

a ZeeVee White Paper

# Your Future in AV is IP

The unstoppable global transition to IP-based networks in pro AV,  
and the factors for integrators to weigh in assessing solutions

**zeevee**<sup>™</sup>  
Signal Intelligence

# Introduction

It's hard to believe so much has already been written about AV over IP (audio and video over Internet protocol, or AVoIP) with so little being said about why it is essential to the future of every AV integrator and integration business.

With the industry focus on engineering and cost benefits stemming from simplified system infrastructure, configuration, deployment, control and expansion — which are indeed all real and significant advantages — too little attention is devoted to a critical customer benefit that has already become a driving force accelerating its adoption: the capacity for real-time and interactive applications that enhance end-user experience and value.

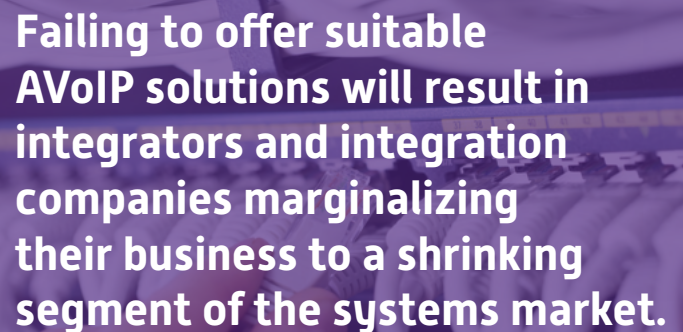
These applications, some available now with many more to come in the future, will make IP-based data networks the must-have foundation for commercial AV solutions — in business, education, government, industry, hospitality, healthcare, entertainment, retail, public safety and every other market where pro AV integrators make their living.

While conventional point-to-point signal distribution has its role in presentation and other simplex (one-way) communication, the ability to convey, communicate and interact vocally and visually in real time, from every endpoint and multiple endpoints -- throughout an office, building or campus -- heralds an exciting and promising future for the pro AV business.

Rather than a creating a roadblock between AV integrators and their customary commercial clients, AV data networks open new avenues for integrators to serve (and sell) clients -- while preserving their position as the expert authority to specify and install AV systems that meet the precise quality, performance and feature requirements of each customer.

Failing to offer suitable AVoIP solutions results in integrators and integration companies marginalizing their business to a shrinking segment of the systems market. As explained more deeply below, competitive pressure is another factor pushing the market toward AVoIP solutions. Integrators, if they have not done so already, must begin to make the transition, since trends in the workplace and technology development foreshadow a future for AV systems functioning on IP-based platforms.

This paper summarizes some of the “macro” marketplace trends that point to AVoIP's future primacy, reviews the technology fundamentals that make its appeal strongly compelling and finally discusses the factors integrators would be wise to consider in selecting manufacturers as their preferred solutions providers.



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While many papers on AVoIP typically start with talking technology, this tract begins with a look at some key marketplace trends, which taken collectively, should deliver a clear message to integrators about the systems and solutions they must be able to deliver to [1] meet current and evolving customer needs and expectations and [2] compete successfully in the regions or industries where they do business.

# Marketplace Trends

Several research studies have documented the steadily growing use of streaming and interactive video within all types of organizations as an essential, multi-dimensional element of business operations. The ability to enable virtual collaboration, meetings and group presentations, corporate communications, instruction, training, and other interactive activities, in real time or on-demand, and with high cost-effectiveness, is essential in keeping pace with the working world.

One recent study reveals not only steadily increasing numbers of organizations utilizing video streaming and collaboration but also that the amount of time workers spend weekly utilizing these services continues to grow. The trend is far from peaking: researchers forecast continued growth in both adoption and utilization. The global market for video conferencing alone, estimated at \$5 billion in 2016, is forecast to exceed \$10 billion (in 2016 dollars) by 2026.

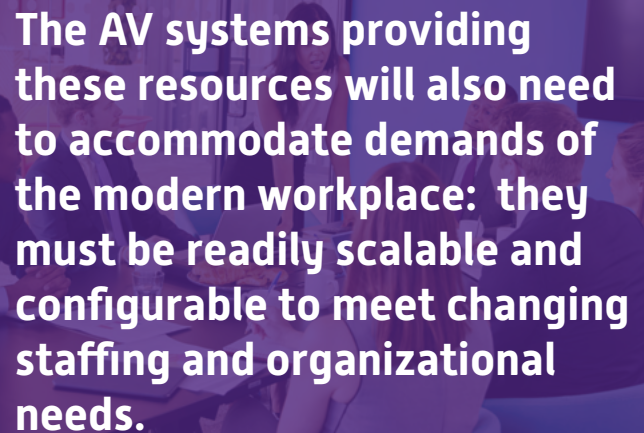
Putting aside applications in use now, it's also essential to consider that innovative, interactive business and workplace applications, potentially involving artificial intelligence or virtual or augmented reality, are already on the horizon. While it's not the purpose here to explore or predict what form they'll take, it's more than sensible to assume that future AV systems should be designed to operate on a platform likely to be compatible with these technologies — systems based on (non-propriety) IP network standards.

The low-latency and high-speed at which many AV networks need to operate, a concern especially when handling rich content, also favors an IP-based approach, since data networks provide a proven, reliable and continuously improving means of moving huge volumes of real-time information at ever-increasing speeds with near-zero latency.

Looking at AV from an individual user's perspective, the ease with which everyone can stream, conference and video chat using their smartphone or laptop creates the expectation,

particularly among younger people but also persons of any age in positions of influence or authority, that cutting-edge capabilities be available at work. Whether utilizing public or private networks, workers and other colleagues expect levels of interactivity and interoperability similar or superior to what they experience every day on their devices.

The AV systems providing these resources need to accommodate the demands of the modern workplace: they must be readily scalable and configurable to meet changing staffing and organizational needs. Systems that require less time and cost to adapt – a clear advantage of IP-based networks over matrixed distribution – have a distinct competitive advantage.



**The AV systems providing these resources will also need to accommodate demands of the modern workplace: they must be readily scalable and configurable to meet changing staffing and organizational needs.**

Shifting the focus from the clients' needs to the integrators' competitive landscape, industry trends suggest continuing merger and acquisition activities involving major integration companies seeking to expand their geographic and industry coverage. For many of the remaining regional or local firms, this means contending with newly aggressive rivals offering every conventional solution as well as some "leading edge" AVoIP solution. At the same time, start-up firms specializing exclusively in network-based AV systems are working hard to educate and win over customers.

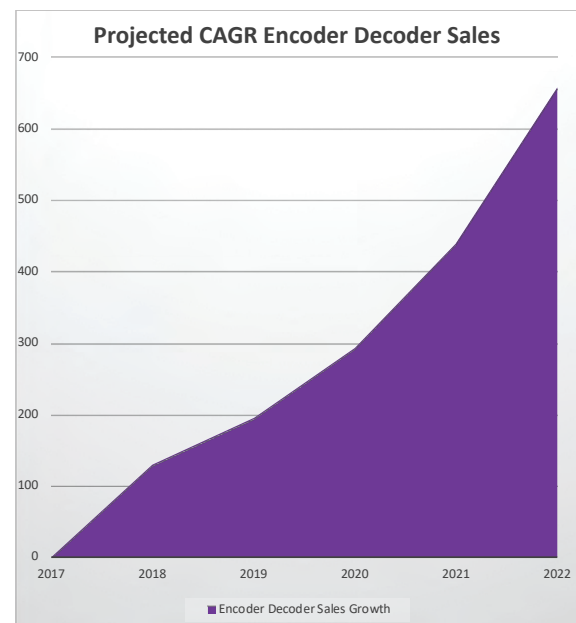
In 2014, a handful of manufacturers were early entrants into the AV over IP space that served to define and prove the viability and effectiveness of AV over IP as an AV distribution technology. These veterans paved the way for more than two dozen AV manufacturers, in the first half of 2018 alone, including every significant maker of AV distribution systems, the ability to unveil AVoIP components. Simultaneously, traditional IT network switch companies such as NETGEAR introduced entire lines of high-speed switches preconfigured explicitly for AVoIP applications. Leaders and innovators in both the AV and IT industries have made it abundantly clear where they see the future of AV headed, and integrators not offering AVoIP solutions will find themselves at a competitive disadvantage with solutions that do not keep pace with industry innovations.

Integrators in Western Europe indicate that AV over IP has been the go-to standard for new project builds since ISE 2018, further reinforcing the global trend of AV technology in developing markets which have little or no legacy investment in (or comfort level with) matrixed or RF-based systems. In these places, where integrators and end-users start with a clean slate and the desire and freedom to choose best-in-class technology, AVoIP is taking a market leadership position.

While there is real peril for integration firms in not keeping pace with the network trend in AV technology, there is an excellent opportunity for those looking to embrace it for the benefits it can provide to customers and their businesses. As described below, IP-based AV networks offer real advantages that reduce cost while increasing capability, and they have an immediate appeal to many clients. Organizations that don't embrace AVoIP early for a competitive advantage will eventually have to adapt (and adopt) merely to keep up or because of diminishing support for legacy technology.

FutureSource, an independent research firm following the pro AV market, forecast 130 percent sales growth in the IP

encoder/decoder market from 2017 to 2018 and predicts 50 percent compound annual growth rate in the ensuing five years. It says the verticals generating the most business will be in education and entertainment. Meanwhile, according to an AVIXA/IHS report, AV spending in the global hospitality market alone is forecast to double between 2018 and 2022, to \$14 billion. With much of that spending coming from casinos and resorts, businesses well-known for utilizing technology and data, network-based AV solutions are likely to become a preferred choice, especially for newly built or wholly renovated facilities.



While maintaining an unassailable advantage as ultimate authorities on AV quality – valuable skills never to be usurped by IT managers – integrators of AVoIP solutions can also establish their role as a resource for new services and interactive applications that bring real value to customers' businesses or organizations, particularly those firms that have dedicated data networks for AV systems. As larger integration firms have shown, acting in such a leadership role can help create enduring – and profitable partnerships between integrators and clients.

# Technology Fundamentals

With the AV industry still in the early stages of transition to IP-based AV networks, many integrators have been able to confine their networking knowledge to what's been necessary for using IP-based control systems, which are increasingly dominating the market for AV control technology.

Fully IP-based AV networks, while technologically complex in order to meet standards of quality and performance, actually reduce the complexity of AV system design, installation and maintenance, while adding a whole new layer of capability stemming from the bi-directional nature of data networks compared to typical AV systems, where conduits carry content in just one direction.

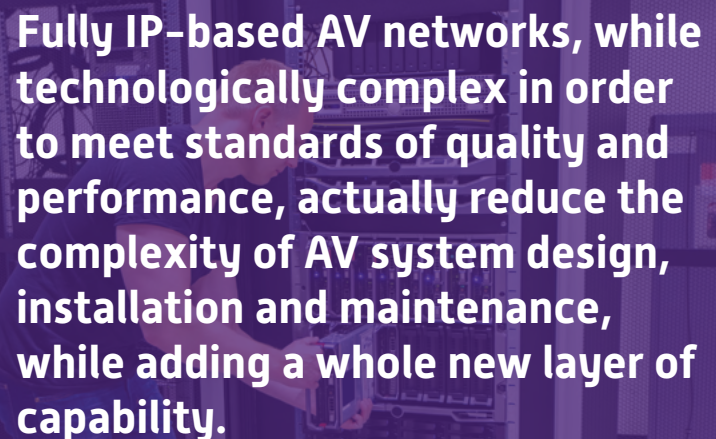
A brief look at some of the fundamentals of data network technology shows why its application to AV offers many advantages over conventional (matrixed and RF-based) digital distribution schemes.

To recap, the abbreviation IP stands for Internet Protocol, which refers to the method of sending data packets over Ethernet-type networks, including the Internet and most private IT networks. Rather than traveling as a constant signal from source to destination, the content signals are parsed into discrete packets and transmitted to a destination IP address, where they are reassembled to recreate the original signals. Unlike AV distribution systems, data networks are inherently bi-directional, since they are designed, at the most basic level, for data exchange, and not merely data distribution.

Traffic management in data networks is handled by network switches, which are typically rated by bandwidth and with the bandwidth rating (for example, 1Gb) referring to the maximum data rate, per second, that can pass through each connection to the switch. The number of connections that can be made to a switch is determined by the number of physical "ports" on the switch. Port connections are typically designed for either category-rated networking cable, optical fiber, or both.

While signal connections to an AV matrix switch or RF-system are dedicated as either inputs or outputs (as far as content is concerned), ports on a network switch are bi-directional, and each can convey content (as well as control signals) into the switch or out from it.

This flexibility presents a central benefit of network technology to installers and end-users, since (1) it releases them from a pre-defined configuration of inputs and outputs, and (2) it enables any endpoint on the network to connect to a source or destination (display or other playback device), including the option to change smoothly from one to the other to meet changing needs. (3) eliminates need to rip, replace, and reprogram if an organization grows from say 32 inputs to 33.



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With this increased flexibility also comes much more straightforward, faster and less expensive scalability and expandability of the system. Adding ports on a data network is a straight-forward affair of stacking switches together, which allows existing switches to be left in place as the network expands. Systems can expand gradually and modestly, or rapidly and substantially, all based on costs of what is being added, not what must be replaced to enable expansion. Finally, concerning AVoIP networks vs. matrixed or RF-based systems, the scale of an IP network is, practically speaking, unlimited.

AVoIP also frees dealers' "hardware monopolies" where end-to-end distribution components – matrixes, switchers, extenders, etc. – were best sourced from a single company. As in the data center industry, where companies specialize in areas such as processing components, or switching products, or storage devices, etc., and build according to (open) standards that enable interoperability, the AVoIP market gives integrators the freedom to choose the combination of coding and switching components it determines is best.

Hardware economy is another principal advantage of AVoIP over previous technology. (Granted, end-users may more appreciate this than dealers.) Not only can components enjoy an extended lifecycle as systems expand, network switches substantially reduce the cost and complexity of adding endpoints compared to other technologies, especially as systems become very large. While an IP encoder or decoder may be required at network endpoints, being able to specify these components according to the resolution, bandwidth and other requirements of the application (for example, uncompressed 4K streaming vs. compressed HD video for conferencing) produce an optimal cost benefit to customers.

AVoIP networks should provide an equal or greater measure of content and system security as existing AV systems since they can support content-protection technologies such as HDCP and encryption, including encryption of control signaling, as well as provide secure user authentication. This makes systems strongly resistant to unauthorized access or tampering. Additionally, where AVoIP networks run independently of company data networks, over separate physical infrastructure, the risk of unauthorized access, tampering or theft of content is further reduced.

(While some companies may encourage the selection of specific AVoIP solutions because of security features, companies such as ZeeVee provide an equally high level of security across all AVoIP network solutions.)

## Security Matters:

Forward-looking organizations are deploying AV over IP systems to eliminate electronic video distribution cost and complexity. Hackers may try to penetrate IP networks to steal video content or disrupt operations so system integrators and planners must properly secure AV over IP implementations to avoid exposure.

### [View the AV over IP Security Whitepaper for Best Practices](#)



## Training Resources:

The SDVoE Design Partner Program is open to leaders in the field of AV over IP and experts in the design and architecture of SDVoE systems. The goal of the program is to establish recognized consultants and designers who can provide guidance to integrators, installers and end users in leveraging the SDVoE standard for high performance AV network deployments.

**Leverage the free SDVoE AV over IP training program**



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IP-based networks offer additional advantages over conventional distribution technologies – in terms of signal integrity, bandwidth and latency – as network coverage area and the distance between endpoints increase.

As the bandwidth requirements for AV continue to increase – the latest HDMI specification calls for 48 gigabytes per second (Gbps) and DisplayPort 32.4Gbps – IP-based solutions become the most practical, affordable means of handling AV traffic, especially for larger installations. IP-based data networks already operate at such speeds, and faster, and may help facilitate faster customer adoption of cutting-edge capabilities in content, displays, audio, etc.

As technical tests and demonstrations have conclusively shown, AVoIP technology delivers content quality equal or superior to other distribution technologies at comparable specifications for resolution, compression, etc. In addition to maintaining quality, key features such as switching, perform with reliable speed and precision.

Within every AVoIP system, the primary components consist of AVoIP encoders and decoders, as well as the management platform they run on. Advice on these is saved for the next and final section, Selecting an AVoIP Vendor.

Before moving on, here is one crucial last fundamental fact about AVoIP technology: while it is most assuredly the AV distribution technology of the future, AVoIP is also technology that is available and in use today. Large scale installations have been in operation in mission-critical facilities since 2014. The opportunity to be an early adopter has passed. There's nothing to be gained, and much to be lost, in waiting.

# Selecting an AVoIP Vendor

With many manufacturers – some well-known, others lesser-known and many unknown – now offering and aggressively promoting AVoIP components, particularly encoders and decoders, integrators can't be blamed for being confused about whether or with which company to make commitments.

At the same time, relying reflexively on a legacy brand to provide the best options in this new technology may result in integrators failing to find or being able to offer the optimal solution for a given client or important prospective customer.

With these factors in mind, here are six “brand agnostic” guidelines that integrators can use to narrow the field of potential AVoIP manufacturing partners. Far from being technical specifications that lead to one or two firms, these recommendations pursue a path of common sense to help integrators navigate technical claims in finding the right partners.

**1. Experience** - First, and probably most obviously, look for companies with real-world experience, especially field-proven installations with applications or user environments mirroring or resembling those of your clientele. Real-world experience should be supplemented by dealer and customer testimonials that substantiate (or debunk) a manufacturer's claims about ease of deployment and use, system performance, manufacturer support and related considerations.

**2. Full Suite of Solutions** - Next, and certainly less apparent to integrators newly exploring this technology, look for manufacturers offering a full suite of solutions, not a narrow slice. AVoIP systems provide users with the option to convey content in highly compressed, lightly compressed and uncompressed formats, as required by the application. Companies offering less than this full range of options will inevitably steer integrators to solutions that meet their needs as opposed to those of their clients.

**3. Control** - Integrators will also find it helpful if all the AVoIP solutions offered by a manufacturer can be configured and controlled using the same platform, rather than having separate control schemes for different solutions — simplifying

deployment, operation, and maintenance, while providing the greatest assurance that products will be well-supported over their expected lifecycle.

**4. Ease of Deployment** - In finding a unified control platform that works across all a manufacturer's solutions, integrators will also want a platform to enable easy and rapid deployment of system resources. No network is going to deliver the “plug-n-play” simplicity of a video game console, but the best platforms come remarkably close and will require surprisingly simple training. Countless days of expensive training and certification are a thing of the past. Here again, references and testimonials will help integrators verify manufacturer's claims, but they should also get a first-hand demonstration of these capabilities prior to making their choice.

**5. Strong Partnerships** - In another analogy to the data center industry, this paper suggests integrators seek out manufacturers that have strong technology partnerships with makers of complementary IT switches and equipment. A “go it alone” approach is more than likely to result in a company not keeping pace with innovations and risking compatibility problems where none should exist.

**6. Standards-based** - Akin to forming manufacturer partnerships is participation in industry consortiums, where companies put aside competitive issues to cooperate in developing and promoting standards that facilitate interoperability – a true hallmark of AVoIP technology — and a consistent user experience. In the global AVoIP market, the consortium with the broadest following and influence is the Software Defined Video Over Ethernet (SDVoE) Alliance, which include makers of integrated chips (ICs), encoders and decoders, network switches and other products and services. Integrators, looking for a reliable technology partner, should take a first, hard, look at manufacturers that are active in this growing and active organization.

It is also vital for integrators to look at manufacturers that not only support the SDVoE, but that also make other standards-based solutions like JPEG-2000, and h.264 — giving the integrator the ability to choose the right technology to fit the application.



# Conclusion

What this white paper has worked to accomplish is to alert integrators to the absolute certainty of AVoIP becoming the dominant global technology for current AV applications, including content sharing and distribution and virtual collaboration, as well as future innovative applications that harness the inherent interactive capabilities, very high speed and very low latency of IP-based networks.

In doing so, it has also endeavored to open integrators' eyes to the real advantages and opportunities in offering IP-based solutions as well as the perils of failing – or just waiting too long – to do so. The market is already moving in that direction and momentum is only increasing.

Without trying to become overly technical, we have also outlined many of the practical benefits IP technology brings to the AV world, especially as systems increase in size and scale and require reconfiguration or expansion.

Finally, we have offered practical guidelines for integrators to use in selecting strong manufacturing partners for supplying the best and most suitable solutions to customers. The next move is up to you.

# About ZeeVee



ZeeVee is the leading global developer of digital technology and products for distributing audio-video content from any source or multiple sources to any number of displays. Our products are manufactured in the U.S. and are deployed worldwide throughout the education, government, corporate, healthcare, broadcasting, hospitality, retail, housing, and other industries.

ZeeVee is the only company in the world offering products for distributing AV over RF and AV over IP, including products with simultaneous RF and IP output as well as the AV industry's most extensive line of IP-based solutions. Our products enable integrators to tailor end-user solutions to meet demanding specifications and tight budgets, utilize existing infrastructure where desirable and provide cost-effective roadmaps for customers looking to migrate from RF-based systems to fully IP-based networks.

Truly unique among all AV equipment makers, ZeeVee was founded on a principle of using only open-standard digital technologies for AV distribution, since they would offer advantages to both integrators and end-users regarding cost, quality, longevity, reliability, scalability, and upgradability. As a result, ZeeVee has established itself as a pioneer in technology development and a global leader in real-world deployments of IP-based AV distribution networks. For more information about ZeeVee and AV over IP solutions Visit [www.zeevee.com](http://www.zeevee.com).



## Founding Member of the SDVoE™ Alliance

The SDVoE Alliance is a nonprofit consortium of technology providers collaborating to standardize the adoption of Ethernet to transport AV signals in professional AV environments, and to create an ecosystem around SDVoE technology allowing software to define AV applications. ZeeVee is proud to be a founding member of the SDVoE Alliance along with Semtech, Aquantia, NETGEAR, Sony, and others. SDVoE Alliance founding members bring different perspectives to the SDVoE initiative spanning the entire ecosystem with expertise in chipsets, networking, and AV distribution.



## GPA Technology Partner

The Global Presence Alliance (GPA) was formed to help customers have a single, global, source for all audio, video and unified communications solutions. The GPA offers a combined talent pool of thousands of professionals, following the same protocols and procedures all across the globe. They also have tight alignment and partnerships around the world to deliver consistent, standardized services. As a technology partner, ZeeVee is actively working with GPA partners to bring high-interest technology solutions to global customers.