AN ARGUMENT FOR OPEN IP STANDARDS IN THE MEDIA INDUSTRY

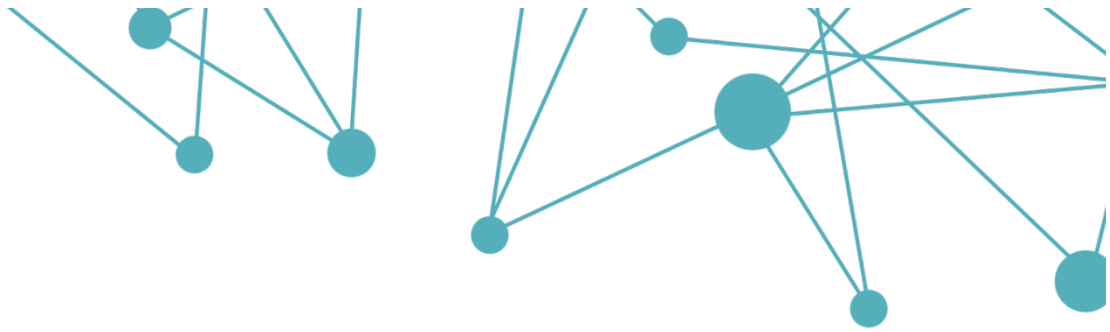Alliance for IP Media Solutions

NOVEMBER 2016

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The Alliance for IP Media Solutions (AIMS) is a non-profit trade organization founded by leading companies to foster the adoption of industry standards for the broadcast and media industry as it transitions from SDI to IP.

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THE NEED FOR A COMMON SET OF PROTOCOLS IN THE TRANSITION TO IP

The broadcast and media industry's transition from Serial Digital Interface (SDI) to Internet Protocol (IP) as the primary means of moving signals between and through facilities is upon us. With it comes the promise of increased agility and system scalability that can help broadcasters develop new business models and remain competitive. While there's no longer a question as to whether or not a transition is necessary, opinions are quite varied as to the pace and level of priority a broadcaster should be placing on the transition. A key impediment in moving the industry forward, however, is the fact that multiple competing approaches to the transition are being introduced to the market, further complicating an already daunting decision.

SDI has served for years as the common language of uncompressed video in broadcast facilities, enabling any piece of equipment to connect with any other equipment that also supports this standard, irrespective of the supplier. The Alliance strongly feels that the broadcast industry must maintain this approach of utilizing a single, standardized interface for transmission of video, as it transitions from SDI to IP, to ensure that widespread signal transport interoperability continues.

IP is an inherently flexible protocol, but that same flexibility creates risk if technology suppliers are not fully aligned. The rationale for common standards is obvious: interoperable solutions based on widely accepted, open standards have driven the industry's growth and success for decades by accommodating broadcasters' current needs and ensuring they are prepared for future advancements. An IP technology infrastructure based on open standards provides broadcasters with the maximum agility and flexibility to adjust business models, capitalize on new revenue opportunities, and add new capabilities and services without having to constantly rebuild their workflows – while having the freedom to build best-of-breed networks.

A ROADMAP TO COMMON STANDARDS FOR IP MEDIA SOLUTIONS

Fortunately, the broadcast industry has a strong technical roadmap for IP that can deliver the same level of interoperability as SDI. The 74-member Video Services Forum (VSF), with the support of organizations such as SMPTE and the EBU, has developed a series of recommendations for achieving a standards-based approach to IP. VSF's approach has been tested, validated and supported by more than 30 broadcast equipment suppliers and broadcasters who came together to find a solution that leads to true interoperability. This thorough vetting process assures broadcasters that VSF's system represents the best foundation for IP migration.

This SMPTE/VSF roadmap represents a path that media companies can follow to adopt IP technology. The roadmap has three stages, which incrementally advance the implementation of IP technology in media solutions. The ratified objective of the AIMS alliance is to ensure interoperability at each stage in the roadmap and to provide a graceful migration as the roadmap evolves. AIMS has adopted this approach to enable the industry to deploy the right technology, at the right time, to solve the right problems.

- **SMPTE 2022-6.** This most widely implemented standard in the industry is recommended for continued use and adoption as a baseline for interoperability. Because the SMPTE 2022-6 payload is identical to SDI, it is seen as an effective way to create hybrid IP/SDI systems and will continue to serve that purpose for the foreseeable future. Companies that support this standard include Sony, Grass Valley, Imagine Communications, SAM, Nevion, Lawo, Axon, EVS, Trilogy, Genelec, Tektronix, Harmonic, Advantech, Evertz and more.

- **VSF TR-04.** VSF TR-04, which also forms the basis for SMPTE ST 2110 (particularly 2110-50), in drafting at the time of writing, is a technical recommendation to use two existing standards: SMPTE 2022-6 for video with embedded audio and AES67 for separate IP addressable audio streams. In VSF TR-04, AES67 effectively operates as the "discrete audio" equivalent in IP. This makes TR-04 an ideal solution for systems that require both the compatibly benefits of SMPTE 2022-6 and the flexibility of discrete audio. AES67 is already in use by numerous audio companies including Lawo, Riedel, Axia, Wheatstone, Audinate, Yamaha and Q-Sys.

  The combination of these two standards into a VSF Technical Recommendation (VSF TR-04) gives the broadcast industry a clear path to separately addressable IP audio in a commercial off-the-shelf (COTS) IP switch that will not require additional conversion from a proprietary IP standard to MADI. With interoperability tests beginning in February of 2016, and with the accessibility of AES67 technology given as a proven standard, broadcast vendors will begin deploying VSF TR-04 systems in the first half of 2016.

- **VSF TR-03.** This is the third stage in the standards-based AIMS roadmap. TR-03, which forms the basis for SMPTE ST 2110, which is in drafting at the time of writing, recommends the transport of uncompressed elementary stream media over IP. TR-03 is very much about essence and separating out the media type, whether video, audio, metadata or timing events. With TR-03, video, audio and metadata are individually packetized into separate IP streams.

  VSF TR-03 improves upon VSF TR-04 by replacing the SMPTE 2022-6 portion of VSF TR-04 with an improved method of distributing video data. With SMPTE 2022-6, the entire video stream must first be de-packetized and then the audio signal must be de-embedded from the SDI stream. When processing is completed, the audio must be re-embedded in the SDI before the SDI signal can once again be packetized. Using TR-03, video is packetized using RFC 4175, which has been a standard since 2005 and is widely used today. As an added benefit, only the active video pixels of TR-03 need to be packetized, thereby reducing the amount of network traffic generated by uncompressed video.

  For audio VSF TR-03 uses AES67, the standard accepted by audio equipment suppliers for high performance audio over IP. AES67 provides flexibility and capacity beyond the limitations of embedded audio. Only the packets containing audio samples are required to be de-packetized before they are processed and then re-packetized back into an IP stream. Not only does this process remove the need for audio embedding and de-embedding, it also greatly reduces the volume of packet traffic that needs to be routed to the audio processor.

  Finally, VSF TR-03 provides a well thought out solution for system timing over IP. The VSF TR-03 recommendation specifies the use of SMPTE 2059, which builds upon IEEE 1588 Precision Time Protocol. Because of this, with VSF TR-03, a fully IP networked solution will not require separate distribution of a black burst video reference.

- **IS-04.** As we move to network based infrastructure, we are also able to move away from static methods for managing the interconnections between devices. Devices need the capabilities of identity, discovery and registration as a foundation to facilitate interoperability. IS-04 defines a methodology to register a device's services (available outputs and inputs and configuration) and discover other devices on a network that it is compatible with and can connect to.
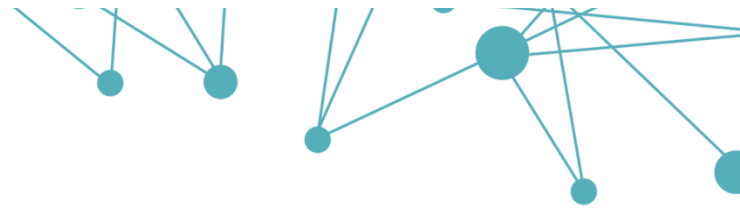
IS-04 is part of the Network Media Open Specification (NMOS) project within AMWA. Member companies have developed APIs for Node, Registration and Query supporting Peer-to-Peer (P2P) operations while offering the capability of scaling into Registration and Discovery Systems (RDS).   This eliminates the need for specific connection types for specific I/O and having to know what devices are compatible. A device can register its I/O capabilities with the registration service, or in the absence of a registration service, use peer-to-peer discovery to find compatible devices to which it may connect. Through this mechanism, we can achieve a more dynamic system which enables enhanced workflow execution and evolution. One methodology covers the simple "plug-n-play" camera and scales to a large distributed system.

The jointly developed APIs have been tested during multi-vendor, developer interoperability tests, and were successfully demonstrated at IBC 2016. There is a distinct advantage for the industry to adopt IS-04 to ensure a base foundation for interoperability that enables rapid deployment of future applications for the industry. As such, IS-04 plays a key role in the AIMS roadmap. The capabilities of IS-04 enable simpler and quicker system configuration. Thus IS-04 technology provides an example of how IP-based systems can provide extended functionality beyond what is possible in SDI-based systems.

Because the set of technologies recommended by TR-04 and TR-03 are well understood, it is projected that systems using the SMPTE/VSF-based interoperability roadmap will be fully realizable in 2016 with system implementations from multiple companies.

VSF TR-03 PROVIDES THE BEST PATH FOR IMPLEMENTING IP TECHNOLOGY BASED WORKFLOWS

It is no secret that the landscape of the broadcast and media industry is changing at a faster rate than ever before. The shift in viewing habits from linear television to digital media is unmistakable. Therefore, In order for the industry to remain competitive, content creators, aggregators and distributors must deploy technologies that allow them to compete with Internet players whether their content is being delivered over a traditional linear channel or digitally. The IP technology choices we as an industry make will have profound implications on our industry's ability to compete. This is why VSF TR-03 is so important.

The Internet players have developed data-center based deployment models that support virtualization of function and the wide scalability necessary to deliver digital content. This ability to virtualize is dependent on an abstraction of the lower layers of the OSI stack so that applications need not know anything about the physical and transport layers underneath them. The "bridge" between application layers and the abstracted transport/physical layers for streaming media is a protocol called RTP (Real-time Transport Protocol). TR-03 is based on RTP. By leveraging RTP protocol, VSF TR-03 is well suited for software/virtualization implementations. VSF TR-03 also is well suited to integrate with standardized, existing Internet technology methods of network timing, discovery and control.

Not all technologies being submitted for standardization in our industry support virtualization as elegantly or efficiently as VSF TR-03. In particular, some proposals are based on MPEG2-TS rather than solely using RTP. MPEG2-TS was developed to provide a direct mapping of data packets into transport for DVB and Ethernet, without IP. When MPEG2-TS is used in an IP network layer, it requires an additional layer of encapsulation, increasing bandwidth consumption. This overhead increases the effort to parse essence data. The 188 byte packet structure of TS requires approximately 7 times more parsing than using a single 1440 byte MTU packet, and there is the added overhead of parsing out different PES and ES as well as PAT, PMT and PID addressing. While it could be useful to standardize the encapsulation of TS as a bridge to interoperability, TR-03 provides the most efficient roadmap enabling the capabilities the production industry demands for Internet Technology based workflows.

STANDARDS FRAGMENTATION POSES CONSIDERABLE RISK

In any technology shift it is quite natural that multiple implementations of a technology are put forth to the industry for standardization. In particular, early adopters and technology suppliers, in their drive to lead, often seek to standardize initial proprietary approaches. AIMS believes that if we as an industry do not adopt a common view of standardization for IP, we risk fragmentation and interoperability nightmares for years to come. If this happens, everyone loses. Implementation costs for both broadcasters and suppliers will increase, system complexity will increase, and importantly, our industry's ability to compete in the new world of connectivity and Internet technology could be significantly impaired.

For these reasons, AIMS seeks to call the industry to one set of common protocols - protocols whose deployment can truly be ubiquitous across the industry. Fortunately, in this endeavor, AIMS does not need to invent. Our industry is already blessed with strong organizations such as VSF, AMWA and others that feed recommendations into SMPTE and the EBU. These efforts are broad-based, enjoying widespread support. As an example, the VSF recommendations TR-03 and TR-04 were developed with the participation of over 30 companies, including both broadcasters and manufacturers. These VSF recommendations have more broad-based support, are technically much stronger, and provide a pathway to virtualization and cloud-based deployments enabling our industry to remain competitive well into the future.

AIMS is calling all companies in our industry to adopt the roadmap that key standards development bodies have developed: open, collaboratively developed standards that allow our industry to thrive. The good news is that because the VSF recommendations are well thought out, they are light to deploy. They require fewer CPU resources (in the case of software) and fewer FPGA gates than alternative standards proposals. This opens the door for any company to implement and upgrade systems in support of the AIMS Roadmap quite easily, encouraging interoperability and freedom of choice for customers. By supporting the AIMS approach, our industry can eliminate the standards fragmentation risk we face and chart a path to the future for all companies.

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