

Media and Entertainment



The broadcast and media market has been evolving to use higher resolution video and this is having a dramatic impact on studio infrastructures particularly around the interconnect.

Consumers increasingly expect all video to be in high-definition all the time. Blu-ray and on-demand streaming have replaced DVDs, while 25" and 32" TVs are rapidly being replaced with flat-screen sets measuring 40", 55" or even 70" in size. News shows must edit and combine video from multiple sources within minutes, and live sports-casts feature instant replay with digital enhancements and markup.

On the movie side, top directors are shooting more blockbusters in 4K and movie theatres have increasingly moved to digital projection and 3D showings. The increased use of special effects and animation are driving the need to view, edit and composite multiple 4K streams simultaneously.

Move To 4K Video

Moving to Ultra HD, 4K, and even 8K formats means data streams used are an order of magnitudes bigger than before. Animation and CGI (computer generated imagery) requires render farms with vast compute power that devour network bandwidth. This has created a major data challenge for studios and post-production houses because 1Gb/s and even 10Gb/s interconnects can no longer handle the workload.

KEY ADVANTAGES

- 56Gb/s per port supports up to 6 streams (10-bit color) or 3 streams (16-bit color) uncompressed at 24fps
- Faster post-production means fewer workstations and lower software license costs
- Process more video in less time, at a lower cost
- Supports Ethernet and InfiniBand for maximum performance and flexibility
- Future-proof solution ready for 8K video

A single uncompressed 4K (4096x2160) stream with 10-bit color depth at 24 fps requires a full 10Gb/s Ethernet link. Using 4K Full (4096x3112) resolution, 16-bit color depth, stereoscopic video, or higher frame rates requires more, and uncompressed 8K video can require 24Gb/s or 28Gb/s. Traditional 1/10Gb/s Ethernet and even 16Gb/s Fibre Channel clearly struggle to handle the new high-definition video workflows.

Format	Resolution	Color Depth	FPS	Bandwidth per Stream	10GbE Ports	8Gb FC Ports	40/56Gb Ports
4K DPX	4096 x 2160	10-bit	24	6.4 Gb/s	1	1	1
4K-Full DPX	4096 x 3112	10-bit	24	9.2 Gb/s	1-2	2	1
4K-Full EXR	4096 x 3112	16-bit	24	14.7 Gb/s	2	2	1
4K-Full EXR	4096 x 3112	16-bit	60	36.7 Gb/s	4	5	1
8K DPX	7680 x 4320	10-bit	24	23.4 Gb/s	3	4	1
8K EXR	7680 x 4320	16-bit	24	28.2 Gb/s	3-4	4	1

Figure 1. Bandwidth required for uncompressed 4K/8K video streams

Traditional Networks Overwhelmed

Today most studios and post-production facilities run on 1Gb/s or 10Gb/s networks and use 4/8Gb/s Fibre Channel or 6/12Gb/s SAS for the storage. While these are sufficient for traditional high-definition video, a single uncompressed 4K stream at 24fps requires multiple 8Gb/s or 10Gb/s links for each workstation and storage node. Due to networking overhead, a 4K-Full DPX video stream that requires 9.2Gb/s of real bandwidth actually requires two 10Gb/s network connections. It's not unheard of studios setting up FOUR 10GbE connections to one high-end workstation to handle uncompressed 4K video. In addition, the storage arrays often require multiple network ports which must also be aggregated.

This complicates networking immensely, as multiple ports per workstation or storage system cannot merely be configured as active-passive or active-active, but require link aggregation and load balancing to achieve the necessary bandwidth. Workstation and storage setup, changes, failover and network routing all require much more planning and effort.

Some claim that expensive upgrades to 16Gb FC are the answer, but this still requires two ports per server in many cases. All the extra ports Ethernet or Fibre Channel ports require extra cards, switches, and cabling, often overrunning available space and power. Studios are being pushed to do more 4K video and multi-stream production but struggle to deliver the needed bandwidth without breaking budget, space and power constraints.

The Mellanox Solution

Mellanox offers an end-to-end interconnect solution that offers high bandwidth, low latency, with the ability to scale to 40Gb/s and 56Gb/s data rates on demand. RDMA (Remote Direct Memory Access) allows even lower latency and higher throughput and is supported with different storage protocols running on the most popular operating systems and hypervisors.

Mellanox Virtual Protocol Interconnect® (VPI) switches have the unique ability to support both Ethernet and InfiniBand at 10Gb/s, 40Gb/s, and 56Gb/s data rates per port, along with the ability to mix Ethernet and InfiniBand ports on the same switch. They feature the lowest latency, highest density, and lowest jitter in the industry, ensuring smooth video ingestions, editing, and playback even with uncompressed 4K and 8K video.

RDMA Advantage

Remote Direct Memory Access (RDMA) makes data transfers more efficient and enables fast data movement between servers and storage without the involvement of server's CPU. Throughput is increased, latency reduced and CPU power freed up for video editing, compositing and rendering work. RDMA technology is already widely used in render farms and other high-performance computing (HPC) applications for efficient data transfer, and now can accelerate video editing, encoding/transcoding, and playback. Mellanox interconnect supports RDMA on both InfiniBand and Ethernet using a variety of storage protocols, with support in multiple storage protocols and file systems, including iSER (iSCSI with RDMA), SMB Direct, IBM GPFS, Quantum StorNext, and Lustre.

Higher Performance Density Improves Your Bottom Line

Mellanox interconnect offers the highest bandwidth and lowest latency available to let your media network handle more streams and higher resolutions with ease. Stream and edit at higher frame rates for sports and action video. High density, low power consumption, and a reduced need for cables all help lower operational costs. At the same time, competitive pricing lowers capital costs needed and you get investment protection with the ability to start at 10Gb/s and upgrade some or all of your interconnects to 40Gb/s or 56Gb/s Ethernet or InfiniBand speeds as needed.

A Scale-Out New Network Design

Mellanox has designed and tested an ultra-scalable post-production architecture that leverages these new networking technologies. The solution uses Mellanox interconnect and a scale-out file system to allow shared RDMA access to the media storage at 40 and 56Gb rates from high-performance servers and workstation. Stations or users using compressed video or not requiring real-time streaming connect through a 1/10Gb gateway and can access the media files of NAS (file) or web (http) protocols.

This design is expected to support up to 48 fps to each workstation for one 4K DPX stream using RDMA. Non-RDMA workstations can also support one 4K DPX stream at 24fps. The storage network will stream from 70 to 130 simultaneous uncompressed Ultra HD streams at 60fps, depending on format used, and support 2000 to 4000 compressed streams, depending on compression used.

Future-Proof Your Network

The adoption of 4K video is increasing rapidly. Whether you are already managing 4K video or planning an infrastructure upgrade to get ready, Mellanox can help you manage more video more efficiently, and future-proof your network for 4K and even 8K video streams.

Unmatched Price - Performance

Contrary to past belief, with the evolution of RDMA and RoCE (RDMA over Converged Ethernet), 40GbE and 56G IB can carry more streams of uncompressed 4K/8K video, with more predictable performance, and at a much lower price point.

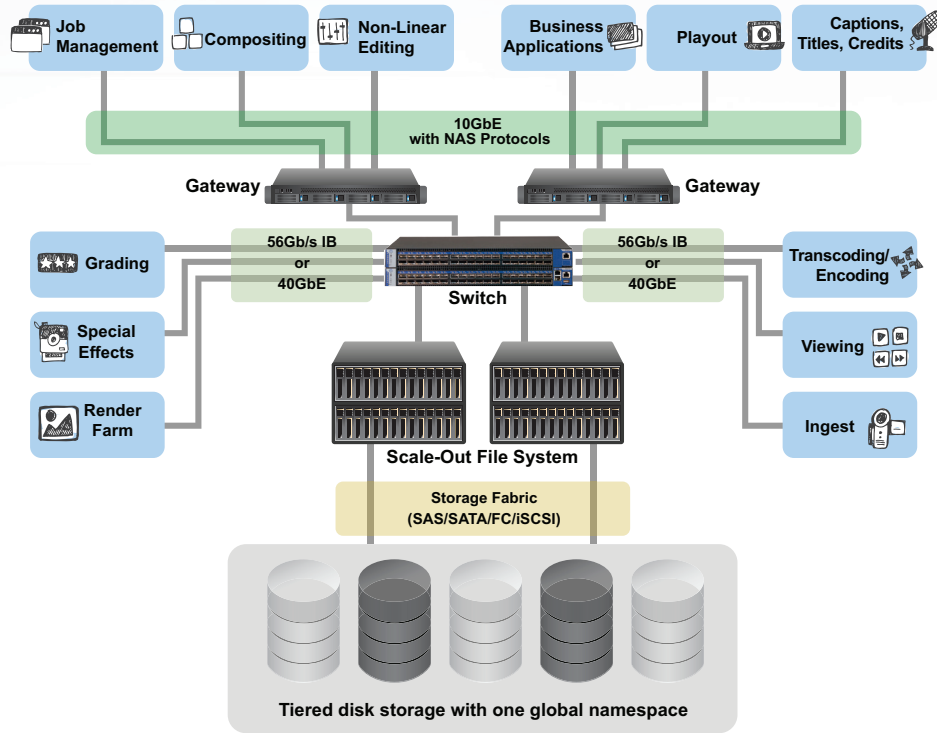
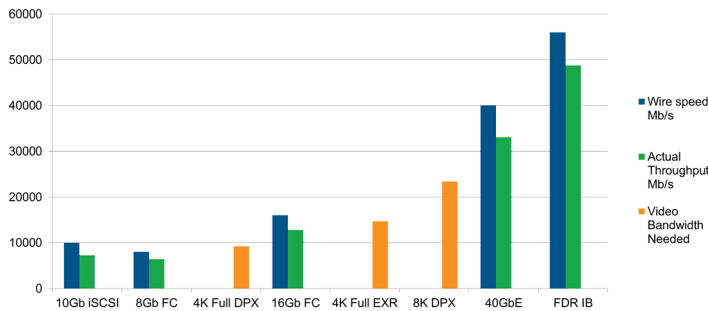


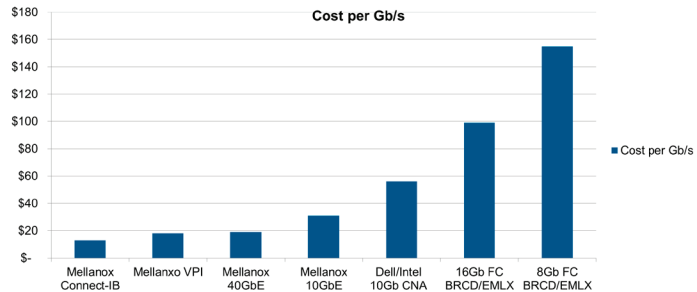
Figure 2. New architecture supports 40 or 56Gb/s per link

Sequential Read Performance vs. 4K/8K Video Requirements



Actual network throughput reflects single large I/O read or write stream on one port with lossless network. Video bandwidth numbers assume uncompressed, 4K video at 24 fps.

Price Per Gb/s of Bandwidth per Port, Switch + Adapter



Based on CDW.com web pricing. All pricing is per port for 2-port adapters and 24/36/48-port modular switches. Mellanox VPI cards and switches support both FDR InfiniBand and 40Gb Ethernet.



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