Voice.Data.Video
BGR
Broadband Gear Report

January 14, 2010

Monitoring Multi-Channel Audio Loudness Issues

By Steve Liu, **Mixed Signals**

On Dec. 15, 2009, the **U.S. House of Representatives** passed H.R. 1084, the Commercial Advertisement Loudness Mitigation (CALM) Act. The bill will require the **FCC** to prescribe a standard to keep commercials from being broadcast louder than the programs they accompany. The CALM Act also makes specific reference to an **ATSC** Recommended Practice: "Techniques for Establishing and Maintaining Audio Loudness for Digital Television," which is applicable to television broadcast stations, cable operators and other multi-channel video providers.

Viewers' Dislike of Loudness Changes

This legislation is a response to TV viewers' dislike of large changes in loudness between commercials and the programs they accompany; and of drastic audio level changes from channel to channel. Because there is currently no guidance in the legislation as to what or how the FCC can regulate regarding audio loudness issues, it is absolutely critical that the industry quickly finds a technologically and economically feasible solution before it is left to Congress and the FCC.

Being able to accurately identify when dramatic volume changes in commercials or programs occur is the first step, but since the inception of digital video, cable operators have either not measured audio levels, or they manually measured the audio level of only a single program for a short period of time (e.g., the duration of a certain program) for compliance purposes. Because of this practice, operators used audio measurement devices originally designed for the broadcast industry, in which only a single program need be monitored. The limitation of such audio measurement devices presents significant challenges for the multi-channel environment of cable operators. These include the cost-effectiveness of monitoring hundreds or even thousands of audio channels in real time and the ability to succinctly differentiate audio loudness anomalies from program to program or from commercial to program.

Monitoring Challenges

To address these challenges, operators must first choose a monitoring system that will automatically, accurately and most importantly, cost-effectively analyze and report audio loudness in real-time across all programs. The monitoring system also must support user-configurable, real-time alert threshold settings to detect audio loudness anomalies at different times, including those that take place in various channels and programs to interstitial (e.g., commercial) transitions.

The next two illustrations show one way of monitoring hundreds (or thousands) of audio channels

in a typical cable video headend -- 1RU rack mounting monitoring system analyzing/reporting/alerting audio loudness across all programs/MPTS in real-time.

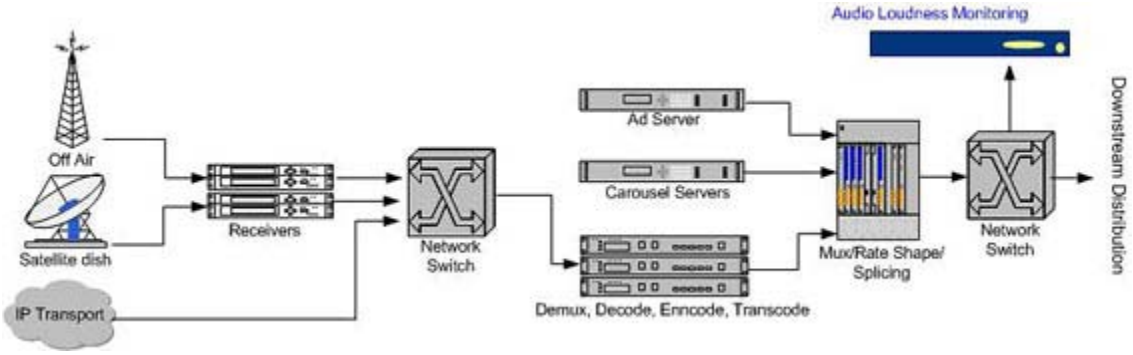
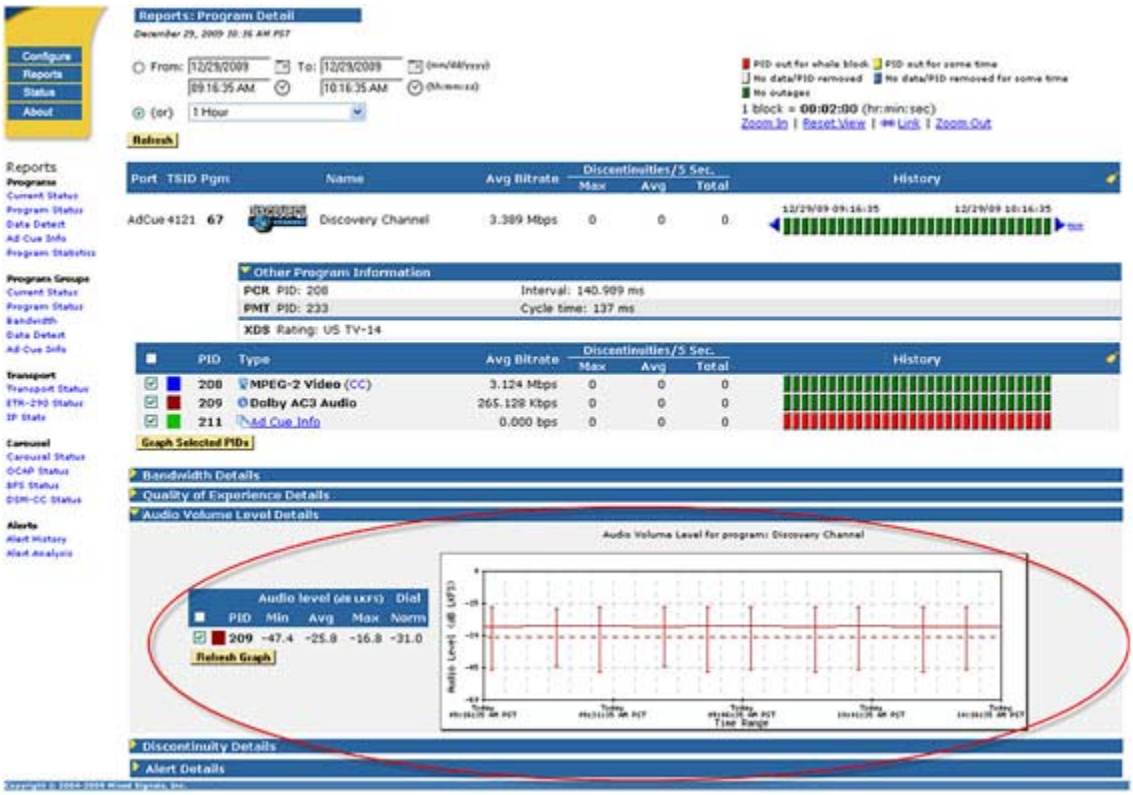


Figure 2 below shows a screenshot for audio channel loudness measurement for one of the programs being monitored.



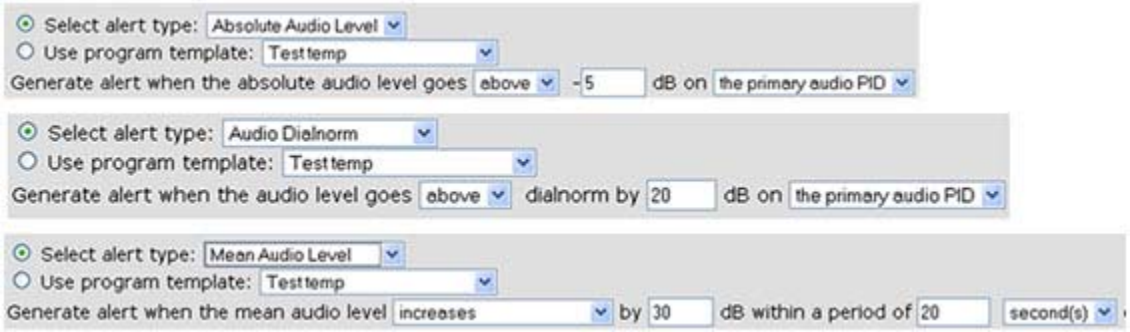
In Figure 2, all measuring units are in LKFS Loudness (Loudness K-weighting Full Scale) as specified by the ITU-R BS.1770 specification for audio level monitoring. The dotted line in Figure 2 indicates the "Dialnorm" value in the AC-3 audio stream; the solid line across the screen indicates the mean audio value and the candlestick indicates the peaks and valleys for the audio loudness level during that period of time (e.g., after the previous candlestick and before the next candlestick). Users can utilize the date/time controls (located at the upper left hand corner of the screen) to generate audio level reports at any time, for any duration (e.g., last 24 hours) on all or any of the programs being monitored. Operators can use such a capability (and reporting) to

compare audio loudness across all channels and, therefore, identify anomalies among different channels.

Alert Threshold

The alert threshold is another piece of the puzzle. Thresholds designate the alert tolerance with respect to Dialnorm value or audio loudness levels specified by the user. The threshold(s) must be comprehensive and flexible enough to allow for different monitoring purposes in various locations. In a nutshell, there should be three different alert triggering algorithms supported in the monitoring system: alert by absolute audio loudness, alert by the difference between absolute audio loudness and Dialnorm, or alert by comparing the moving average measurement to the prior segment with a user configurable sliding time window, as shown in Figure 3 respectively. If the length of sliding window is significantly reduced, say from hours to less than 10 seconds with the intention to catch "loud commercials," one must take into account the appreciable quiet fraction of the normal program and adjust the value judiciously.

Three types of audio loudness alerts:



Summary

As operators take content from multiple and various resources, they must constantly monitor the quality of the content, including audio loudness, in order to ensure a high quality of experience (QoE) for subscribers. The intention of the CALM Act is to benefit viewers. However, the end result will benefit everyone in the business ecosystem, from suppliers to consumers, as the end customers' viewing/listening experience will be improved over time.

As audio (and video) streams are produced, transcoded and re-processed (e.g., spliced), sometimes multiple times in the delivery chain on a large distributed network, the ability to report and tie in these "quality metrics" across systems, regions, and the nation for fast problem discovery, isolation and repair are becoming more important than ever. Having the knowledge and willingness to find the right audio loudness monitoring system and to use it effectively at the right locations in the network will not only give operators the benefit of being "compliant," but this best (monitoring) practice will provide visibility into operations to ensure they are providing the best QoE at all times to their subscribers. This is the ultimate key business advantage cable operators can have over the competition.

Steve Liu is VP, product management and business development at Mixed Signals.