ATSC Technology Group Report: ATSC Audio Language Signaling

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The Advanced Television Systems Committee, Inc., is an international, non-profit organization developing voluntary standards for digital television. The ATSC member organizations represent the broadcast, broadcast equipment, motion picture, consumer electronics, computer, cable, satellite, and semiconductor industries.

Specifically, ATSC is working to coordinate television standards among different communications media focusing on digital television, interactive systems, and broadband multimedia communications. ATSC is also developing digital television implementation strategies and presenting educational seminars on the ATSC standards.

ATSC was formed in 1982 by the member organizations of the Joint Committee on InterSociety Coordination (JCIC): the Electronic Industries Association (EIA), the Institute of Electrical and Electronic Engineers (IEEE), the National Association of Broadcasters (NAB), the National Cable Telecommunications Association (NCTA), and the Society of Motion Picture and Television Engineers (SMPTE). Currently, there are approximately 150 members representing the broadcast, broadcast equipment, motion picture, consumer electronics, computer, cable, satellite, and semiconductor industries.

ATSC Digital TV Standards include digital high definition television (HDTV), standard definition television (SDTV), data broadcasting, multichannel surround-sound audio, and satellite direct-to-home broadcasting.

Revision History

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1. OBSERVED PROBLEMS

Some number of deployed receivers, when their audio preference is set to Spanish or when the user explicitly selects the Spanish language audio stream, fail to select and decode some audio streams labeled 'spa' in the PMT or the event for the current time in the EIT using either the AC-3 or the ISO 639 descriptor(s), or both.

1.1 Commentary by One of the Spanish Language Networks

Regarding the audio problems reported by the network above, the network did not do any independent testing of receivers or cable boxes. The observations are based on calls the stations received from viewers or cable companies.

When the audio descriptors (ISO 639 and AC-3) were set to Spanish for the main channel and the network added a second audio channel using English descriptors for the alternate English language channel on Spanish-service stations, the network got many calls reporting no audio (when there was nothing on the secondary audio) or the wrong audio (getting the secondary audio stream when they wanted the main audio).

Changing the descriptors (AC-3 and ISO 639) to English for the primary channel (which was actually in Spanish) and Spanish for the alternate language (English or VDS) stopped all complaints and the network has had no issues (no calls or complaints) with cable or over-the-air viewers since making the change. In short, it works.

Note that when the network was transmitting only a single audio, at some stations the network set the AC-3 descriptor to Spanish and the ISO-639 descriptor to English on the assumption that the cable boxes only looked at the ISO 639 descriptor. The network had no problems with that configuration, but it may have been because the network didn't have any secondary audio.

1.2 Additional Observed Problems

There are a number of stations that switch language frequently. For example, in the San Francisco Bay Area there is a station running 3 services (HD and 2 down-converts), all aimed at non-English speaking audiences. This broadcaster is transmitting virtual channels xx.1, xx.2, and xx.3. The minor channels tend to be non-agile (e.g., xx.3 is Korean, xx.2 is Mandarin and Cantonese), but xx.1 does all of those plus (at least) Farsi, Hindi, and several others. This is not unique to the Bay Area; Los Angeles, New York, Phoenix, Portland, and Seattle have stations that broadcast in languages other than Spanish. This station signals its language always as "multiple."

2. SUSPECTED CAUSES

Audio language is required to be signaled in the AC-3 Audio Descriptor by the 3-byte language field. ATSC A/53 Part 3 has made it optional to carry the ISO 639 Language Descriptor in the PMT. Many broadcasters nonetheless transmit the ISO 639 Language Descriptor in the PMT to accommodate deployed receivers, in addition to transmitting the AC-3 Audio Descriptor. It is suspected that some deployed receivers do not process the AC-3 Audio Descriptor.

Many deployed digital ATSC receivers use the ISO 639 Language Descriptor to allow users to select an alternative AC-3 audio stream. Use of the ISO 639 Language Descriptor is compatible with broadcasters and cable systems that support the delivery of only two audio streams within a

program. Such use is also compatible with programs that include only two audio streams because it allows the viewer to select between the two.

A second audio stream, when present, might actually be Spanish language dialog, or it might be Video Description audio (also called Descriptive Video or visually impaired audio). The second audio stream might be signaled using the language value of "spa" (Spanish) in the ISO 639 Language Descriptor, even if it is Video Description audio. It might also be signaled using the language code for Portuguese or Middle English. Moreover, some broadcasters that deliver programming created with Spanish language dialog have indicated that they signal that audio as English and signal the second audio stream (carrying dubbed English dialog) as Spanish, in both the ISO 639 Language Descriptor and the AC-3 Audio Descriptor.

While all broadcasters carry the AC-3 Audio Descriptor, not all broadcasters "correctly" populate the values for language and audio service. Rather, some broadcasters set those values to match the information in the ISO 639 Language Descriptor. In this case, the second audio stream is labeled as Spanish, Complete Main, and the AC-3 bsmod value as 00x (complete main), even when the second audio stream is English language and Video Description audio.

While there is guidance given in several ATSC Recommended Practices, especially A/78, "Transport Stream Verification" (which has a detailed discussion in Section 8 on "Consistency Errors"), it does not address audio stream signaling per se. In addition, there is another ATSC RP, A/79, "Conversion of ATSC Signals for Distribution to NTSC Viewers," which in Section 7.5.1 addresses Audio Metadata without addressing these issues directly. Neither of these provide adequate guidance to station personnel nor the FCC. As a result, describing broadcaster's choices of values for language and audio service as "incorrect" does not assist the conversation.

For most broadcasters, the values in the AC-3 Audio Descriptor are "fixed" (and do not change) rather than "dynamic" even when the type of service in the second audio stream changes from one program to another. Consequently, even when the second audio changes from Spanish dialog to Video Description audio at a program boundary, those broadcasters continue to signal Video Description audio as Spanish complete main in the AC-3 Audio Descriptor.

3. CONCLUSIONS

Early ATSC standards and recommendations may not have been clear about robust signaling of audio streams, especially when there is more than one "Complete Main" audio stream per program, and/or the stream in question was other than the "Complete Main" type of service. Similarly, early ATSC decoders may have been designed only to handle "simple" configurations (e.g., single audio stream). Therefore, transport standards (especially early versions) need to be clear about the signaling of both the language and purpose of all audio streams with equal clarity.

Broadcaster emissions systems (particularly those that generate signaling and announcement) need to be designed to handle dynamic changes to audio stream signaling covering both language and the type of service.