THE VIDEO OVER FIBER REVOLUTION:
WHY NOW?

The ability to go longer distances at higher speeds gives fiber a performance edge, and converters are creating cleaner installation deployments. by Kjersti Martino

COPPER WIRING HAS been around since the 1880s. It has survived many generations of video technology. So what has changed? Well, 4K video with HDR became important, and it needs a full 18 Gbps link. Copper HDMI cables, even good ones as thick as your finger, only work to about 20 ft. IP-based video (HDBaseT, SDVoE, etc.) which was a popular extender technology for 1080p, is stuck at 10.2 Gbps for the foreseeable future.

System integrators need a better solution today for 4K HDR video at 18 Gbps and soon for HDMI 2.1 data rates at 24 Gbps, 32 Gbps, and 48 Gbps. At these speeds all copper has to offer are caveats and compromises. Fiber has plenty of bandwidth plus it eliminates issues with electromagnetic interference and ground loops.

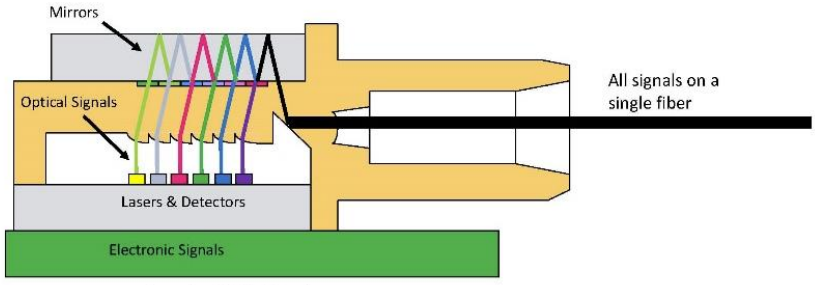
Best of all, video over fiber isn't fighting the future, it's embracing it. Bring on the higher resolutions, faster frame rates, more colors, fancy contrast, and whatever other cool features are to come - fiber can handle it.

Solutions Evolve to Extender Boxes, AOCs, Adapters

Video over fiber was first introduced decades ago and has progressed to now offer a range of solutions, including optical extender boxes, active optical cables and even optical adapters.

Optical extender boxes either have the optics embedded in the system or use plug-in SFP+ modules and often have control signals like IR, serial (RS-232) and/or Ethernet built-in as well. Some can even deliver the full 18 Gbps without compression if they use two SFP+ modules or special embedded optics, though this may require more than one fiber cable.

Active optical cables (AOCs) have also become very popular. These are typically "hybrid" cables with a combination of both optical fibers and copper wires inside a jacket. This hybrid construction allows power and low-speed control signals to use copper wires, just like a standard cable, while the high-speed signals are transmitted optically on multiple separate fibers. However, distance can still be a problem because of signal integrity on the copper side, especially for the DDC. The hybrid cable construction of an AOC also means it must be terminated in the factory because it requires critical optical alignment of at least four fibers simultaneously. Several cables have developed "removable head" technology which makes them easier to pull through walls, but this can also be a common source of failures in the field.



Example of a WDM Optic
(Inneos Wavestacker Technology)

> Wavelength division multiplexing isn't new, but it is new to the AV market where it allows a single industry standard fiber to be deployed in the same way as copper category cabling.

Combining Fiber Performance with Category Cable Deployment Model

The ability to cut AV cables to length and terminate in the field is one of the primary advantages of newer IP-based video solutions. It's just so much easier and cleaner to pull cabling and terminate on site as opposed to measuring and pulling fixed length cables with ends.

Video over fiber can also offer this important benefit. How? A technology called wavelength division multiplexing (WDM) that combines multiple channels onto a single fiber. WDM takes advantage of the fact that different wavelengths of light can be transmitted along a fiber without interfering with each other, even bi-directionally. The channels are stacked right on top of each other inside a single fiber with no performance degradation whatsoever. WDM isn't a new technology, but it's new to the AV market where it allows the use of a single industry standard fiber which can be deployed in exactly the same way that copper category cabling is deployed today.

WDM optical adapters or extenders are small external boxes that make it all work. They convert electrical HDMI, DisplayPort, or other protocols to optical signals (light) at the source, move the video over great distances, and then convert the light back to electrical signals at the display. Best of all, the fiber infrastructure is standard and "future ready" in that it stays in the wall for upgrades spanning several generations into the future.

AV professionals live with the dual challenge of preparing themselves for the future while at the same time trying to make "stuff" work today. Video over fiber is becoming the solution of choice for 4K HDR video, particularly where "visual performance" and "future readiness" are important to the customer.

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