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RESEARCH ARTICLES

Emmy Award-Winning Advertising Standards

Although no one wants to watch commercials, digital ad insertion technology generates billions of dollars in revenue each year. This article explains the origins of ad insertion technology, the transition to digital ad insertion technology, the problems the technology solves, how the standards were developed, and how they have evolved over time.

The original SCTE standard "Digital Program Insertion Cueing Message" defined how to insert cuing messages into MPEG-2 transport streams. Two later standards, "Real-time Event Signaling and Management API" and "Event Scheduling and Notification Interface (ESNI)," standardized out-of-band metadata communication between a content provider and their distributors to communicate business rules around content blackout, substitution, and ad insertion. As a result of the revolutionary nature of these standards and the worldwide adoption of them, the three core SCTE standards on ad insertion technology have each received Technical Emmy Awards.

LIFE BEFORE AD-INSERTION STANDARDS

Television is a huge part of most people's lives, and it's safe to say that most consumers would prefer to watch television without commercials interrupting their programs. However, the reality of television and of video services in general is that commercials pay the bulk of the cost to create and distribute content. Without commercials, there would be very little content, because the costs to create the content would be higher than consumers would be willing to pay to watch the content.

In the 1970s and 1980s, a large percentage of the population began to watch television through cable services instead of using an antenna. Cable TV provided superior video and audio quality and allowed consumers to watch many more stations than they could receive with antennas. Cable had another major advantage: Unlike a TV transmitter, which sends the same signal in every direction, a cable network is able to send different signals to different parts of the area being served.

Consequently, advertisers could now target various cities or sections of cities with ads created specifically for the demographics of the targeted region. It was a wonderful new world for advertisers! A cable program would typically contain a national ad, which would run in every cable region that was not being targeted, but in areas being targeted, the national ad would be replaced with a targeted ad.

Those old enough to remember watching television before the year 2000 might remember those local ads. You could tell that something "weird" was going on, because you'd often see a second or two of the national ad before it suddenly and abruptly got replaced by a local ad. Then, when the local ad was over, there would be another abrupt change back to the national program. Sometimes the last

second or two of the national ad would be seen after the local ad ended. Other times, the local ad could overlap the beginning of the program content, much to the displeasure of the audience!

To avoid overlapping part of the program with the end of the local ad, additional black screen time was sometimes added to the national feed at the end of the national commercial. This had the unfortunate result of forcing users to look at several seconds of a blank screen with no sound at the end of the ad break. It was clumsy, but it did bring in the money!

One more important aspect of local ad insertion was that the machine doing the ad insertion needed to be told when to insert the ad. The cable companies would have ad insertion equipment in line with the national program content, waiting for the "cue" to insert the next local ad. The cue to insert the ad was often a fast series of touchtones in the audio stream. Viewers would frequently hear four fast, dual-tone, multi-frequency (DTMF) tones (like someone was dialing a four-digit phone number really fast) before and/or after the ad. Those tones triggered the ad insertion equipment. The insertion was crude and relatively inaccurate, but it got the job done.

SCTE 35 TO THE RESCUE!

In the late 1980s, the Society of Cable Telecommunications Engineers (SCTE), a non-profit professional association for the advancement of technology, standards, and workforce education related to cable telecommunications engineering, began to develop voluntary standards. For the first decade, the SCTE developed standards documents for the design and maintenance of basic cable networks, but without any specific accreditation. Around 1993, the SCTE Board of Directors agreed that the standards program should seek American National Standards Institute (ANSI) accreditation for the SCTE standards program.

The ANSI Executive Standards Council granted accreditation on August 7, 1995. In 1996, the Digital Video Subcommittee (DVS) was formed as a consensus body within the ANSI-accredited SCTE Standards program and began developing standards related to the carriage of digital video over cable networks.

One of the first topics to be tackled was ad insertion technology. Cable operators and customers wanted a better method to control the insertion of ads on cable networks. Ultimately, SCTE 35, "Digital Program Insertion Cueing Message"[1] was born. The new standard was first released in 2001 and was revolutionary for cable networks.

SCTE 35 was designed to work in MPEG-2 transport streams, which was how most video arrived at the cable networks during that time. The Scope statement of the 2001 standard contained this descriptive text:

"This standard supports the splicing of MPEG-2 streams for the purpose of Digital Program Insertion, which includes advertisement insertion and insertion of other content types. An in-stream messaging mechanism is defined to signal splicing and insertion opportunities... "

The new SCTE 35 standard defined the concept of "Splice Points" in the MPEG-2 transport stream:

"Splice Points in an MPEG-2 transport stream provide opportunities to switch from one program to another. They indicate a place to switch or a place in the bit stream where a switch can be made. Splicing at such splice points may or may not result in good visual and audio quality. That is determined by the performance of the splicing device."

The fact that Splice Points could be used for ad insertion and insertion of other content types was revolutionary. The SCTE 35 standard quickly became the de facto world-wide standard for inserting all types of signaling information into MPEG-2 transport streams.

SCTE 35 was soon joined by SCTE 104, "Automation System to Compression System Communications Applications Program

Interface (API),"[2] which defines the communications API between an automation system and the associated compression system that will insert SCTE 35 private sections into the outgoing transport stream. SCTE 35 and SCTE 104 are still used worldwide and are still being updated every year or two to add additional features.

In recognition of the global impact SCTE 35 and SCTE 104 had on digital video systems, the SCTE received a Technical Emmy® Award in 2011 for the creation of the SCTE 35 and SCTE 104 standards.

THE NEW PROBLEM: VIDEO OVER IP

For 20-plus years, the bulk of cable programming was distributed over satellite links to cable headends. The satellite signal was received by integrated receiver and decoder (IRD), which would convert the satellite signal to a quadrature amplitude modulation (QAM) signal for transmission over the cable network. The SCTE 35 messages were received by the IRDs and were subsequently processed by the program insertion and distribution systems. As video distribution began transitioning from satellite delivery and QAM distribution to Internet protocol (IP) networks, a new solution was needed.

Many QAM systems were developed to enable programmers to inform and affect the content delivery to subscribers. For example, during a regional sports blackout, a video provider may be required to provide alternate content to a unique geographic area serving a set of subscribers. As distributors migrate to IP-delivered content, systems must be created to replicate the traditional QAM systems in order to create a consistent service capability between QAM and IP video delivery.

THE SOLUTION: ESAM AND ESNI

In 2008, the Open Authentication Technology Committee (OATC)[3] was formed to address authentication technical challenges, as more traditional TV subscribers were trying to access content through devices other than the television. The distribution of linear video signals was growing across a broad cross-section of consumer platforms, including PCs, phones, tablets, smart TVs, and connected devices. Programmers wanted open standards for content over IP and supported the efforts within the OATC. In 2013, the OATC partnered with SCTE to turn their efforts into American National Standards.

The Event Signaling and Management (ESAM)[4] standard established a foundational method for inter-device communication of timed events. Subsequent development of the Event Scheduling and Notification Interface (ESNI)[5] allowed standardized out-of-band metadata communication between a content provider and their distributors to communicate business rules around content blackout, substitution, ad insertion, and so on. ESNI is widely used throughout the video delivery infrastructure and enables (1) regional blackout/alternate content selection, market protection, and other content restrictions; (2) advertising breaks, ad replacement, addressable ad opportunities, network digital video recorder (DVR) record times and restrictions and program information; and (3) audit methodology that allows providers to confirm policy execution and verify execution results. A conceptual content ecosystem for ESNI is shown in Figure 1.

The key points to know about the ANSI/SCTE 250 ESAM Real-time Event Signaling and Management API are the following:

*ESAM is an interface that allows a signal acquisition system (e.g., an encoder, transcoder, packager, or stream switcher) to submit signals to a signal decision system and receive relevant instructions for processing the signal or associated content.

*ESAM is about how the scheduler talks to the compression encoder – how to coordinate that an event is coming, start the countdown, and provide internal equipment coordination.

*The signal decision system has the ability to initiate a set of instructions based on a

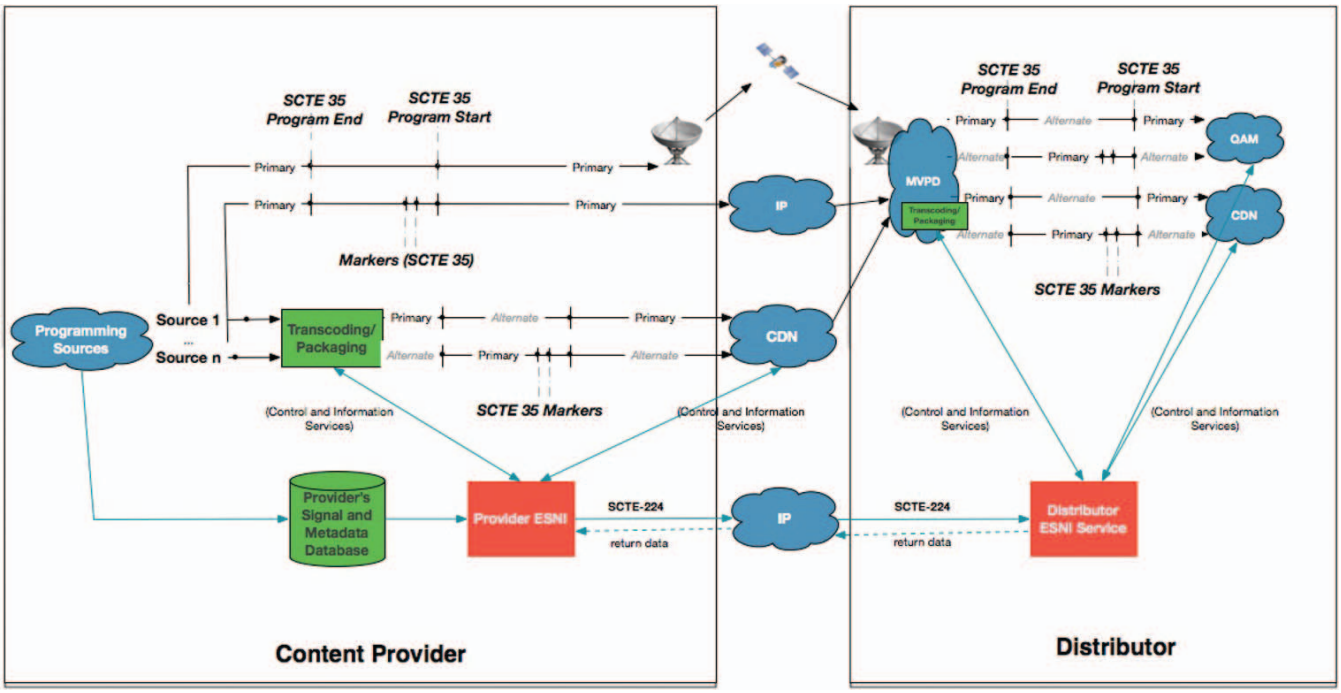

Figure 1. *Conceptual Cable Content Ecosystem from SCTE 224.*

schedule or event that is not signaled in the content.

The key points about the ANSI/SCTE 224 Event Scheduling and Notification Interface (ESNI) are the following:

*ESNI provides a method to perform out of band signaling – to create a document on the Internet to say what time something needs to happen and what's allowed to happen. It enables communication from a programmer to a distributor.

*ESNI is a web interface facilitating the transmission of event and policy information.

*ESNI enables control of content distributed to audiences based on attributes of that audience, including (but not limited to) geographic location and device type.

*ESNI enables regional blackout/alternate content selection, market protection, and other content restrictions as they may relate to a defined audience.

*ESNI can also inform the distributor of other events, such as advertising breaks and availability for digital ad insertion, network personal video recorder (PVR) record times and restrictions, or program information.

*ESNI supports an audit method that allows the provider to query the status of policy execution and verify the execution result.

USING ESNI FOR ADDRESSABLE ADVERTISING

The popularity and adoption of SCTE 224, Event Scheduling and Notification Interface (ESNI), is opening new use cases where the protocol is a great fit. One new and exciting use cases is for addressable advertising where content providers and operators can use a static, national ad inventory that is better targeted to viewers and therefore can potentially generate higher ad revenues. Addressable advertisements, in this context, means replacing advertisements sold on broad age/gender demographics with advertising sold on more specific audience definitions.

This evolution in ad availability has both content providers and operators excited for revenue growth potential in this relatively untapped market. According to eMarketer (see Figure 2), U.S. addressable TV advertisement spending is expected to grow 33.1%, 27.4%,

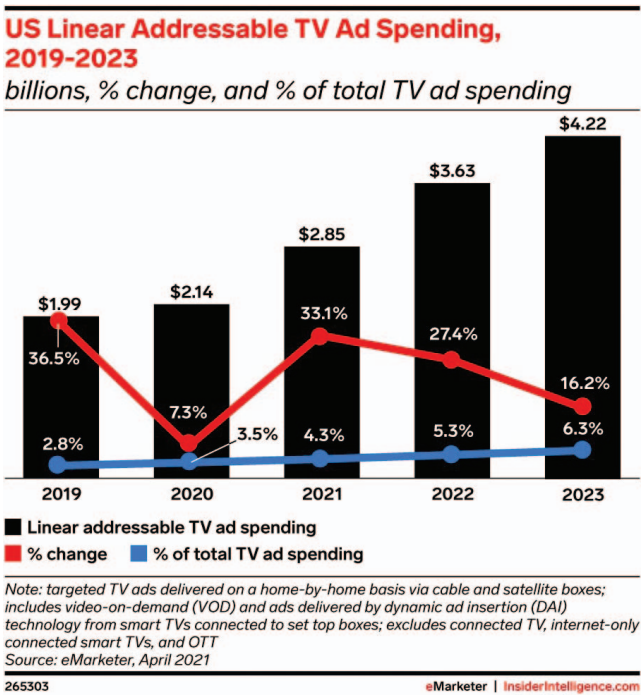

Figure 2. *U.S. Linear Addressable TV Ad Spending, 2019-2023.*

and 16.2% respectively in 2021, 2022, and 2023 and will eventually represent 6.3% of total TV ad spending.[6]

SCTE 224 has proven itself to be an efficient and effective means for machine-to-machine communication of out-of-band (OOB) linear rights management. Additionally, combining SCTE 224 with SCTE 35 to trigger the in-band signaling allows precision execution of linear rights for content substitution and addressable advertising management.

Ultimately, the benefits of using SCTE 224 to implement addressable advertising are plentiful and could enrich the ad environment for both content providers and operators/distributors. A short list of benefits includes the following:

*Addressable ad slots can be identified uniquely for different operators.

*Different ad decisioning systems can be supported by different operators.

*Inclusion and exclusion rules can be conveyed machine-to-machine.

*Different inclusion an exclusion rules can be executed for different operators.

*Advertisements can be enriched with scene, actor, or creative metadata in ways that strengthen visual ties and could improve overall effectiveness/CPMs.

All of those benefits come with reduced complexity within SCTE 35, because they all can be realized with a single simple SCTE 35 trigger; the rest is carried in the SCTE 224 Audience, Viewing Policy, and Policy construct. This provides a content provider with control and execution within its linear feed. No more multiple versions of a video are needed just to carry different SCTE 35 markers to different operators or multiple complex SCTE 35 markers into the video, which lead to confusing and problematic interpretations by operators.

WIDESPREAD DEPLOYMENT AND EMMY AWARDS

It's one thing to create a technology solution and create a national standard around it, but for the standard to be successful, it needs widespread adoption. To promote wider adoption, the programmers and distributors who understood the value of the ESAM and ESNI had a day-long forum for other programmers and distributors so that everyone could understand the value and could suggest further enhancements and improvements to the standards. That effort was highly successful. At the moment, Warner Media, Comcast, Charter, Cox, Fox, Disney, NBC and others fully support and promote usage of the ESAM and ESNI standards.

The SCTE was very excited to receive a Technology & Engineering Emmy® Award for its development of the Event Scheduling and Notification Interface (ESNI) standard (ANSI/SCTE 224) at the 73rd Annual Technology & Engineering Emmy® Awards, presented by the National Academy of Television Arts and Sciences (NATAS), on April 25, 2022.[7]

ESNI builds on the Event Signaling and Management API (ESAM) standard

(ANSI/SCTE 250), for which SCTE received an Emmy® Award in 2021. ESNI allows content providers to distribute alternative programming based on geographical region, timing, and other related policies.

This latest win represents the third Emmy® Award earned by SCTE. In addition to the ESNI and ESAM awards, SCTE also received a Technology & Engineering Emmy® in 2012 for developing local ad-insertion standards for cable (ANSI/SCTE 35 and ANSI/SCTE 104), which are used worldwide as foundational standards for ad insertion and program distribution control. Partnering with experts and other industry professionals to develop operational best practices for emerging technologies, the SCTE Standards program is the only American National Standards Institute–accredited developer focused on cable telecommunications.

All three SCTE Emmy® Awards are the result of the work of the SCTE Standards Program's Digital Video Subcommittee's (DVS) Working Group 5 on Digital Program Insertion (DPI). I want to congratulate that group on their excellent work for over 25 years, developing fundamental standards that are used world-wide for program signaling and ad insertion. I especially want to thank Paul Woidke, who has been the chair of DPI for over 20 years, for leading the group's development of all three Emmy® Award-winning standards!

The Digital Program Insertion Working Group is focused on the development of standards and practices that support an important revenue stream for the cable industry: advertising insertion into programs. Affecting both the content providers and the operators themselves, advertising revenue continues to grow in importance and the variety of programming vehicles expands beyond traditional QAM-based "linear television" to include IP distribution.

If you would like to join the SCTE Standards program, visit https://scte.org/standards for more information.

ABBREVIATIONS

ANSI: American National Standards Institute
API: applications program interface
DCS: digital compression system
DVR: digital video recorder
DTMF: dual tone multi-frequency
DVS: Digital Video Subcommittee
ESAM: event signaling and management
ESNI: event scheduling and notification interface
IP: Internet protocol
IRD: integrated receiver and decoder
OOB: out-of-band
OATC: Open Authentication Technology Committee
QAM: quadrature amplitude modulation
SCTE: Society of Cable Telecommunications Engineers
VOD: video on demand

NOTES

1. ANSI/SCTE 35, Digital Program Insertion Cueing Message
2. ANSI/SCTE 104, Automation System to Compression System Communications Applications Program Interface (API)
3. https://oatc.streamingvideoalliance.org/
4. ANSI/SCTE 250, Real-time Event Signaling and Management API
5. ANSI/SCTE 224, Event Scheduling and Notification Interface (ESNI)
6. Using SCTE 224 To Increase Advertising Revenue, Gregg Brown, Comcast Technology Solutions, SCTE CableTec Expo Fall Technical Forum, 2021 (https://expo.scte.org/download/12773/%22%20rel=%22nofollow%22%3E2109_Brown_3374_paper(49%20downloads)%3C/a%3E)
7. https://theemmys.tv/tech-73rd-award-recipients/

Dean Stoneback is Senior Director of Engineering and Standards at SCTE and is responsible for the development of standards and operational practices for the broadband communications industry. Specific targets include assuring that networks are ready for Data Over Cable Service Interface Specification (DOCSIS) 4.0 deployments; enabling advanced and IP video services and digital advertising; developing Internet of things (IoT) deployment methods; and supporting the migration of networks from coax to fiber delivery. Prior to joining SCTE in 2014, Dean spent 26 years with General Instrument, Motorola, and ARRIS.