User Report

GatesAir Intraplex LiveLook Software

by Timothy Schultz

We all know the expression, "A picture is worth a thousand words," and that's exactly what the GatesAir Intraplex LiveLook software does for the IP Link streaming audio codecs; it shows the user, in a graphical format, the end-to-end performance of their Internet Protocol (IP) links.

By way of background, KCLU is a community service of California Lutheran University, delivering comprehensive local news and National Public Radio programming to listeners in Ventura, Santa Barbara and San Luis Obispo counties via five transmitter sites. Our flagship station, serving Ventura County, is KCLU-FM, Thousand Oaks. Southern Santa Barbara County is served by KCLU(AM), Santa Barbara and its companion FM translator. Coverage is extended further north into the Central Coast region by KCLM, Santa Maria and its companion translator in San Luis Obispo.

While KCLU-FM still uses a traditional 950 MHz STL, the other stations mentioned above are too far removed from the KCLU studios in Thousand Oaks to have their programming delivered by a simple one or two hop microwave link. So, for years, we used the tried and true Intraplex IX-STL hardware and paid for point-to-point T1 circuits into Santa Barbara.

However, when KCLU expanded its coverage into the Central Coast region, we looked for a less expensive alternative to the point-to-point T1 solution and felt that delivery of streaming audio over the Internet had matured to a point where it would be safe to use. After comparing several products, we chose the GatesAir Intraplex IP Link. Soon after putting KCLM on the air, we replaced the point-to-point T1 links to Santa Barbara with IP Link systems; the return on investment was about 18 months, due to the monthly cost savings of the tariffed T1 circuits.

The IP Link monitors packet loss and shows the user both instantaneous and long-term error rates – but that doesn't tell the whole story. For example, unless a stream actually went down, which would cause an entry in the IP Link's alarm log, there's no way to tell when the packet losses occurred or how severe they were. Did the losses occur all at once, or were they spread out over the course of several seconds, minutes or hours? Is this a recurring problem that shows up at about the same time every day?

The LiveLook software can show you all of this at a glance. LiveLook is a Windows PC application that grabs all of the real-time packet information from the IP Link and saves it on the PC's hard drive. Each saved file contains up to a week's worth of data (user configurable). LiveLook continually plots the most recent hour of real-time data on the screen in the Live View window. Stored data files can be recalled from the hard drive and viewed on the screen by selecting the History tab. Viewed graphs can be saved/exported in .png or .svg formats. The line colors are customizable for each graph and up to four lines can be shown in each graph pane.

In **Figure 1** you can see a sample screenshot of the Live View tab. This is a view taken at the KCLU studios of the return streams from the transmitter sites, which we use for confidence audio. As you can see, the most packet loss errors are coming in on the second stream in each window, which happens to be green in color. Both of these streams are coming in on the network connection provided by the university; we supplement this connectivity with a different ISP using an independent cable modem.

Figure 2 shows a historical graph for a week's worth of data for this same network. I chose this particular week to highlight the struggle the university has in supplying enough bandwidth for its students.
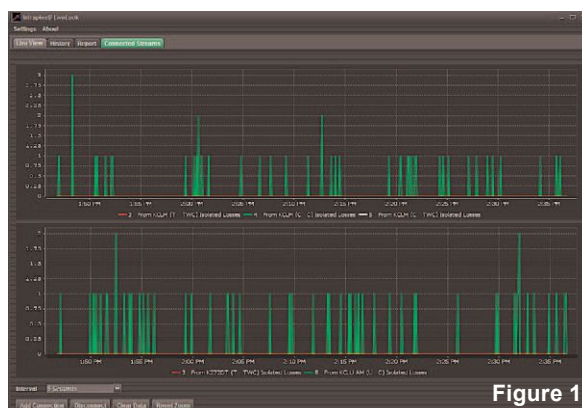

Figure 1

April 14, 2017 was the Friday before Easter, and the students were on break. They returned to the campus throughout the day on Monday, April 17 and resumed their normal habits of streaming Netflix, etc. The data loss rate hovers around 0.25% throughout the day (every weekday throughout the school year) and then drops off after midnight as the students go to sleep.
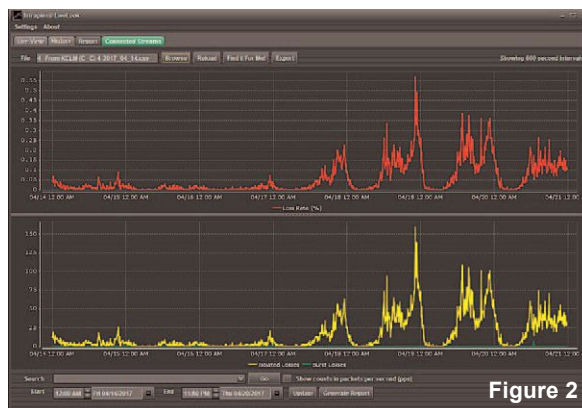

Figure 2

In my experience, LiveLook will run on just about anything (WinXP on up) as long as it has Java installed. I have LiveLook running at the studios and at the transmitter sites using the same PC that runs the remote control software along with other applications; LiveLook is not a very resource intensive application, as it spends most of its time merely logging small amounts of data. The LiveLook software is free, but a license key is required for the IP Link.

LiveLook does not need to be installed at each site; I simply chose to deploy it that way for best data integrity. One could choose to centrally locate the LiveLook PC, and monitor multiple sites from one location, such as at a NOC or even one's office. The LiveLook application can traverse a NAT router, so it can be just about anywhere, but the IP Link will only allow one LiveLook connection per stream at a time.

The one feature I probably get the most use of is LiveLook's ability to send me an email message when a stream is in trouble (typically, it is down). For each stream being monitored, one can configure a threshold for how long and for what percentage of packet loss there needs to be before sending out an email alarm. If you don't want an email for a particular stream, simply turn it off – it's not an all or nothing proposition.

As we all know, any Internet connection from any provider will drop from time-to-time for any number of reasons. Loss of service can range in duration from a few seconds to a couple hours. It's been my experience that these service interruptions occur much more frequently on "The Internet" than they did on the legacy point-to-point circuits they are replacing. To over-

come this reality, I send multiple streams via multiple ISPs and use stream-splicing within the IP Link, to ensure as best I can that the audio packets will arrive at intact. So, if a particular stream drops for a few seconds or even a few minutes, I don't need to get a page, because I'm not off the air. However, if it drops for a significant block of time, I want to know so that I can get on the telephone to the ISP to figure out what is going on. Perhaps I'm fortunate, but in the four years that we've been streaming audio using the IP Link, I've only been off the air for a few minutes due to two ISPs performing overnight maintenance with slightly overlapping schedules.

Here's an example of how the data captured in LiveLook was able to help me identify and solve a problem. For almost 3.5 years, one of the two ISPs providing service to the KCLM transmitter site had run clean (occasional outages excepted). Then, on August 3, 2016, it went nuts. The latency on the circuit would intermittently run high at random times throughout the day – up to a couple thousand milliseconds.

I was able to compensate for the huge variations by adjusting the buffer size in the IP Link, but that increased my audio delay. Okay, so what happened? Records showed that the ISP had made, "some improvements to the network," but I couldn't get the details as to what changes they actually made. At first, they were in a state of denial – "No problem found," and they'd close the trouble ticket. Well, if you only test the circuit for a few minutes during the day or in the middle of the night, you likely wouldn't see the problem. It took me months of arguing and providing LiveLook graphs, along with other ping and tracert results, to eventually convince them I wasn't making this problem up. Finally, in January 2017, after months of complaining, they were able to pinpoint the source of the problem: an over-subscribed circuit (99.04% utilization) between the main and remote central office serving my location.

Figure 3 is an example of the problem taken a few days before it was actually fixed. Most of the latency hits were of short duration, but on this particular day, the problem lasted for almost two hours.
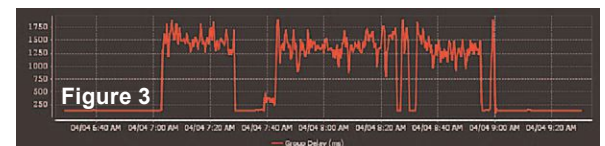

Figure 3

To make matters worse, on February 10 at 3:44 PM, my packet loss rate shot up (see **Figure 4**). I suspect some other customer on this already overloaded circuit began streaming something, like a surveillance camera, because this error rate never changed 24x7 (well, in all honesty, sometimes it actually got worse than what is shown).
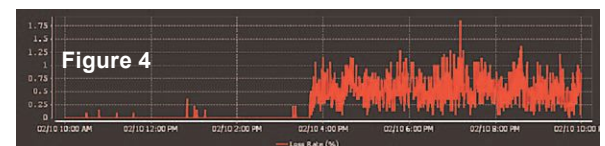

Figure 4

When the ISP finally added more bandwidth between COs, both problems instantly disappeared. In reading the Service Level Agreement (SLA) for this particular ISP, this error rate and intermittent high latency were both outside of acceptable limits.

If you have, or are planning to use, the IP Link to stream audio across the Internet, then LiveLook is a great tool to have running in the background, collecting link performance data. It's just like logging readings on a transmitter; it's always good to be able to look back on how something has been performing when comparing it to how it is currently performing – and just like owning any tool, such as a spectrum analyzer or even a Crescent wrench, you may not use it every day, but when you need it, you've got it.

Timothy Schultz has been a broadcast engineer for 40 years and is currently an independent consulting engineer. He placed KCLU-FM on the air in 1994 and continues to serve as its Chief Engineer.