Dealing with HDMI

Be prepared to service your clients with the digital video standard

Like it or not HDMI is here to stay. Presentation systems display content, usually from computers, laptops, and DVD players. Dell PCs and DVD players all have DVI or HDMI outputs, and Macs have DVI connectors. Up until today, dealers have been able to tell clients that HDMI is not ready yet and avoid switching and distributing these types of signals. Often a HDMI signal is knocked down to an analog component signal for distribution. Soon, however, clients that are spending big money on 1080p displays and are used to true HD quality images at home will demand the same quality in the office or university.

High-end displays, video games and Blu-ray players are driving HD specs and customer expectations through the roof. Today's HD displays are capable of 1080p, 60 Hz and 24-bit color. The HDMI 1.3a specification increases its single-link bandwidth from 165 MHz (4.95 Gbps) to 340 MHz (10.2 Gbps) to support the capabilities of next-generation displays such as 1440p (2560x1440), 120 Hz, and Deep Color. Deep Color enables the processing and transmission of billions rather than millions of colors, greatly increasing a display's contrast ratio, vividness, and accuracy.

While HD content such as HDTV (satellite and cable) and Blu-ray are delivered as compressed MPEG streams, all outputs on the playback devices are uncompressed video. Only HDMI can transmit full uncompressed HD signals with Deep Color and deliver optimal refresh rates, which eliminates jerkiness of movie content and optimizes the display's capabilities.

More importantly, now that the HD signal wars are over, DVD players will join VCRs in trash bins and yard sales, replaced by Blu-ray players, which will be integrated into laptops and computers. Content is king, and Blu-ray embeds High-Definition Content Protection (HDCP). Component HD signals do not carry HDCP encryption, so all HD signals must be transmitted as HDMI.

HDMI signals deliver full picture quality, but are limited to short cables, making true HD digital distribution nearly impossible. In-line amplifiers may not help if they simply boost the signal, adding noise that may result in lost data, rather than regenerating the digital signal. A bad HDMI signal can result in dropped or frozen frames, HDCP errors, or complete signal loss, which will stop playback.

The critical issue with distributing HD content, however, is not driving the signal over long distances. Certainly the HDMI 1.3a specification of a mere 50 feet is a challenge, but one that is being addressed by several experienced distribution and switching companies in our industry that are making better line drivers. The problem lies in processing and distributing the control signal embedded in the content and transmitted via HDMI or DVI. HDCP is a highly complex technology developed by Intel to control the distribution of digital content. (See related HDCP story on the next page.)

In this digital age, where anyone can record or download content, and instantly distribute that content globally on the Internet, movie studios are understandably concerned about piracy. Financial institutions and universities are also concerned about protecting content. Investment banks and hedge funds conduct morning video teleconference meetings in which they discuss stocks and commodities they will buy and sell that day. Millions of dollars are at stake if the information is intercepted. Universities record and distribute classes and conduct distance learning courses. Students are now recording these lectures and posting them on YouTube, which costs universities thousands of dollars in lost tuition each semester.

"HDMI distribution is a control and communications challenge."

HDCP is designed to prevent content from being recorded, played, displayed, or distributed without authorization. A simple digital video switcher cannot manage the multiple levels of encryption, key codes, and handshakes that are required to distribute an HD signal. HDCP is designed to block non-compliant signals. If the HDCP encryption is not properly managed by the mid-stream device, the signal will not be displayed.

Technically, HDMI distribution is a control and communications challenge. As the control systems leader, Crestron has been managing HDMI/DVI with HDCP for years. For example, the DVPHD is a multi-window HD video processor that accepts multiple HDMI signals and processes and decodes all the layers of encryption, then regenerates them on each of the outputs to deliver pristine 1080p or 1920x1200 HD signals in multiple video windows simultaneously. No other multi-window display or video processor available today can do that. Similarly, the Adagio Media System with Advanced Image Processing (AMS-AIP) features an integrated video source switcher that accepts HDMI and DVI signals and processes the selected signal, including the content protection, then regenerates the signal to the display to deliver a pure HD image.

Crestron is also introducing a revolutionary new technology called DigitalMedia™, which is designed to route and distribute HDMI signals over extended distances while processing and managing HDCP content protection.