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Studio and tower consolidations are a commonplace in today's radio markets. While these major projects can be fun for the engineering team, they also bring about new challenges as well. One of these challenges is how to get the audio from the studio to the tower site. Standard STL frequencies are becoming crowded which is especially problematic when you combine multiple radio stations over the same RF path. Multiple channel digital STLs are an option, however some of them require digital data reduction to fit all four channels on one carrier, and even then they don't address the needs of the return link from the tower back to the studio.

I decided to research all of the options available when designing the consolidation of Cox Radio's six Orlando radio stations. While walking the exhibit floor at the NAB convention, I came across the combination of the Intraplex STL Plus, and the Aurora Spread Spectrum radio link. I had always thought of Intraplex as being an interface for T-1 lines, which are very good, but come with a high monthly cost, not to mention the fear of a phone line being cut, taking your stations off the air. The spread spectrum link was an intriguing idea. Available in two frequencies, the 2.4 G channel gives the equivalent bandwidth of one T-1 line, and the 5.8 G link doubles that capability.

For my application, I had two FM radio stations linking to the same tower site about 4 miles away from the studio location. I wanted to do more than just send the audio to the tower site so I chose the 5.8 G system for it's extra bandwidth. The first objective was to get clean, uncompressed digital audio to the tower site. To keep our 100% digital audio chain, I chose the AES digital 15 kHz stereo cards, one for each station. (20 kHz cards are also now available for HD Radio applications)

Since this tower was located centrally in the market, I decided to make it the receive location for our remote broadcast RPU channels and our traffic airplane radio. Since the quality of the audio on these channels is already limited, I chose audio cards with apt-x data compression for the Intraplex system to give me a total of ten 15 kHz return audio channels to the studio, but I wasn't finished yet.

The remaining bandwidth is divided among several other available options. First of all I incorporated a LAN network card so that I could put a computer at the tower site on our studio network. All my files are now available at the tower site as well as e-mail and Internet access. Other lower speed data cards handle bi-directional data for the transmitter remote controls eliminating the need of a TSL system. I also added the telephone port cards allowing me to put a studio telephone extension at the tower site. Calls to the office can now be answered at the tower site directly. A second telephone port allows me to connect a fax machine to telephone lines at the studio location. This allows us to take advantage of the cheaper long distance rates that we get on our business lines.

Since the spread spectrum systems don't require licenses, I was concerned about interference. Harris provided special transmit and receive dishes for the link which are extremely directional. Even moving them slightly will

cause a major change in the signal strength. This is important in being able to reject nearby interference. While my link is only four miles, Harris / Intraplex claims the system will be reliable at distances up to 30 miles. We have had our system on the air for well over a year now, and even during times of extreme atmospheric disturbances, heavy rains wind and lightning, we have yet to experience any down time or RF fade. The system has performed very well for us. There was a price sticker shock at first, but after taking a breath, and adding up the cost of all the components that it replaces, I found the price to actually be less than the alternative of two separate STL / TSL links.

Cox Radio, Orlando system at a Glance:

Studio Site		Tower Site
	Station 1	
AES Uncompressed Audio In	→	AES Uncompressed Audio Out
	Station 2	
AES Uncompressed Audio In	→	Analog Audio Output Card
	Aux Audio	
(10) APTX Audio Channels	←	RPU and Airplane (10 Channels)
	Data	
(2) Bi-Directional Data Channels	↔	(2) Transmitter Remote Ctrl Data
	Communication	
PBX System Analog Phone Port	→	Telephone Extension from studio
PBX System Analog Phone Port	→	Fax Machine (Low LD Rates)
Computer LAN Network Port	→	Computer on Studio Network

Features at a Glance:

- Configuration based on your needs
- AES Digital or Analog cards available
- Can be configured for Linear Digital, MPEG Layer 2, or apt-x data compression for up to 6 stereo 15 kHz channels on one T-1 line
- Available Option Cards:
 - LAN Network Port
 - OPX - Off Premise Telephone Extension port
 - RS 232 data ports
- Bandwidth using Harris Aurora Spread Spectrum:
 - 2.4 G link = One (1) T-1 Line
 - 5.8 G link = Two (2) T-1 Lines