                                : 400  MHz
      MLP6                                : 400  MHz
      MLP7                                : 400  MHz
      MLP8                                : 400  MHz
      MLP9                                : 400  MHz
      MLP10                               : 400  MHz
      MLP11                               : 400  MHz
      MLP12                               : 400  MHz
      VEC_EMB                             : 600  MHz
      MEMORY                              : 770  MHz
```

Figure 12 Query clock information

`-l SEC, --loop=SEC`

Continuously report query data at the specified interval, rather than the default of just once. The application will sleep in-between queries. Pressing Ctrl+C at any time will abort the loop, which will otherwise run indefinitely.
If no argument is specified for the `-l` form a default interval of 5 seconds is used.

3.4 Dmon Options

The "`neuchips-smi dmon`" command-line is used to monitor one or more GAPs (up to 4 devices) plugged into the system. This tool allows the user to see one line of monitoring data per monitoring cycle. The output is in concise format and easy to interpret in interactive mode. The output data per line is limited by the terminal size. By default, the monitoring data includes Power Usage, Temperature, clocks, Memory clocks and Utilization values, Memory, Encoder and Decoder. It can also be configured to report other metrics such as frame buffer memory usage, memory usage, power/thermal violations. The user can also configure monitoring frequency and the number of monitoring iterations for each run. There is also an option to include date and time at each line. All the supported options are exclusive and can be used together in any order.

Usage:

1. fault with no arguments

   `neuchips-smi dmon`

   Monitors default metrics for up to 4 supported devices under natural enumeration (starting with GAP index 0) at a frequency of 1 sec. Runs until terminated with Ctrl+C.

```
user@neuchips:~$ neuchips-smi dmon
# gap     pwr     gtemp     mem     mclk     vclk     mlp
# Idx     W       C         %       MHz      MHz      MHz
  0       NA      41        NA      50       600      770
  1       NA      38        NA      50       600      770
  0       NA      41        NA      50       600      770
  1       NA      38        NA      50       600      770
  0       NA      41        NA      50       600      770
  1       NA      38        NA      50       600      770
  0       NA      41        NA      50       600      770
  1       NA      38        NA      50       600      770
  0       NA      41        NA      50       600      770
  1       NA      38        NA      50       600      770
  0       NA      41        NA      50       600      770
  1       NA      38        NA      50       600      770
  0       NA      41        NA      50       600      770
  1       NA      38        NA      50       600      770
  0       NA      41        NA      50       600      770
  1       NA      38        NA      50       600      770
  0       NA      41        NA      50       600      770
  1       NA      38        NA      50       600      770
  0       NA      41        NA      50       600      770
  1       NA      38        NA      50       600      770
  0       NA      41        NA      50       600      770
  1       NA      38        NA      50       600      770
  0       NA      41        NA      50       600      770
  1       NA      38        NA      50       600      770
  0       NA      41        NA      50       600      770
  1       NA      38        NA      50       600      770
  0       NA      41        NA      50       600      770
  1       NA      38        NA      50       600      770
  0       NA      41        NA      50       600      770
  1       NA      38        NA      50       650      770
  0       NA      41        NA      50       600      770
  1       NA      38        NA      50       600      770
  0       NA      41        NA      50       600      770
  1       NA      38        NA      50       600      770
```

Figure 13 Neuchips-smi dmon

2. Select one or more devices.

`neuchips-smi dmon -i <device>`

Reports default metrics for the devices selected by comma separated device list. The tool picks up to 4 supported devices from the list under natural enumeration (starting with GAP index 0).

```
user@neuchips:~$ neuchips-smi dmon -i 0
# gap     pwr     gtemp     mem     mclk     vclk     mlp
# Idx     W       C         %       MHz      MHz      MHz
  0       NA      41        NA      50       600      770
  0       NA      41        NA      50       600      770
  0       NA      41        NA      50       600      770
  0       NA      41        NA      50       600      770
  0       NA      41        NA      50       600      770
  0       NA      41        NA      50       600      770
  0       NA      41        NA      50       600      770
  0       NA      41        NA      50       600      770
  0       NA      41        NA      50       600      770
  0       NA      41        NA      50       600      770
  0       NA      41        NA      50       600      770
  0       NA      41        NA      50       600      770
  0       NA      41        NA      50       600      770
  0       NA      41        NA      50       600      770
  0       NA      41        NA      50       600      770
```

Figure 14 Specify target on neuchips-smi dmon

3.5 Daemon Options

The "`neuchips-smi daemon`" starts a background process to monitor one or more GAPs plugged in to the system. It monitors the requested GAPs every monitoring cycle and logs the file in compressed format at the user provided path or the default location at /var/log/neustats/. The log file is created with system's date appended to it and of the format neustats-YYYYMMDD. The flush operation to the log file is done every alternate monitoring cycle. Daemon also logs its own PID at /var/run/neudaemon.pid. The daemon requires root privileges to run, and only supports running a single instance on the system. All the supported options are exclusive and can be used together in any order.

usage:

1. Default with no arguments

   ```
   neuchips-smi daemon
   ```

   Runs in the background to monitor multiple GAPs devices under natural enumeration (starting with GAP index 0). The log file stamped with the current date is created at /var/log/neustats.

2. Terminate the daemon

   ```
   neuchips-smi daemon -t
   ```

   This command-line uses the stored PID (at /var/run/neudaemon.pid) to terminate the daemon. It makes the best effort to stop the daemon and offers no guarantees for its termination. In case the daemon is not terminated, then the user can manually terminate by sending kill signal to the daemon.

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