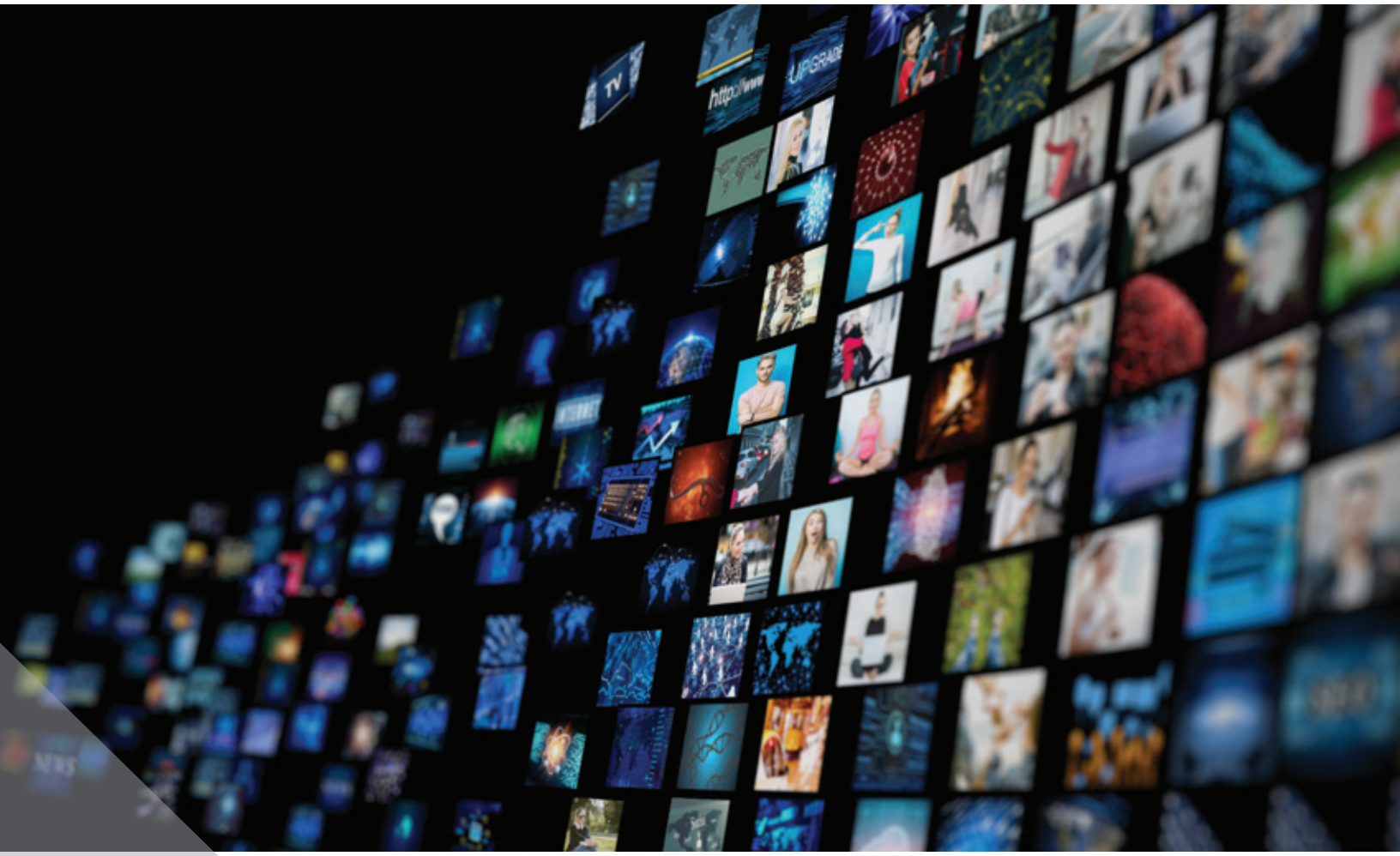
Commercial INTEGRATOR EXPERT SERIES



AMPING UP YOUR AV-OVER-IP: NETWORK KNOW-HOW

Fundamental elements behind the growth of AV over IP.

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AV over IP requires some networking comprehension to assemble complete distribution systems. Find out the basics behind the technologies required to specify these solutions. By Robert Archer

AV over IP is one of the hottest technologies in the commercial market. Driving the category's surging popularity is a broadening selection of increasingly affordable networking devices and the growing adoption of networking standards by AV equipment manufacturers that are looking to leverage the advantages of networking technologies.

The problem with this sudden surge of IP everywhere is that networking nomenclature is now thrown around as much as commonly known terms that even the general public recognizes.

Disseminating these terms can be tricky for integrators steeped in tradi-

tional audio and video backgrounds. Conversely, learning AV terms can be nearly as difficult for networking pros used to the stability of an industry backed by standards.

To help both sides of the commercial integration spectrum understand these converging categories, here are some fundamental elements behind the growth of AV over IP.

The Impact of the Network Switch

Like other markets, AV-over-IP technology places the network in position to serve as the backbone of the technology systems.

Ayham Ereksousi, director of product management, networking, SnapAV Araknis, says there are some fundamental networking components necessary to assemble a basic AV-over-IP system. The most important of these foundational products is a managed Ethernet network switch, he says. "The network switch replaces the traditional media switcher," Ereksousi explains.

"The network switch requires Internet Group Management Protocol [IGMP] snooping, and for the most part VLAN capability in order to separate AV-over-IP traffic from the rest of the network. So basic unmanaged will not work. It must be a managed switch."

Network switches are becoming more advanced every year through products such as Layer 2 (L2) and Layer 3 (L3) solutions that provide increasing levels of network traffic management for more efficient data delivery.

Layer 2 switches manage packets by sending them to specific (Media Access Control) MAC addresses within a network. Layer 3 switches add the ability to perform routing functions in addition to switching functions.

Ereksousi points out that beyond the basic requirement of a managed network switch, AV-over-IP manufacturers vary with their specific requirements. He says some require L3 network switches, while other manufacturers' products work fine with L2 switches. Other manufacturers require 10-Gigabit switches, while other companies' products work with traditional 1-Gigabit switches.

Elaborating on the speed requirements of network switches and the integration of AV-over-IP components, Ereksousi notes that peak bandwidth per stream and network design are the two greatest factors that influence the choice of 1Gb or 10Gb products.

Video compression codecs such as MJPEG and H.264, as well as the resolution of the stream — 1080p, 4K, 4K HDR (high dynamic range) also play a role in determining the choice of network switches, but he says the AV-over-IP manufacturer usually specifies what switches integrators should choose.

Ereksousi asserts that in Araknis' testing, a majority of the time most stan-

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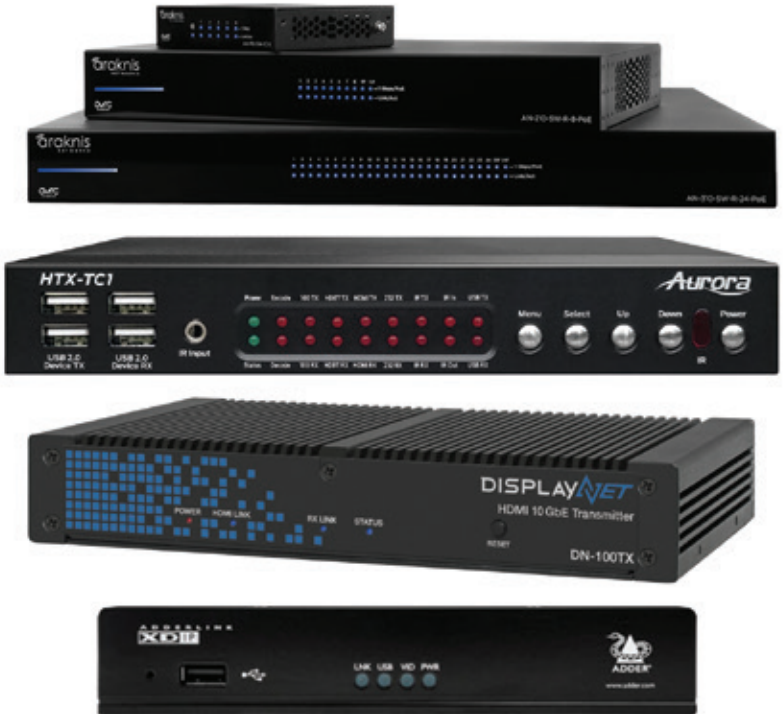

Network switch manufacturers are facilitating AV-over-IP distribution with various managed components (shown are examples from Araknis, Aurora Multimedia, DVIGear and Adder Technology).

dard 1Gb switches worked fine for the distribution of AV content over IP. "We found the majority of 1080p and 4K solutions peak between 300Mbps and 800Mbps per stream, which is enough for a traditional business-grade 1Gb switch to handle as long as all of the transmitters and receivers are live on the same switch," he comments.

However, adds Ereksousi, in situations where the network design requires connecting receivers on multiple switches — if you can't home run the receiver to the same network switch as the transmitter — then in the uplink between the edge switch and the AV-over-IP switch can bottleneck at 1Gb speeds.

As an example, Ereksousi says, picture the installation scenario where you have two 4K TVs connected to an edge switch with two AV-over-IP receivers, and the transmitters are connected to a core switch in the rack. In this type of setup if the link between the core switch and edge switch is only 1Gb, he says, the stream from the transmitter to the receiver could potentially absorb the entire bandwidth of the uplink.

In this situation a 10Gb managed network switch will solve the uplink problem. Ereksousi adds there are cases that Araknis has encountered during its testing where high-performance AV-over-IP solutions require all of the ports on the switch to support 10Gb because of the compression techniques used with these particular AV-over-IP products.

Bandwidth Appetite Necessitates Choices

Offering affordable system flexibility, Alex Peras, product manager of DigitalMedia, Crestron, points out that 1G technologies provide a balance of efficiency and cost effectiveness without compromising performance.

"Utilizing 1G allows you to reuse your existing cabling, use the readily available standard gigabit Ethernet infrastructure, and ensures you can get all the video you need between switches over standard uplink bandwidth," he says. "We examined 10G. In fact, when we first started designing the DM NVX Series, we were more comfortable with 10G because effectively, when you look at HDBaseT, it is essentially a 10G link. However, we quickly realized you cannot take full advantage of the network if you stick with 10G —you might as well use HDBaseT.

"In order to get stable video on 10G, you need Cat6A shielded cabling along with more expensive switching infrastructure. Also, when moving 10G video out of a switch you immediately run into bandwidth issues. The 1G network is really what IT is most comfortable with and it is the only way to truly take advantage of moving video over the network," says Carter.

Adding to the choices that professional integrators have beyond 1G- or 10G-based AV over IP during the design process is another technology: HDBaseT. This category-based connectivity solution has rapidly grown in popularity over the past several years, but Paul Harris, CEO of Aurora Multimedia, says that higher bandwidth AV signals will require integrators to choose AV over IP over HDBaseT.

According to Harris, one way to guard against obsolescence is to use higher bandwidth solutions such as 10Gb, which technologies like Samtech's AptoVision BlueRiver NT series AV-over-IP products offer.

"BlueRiver, which is a 10Gbps technology, can properly do 4K at 60Hz 4:4:4 [chroma subsampling] with no detectable artifacts with or without motion," states Harris.

"10Gbps is the way of the future and the path for 8K. Once into those higher refresh rates and bandwidth, you must be on a 10Gbps system — period."

The only issue with utilizing 10Gb solutions, Harris notes, is the devices produce a lot of heat because they draw more power than 1Gb products, and they are also more expensive than 1Gb products.

Carter suggests using Crestron's NVX series of products, which are specifically designed to work on a 1G network infrastructure.

"With NVX, there are a significant amount of advantages for using a 1G network, but, if you already have a 10G Ethernet switch, then that is also an option," notes Carter.

A best-of-both-worlds solution, Harris suggests, is a hybrid system like

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HDBaseT-IP. According to the HDBaseT Alliance, "HDBaseT-IP seamlessly and easily extends HDBaseT from in-room to cross-campus applications, and leverages existing pro-AV installations and interfaces to achieve end-to-end system optimization and reduced total cost of ownership."

"HDBaseT seemed like it was a technology that was on its way out, but maybe we're all wrong about that," admits Harris. "Maybe we need this technology to be the fix for IP itself."

In a hybrid-based solution, Harris says for instance, single- and double-gang HDBaseT-IP wallplates could be used to bridge IP to provide 10Gbps 4K at 60Hz 4:4:4 from the wallplate to the network. This type of solution he says would mitigate the cost of using expensive 10Gb AV-over-IP transmitters and receivers.

Ereksousi points out another advantage of 10Gb networking technologies is that it does provide greater system design flexibility. Another of its disadvantages is that when using category cabling these systems can only support the transmission of bandwidth intensive content for limited distances.

Once an integrator exceeds the reliable transmission capabilities of copper-based cabling, fiber cabling must be used.

"... WILL WE EVER SEE HIGHER SPEEDS SUCH AS 20/40/100GB ETHERNET FIND THEIR OUTSIDE OF DATACENTERS?"

Network Companies Influence Category Roadmap

As AV-over-IP adoption continues to gain momentum as a solution to support the distribution of bandwidth-intensive AV content, manufacturers such as Araknis will engineer their products to enable these technologies.

In the case of Araknis, Ereksousi says the company is keeping a close eye on the latest market developments. He also points out that it has worked with AV-over-IP manufacturers such as Crestron and Key Digital to ensure its 210 and 310 series of switches work with their products.

"We're happy that we are an approved vendor for Key Digital, and we are releasing a firmware update and white paper soon to walk integrators through how to get Araknis switches to work with Crestron NVX," he notes. "This trend is also influencing our roadmap for network switches."

A key aspect of the ecosystem of a network from a company like Araknis is the product family's remote monitoring capabilities. Ereksousi explains that once integrators move beyond the IGMP snooping settings, which can be confusing, a cloud-based monitoring solution like Araknis' OvrC system can be used to simplify the setup process and get the benefit of additional levels of reporting the cloud-based system provides.

Looking ahead, Ereksousi says that as AV over IP evolves one thing that will be of interest to integrators will be to see how companies utilize remote monitoring to aid in the integration and support of AV over IP.

With both the consumer entertainment and commercial integration industries moving towards 4K and 8K video, the need for bandwidth will only increase because of the stress these resolutions place on the throughput of existing distribution networks, Ereksousi and Harris emphasize. The question looming over this transition will be the costs associated to transport these next-generation signals.

"Ultra HD 4K over IP solutions will drive adoption of higher speed port options such as 10Gb Ethernet. In the future when 8K over IP becomes a reality, integrators will need to specify full 10Gb solutions. The concern is that the average cost of the network will rise significantly when moving from 1Gb to 10Gb. While this is great for network manufacturers such as Araknis, it can become a barrier to adoption for end users who are used to lower ticket items when it comes to networking," explains Ereksousi.

"The question might become: Will we ever see higher speeds such as 20/40/100Gb Ethernet find their outside of datacenters? It's doubtful in the short term, but it is possible in the long term. The cost of a 20Gb solution is much higher than 10Gb, so that may force the AV industry to find smarter, more efficient ways to send signals over IP."

Is all of this still confusing? Crestron offers a training class that teaches attendees about NVX and the networking knowledge this need to successfully deploy it. It includes content that focuses on where a 1G solution makes sense at the actual endpoint and where 10G factors in on inter-switch uplinks, says Carter.

"It's always a good thing to learn more," he says. "The NVX training offered here at Crestron covers all of the basics needed to successfully deploy an NVX system. Once you start mixing in NVX on other networks, having a broader networking knowledge can certainly lead to more success."