

by Bob Newberry

## Solving STL Problems with the Axia IP-Audio System

We have been using two Moseley four-channel Starlink STL systems to provide program audio to the four transmitters at our master FM transmitter site. Remote control and RDS data is sent to the site on a companion Moseley LanLink system.

While this arrangement has worked fine for several years we recently ran into a pair of "opportunities" that set us on a search for a better system.

### URGENCY FOR SOLUTION GROWS

Then, this past summer, a pair of our stations were silenced for 30 minutes when another company in town tuned up on the wrong STL frequency. That unfortunate accident set the planning in motion for a redundant audio path on a completely different frequency band.

We were also planning to add SPS (Supplemental Program Service) to our HD stations. The HD-2 channels are encoded at the studio into TCP/IP streams. While these streams are fairly small, we thought that three of these streams with remote control and RDS data might be too much for our existing LanLink system to handle.

### GETTING FROM POINT A TO POINT B

The search was on for a new wireless system that could handle our audio and data needs. I started out examining equipment for the popular 5.8 GHz band. A little too popular, for I quickly found out a wireless Internet Service Provider was transmitting from the roof of our own studio building using several links in all directions. That kicked my frequency search up to the 14, 18, 23 and 24 GHz bands.

My search began with TDM or time slot-based radios where most of the slots would be dedicated to conveying digital audio. Surplus time slots ferry IP data using added hardware. Then my thought was, "Why not start with a pure IP radio to begin with, and find a way to get uncompressed audio over IP?" That seemed logical because there is so much standardized Ethernet equipment from which to choose.

I had been familiar with the Axia products and knew sooner than later I would have a chance to try them out. The Axia Audio Node is a product with eight stereo audio pairs in and out. The one-rack-unit box can be purchased in either analog or AES form.



Axia Livewire Audio Node

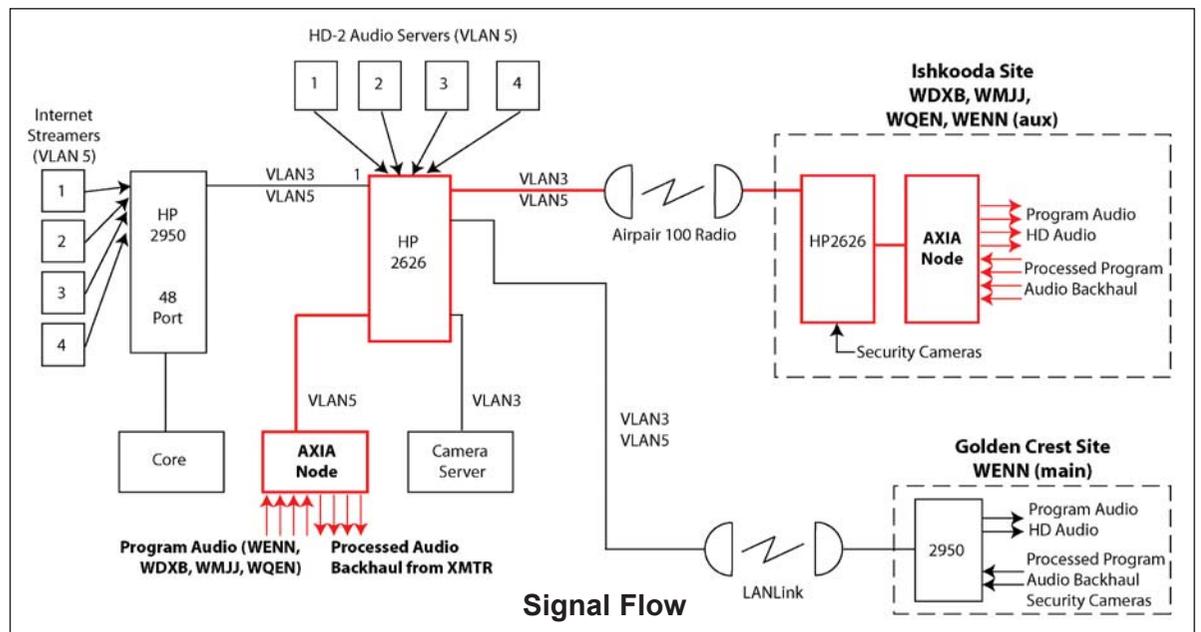
The audio is sampled 24 bits deep at a 48 kbps rate and converted to extremely low latency packets they call "Livewire." The latency delay of an Axia node is less than one millisecond per network hop. The rear panel has 16 RJ-45 connectors for AES audio in and out and an additional one for your Ethernet network connection; it cannot get any simpler than that.

Now I had to find a wireless link up to the task. My research led me to a carrier class radio that could send and receive 100 MB/s in both directions at the same time. Many wireless systems can transmit in only one direction at a time. This full-duplex operation is important to keep latency and stream jitter to a minimum.



A Dragonwave Airpair 18 GHz link got the data stream to the transmitter.

We zeroed in on the 18 GHz band for the lack of potential interference. Wal-Mart is not selling anything in the 18 GHz band, yet, so I checked with the Axia folks about my radio selection. They thought the radio I had chosen might be up to task and gave me their "thumbs up" on the project.



### TWO DIRECTIONS FOR THE PRICE OF ONE

Like other broadcasters transmitting digital radio, we had to delay our FM audio almost eight seconds to properly "blend" it with our HD-1 stream.

At the same time, since the Axia nodes and the wireless path are both bi-directional, I realized I could bring low-latency audio back from the non-delayed but otherwise processed HD audio stream. This would be a

good source of processed audio for the announcer's headphones.

The one rack-unit Axia node has now become our primary STL for all transmitters at this site. The FM and HD-1 audio sources delivered by Axia are backed up now by the Moseley Starlinks.

I feed the main and backup audio sources through automatic A/B AES switches that switch instantly to the backup audio source upon a missing AES WORD clock. These switches are manufactured by BDI and have a handy built-in DA for four outputs on each switch.

The original firmware in the Axia switch preserves the AES WORD clock in the event of a communication loss. This is fine for studio work but not when you are trying to detect a communications problem automatically.

I explained this problem to Kirk Harnack of Telos/Axia one afternoon and he had a firmware revision emailed to me that evening. Problem solved.

### THE FUTURE AND BEYOND

My original testing was with all eight audio channels of the Axia Audio Node enabled in both directions. After several days of good results we cut back to four audio streams up and down, confident that if we ever need more audio sources to or from the transmitter site they can simply be switched back on in the Axia software.

Since going on-line with this system in mid November it has been performing to our great satisfaction. What about rain fade at 18 GHz? With our four-mile hop and two-foot dishes, it takes a seriously heavy rain to take it down.

And when there is rain fade, the BDI AES switches instantly switch the audio back to the 950 MHz links without missing a beat. The HD-2 streams do go down for now, but the longest it has been out has been two minutes at any one time. The remote control and other slow speed data requirements continue to be met on the LanLink.

I see the future of audio transmission belonging to Internet Packet data. There is no end to the wealth of reliable products to get the broadcaster's job done economically using the consistent protocols and connections of the Ethernet standard.

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