NAB TV TechCheck

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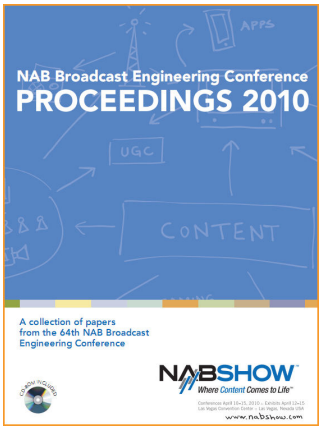
Broadcast Service Quality Monitoring Strategies



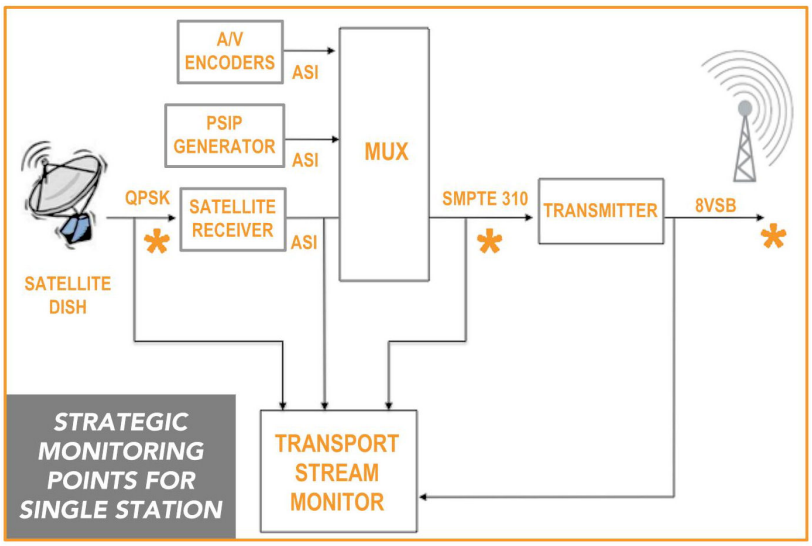
The ultimate goal of the broadcaster is to provide a quality viewing experience for the viewer. A paper at the 2010 NAB Broadcast Engineering Conference (BEC, April 10-15, 2010, Las Vegas, NV) entitled "Broadcast Service Quality Monitoring Strategies" discusses various approaches and strategies for monitoring service quality throughout the broadcast system and for applying distributed monitoring to broadcast architectures. This paper, excerpted here, was written by Ralph Bachofen and Rich Chernock of Triveni Digital, Princeton Junction, New Jersey.

DTV SYSTEM EFFECTS – DTV systems are very complex, with numerous components that interact and need to be linked correctly. Typical symptoms when things are not correct can include: receivers having trouble tuning, no information in on-screen program guide, programs missing, picture or sound breaking up, picture or sound missing, noticeable "lip synch" errors and, most importantly, upset viewers – resulting in complaint calls.

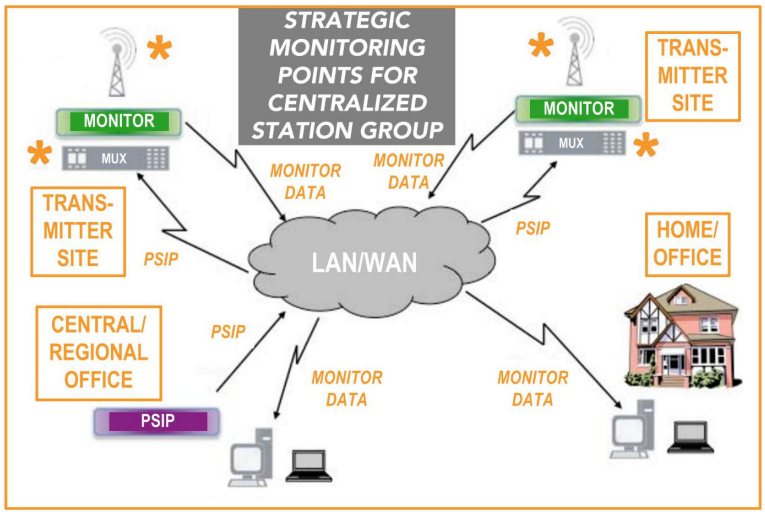
Symptoms of this sort can arise from numerous system issues: equipment setup / configuration problems, equipment drift, equipment failures, communication link failures, loss of synchronization and human error (the "OOPs" factor). Finally, the actual problems in the transport that can produce these symptoms include: PSI/PSIP (Program Specific Information/Program and System Information Protocol) tables missing, incorrectly formatted, incomplete and/or inconsistent; excessive jitter in PCR (Program Clock Reference) values; audio or video buffer underflow or overflow, audio or video program element(s) missing (or effectively missing) or incorrect audio/video synchronization.

STRATEGIC VIDEO MONITORING POINTS – from an engineer's viewpoint, an ideal monitoring strategy might involve placing monitors at all points that manipulate the digital signal, however the costs of doing so might be too high. A more economical alternative would be to the place permanent monitoring equipment at strategic points and use portable equipment to uncover stream impairments at tactical points as needed. In defining which points would be considered strategic, there are basically two goals – to be able to determine that an actionable impairment has taken place, and to be able to localize the source of that impairment. The first figure shows a single broadcast station and suggests strategic points for monitoring (marked with "*"). These points have been selected to have the highest impact for localizing impairments. The rationale for these points is as follows:

- 8-VSB represents the final output transmission signal from the station and is the one directly impacting the viewers. Monitoring this point allows determination of the quality of the broadcast reaching the consumers;
- The mux output represents the output signal from the studio to the transmitter;
- The input from the satellite dish (if used) represents compressed signals coming into the plant.



The second figure shows a more complex DTV broadcast distribution system (typical for a small, centralized station group) and suggests strategic points for monitoring. As above, "*" symbols are used to indicate recommended strategic monitoring points. By appropriately placing monitoring devices at each transmitter site, it is possible to quickly isolate faults to a reasonable subset of systems to troubleshoot.



For a centralized station group, there is often a distribution of roles and expertise. Having the ability to remotely monitor the transport at each of the stations in a region (both inside the station and the RF emission output), it is possible for different members of the organization to be aware of any impairments. Often, there are regional "experts" who can react to and help with any problems encountered at the stations. Distributed monitoring makes this role possible without extra travel.

MONITORING INTERNAL AND EXTERNAL STREAMS – The internal monitoring of transport streams by broadcasters ensures that over-the-air viewers are receiving compliant digital television signals, but effective monitoring of streams carried by a cable provider or other downstream infrastructure also is critical to successful carriage agreements and viewer satisfaction. Regardless of how they receive a particular channel, audiences often associate video and audio quality with the program, channel, or network they're watching rather than with the service provider. The following real-life example illustrates a situation where the ability to monitor and compare internal and external streams on a continuing basis would have been particularly effective in identifying and resolving a problem quickly (conventional troubleshooting techniques were used, which while solving the problem, were not as efficient).

- *Problem:* cable viewers experienced visible or audible glitches at approximately 7-minute intervals.
- *Root cause of problem & resolution:* it was determined that an ASI/SMPTE-310 converter at the egress point of the station (which fed both links) was dropping packets at approximately 7-minute intervals (possibly a buffer mismatch issue). Updating software on the converter solved the issue.
- *Suggested monitoring approach:* by placing permanent monitoring devices at both the broadcast output of the DTV station and the ingest point of the cable head-end, existence of any impairments could be quickly identified. Comparison of the transport stream quality at both locations would quickly show whether the impairment arose within the station or in the distribution link.

The full text of this paper is included in the Proceedings of the 2010 NAB Broadcast Engineering Conference, which is available for purchase online (book plus CD-ROM or CD-ROM only) from the NAB Store at www.nabstore.com.