



# NVIDIA Mellanox Rivermax Frequently Asked Questions (FAQ)

Rev 2.0

# Document Revision History

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Version	Date	Description of Change
2.0	Jan 1, 2021	Updated the document based on Rivermax version 1.7 release
1.6	May 20, 2019	Updated list of currently supported adapters.
1.5	April 01, 2019	Updated various sections throughout the document.
1.4	Sept 06, 2018	Official release of this document.
1.3	April 12, 2018	Final Remarks/Edits.
1.2	March 26, 2018	Added additional FAQ.
1.1	March 15, 2018	Initial version of the document.
1.0	March 14, 2018	Updated list of currently supported adapters.

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# INTRODUCTION

NVIDIA® Mellanox® Rivermax® offers a unique IP-based solution for any media and data streaming use case. Rivermax together with NVIDIA GPU accelerated computing technologies unlocks innovation for a wide range of applications in Media and Entertainment (M&E), Broadcast, Healthcare, Smart Cities and more.

Rivermax leverages NVIDIA Mellanox ConnectX® hardware streaming acceleration technology that enables direct data transfers to and from the GPU, delivering best-in-class throughput and latency with minimal CPU utilization for streaming workloads.

Rivermax implements a dedicated solution for IP-based video streaming of HD to Ultra HD flows. Moreover, Rivermax is the only fully virtualized streaming solution which complies with the stringent timing and traffic flow requirement of the SMPTE ST2110-21 specification - Enabling the future cloud-based broadcast solutions.

The Rivermax library is a cross-platform library, with support for both Linux and Windows OSs over Bare Metal and Virtualized solutions. For more details, go to the [Rivermax Product Page](#)

The sections below address FAQ related to NVIDIA Mellanox Rivermax.

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# FAQ: NVIDIA MELLANOX RIVERMAX

## 1. Supported Operating Systems/Network Interface Cards (NICs)

Question	What Operating Systems (OS) does Rivermax support? Linux/Windows?
Answer	<p>Rivermax supports both Linux and Windows</p> <ul style="list-style-type: none"><li>• Windows Server 2016</li><li>• Windows 10 Pro</li><li>• Linux distros: Ubuntu 16.04, 18.04 &amp; 20.04, Centos 7.7 and RH7.5-7</li></ul> <p>For a complete update list, go to <a href="#">Rivermax Product Page</a></p>

Question	Which NVIDIA Mellanox Network Adapters (NICs) does Rivermax support?
Answer	<p>Rivermax supports both Linux and Windows</p> <p>Rivermax supports the following list of adapter cards:</p> <ul style="list-style-type: none"><li>• MCX512A-ACAT - ConnectX-5 10/25GbE</li><li>• MCX516A-CDAT - ConnectX-5 Ex 100GbE</li><li>• MCX623106AN-CDAT - ConnectX-6 Dx 100GbE</li><li>• MCX621102AN-ADAT - Connect6 Dx 25GbE</li></ul> <p>For a complete update list, go to <a href="#">Rivermax Product Page</a></p> <p>BlueField-2 DPU will be supported in future releases</p>

<b>Question</b>	<b>How can I ensure that Rivermax is using the supported NIC type? (i.e., both ConnectX-4 and ConnectX-5 NICs are installed on my machine)</b>
Answer	The device IP is used when creating Rivermax resources. Rivermax uses the IP address to detect if the associated Mellanox NIC is supported by the Rivermax library. If the NIC is not supported, the API returns an error code.

<b>Question</b>	<b>Does the same Rivermax SDK work on all supported NIC types?</b>
Answer	Yes. Advanced features are hardware-dependent; this means they might be supported on specific NICs and not on other types.

<b>Question</b>	<b>Does Rivermax support Arm architecture?</b>
Answer	Rivermax can run on x86 or Arm architectures.

<b>Question</b>	<b>Does Rivermax support AMD ?</b>
Answer	Rivermax supports AMD and Intel. Refer to the <a href="#">tuning guide</a> for tips on achieving maximum performance.

<b>Question</b>	<b>Which applications can be supported by Rivermax SDK?</b>
Answer	The Rivermax SDK can be used with any data streaming application. Rivermax provides very high bandwidth, low latency, GPU-Direct and zero memory copy. Applications that need to support IP-Enabled TV Studio Media (SMPTE ST 2110) is a good example of a use case for the Rivermax SDK. Some other popular use cases include video broadcasting, video wall-display, high BW camera ingest, retail camera input analytics, healthcare DICOM-RTV, and H.264 and H.265 compressed data.

## 2. Virtual Machine (VM) and Containers

<b>Question</b>	<b>Does Rivermax support a VM/SR-IOV?</b>
Answer	Rivermax supports virtualization on top of VMware ESXi and OpenStack (KVM)

<b>Question</b>	<b>Can Rivermax run from Docker Containers</b>
Answer	Yes. Rivermax can run inside a container, without any impact on performance or functionality; a code example is provided as part of Rivermax release 1.7.

### 3. SDP, RTP and Network Headers

Question	Does Rivermax generate RTP packets?
Answer	No. Rivermax receives from the application RTP packets and based on that it generates network packets (adds MAC/IP/UDP).

Question	Does Rivermax create the Ethernet & IP layer?
Answer	Yes. The Rivermax layer creates all the Ethernet/IP/UDP headers (based on the information extracted from the SDP).

Question	Does Rivermax support receiving or transmitting RTP payload/header with variable length?
Answer	<p>Yes. This is supported by Rivermax.</p> <p>For send requests, the sizes must be indicated upon the output stream creation via <code>rmax_mem_block.app_hdr_size_arr</code>/<code>data_size_arr</code>.</p> <p>For receive requests, the min and max sizes must be indicated upon the input stream creation via <code>rmax_in_buffer_attr.min_data/hdr_size</code> and <code>rmax_in_buffer_attr.max_data/hdr_size</code>.</p>
Note: Rivermax input stream can receive traffic that consists of packets with variant sizes that can dynamically change during runtime but must be in the range:	
[ <code>min_data/hdr_size - max_data/hdr_size</code> ]	
Note: It is strongly recommended to work with constant length in order to fully utilize hardware offloads and achieve the optimal performance.	

Question	On the sender application (application TX), can the data be separated from the RTP headers?
Answer	Yes. The RTP headers can be separated from the data or placed with the data. Rivermax supports both options.

<b>Question</b>	<b>Is the usage of SDP mandatory?</b>
Answer	<p>No. Rivermax supports any data stream that is based on UDP/IP.</p> <p>SDP provides important information used by Rivermax to configure the correct parameters for the transmitted stream. It is used by applications that support SMPTE ST 2110.</p> <p>A generic API can be used for other types of application that would like to benefit from the Rivermax performance but don't support SMPTE ST 2110.</p> <p>Receiving any data stream by Rivermax doesn't require an SDP file.</p>

<b>Question</b>	<b>Media attributes are provided to Rivermax via string, why?</b>
Answer	<p>Rivermax uses a standard SDP format which is textual.</p> <p>The SDP string stores a lot of information. Some of this information is being used by Rivermax today, while some of it will be used in future versions.</p> <p>The Generic API doesn't require media attributes.</p>

<b>Question</b>	<b>An application holds the data in a binary format. Is it complicated to convert it to an SDP format?</b>
Answer	The application can easily convert the binary format to an SDP textual format, e.g. via sprintf().

<b>Question</b>	<b>How can I know which SDP attributes are required by Rivermax?</b>
Answer	<p>Documentation of rmax_create_output_stream() routine explains what the minimal set of required SDP attributes is.</p> <p>Please refer to the rivermax_api.h file for an example of an SDP.</p>

<b>Question</b>	<b>Does Rivermax support offload of localhost addresses?</b>
Answer	<p>No. Using addresses in the 127.0.0.0/8 subnet is not supported for loopback offload.</p> <p>To offload packets that must be looped back, use one of the following:</p> <ul style="list-style-type: none"> <li>• NIC local IP address</li> <li>• Multicast address (which the host has joined) - please review documentation for further details</li> </ul>

<b>Question</b>	<b>Does Rivermax support PTP? (timing synchronization)</b>
Answer	<p>Yes. Using Rivermax, each frame must be committed with the time parameter set to the system time (in nanoseconds) at which it must be sent.</p> <p>The system time is synchronized using a 3rd party software to lock the system time to a PTP GM.</p> <p>The timing synchronization is supported for both Linux and Windows.</p> <p>The PTP client is provided by a 3rd party.</p>

<b>Question</b>	<b>Does Rivermax support unicast and multicast IP?</b>
Answer	Yes - Rivermax supports both unicast and multicast IP formats

## 4. Supported Video Formats

<b>Question</b>	<b>Which SMPTE streams are supported by Rivermax?</b>
Answer	Rivermax supports 2110-20, 2110-30, 2110-40 2022-7, 2022-6, 2110-31 and 2110-22

<b>Question</b>	<b>Does Rivermax support the 2022-7 streams? If Yes, how?</b>
Answer	<p>Yes.</p> <p>Transmit:</p> <p>Rivermax reads from the SDP string if a redundant transmission is requested using the a=group: attribute with the DUP semantic, and what are the properties of the duplicated streams.</p> <p>When redundancy is requested, Rivermax internally replicates chunks to multiple streams. This mode is currently not validated.</p> <p>Receive:</p> <p>ConnectX-5 provides software support: Rivermax supports 2022-7 on the receive side just by allowing the application to receive 2 media streams. The redundancy is made in the application layer.</p> <p>ConnectX-6 Dx provides HW offload: Redundant stream seamless reconstruction uses ConnectX-6 Dx hardware</p>

<b>Question</b>	<b>Does Rivermax support 8K UHD streams?</b>
Answer	<p>ConnectX-5 Rivermax Linux version supports receiving an 8K UHD video format of 20-80Gb/s. Accurate pacing for an 8K stream according to the SMTPE ST 2110 is supported by ConnectX-6 Dx.</p> <p>An example code will be provided in future releases.</p>

<b>Question</b>	<b>Does Rivermax support both interlaced &amp; progressive (i.e. 1080i &amp; 1080p) modes?</b>
Answer	Yes. Rivermax supports both interlaced and progressive modes.

## 5. Miscellaneous

<b>Question</b>	<b>Does Rivermax support NMOS IS-04 /IS-05?</b>
Answer	<p>NMOS is used for discovering, registering and managing Media flows—it is part of the application layer.</p> <p>The NMOS specifications describe a control plane that makes a ST 2110-based infrastructure manageable and simpler to operate.</p> <p>Rivermax versions 1.7 and up provide an example code on how to integrate NMOS with Rivermax.</p> <p>There is a NMOS implementation provided by Richard Hastie- You can run this on our switch or on a host.</p> <p>You can see Richard's presentation from IBC: <a href="http://www.ipshowcase.org/wp-content/uploads/2019/10/1500-Simplifying-JT-NM-TR-1001-1-Deployments-through-Microservices.pdf">http://www.ipshowcase.org/wp-content/uploads/2019/10/1500-Simplifying-JT-NM-TR-1001-1-Deployments-through-Microservices.pdf</a></p> <p>Richard wrote this as well: <a href="https://github.com/rhastie/docker-nmos-cpp">https://github.com/rhastie/docker-nmos-cpp</a></p>

<b>Question</b>	<b>Which SMPTE ST 2110 sender types are supported by Rivermax?</b>
Answer	Rivermax supports Narrow Sender (2110-20TPN) and Narrow Linear sender for 2110-22TPNL

Note: Wide sender has not yet been fully tested.

<b>Question</b>	<b>Does Rivermax support the extended UDP Size?</b>
Answer	Yes, make sure you increase interface MTU and set Rivermax strides sizes correctly.

<b>Question</b>	<b>Does Rivermax support GPUDirect (direct access to GPU memory)?</b>
Answer	Rivermax supports GPUDirect—memory can be allocated directly on the GPU. Example code is provided as part of Rivermax release 1.7

Note: This feature is supported only for Linux. Windows will be supported in future releases.

<b>Question</b>	<b>Memory allocation: Is it done by Rivermax or user/application?</b>
Answer	Both modes are supported: memory can be allocated by application or by Rivermax. For input stream, it is necessary to precede the memory allocation with a call to <code>rmax_in_query_buffer_size()</code> to determine the amount of memory required to be allocated by the application.

<b>Question</b>	<b>Does Rivermax check the content of the data?</b>
Answer	No

<b>Question</b>	<b>Can an application dynamically, during runtime, change the output stream data/app headers sizes or can these sizes be set only once upon output stream creation?</b>
Answer	The sizes must be set once upon output stream creation. Dynamic modification of data/app header sizes is not supported for media streams. Using the Tx Generic API, the data/header sizes can be modified on the fly.

<b>Question</b>	<b>Does Rivermax support Receive and Transmit?</b>
Answer	Yes. Both are supported and provide very high bandwidth with low CPU consumption

<b>Question</b>	<b>Why use Rivermax and not Mellanox VMA?</b>
Answer	Rivermax is based on the Mellanox VMA Linux technology combined with a more dedicated solution for the M&E industry needs. Mellanox VMA does not provide a solution for Windows, whereas Rivermax works on both Linux and Windows OSs and provides the same API and functionality set. Dedicated features (software and hardware) for the data streaming will be supported only by Rivermax.

<b>Question</b>	<b>Do we still need VMA for Linux?</b>
Answer	<p>Yes. VMA is needed.</p> <p>Rivermax uses VMA services in the control path: e.g. Hardware resources allocation, address resolution, memory registration and more.</p> <p>However, the data path is fully implemented in Rivermax in order to provide the optimal performance.</p>

<b>Question</b>	<b>Does Rivermax provide information such as how many buffers are available, committed, or sent?</b>
Answer	No. This capability will be available in future versions

<b>Question</b>	<b>Does Rivermax expose advanced programmable capabilities of the Mellanox NIC for enhanced filtering?</b>
Answer	<p>No.</p> <p>Mellanox NICs have some advanced parser capabilities that are not fully exposed by Rivermax.</p>

<b>Question</b>	<b>Does Rivermax support audio or ancillary on top of video?</b>
Answer	Yes—these are 2110-30, 2110-31 and 2110-40. An example code for 2110-30 and 2110-40 is available as part of the SDK.

<b>Question</b>	<b>Does the Rivermax SDK provide an example that sends real video content?</b>
Answer	<p>Yes—Rivermax media_receiver can send a pre-prepared video template file in YCbCr format (part of the example code).</p> <p>Rivermax SDK also provides rivermax_player—an example code that integrates FFmpeg with Rivermax. This example allows sending an MP4 video file.</p>

<b>Question</b>	<b>Is Rivermax SMPTE ST 2110 JT-NM tested ?</b>
Answer	Rivermax is “JT-NM Tested” and has been tested for SMPTE ST 2110-20/30/40, 2022-7 compliance. Rivermax also supports ST2022-6 and ST 2110-31. The full report can be downloaded from the JT-NM.org: <a href="https://jt-nm.org/jt-nm_tested/index.shtml">https://jt-nm.org/jt-nm_tested/index.shtml</a>

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