



Real 4K Video Distribution: HDMI Extenders go Head-to-Head



Getting the best 4K picture quality?

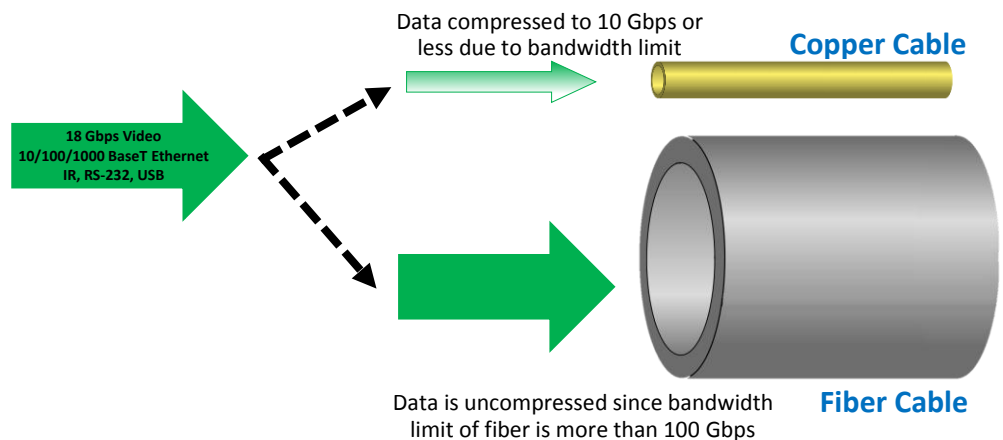
Visual quality matters and with the proliferation of 4K sources, displays, projectors, and especially high dynamic range (HDR) content, it is becoming critical that your video extenders are not limiting the performance of your system.

“It says 4K, so it’s fine, right?”

Not so fast. With HDR content, video bandwidth has crept above 10 Gbps and many video extenders, including HDBaseT and most video over IP solutions, must use **compression** to fit the video and control signals within the bandwidth limitations of copper cable. That means installers must now consider the compromises involved with their choice of extender technology.

The Compression Compromise

Before HDR, compression wasn’t much of a compromise because the HDMI video bandwidth still fit within the 10G limit supported by HDBaseT, SDVoE, and Video over IP. With HDR, compression causes visual quality sacrifices that are easily seen by customers. If visual quality matters to your customer, don’t compromise. Full-bandwidth **uncompressed** solutions using just one fiber are available now and will have enough bandwidth for 8K and beyond.



Head-to-Head comparison of HDMI extenders

For the professional installer, the ability to pre-wire and field terminate cables, as well as get both video and control over a single link are both critical requirements of an extender solution. Additionally, it would be nice to be able to leave the cabling in place for the transition from 4K to 8K video, a transition that will be coming soon, ready or not.

HDBaseT systems support all of the HDMI video and control signal options using just a single copper category cable run with the caveat that any of the video data rates above 10 Gbps will be compressed – 4K, 60Hz, 4:2:2, HDR video will need to undergo compression to be transmitted via these extenders. Next generation HDBaseT is going to support an uncompressed video link for HDMI 2.0, but it isn't released yet and will take time to become widely available once it is. The maximum distance that can be supported by HDBaseT is 100m in the ideal case, in reality though electromagnetic interference (EMI), crosstalk and other signal integrity issues can reduce that distance significantly and higher data rates only cause more problems. The increased data rate per channel for 8K will likely require lossy compression, a higher grade of category cable, reduced run lengths, or likely a combination of all three.



Banding Artifacts

11.1 Gbps: 4K/60/4:2:0/HDR →
8.9 Gbps: 4K/60/4:2:0/SDR



Blocking/Fuzzy Edges

17.8 Gbps: 4K/60/4:4:4 →
8.9 Gbps: 4K/60/4:2:0

Video over IP, including SDVoE, also supports both HDMI video and control signals, generally using just a single copper category cable run over standard Ethernet protocol and hardware. This means that a 10G Ethernet network system can support uncompressed video up to 10 Gbps and must use compression for anything above that. Plus the same crosstalk and EMI issues arise with the category cable. Moving to a 40G Ethernet network is of course possible, but the cost for the equipment is much more expensive than a 10G Ethernet network or HDBaseT hardware.

The performance and distances compromises aren't inevitable though! Fiber links can overcome the bandwidth and distance issues, plus fiber is immune to EMI. Fiber itself has a bandwidth >400 Gbps, so video and control bandwidth can increase significantly before the limits of the fiber pipeline are reached. This means full rate, uncompressed 4K HDR video along with all of the control signals can be run over fiber cable that can be field terminated with a standard SC or LC connector in just a few minutes. The fiber cable can either be duplex, with a transmit and receive fiber side-by-side, or just a single simplex fiber cable since light can simultaneously transmit and receive on the same fiber as long as the wavelength of light is different. This means that fiber extenders, as long as they are NOT using 10G SFP+ optical Datacom modules, really can meet all of the requirements of a video distribution link, plus be future-proof since that same cable can be used for 8K and beyond.



Fiber Extenders Support Uncompressed Solutions



Real4K Extenders for HDMI Video



Pre-terminated fiber designed for AV

The Inneos Real4K fiber extenders support fully uncompressed 4K video plus IR control all over one multimode fiber up to 1000m for OM4 fiber. The four HDMI TMDs channels are all run over different wavelengths of light, so this extender doesn't do any data processing on the actual HDMI video – it just passes it straight through. Another two wavelengths of light support the bi-directional communication and control functionality for an all-fiber link where the cable can be pre-installed and field-terminated with standard SC connectors. The same OM4 multimode cable can stay in the wall when it is time to upgrade to 8K, so upgrading a system simply requires plugging in new extender ends. Future generations of the Real4K and Real8K family will also include support for RS-232, USB 2.0, 10/100/1000BaseT Ethernet and then even 10G Ethernet and USB 3.0 side-channels, all without having to change out the fiber.

Check out the Inneos Real4K™ Optical Adapters and Extenders at <http://www.inneos.com>. We also offer pre-terminated fiber designed especially for the AV environment for easy installation solutions to get started with fiber. We can also provide more information on fiber, fiber installation and field termination as well as helpful tips on working with fiber. Email Inneos at contact@inneos.com. ***No compromises required... just amazing video as it was meant to be seen.***

