NVIDIA DOCA App Shield

Sample Guide
Table of Contents

Chapter 1. Introduction........................................................................................................ 1
Chapter 2. Dependencies..................................................................................................... 2
Chapter 3. Prerequisites...................................................................................................... 3
Chapter 4. Running the Sample...........................................................................................4
Chapter 5. Samples.............................................................................................................. 5
  5.1. Apsh Libs Get.....................................................................................................................5
  5.2. Apsh Modules Get.............................................................................................................5
  5.3. Apsh Pslist...........................................................................................................................6
  5.4. Apsh Threads Get............................................................................................................. 7
  5.5. Apsh Vads Get.................................................................................................................. 7
  5.6. Apsh Envvars Get............................................................................................................. 8
  5.7. Apsh Privileges Get.......................................................................................................... 9
Chapter 1. Introduction

DOCA App Shield is a library for monitoring the host and authenticating the integrity of core processes.

For more information about DOCA App Shield library, refer to NVIDIA DOCA App Shield Programming Guide.
Chapter 2. Dependencies

The library requires a minimum DPU firmware version of 24.32.1010.
Chapter 3. Prerequisites

Make sure to follow the stages of the library prerequisites detailed in NVIDIA DOCA App Shield Programming Guide to make sure the library could be used by the samples. Afterwards, make sure to copy the generated JSON files into the DPU to the following path:

- /tmp/symbols.json
- /tmp/mem_regions.json

For more information regarding the runtime arguments, including how to get the VUID, please refer to section “Arg Parser DOCA Flags” of the NVIDIA DOCA App Shield Agent Application Guide.
Chapter 4. Running the Sample

1. Refer to the following documents:
   ► **NVIDIA DOCA Installation Guide for Linux** for details on how to install BlueField-related software.
   ► **NVIDIA DOCA Troubleshooting Guide** for any issue you may encounter with the installation, compilation, or execution of DOCA applications.

2. To build a given sample:
   ```bash
cd /opt/mellanox/doca/samples/doca_apsh/<sample_name>
meson build
ninja -C build
```
   **Note:** The binary `doca_<sample_name>` will be created under `./build/`.

3. Sample (e.g., `apsh_libs_get`) usage:
   ```
   Usage: doca_apsh_libs_get [DOCA Flags] [Program Flags]
   
   DOCA Flags:
   -h, --help                        Print a help synopsis
   -v, --version                     Print program version information
   -l, --log-level                   Set the log level for the program
   <CRITICAL=20, ERROR=30, WARNING=40, INFO=50, DEBUG=60>
   
   Program Flags:
   -p, --pid                         Process ID of process to be analyzed
   -f, --vuid                        VUID of the System device
   -d, --dma                         DMA device name
   -s, --osty <windows|linux>        System OS type
   
   For additional information per sample, use the -h option:
   ./build/doca_<sample_name> -h
   ```
Chapter 5. Samples

5.1. Apsh Libs Get

This sample illustrates how to properly initialize DOCA App Shield and use its API to get the list of loadable libraries of a specific process.

The sample logic includes:

1. Opening DOCA device with DMA ability.
2. Creating DOCA Apsh context.
3. Setting and starting the Apsh context.
4. Opening DOCA remote PCI device via given vendor unique identifier (VUID).
5. Creating DOCA Apsh system handler.
7. Getting the list of system process using Apsh API and searching for a specific process with the given PID.
8. Getting the list of process-loadable libraries using `doca_apsh_libs_get` Apsh API call.
9. Querying the libraries for 3 selected fields using `doca_apsh_lib_info_get` Apsh API call.
10. Printing libraries’ attributes to the terminal.
11. Cleaning up.

References:

‣ `/opt/mellanox/doca/samples/doca_apsh/apsh_libs_get/apsh_libs_get_sample.c`
‣ `/opt/mellanox/doca/samples/doca_apsh/apsh_libs_get/apsh_libs_get_main.c`
‣ `/opt/mellanox/doca/samples/doca_apsh/apsh_libs_get/meson.build`
‣ `/opt/mellanox/doca/samples/doca_apsh/apsh_common.c; /opt/mellanox/doca/samples/doca_apsh/apsh_common.h`

5.2. Apsh Modules Get

This sample illustrates how to properly initialize DOCA App Shield and use its API to get the list of installed modules on a monitored system.
The sample logic includes:

1. Opening DOCA device with DMA ability.
2. Creating DOCA Apsh context.
3. Setting and starting the Apsh context.
4. Opening DOCA remote PCI device via given VUID.
5. Creating DOCA Apsh system handler.
7. Getting the list of system-installed modules using `doca_apsh_modules_get` Apsh API call.
8. Querying the names of modules using `doca_apsh_module_info_get` Apsh API call.
9. Printing the attributes of up to 5 modules' attributes to the terminal.
10. Cleaning up.

References:
- `/opt/mellanox/doca/samples/doca_apsh/apsh_libs_get/apsh_libs_get_sample.c`
- `/opt/mellanox/doca/samples/doca_apsh/apsh_libs_get/apsh_libs_get_main.c`
- `/opt/mellanox/doca/samples/doca_apsh/apsh_libs_get/meson.build`
- `/opt/mellanox/doca/samples/doca_apsh/apsh_common.c; /opt/mellanox/doca/samples/doca_apsh/apsh_common.h`

5.3. **Apsh Pslist**

This sample illustrates how to properly initialize DOCA App Shield and use its API to get the list of running processes on a monitored system.

The sample logic includes:

1. Opening DOCA device with DMA ability.
2. Creating DOCA Apsh context.
3. Setting and starting the Apsh context.
4. Opening DOCA remote PCI device via given VUID.
5. Creating DOCA Apsh system handler.
7. Getting the list of processes running on the system using `doca_apsh_processes_get` Apsh API call.
8. Querying the processes for 4 chosen attributes using `doca_apsh_proc_info_get` Apsh API call.
9. Printing the attributes of up to 5 processes to the terminal.
10. Cleaning up.

References:
- `/opt/mellanox/doca/samples/doca_apsh/apsh_pslist/apsh_pslist_sample.c`
5.4. Apsh Threads Get

This sample illustrates how to properly initialize DOCA App Shield and use its API to get the list of threads of a specific process.

The sample logic includes:
1. Opening DOCA device with DMA ability.
2. Creating DOCA Apsh context.
3. Setting and starting the Apsh context.
4. Opening DOCA remote PCI device via given VUID.
5. Creating DOCA Apsh system handler.
7. Getting the list of system processes using Apsh API and searching for a specific process with the given PID.
8. Getting the list of process threads using `doca_apsh_threads_get` Apsh API call.
9. Querying the threads for up to 3 selected fields using `doca_apsh_thread_info_get` Apsh API call.
10. Printing thread attributes to the terminal.
11. Cleaning up.

References:
- /opt/mellanox/doca/samples/doca_apsh/apsh_threads_get/apsh_threads_get_sample.c
- /opt/mellanox/doca/samples/doca_apsh/apsh_threads_get/apsh_threads_get_main.c
- /opt/mellanox/doca/samples/doca_apsh/apsh_threads_get/meson.build
- /opt/mellanox/doca/samples/doca_apsh/apsh_common.c; /opt/mellanox/doca/samples/doca_apsh/apsh_common.h

5.5. Apsh Vads Get

This sample illustrates how to properly initialize DOCA App Shield and use its API to get the list of virtual address descriptors (VADs) of a specific process.

The sample logic includes:
1. Opening DOCA device with DMA ability.
2. Creating DOCA Apsh context.
5.6. Apsh Envars Get

This sample illustrates how to properly initialize DOCA App Shield and use its API to get the list of environment variables of a specific process.

Note: This sample works only on target systems with Windows OS.

The sample logic includes:

1. Opening DOCA device with DMA ability.
2. Creating DOCA Apsh context.
3. Setting and starting the Apsh context.
4. Opening DOCA remote PCIe device via given VUID.
5. Creating DOCA Apsh system handler.
7. Getting the list of system processes using Apsh API and searching for a specific process with the given PID.
8. Getting the list of process envars using `doca_apsh_envars_get` Apsh API call.
9. Querying the envars for 2 selected fields using `doca_apsh_envar_info_get` Apsh API call.
10. Printing the envars attributes to the terminal.
11. Cleaning up.

References:
5.7. **Apsh Privileges Get**

This sample illustrates how to properly initialize DOCA App Shield and use its API to get the list of privileges of a specific process.

*Note: This sample works only on target systems with Windows OS.*

The sample logic includes:

1. Opening DOCA device with DMA ability.
2. Creating DOCA Apsh context.
3. Setting and starting the Apsh context.
4. Opening DOCA remote PCIe device via given VUID.
5. Creating DOCA Apsh system handler.
7. Getting the list of system processes using Apsh API and searching for a specific process with the given PID.
8. Getting the list of process privileges using the `doca_apsh_privileges_get` Apsh API call.
9. Querying the privileges for 5 selected fields using the `doca_apsh_privilege_info_get` Apsh API call.
10. Printing the privileges attributes to the terminal.
11. Cleaning up.

References:

- /opt/mellanox/doca/samples/doca_apsh/apsh_privileges_get/apsh_privileges_get_sample.c
- /opt/mellanox/doca/samples/doca_apsh/apsh_privileges_get/apsh_privileges_get_main.c
- /opt/mellanox/doca/samples/doca_apsh/apsh_privileges_get/meson.build
- /opt/mellanox/doca/samples/doca_apsh/apsh_common.c; /opt/mellanox/doca/samples/doca_apsh/apsh_common.h
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