Move to 4K, The Right Way!

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 inch TVs are rapidly being replaced with flat-screen sets measuring 40, 55 or even 70 inch in size. News shows must edit and combine video from multiple sources within minutes, and live sportscasts feature instant replay with digital enhancements and markup.

With respect to filming future blockbusters, top directors are shooting more movies in 4K and movie theatres are increasingly moving to digital projection and 3D showings. The amplified use of special effects and animation are driving the need to view, edit and composite multiple 4K streams simultaneously.

HIGHLIGHTS

- 100Gb/s per port supports up to 4 streams (10-bit color) or 2 streams (16-bit color) uncompressed at 60fps
- Faster Post-Production with RDMA means fewer workstations and lower software license costs
- Process more video streams in less time with Mellanox VMA, at a lower cost
- Future-proof solution ready for 8K
- Supports Ethernet and InfiniBand for maximum performance and flexibility

Move To 4K Video

Moving to Ultra HD, 4K, and even 8K formats means data streams used are at 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.

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 60fps 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 23Gb/s of real bandwidth actually requires three 10Gb/s network connections. It is 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 over-running 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.

Format	Resolution	Color Depth	FPS	Bandwidth per Stream
4K DPX	4096 x 2160	10-bit	60	16 Gb/s
4K-Full DPX	4096 x 3112	10-bit	60	23 Gb/s
4K-Full EXR	4096 x 3112	16-bit	60	36.75 Gb/s
4K-Full EXR	4096 x 3112	16-bit	120	73.44 Gb/s
8K DPX	7680 x 4320	10-bit	60	58.5 Gb/s
8K EXR	7680 x 4320	16-bit	60	70.5 Gb/s

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

The Mellanox Solution

Mellanox offers an end-to-end interconnect solution that delivers high bandwidth, low latency, with the ability to scale to 100Gb/s data rates on demand. RDMA (Remote Direct Memory Access) allowing even lower latency and higher throughput. It is supported with different storage protocols running on the most popular operating systems and hypervisors. In addition, Mellanox VMA enables highest efficiency and application density for CPU intensive applications like video processing and rendering.

Mellanox Spectrum deliver industry's highest performance and lowest latency Ethernet switches at various speeds including 10/25 and 40/50/100Gbps to support throughput required for all video requirements including 4K, 8K, HFR and HDR. With its flexible switch buffers with zero-packet loss, predictable network performance and QoS & DSCP marking, it provides the ultimate experience to the viewers whether its live streaming or from post production studios.

RDMA & Mellanox VMA Advantages

Remote Direct Memory Access (RDMA) makes data transfers more efficient between servers and storage. This enables faster data access for post-production processing and video editing workstation. Mellanox interconnect supports RDMA on both Infiniband and Ethernet using a variety of storage protocols and file systems, including iSER (iSCSI over RDMA), SMB Direct, IBM Spectrum Scale, Quantum StorNext, Lustre and CEPH.

In addition, Mellanox VMA, a user space kernel bypass solution, accelerates CPU intensive video processing like video editing, encoding /transcoding, playback and rendering, without needing any application changes. VMA helps boost application performance as much as 5X times and cuts latency by as much as 80percent.

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 25Gb/s and upgrade some or all of your interconnects to 40Gb/s or even 100Gb/s 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 100Gb rates from high-performance servers and workstations. Stations or users working with compressed video or not requiring real-time streaming connect through a 10/25Gb gateway, can access the media files of NAS (file) or web (http) protocols.

This design is expected to support up to 60 -120 fps to each workstation for one 4K DPX stream using RDMA or VMA. 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 infra- structure 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.

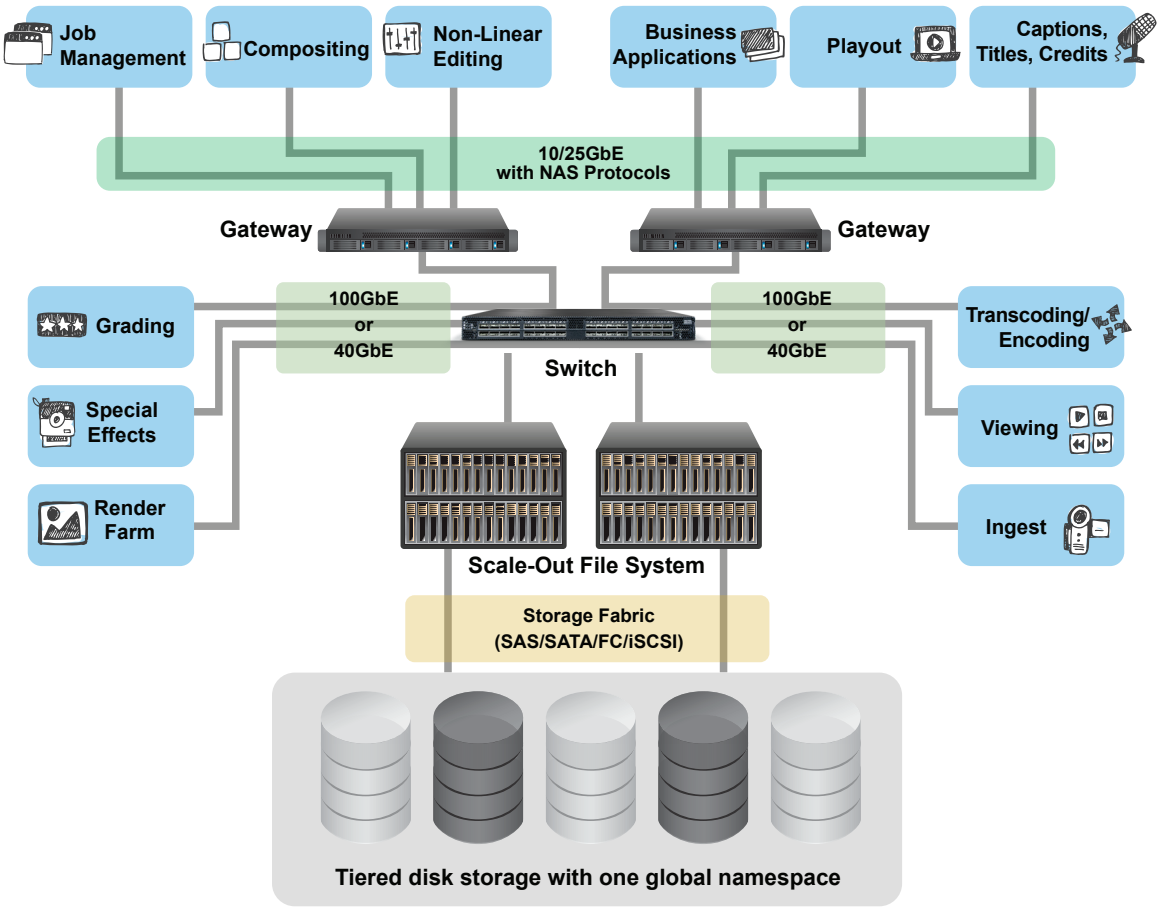

Figure 2. New architecture supports 40 or 56Gb/s per link

About Mellanox

Mellanox Technologies is a leading supplier of end-to-end InfiniBand and Ethernet interconnect solutions and services for servers and storage. Mellanox interconnect solutions increase data center efficiency by providing the highest throughput and lowest latency, delivering data faster to applications and unlocking system performance capability. Mellanox offers a choice of fast interconnect products: adapters, switches, software, cables and silicon that accelerate application runtime and maximize business results for a wide range of markets including high-performance computing, enterprise data centers, Web 2.0, cloud, storage and financial services.

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