



NVIDIA DOCA Rivermax

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. List Devices.....	5
5.2. Set CPU Affinity.....	5
5.3. Set Clock.....	6
5.4. Create Stream.....	6
5.5. Create Stream – Header-data Split Mode.....	7

Chapter 1. Introduction

DOCA RMAX is a DOCA API for NVIDIA Rivermax, an optimized networking SDK for media and data streaming applications. This allows accelerating different networking operations by leveraging the DPU's hardware streaming acceleration technology.

This document describes DOCA RMAX samples based on the DOCA RMAX library. These samples illustrate how to use the DOCA RMAX API to create and configure the stream to receive data. In addition, the samples show how to query network device capabilities (PTP), set a preferred device for querying PTP time, and set CPU affinity for the internal Rivermax thread, using DOCA RMAX API, to achieve better performance.

For more information about the DOCA RMAX library, refer to [NVIDIA DOCA Rivermax Programming Guide](#).

Chapter 2. Dependencies

As mentioned in the [NVIDIA DOCA Rivermax Programming Guide](#), the samples require the DOCA RMAX and Rivermax libraries to compile properly. To run samples, you also must obtain a Rivermax license.

Chapter 3. Prerequisites

N/A

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 samples.

2. To build a given sample:

```
cd /opt/mellanox/doca/samples/doca_rivermax/<sample_name>
meson build
ninja -C build
```



Note: The binary `doca_<sample_name>` will be created under `./build/`.

3. Sample (e.g., `doca_rivermax_create_stream`) usage:

```
Usage: doca_rivermax_create_stream [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, --pci_addr <PCI-ADDRESS> PCI device address
For additional information per sample, use the -h option:
./build/doca_<sample_name> -h
```

Chapter 5. Samples

5.1. List Devices

This sample illustrates how to list all available devices, dump their IPv4 addresses, and tell whether or not the PTP clock is supported.

The sample logic includes:

1. Initializing DOCA Rivermax (RMAX) library.
2. Iterating over the available devices.
3. Dumping their IPv4 addresses
4. Dumping whether a PTP clock is supported for each device.
5. Releasing DOCA Rivermax library.

References:

- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_list_devices/rivermax_list_devices_sample.c`
- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_list_devices/rivermax_list_devices_main.c`
- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_list_devices/meson.build`
- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_common.h; /opt/mellanox/doca/samples/doca_rivermax/rivermax_common.c`

5.2. Set CPU Affinity

This sample illustrates how to set the CPU affinity mask for Rivermax internal thread to achieve better performance. This parameter must be set before library initialization; otherwise, it is not applied.

The sample logic includes:

1. Setting CPU affinity using the DOCA Rivermax (RMAX) API.
2. Initializing DOCA Rivermax library.
3. Releasing DOCA Rivermax library.

References:

- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_set_affinity/rivermax_set_affinity_sample.c`
- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_set_affinity/rivermax_set_affinity_main.c`
- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_set_affinity/meson.build`
- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_common.h; /opt/mellanox/doca/samples/doca_rivermax/rivermax_common.c`

5.3. Set Clock

This sample illustrates how to set the PTP clock device to be used internally in DOCA Rivermax (RMAX).

The sample logic includes:

1. Opening a DOCA device with a given PCIe address.
2. Initializing the DOCA Rivermax library.
3. Setting the device to use for obtaining PTP time.
4. Releasing the DOCA Rivermax library.

References:

- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_set_clock/rivermax_set_clock_sample.c`
- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_set_clock/rivermax_set_clock_main.c`
- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_set_clock/meson.build`
- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_common.h; /opt/mellanox/doca/samples/doca_rivermax/rivermax_common.c`

5.4. Create Stream

This sample illustrates how to create a stream, create a flow and attach it to the created stream, and finally to start receiving data buffers (based on the attached flow).

The sample logic includes:

1. Opening a DOCA device with a given PCIe address.
2. Initializing the DOCA RMAX library.
3. Creating an input stream.
4. Creating the context from the created stream.
5. Initializing DOCA core related objects.
6. Setting the attributes of the created stream.

7. Creating a flow and attaching it to the created stream.
8. Starting to receive data buffers.
9. Clean up—detaches flow and destroys it, destroys created stream and DOCA core related objects.

References:

- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_create_stream/rivermax_create_stream_sample.c`
- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_create_stream/rivermax_create_stream_main.c`
- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_create_stream/meson.build`
- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_common.h; /opt/mellanox/doca/samples/doca_rivermax/rivermax_common.c`

5.5. Create Stream – Header-data Split Mode

This sample illustrates how to create a stream in header-data split mode when packet headers and payload are split to different RX buffers.

The sample logic includes:

1. Opening a DOCA device with a given PCIe address.
2. Initialize the DOCA RMAX library.
3. Creating an input stream.
4. Creating a context from the created stream.
5. Initializing DOCA core related objects.
6. Setting attributes of the created stream. Chaining buffers and setting header size to non-zero is essential to create a stream with header-data split mode.
7. Creating a flow and attaching it to the created stream.
8. Starting to receive data to split buffers.
9. Clean up—detaches flow and destroys it, destroys created stream and DOCA core related objects.



Note: When running "Create Stream" samples, with or without header-split mode, an IPv4 address of value 192.168.105.2 must be configured to the required PCIe device prior to the run so the samples could run as expected.

If a different IPv4 address is configured, the user can either change the IPv4 address to 192.168.105.2 or change the IPv4 addresses in `init_config()` function found in the samples source code to the configured one before building and compiling the samples.

References:

- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_create_stream_hds/rivermax_create_stream_hds_sample.c`
- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_create_stream_hds/rivermax_create_stream_hds_main.c`
- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_create_stream_hds/meson.build`
- ▶ `/opt/mellanox/doca/samples/doca_rivermax/rivermax_common.h; /opt/mellanox/doca/samples/doca_rivermax/rivermax_common.c`

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