



Ethernet Video Fabric

Mellanox IP Based Networking Solutions Accelerate and Simplify Workflows for IP based Media & Entertainment Industry

Transition to IP Based Networking

An explosion in the volume of data caused by video resolutions evolving from HD to UHD, 4K, and in the near future 8K. Past proprietary solutions of Serial Digital Interfaces (SDI) are expensive, can't keep pace with transitions and introduce many difficult challenges in the business processes of rapid set up and tear down required when switching projects and changing to file-based workflows. All this has left media and production companies searching for solutions to simplify operations and reduce costs while keeping pace with higher resolutions. Also, the time-sensitive nature of video can be particularly sensitive to network jitter, requiring higher performance and lower latency interconnects. This has opened an opportunity to use IP as a video transport.

The Mellanox Ethernet Video Fabric (EVF)

Mellanox offers an end-to-end Ethernet Video Fabric (EVF) solution that supports the emerging video over IP standard (SMPTE 2110-21) at speeds of 10, 25, 50, 100 and 200 Gb Ethernet. Mellanox has also introduced advanced offload and kernel bypass technologies that accelerate data communication for servers and storage in modern video data centers. To achieve even greater benefits for deep application integration, Mellanox has been working alongside major broadcasters to help define and deliver a next generation IP studio to future-proof networks for tomorrow's demands.

HIGHLIGHTS

- Easily and non-disruptive linear scaling
- Move hundreds of 2K and 4K streams concurrently for file access ingest, edit, and rendering
- SMPTE 2110-21 compliance with NIC packet pacing even at 100GbE
- SMPTE ST 2022-6 Transport, 2110-30 Audio, and 2110-40 Ancillary for live production
- Provide simplicity and ease-of-use that improves productivity and ROI
- Reduce technology "lock-in" risk with standard based IP protocol
- Cloud ready solution

Components of an EVF

Mellanox has been leading the way in helping to define IP studios with the Joint Task Force on Networked Media (JT-NM), the Advanced Media Workflows Association (AMWA) and Society for Motion Picture and Television Engineers (SMPTE) standards. In the process, the development of an end-to-end Ethernet Video Fabric solution was designed and optimized for broadcast and streaming applications. EVF is comprised of Mellanox Spectrum[®] Ethernet switches running Onyx[®] Network Operating System, Rivermax[™] - a user-space library and kernel bypass to offload sophisticated network processing to the Mellanox [ConnectX[®] Ethernet adapters](#) and Mellanox [LinkX[®] cables](#) combine to provide a high speed and low latency Ethernet network.

Spectrum[™] Ethernet Switches

Mellanox [Spectrum open switches](#) deliver the industry's highest performance and lowest latency to support throughput required for all video requirements including 4K, 8K, HFR and HDR. With flexible switch buffers and zero-packet loss they provide predictable network performance. Consistent and very low port-to-port latency and jitter with QoS & DSCP features ensure an ultimate experience whether its live streaming or post production studios.

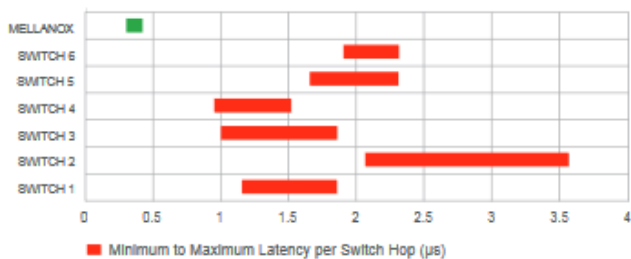


Figure 1: Port-to-Port Switch Latency

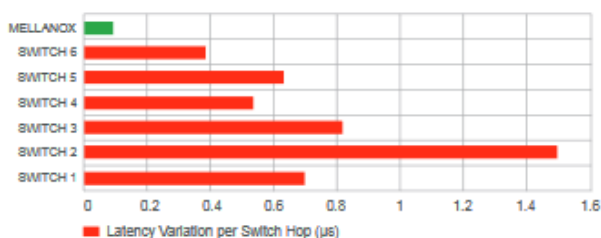


Figure 2: Packet Delay Variations (Jitter)

Onyx[™] Network Operating System

[Onyx](#) delivers an integrated switch software solution, which is optimized for media and entertainment applications. Onyx supports L2 and L3 multicast protocols, PTP, fabric containerized broadcast services and OpenFlow, network automation and improved traffic telemetry infrastructure.

Mellanox's Rivermax[™]

Mellanox's [Rivermax](#) is a user-space Linux/Windows library and kernel bypass solution that optimizes video processing by offloading network processing from the CPU. Bypassing the kernel and IP stack minimizes context switches, buffer copies and interrupts, resulting in extremely high bandwidth and low latency.

Streaming Application over Rivermax
Receive Throughput vs CPU Usage
Single Video Stream via 1 CPU Core

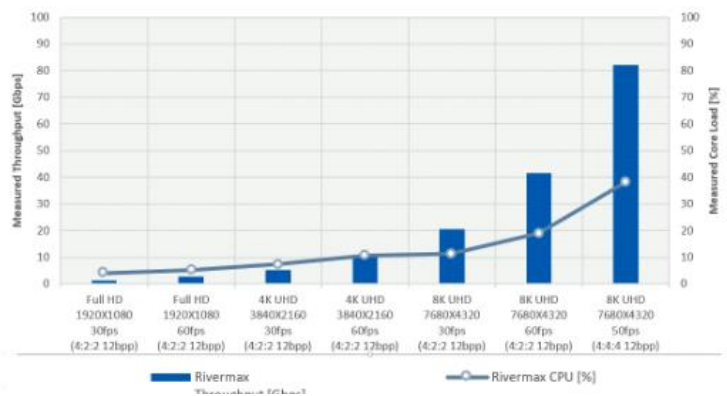


Figure 3: Streaming Application over Rivermax: Receive Throughput vs. CPU Usage

LinkX Cables

Transmitting video over any fabric requires a very high degree of performance and accuracy. All Mellanox Interconnects are built to a very high standard to support and maintain our company mantra of high speed and low latency. The passive copper and active fiber (VCSEL [Vertical-Cavity Surface-Emitting Laser] Silicon Photonics) cables as well as the optical transceivers are all built with lowest power and lowest cost in mind in both SFP and QSFP form factor. Tested to an industry's lowest Bit Error Rate (BER) of 10e-15 means fewer transmission errors and retries compared to competing products.

Advantages of an EVF

Media and entertainment companies are realizing the advantages of consolidating their IT into a common infrastructure, more effectively manage and better utilization of computing assets. A Mellanox EVF reduces the number of different technologies that must be deployed and provides a foundation to transform to a high-speed switched networking infrastructure that allows many different end point systems to be connected reliably, efficiently, and at scale while enhancing video streaming performance. The advantages of an EVF include:

- Provides a specially designed API for the application, tailored to today's IP-standards.
- Enables cutting through the entire IP stack and offloading some of the non-networking application parts.
- IP-Specification compliance – enables SMPTE ST2110-21 standard compliance in NIC hardware, offloading all packet-pacing and network transmission handling.
- Selective kernel bypass – The kernel handles Address Resolution Protocol (ARP), Internet Group Management Protocol (IGMP) and other traffic, which eliminates the need for a full complex network stack in user space.
- Designed and optimized for broadcast and streaming applications.
- Offloads sophisticated network processing to the adapter, allowing applications to deal with lines/frames instead of individual packets.
- Reduces CPU overhead, improving application efficiency.
- Delivers the highest bandwidth and lowest latency in the industry, freeing up CPU cycles for the application to perform video processing.

Conclusion

Leading broadcasting companies such as BBC, FOX and NBC are realizing that migrating to an IP-based infrastructure empowers broadcasters to innovate in all the areas of content creation and distribution, streamlining multi-platform environments and supports future video formats. Mellanox Ethernet Video Fabric accelerates, non-linear editing (NLE), distribution, live broadcasting, content distribution and post production alike. Proving an end-to-end IP-based Ethernet technologies bringing the audience and content closer together. An EVF provides connectivity for up to 200G Ethernet delivering full HD to 8K UHD (7680x4320 50fps 4:4:4 12bpp) flows equivalent to 82.2Gb/s bandwidth while only using a single CPU core at a low CPU usage, enriching the video experience, bringing about a revolution in the media and entertainment industry.

Learn more about Mellanox Ethernet Video Fabric

Mellanox Media and Entertainment Solution Site:

<http://www.mellanox.com/solutions/media-entertainment/>

Mellanox IP Broadcasting White Paper :

<http://www.mellanox.com/related-docs/solutions/WP-Powering-Next-Gen-IP-Broadcasting-with-Mellanox.pdf>

Mellanox IP Broadcasting Solution Brief:

<http://www.mellanox.com/related-docs/solutions/SB-Mellanox-IP-Broadcasting-Media-Solutions.pdf>

Mellanox Rivermax Solution Brief:

http://www.mellanox.com/related-docs/applications/SB_Rivermax.pdf



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