OPIF | AES67 at NAB Show | Hosted Solutions | 2016 Best of Show Winners ›

Radio

THE RADIO TECHNOLOGY LEADER

2016 BEST of SHOW Radio

Student Station Is Community Leader in Dallas

KEOM(FM) offers education and good tunes

LXEvolved

The Evolution of LX Radio Control Console

Wheatstone's new LXE console brings control surface configuration to a new level. Going far beyond the usual "any source to any fader" network concept, the LXE is a fully flexible control interface, where every switch and rotary control is programmable to perform any desired function. This means console architecture is completely customizable to client requirements, and limitations to functionality are no longer a factor. Physically compact, the LXE is available in several different form factors including countertop, countertop sunken, and split frames (split sections are not confined to one room, they can actually be in different studios).

Any Way You Want It

ConsoleBuilder software allows every switch on the surface to be programmed for function, mode, and even color (switches are RGB led illuminated). In fact, built-in software allows every button to be scriptable, letting you create powerful macros for as many controls as you want. Multiple full color OLED displays on each panel keep pace with ongoing operations, and event recall allows painless one touch console reconfiguration at the press of a button. With its inherent control flexibility and ability to access thousands of signals (sources and destinations are limited only by the size of the network) the LXE takes facility work flows and audio control to a new level.

LXE is the recipient of NewBay Best of Show awards from Radio World and TV Technology

The World At Your (Motorized) Fingertips

The LXE can have up to 32 physical motorized faders, with full DSP processing available on all 32 channels. Surface(s) interface seamlessly into the WheatNet-IP Intelligent Network, and utilize BLADE-3s for audio, control and associated logic data flowing on single CAT6 interconnecting cables. The system can ingest and convert virtually all audio formats: analog, microphone, AES/EBU, SPDIF, AoIP, MADI, SDI and even AES67. Loudness metering, phase control, and full EQ/Dynamics are included.

All New Graphical User Interface

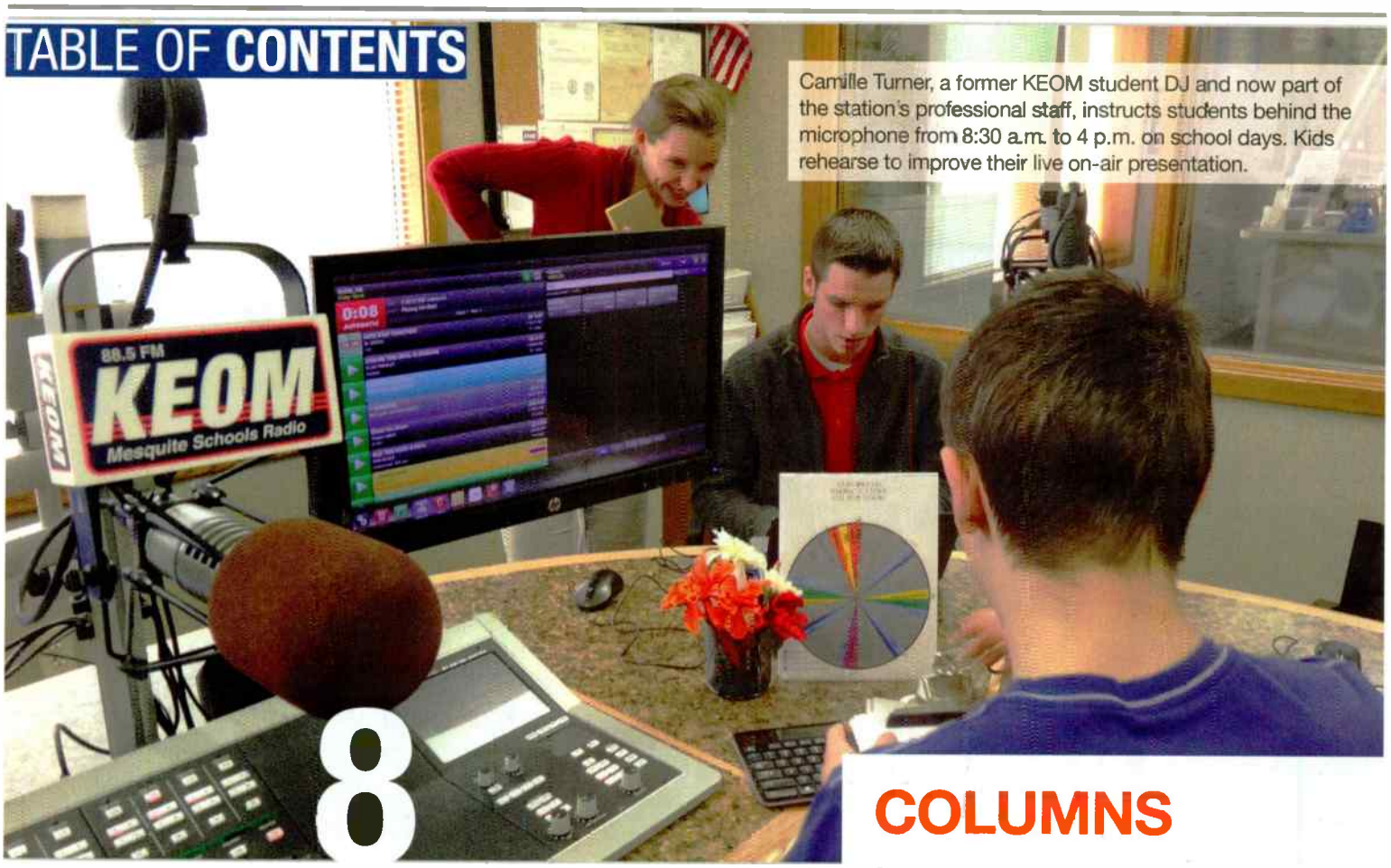
LXE's new GUI is has pre-built screens for everything you normally use – metering, clocks, timers, dynamics, EQ, assigns, and more. All are touch-screen accessible with gestures you're used to using on your smart devices. And, the GUI is just as customizable as the LXE surface. Using our ScreenBuilder-LXE software, you simply drag and drop objects and define their functions via a simple wizard interface. You can store multiple custom screens, if you like, to go with your custom LXE setups.

THE ALL NEW LXE BROADCAST AUDIO CONSOLE

Wheatstone
BROADCAST AUDIO PERFECTIONISTS®

phone +1-252-638-7000 | wheatstone.com | sales@wheatstone.com

TABLE OF CONTENTS



Camille Turner, a former KEOM student DJ and now part of the station's professional staff, instructs students behind the microphone from 8:30 a.m. to 4 p.m. on school days. Kids rehearse to improve their live on-air presentation.

FEATURES

2016 BEST of SHOW Radio

COLUMNS

DEPARTMENTS

On the cover: The 514-foot KEOM lattice tower was built in 1990 by Landmark Tower of Ft. Worth, Texas.

Photo Credit: Barry Walters, WideOrbit

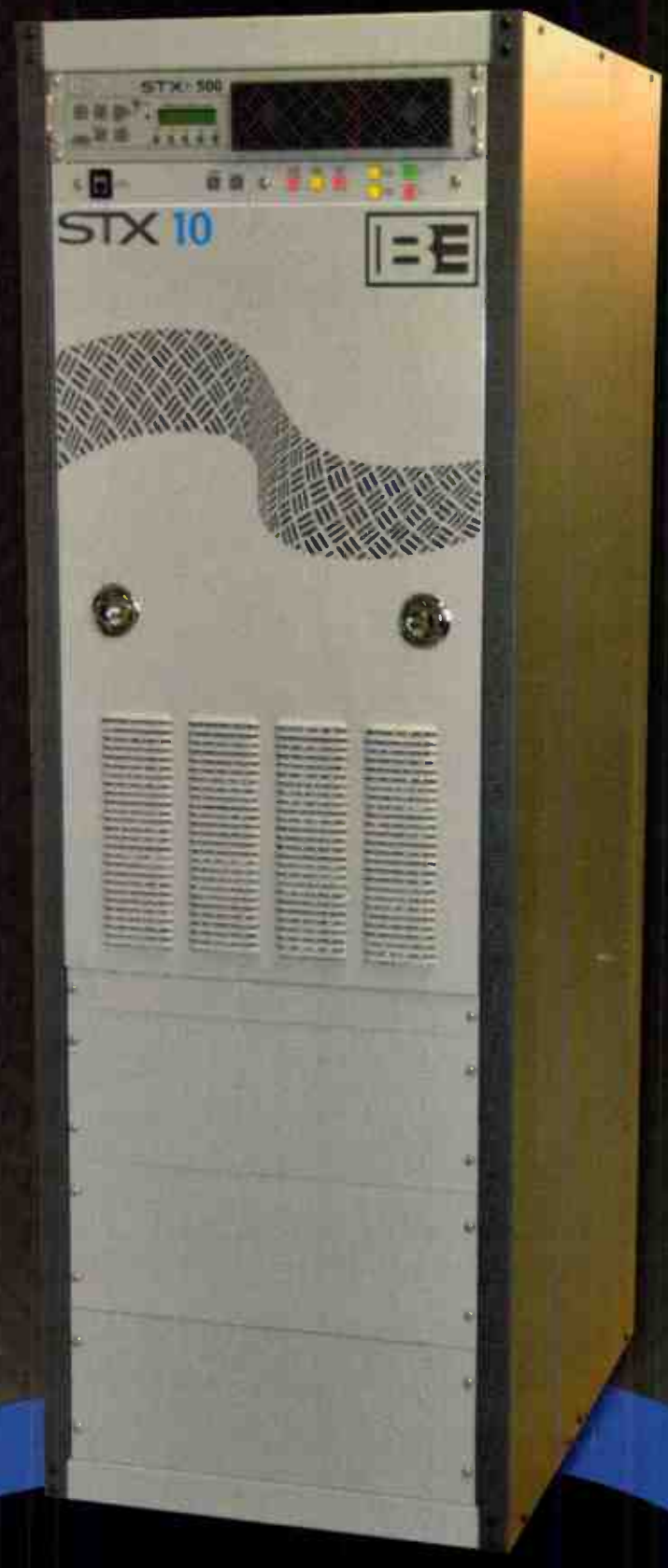
FIND THE MIC AND WIN!

Tell us where you think the mic icon is placed on this issue's cover and you could win a **Hosa IBT-300 Drive Bluetooth Audio Receiver**. Send your entry to radio@RadioMagOnline.com by **July 10**. Be sure to include your answer, name, job title, company name, mailing address and phone number. No purchase necessary. For complete rules, go to *RadioMagOnline.com*.

STX 10

10KW FM TRANSMITTER

1. 70% AC to RF Efficiency
2. Hot-Pluggable P.A. Modules
3. Hot-Pluggable P.S. Modules
4. RDS Generator Built-In
5. IP Connectivity
6. Intuitive Web GUI
7. Compact Design – Only 22RU
8. SNMP Level 3 Security
9. Best of Class Audio Quality
10. N+1 and Synchronous FM Capable



A PERFECT 10

BE

Broadcast Electronics • www.bdcast.com

VIEWPOINT

Post-Show Reflections and Summer Projections

Another NAB Show has come and gone. I enjoy attending the convention, and it was great to meet so many people this year. But even with four full days, I didn't see everything or everyone I wanted to; it can be quite overwhelming, to tell the truth.

But now we've had a chance to recover and to assemble some 2016 post-show coverage, including our Best of Show Award winners featured this month.

The Broadcast Engineering Conference opened before the exhibition floor opened; there were innumerable topics and techniques covered in Las Vegas this year. Alan Jurison is a nationally known expert on HD Radio, and we're sharing his subject of choice, modified from his paper presentation. Look for more topics from the BEC soon.

Chris Wygal has reported from the floor in Las Vegas on behalf of Radio for many years, and 2016 was no different. He says every show seems to have a dominant theme. Check out his article to discover this year's.

Right before the show, a now-infamous "hack" attacked a radio station using the public internet for audio transmission (and, perhaps, also taking less than appropriate precautions). In this issue, IT expert Chris Cottingham offers simple techniques to prevent that kind of breach, as well as how to keep your station safe from ransomware attacks.

Lee Petro uses his soapbox to bring you up to date on a couple of important FCC items. First, if you are in a top-50 market and have more than five full-timers (if you have fewer employees than that, we want to hear from you), then you need to know about the new online public file system. Lee will also clue you in on the EAS Test Reporting System. You know there's another nationwide test scheduled for September, right? (If not, read FCC Update.)

We all know they love their football down in Texas. Well, KEOM(FM)'s tower is practically in the end-zone! This student radio station is featured in our Facility Showcase. And if you're looking to hire some new blood, this is the kind of feeder program you should know about.

At first, the problem addressed in this month's Field Report may appear minor; then, you'll start to think about how any different times and different ways you've tried to do this. You may have deployed a kludge or two in the course of your quest. Those days are over, thanks to technology!

The Wandering Engineer is at it again this month — this time pining for the days of more FCC regulation! Are you old enough to remember what it was like way back when? (Actually, it wasn't that long ago, and I, too, agree that some of the rules meant to benefit broadcasting haven't necessarily worked out that way.) The law of unintended consequences certainly applies to broadcasting.

Thanks for picking up Radio — and don't forget to visit our website, *radiomagonline.com*, for more content to hold you over until the July issue.

Doug Irwin, CPBE AMD DRB | Technical Editor

FOLLOW RADIO MAGAZINE

Email | radio@RadioMagOnline.com
Facebook | RadioMagazine
Twitter | @RadioMagazine

Radio
THE RADIO TECHNOLOGY LEADER

June 2016 | Vol. 22 No. 6

EDITORIAL
Technical Editor: Doug Irwin, CPBE DRB AMD
Managing Editor: Emily Reigart
Web Editor: Michael Balderston
Editorial Assistant: Cameron Vigliano

CONTRIBUTORS
Fred Baumgartner, Russ Berger, Scott Bridgewater, Chris Cottingham, Lee Petro, Jeremy Ruck, The Wandering Engineer, Chris Wygal

CORPORATE
President and CEO: Steve Palm
Chief Financial Officer: Paul Mastronardi
Controller: Rick Ng
Vice President of Web Development: Robert Ames

VIDEO/BROADCAST GROUP
Executive Vice President: Carmel King
Vice President of Sales/Group Publisher: Eric Trabb

ADMINISTRATION AND PRODUCTION
Editorial Director: Paul J. McLane
Production Manager: Lisa McIntosh
Advertising Coordinator: Caroline Freeland

AUDIENCE DEVELOPMENT
Corporate Director, Audience Development: Meg Estevez
Circulation Manager: Kwentin Keenan
Circulation Coordinator: Michele Fonville

ADVERTISING SALES REPRESENTATIVES
Publisher, U.S. Sales: Steven Bell
sbell@radiomagonline.com | 212-378-0400 x519

International Sales Manager: Rafaella Calabrese
rcalabrese@nbmedia.com | +39 320 8911938

Japan: Eiji Yoshikawa
callems@world.odn.ne.jp | +81 3 3327 5759

Asia-Pacific: Wengong Wang
wwg@imaschina.com | +86 755 83862930/40/50

Member: American Business Media

A NewBay Media Publication

NewBay Media

NewBay Media, LLC
28 East 28th Street, 12th floor
New York, NY 10016

SUBSCRIPTIONS: Free and controlled circulation to qualified subscribers. Customer Service can be reached at: newbay@computerfulfillment.com or by calling 888-266-5828 (USA only) or 978-667-0352 (Outside US) or write us at Radio Magazine, P.O. Box 1884, Lowell, MA 01853, USA. Back issues are available by calling Customer Service.

LIST RENTAL: 914-925-2449
danny.grubert@lakegroupmedia.com

REPRINTS: For custom reprints and eprints please contact our reprints coordinator at Wright's Media 877-652-5295 or NewBay@wrightsmedia.com.

PHOTOCOPIES: Authorization to photocopy articles for internal corporate, personal or instructional use may be obtained from the Copyright Clearance Center (CCC) at 978-750-8400. Obtain further information at copyright.com.

Radio, Volume 22, Number 6, (ISSN 1542-0620) is published monthly by NewBay Media LLC, 28 East 28th Street, 12th floor, New York, NY 10016. Periodical postage paid at New York, NY and additional mailing offices. Postmaster: Send address changes to Radio, PO Box 1884, Lowell, MA 01853.

Work smarter. Anywhere.

Remote access is here!

Simian Radio Automation with iPad, iPhone and Windows remote.

Call (888) 274-8721

(888) BSI-USA-1

or email us at sales@bsiusa.com

Texas Station Takes "Old School" Broadcasting to Heart

by John Hicks

The author is an Inside Sales Representative for WideOrbit. He is based in the Dallas metro area.

When you tune in KEOM 88.5 FM out of Mesquite, Texas, a suburb just east of Dallas, you might be surprised to learn you're listening to a high school radio station.

Blasting a strong, clear signal across the Dallas market and virtually ignoring the hip-hop, top 40 and alternative formats popular with teenagers, KEOM's live student DJs throw down the biggest hits from the '60s, '70s and '80s. In a typical hour, KEOM DJs might drop classic rock from Elton John, Led Zeppelin and David Bowie, vintage R&B from Marvin Gaye or a Donna Summer disco epic.

The tunes come sandwiched between all the other features you would expect from a professional, highly staffed station. Students contribute local and state news reports, weather, traffic, community announcements and jingle IDs.

Operating under the tagline "Your Community Leader," KEOM has become a favorite in Dallas's ultra-competitive radio market. Its unique blend of upbeat nostalgic music has an instant appeal for parents, school district patrons and other adult listeners. KEOM's "old school" format has made the station a popular pick among Dallas-area adults. In fact, the station was a MARCOM (International Competition for Marketing and Communications Professionals) award winner in 2015, 2014, 2013 and 2011 and it has been a reader's choice nominee for D Magazine's "Best Radio Station" every year since 2012.

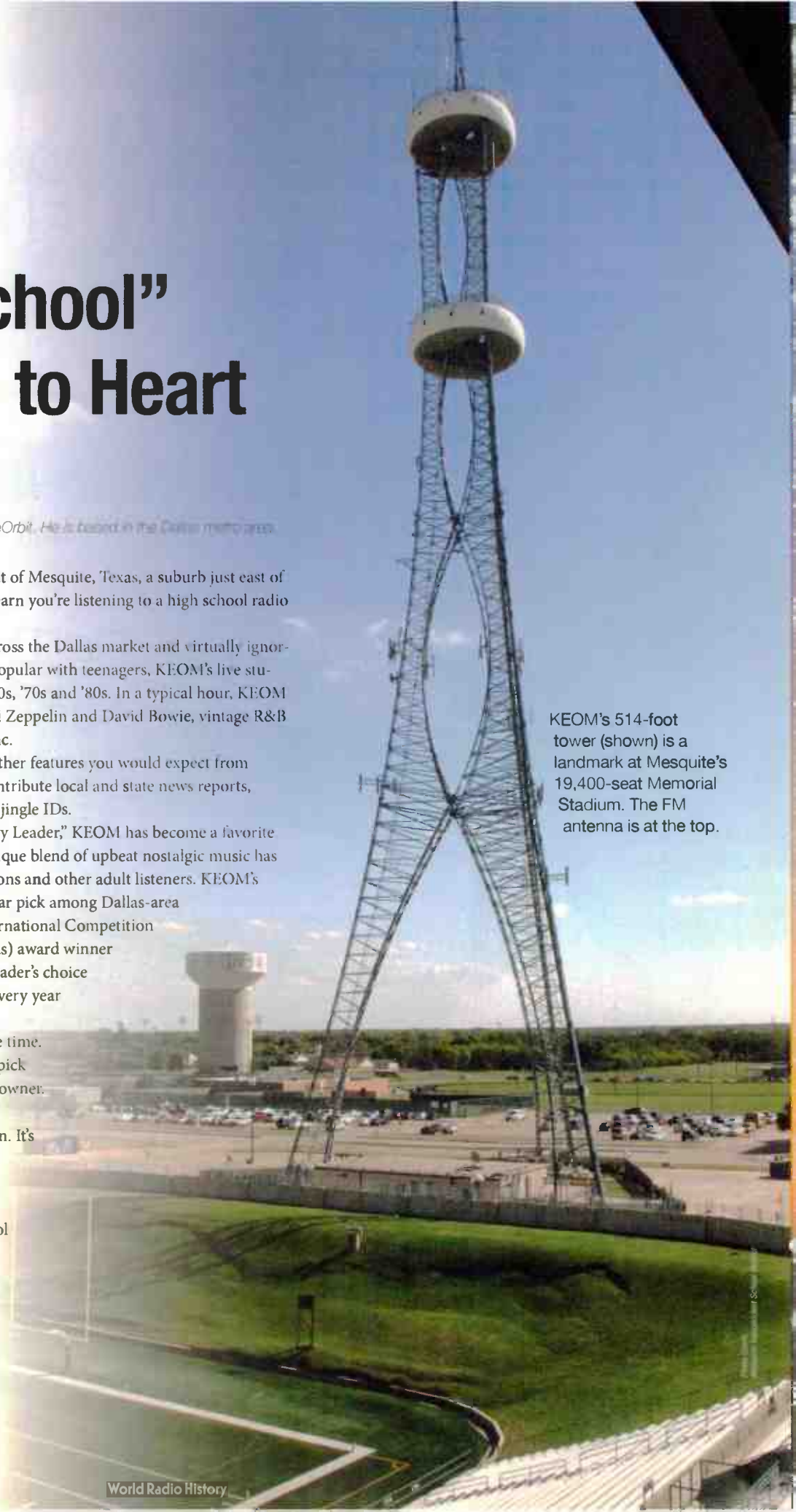
"It's cool because it's not the same genre all the time. It's like they let the students go back in time and pick the genre," said Jay Ross a Plano, Texas, business owner. "Anyone between the ages of 35–60 will get it."

Bill Arnold of Dallas agrees. "I love that station. It's on in my truck all the time."

EDUCATIONAL PURPOSES

For 31 years, the Mesquite Independent School District has operated KEOM as an asset to serve the community while teaching local students about the broadcast business.

Kids who want to work at the station face stiff competition to secure a coveted spot in the KEOM student program. Applicants from the Mesquite Independent School District's five high schools compete for 56 openings in the



KEOM's 514-foot tower (shown) is a landmark at Mesquite's 19,400-seat Memorial Stadium. The FM antenna is at the top.

Photo Credit: John Hicks, WideOrbit

KEOM(FM) General Manager / Programmer Peggy Brooks

Advanced Journalism class, which is responsible for running the station.

Students first learn the basics like terminology, Federal Communications Commission rules, speaking skills, operating the broadcast console, editing/production and script writing. In the second year, the course becomes more in-depth. Peer leaders provide on-air training, music programming skills, advertising sales and traffic scheduling. Training in interview skills and news and feature production also includes coaching on ethical considerations and laws affecting broadcast journalism.

In addition to earning special credit, participating students can explore broadcast or engineering careers while working at the station. The course covers all kinds of radio duties including voice and on-air training, writing, researching, news reading, programming, production skills, ad sales and traffic.

On average, at least half of the participating students go on to pursue a higher education degree in broadcast media. This year, KEOM awarded five scholarships to deserving seniors who plan to major in journalism, radio/ TV in college. Funding for these scholarships come, from underwriting sponsorships of local sports broadcasts.

"Our students find this is an eye-opening experience. Most admit they never fully realized so much was going on in their own community and how much work is involved before they get to the fun part," says General Manager and Programmer Peggy Brooks.

Kids who make it into the program don't want to cut this class. "Good attendance is required. Generally students would rather be at the station than sitting in a classroom somewhere," Brooks says.

When school is out of session, that doesn't mean students disappear from station activities. Some top performers can work over summer vacation. In exchange, they get more on-the-air time and even earn a little money for their efforts.

TECHNOLOGY AND EQUIPMENT

Part of what makes KEOM's high school staff sound so professional is the district's dedication

to staying current with broadcast technology. Brooks and her team value bringing students the latest in station tech because they want to make sure the studio experience is as professional as possible.

As a result, KEOM's teen staffers receive hands-on training on state-of-the art equipment. Housed in the former school district headquarters facility, KEOM has five fully equipped studios. These include one main, one backup on air/ interview room and three production workstations. All of the studios run on Adobe Audition and WideOrbit's WO Automation for Radio.

"We went with live assist WideOrbit's WO Automation for Radio because we wanted to give a real world picture of radio," continued Brooks. "And our kids love the touch-screen technology."

Photo Credit: John Hicks, WideOrbit

Dennis Hevron (left) with assistants Andy Floyd and Clay Cottles of Mesquite ISD stand in front of a Nautel NV40 transmitter.

Founded by former Mesquite ISD Superintendent Dr. Ralph Poteet, KEOM signed on the air Sept. 4, 1984 on 88.3 with 3,000 watts at 250 feet. The station moved to 88.5 in 1992 and increased power to 61,000 watts after completion of the 514-foot tower project at the city-owned stadium.

Throughout the years MISD Director of Technical Services Dennis Hevron has been heavily involved with the stations' power increases, the landmark tower project, and most recently, the addition of HD Radio. Hevron is a 37-year district veteran with a staff of 65. He relies on Department Manager Clay Cottles and Andy Floyd to assist with station engineering.

MISD engineers, regional broadcast engineering contractor Broadcast Works and KEOM staff collaborated on recent rebuilds and upgrades in the

ARRAKIS SYSTEMS

DIGILINK-XTREME 2.0 AUTOMATION

For a low $100 per month you receive All softare, Bridge hardware, support and upgrades.
Always up to date, no yearly support contracts, plus next day Bridge replacement.
Just add a Windows PC and st r '

On Air Studio

Management

Production Studio

Network Recor

Traffic Studio

Windows 8
compatible

On Air, Production, Traffic, News, Programming
complete

$100 /month

call or go to our website today to learn more about Arrakis radio automation systems

www.arrakis-systems.com **970.461.0730**

The KEOM 60-dBu service contour covers a large portion of the Dallas metro.

studio environment. The equipment upgrades include a new 12-channel Wheatstone E1 console and integration with WO Automation for Radio for the on air studio, Comrex codecs for remote game broadcasts, and a Gentner SPH-3 Phone hybrid for caller audio. A new Wheatstone L-8 was added as the production console late last year. Lastly, KEOM's on-air processing was upgraded to an AirAura X3.

Transmitted from a unique tripod tower just 10 miles east of downtown Dallas, Mesquite's student DJs can be heard loud and clear throughout most of the top 5 market.

The 514-foot KEOM tower with its unconventional lattice design was built in 1990 by the Landmark Tower Co. of Fort Worth, Texas. It also supports two 1,500-square foot "pods" that accommodate additional equipment for customers who lease space. Two or perhaps three of this specific design were built.

A set of Wheatstone blades operate over a dedicated fiber network that is part of the 53 miles of underground fiber owned by the Mesquite Independent School District. They connect the studio to the transmitter site, which is located just beyond the end zone of Mesquite Memorial Stadium, on the campus of rival West Mesquite High School. The communications center and tower complex houses a Nautel NV40 transmitter and associated broadcast equipment including a standby STL and a dedicated WideOrbit Automation system, which backs up the studio facility.

The tower acts as a virtual commercial for KEOM to the Mesquite school district's football-hungry fans who pack the 19,400-seat stadium under the Friday night lights.

High atop the structure a remote video camera provides a bird's eye view of the stadium. The camera can zoom on downtown Dallas to project the city skyline onto stadium's large screen digital scoreboard.

In addition to being a great confidence booster, students working at KEOM pick up experience they might not fully appreciate until they graduate, start college or enter their chosen field. The professionalism of the facilities and on-air product prepares them well for continuing in the radio industry.

Photo Credit: John Hicks, WideOrbit

KEOM's students are trained in use of WideOrbit's WO Automation for Radio.

Students also get recognition throughout the community. It turns out that student DJs — just like more seasoned radio colleagues — never get tired of being greeted with "Hey, I heard you on the radio!"

To hear KEOM anywhere in the world, tune in to its live stream at *http://www.keom.fm* or check it out on your mobile via the TuneIn app.

Summer Desk Clearing

by Lee Petro

The days are getting longer, which must mean that the Federal Communication Commission's staff wants to clear their desks before summer vacations kick in. In a flurry of recent activity, the FCC moved forward on several initiatives we've been waiting to see.

PUBLIC FILE

First, the commission announced that it had completed the development of its new online public inspection file database. As discussed in the March 2016 edition of our column, the FCC adopted rules to require radio, cable, DBS and satellite radio licensees to migrate to an online public file report. The requirements for terrestrial radio licensees are staggered based on the size of their respective radio market, and the requirements for cable companies are staggered based on the size of their respective cable systems.

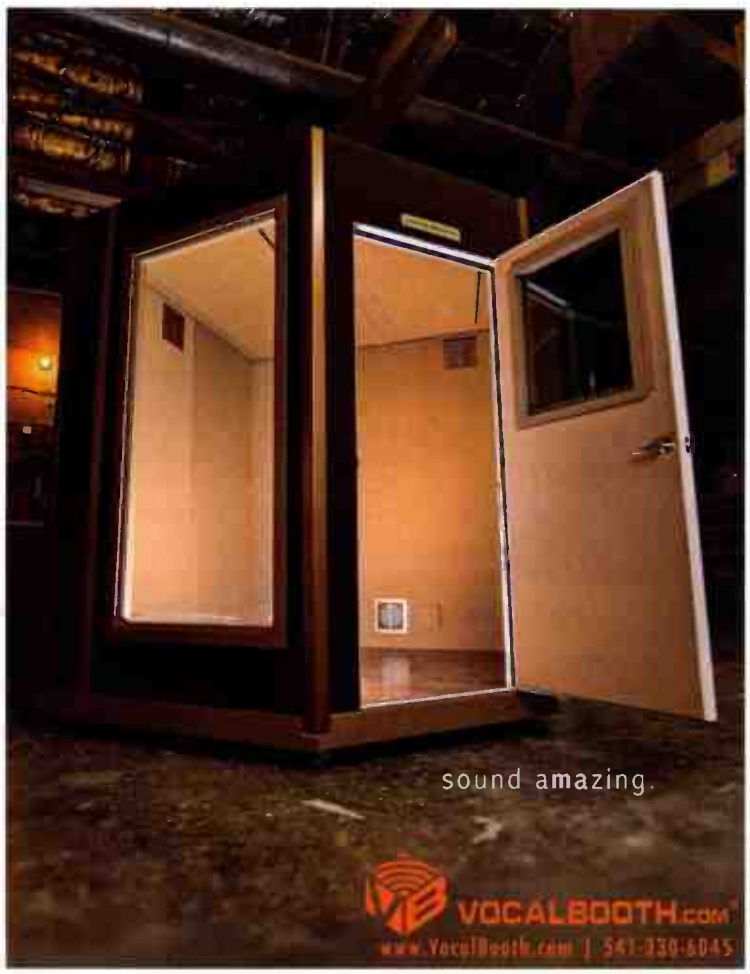
In a public notice released May 12, the FCC announced that the first wave of entities will need to begin using the online public file database as of June 24, 2016. This requirement applies to commercial radio stations in the top 50 Nielsen Audio radio markets that have five or more full-time employees. These licensees must begin uploading newly created materials (think second quarter issues/program lists due by July 10) starting on that date. Furthermore, these licensees will need to make sure that any document that is required to be in the station's public file (with one exception) is placed in the database as of Dec. 24, 2016.

The one exception relates to the station's political file. As previously noted, the FCC's new rules will not apply to the first wave of radio stations for their existing materials that

are required to be kept in the station's political file. Instead, these stations are only required to upload newly prepared political file materials to the online database.

While there had been some speculation (hope?) that the new online database would not be ready for prime-time until the fall political season was well underway, the June 24 launch date ensures that radio stations with five or more full-time employees in the top 50 markets will be busy uploading political file materials throughout the summer and fall.

All other radio stations, including noncommercial radio stations, must be ready with their materials uploaded to the database by March 1, 2018. Stations can convert to the new system earlier than that deadline, but once they notify the FCC that they have completed the transition, they may no longer rely on the materials in the public file located at their main studio.



ALERTING

Next, the FCC released details about the new Emergency Alert System Test Reporting System that EAS-participating stations must use after a nationwide EAS test.

The FCC had adopted new rules in June 2015 which introduced a new location code for nationwide testing and the creation of ETRS. The information collection aspects of the new rules were approved in December 2015, and recently, the Federal Emergency Management Agency announced its intention to initiate a nationwide EAS test on Sept. 28. The FCC's public notice released in April 2016 announced the progress made in creating ETRS, and informed the public that it intends for EAS Participating stations to use ETRS to report on their participation during this upcoming test.

The April 2016 Public Notice provided screenshots of ETRS step-by-step instructions for the preparation of an ETRS report. Stations will be required to register with ETRS within 60 days of the official launch of the system. Licensees will be required to complete sections of the form providing the identification of EAS participants and related background information, such as the EAS Participant's facility identification number, transmitter locations EAS designation, EAS monitoring assignments, the equipment type and the software version of installed EAS equipment.

Subsequently, when a nationwide EAS test is activated, stations will need to complete a report within 24 hours. The report requires confirmation whether the EAS message was received and retransmitted, information about the source of the EAS message and disclosure of any difficulties experienced by the station regarding the receipt or retransmission of the message.

The public notice indicated that the FCC will announce the first deadline in an upcoming public notice. The FCC will also release a public notice at least two months prior to the September nationwide EAS test. 0

Petro is of counsel at Drinker Biddle & Reath LLP.
Email: lee.petro@dbr.com.

DATELINE

June 24, 2016 — Commercial radio stations with five or more full-time employees must being uploading newly-prepared public file materials to the new online public inspection file database.

July 10, 2016 — Issues/program lists must be placed in stations' public inspection files (online or paper depending on location).

AES67 Is Trending

by Chris Wygal

For the past nine years, I've had the privilege of working the floor at NAB Show in Las Vegas for Radio magazine. The primary focus is to represent the magazine on the exhibition floor, make contact with vendors and see what products we engineers would find interesting over the upcoming year. A common "vibe" or element generally manifests itself halfway through the first day of exhibition floor investigation.

For example, just a few years ago, flat-panel LED lighting was all the rage, and it was of great interest to the radio folks who wanted to delve into video. Prior to that, HD Radio widely dominated the conversation, of course.

Some NAB Show trends are easy to spot, and others require a little more digging.

This past April, by the end of day one, the term "AES67" buzzed about consistently. After the third booth visit, when "AES67-compliant" rolled off the tongue of the exhibitor, I finally said, "OK, let's back up. Give me some details."

After a crash course and some subsequent research, I've come up with a quick history and simple description with the hope that it sheds some light on AES67 and why radio broadcasters should pay attention.

A QUICK HISTORY

Most audio and radio techs are familiar with AES3. It's a digital audio standard that was put forth by the Audio Engineering Society and European Broadcasting Union in 1985.

AES3 spelled out a groundbreaking digital format that eventually made digital audio products talk nicely with one another. The AES remains a household name (although there are others) in developing interoperability standards for the audio industry.

The AES continued its work in providing cross-platform continuity

The exhibit floor drew a large and curious crowd, as usual.

when it unveiled AES67 in September 2013. It's a product of the AES-X192 project, headed by AES Fellow Kevin Gross that addresses standards for networkable AoIP (audio-over-Internet Protocol) gear.

Gross and his team came together with the understanding that the current protocols used by different broadcast audio manufacturers are actually very similar, but the dissimilarities create a brick wall when it comes to interoperability. Deploying a standard to make everyone compliant with one another was a reasonable undertaking.

Nearly three years after its conception, AES67's debut was a big deal in Las Vegas.

A SIMPLE DESCRIPTION

Prior to the implementation of AES-EBU in the mid-1980s, the interconnection of equipment that supported stereo PCM formats was — for lack of a better term — a crapshoot. The AES-EBU standard allowed PCM or DAT formats to work interchangeably at different clock rates.

AES67 accomplishes the same objective, but it is set in place for audio systems that exist together on IP networks. It calls for agnostic data protocols to be used in the Ethernet Layer–3 world. The Ethernet layers are spelled out by the Open Systems Interconnection Model, on which the Ethernet standard was built. The OSI Layer–3 is the "network" layer and it determines many of the critical factors that affect audio transport like quality of service and host naming, for example.

Since I am far from a networking expert, it will be sufficient to say that the AES67 framework of rules allows differing IP audio products to see and recognize each other.

Let's make an analogy with speech: You speak English and a colleague 3,000 miles away speaks German. However, you both speak French, so you use French to communicate.

Another analogy that I heard on the exhibition floor: You speak

English into a telephone, but your French-speaking colleague understands it as French. Conversely, he speaks back to you in French and you understand it as English. The two of you are able to conduct regular business as usual because the language differences are no longer a hindrance.

Here's a real world example: A station using Wheatsone- or WheatNet- or Axia Livewire-compatible consoles could transport its program via audio over IP to an Orban 8700 at the transmitter site. We can even consider Tieline's Genie and Merlin products; both are AES67-compliant and will interface with WheatNet in such a way that the Genie and Merlin appear as sources or destinations in WheatNet's Navigator software.

I have personally experienced situations where other radio networks aren't able to connect to my facility (and the other way around) because we both have different IP codec products. If all stations were AES67 compliant, the world would be a much simpler place!

AES67 is not an effort by the AES-X192 team to replace anything — it simply offers an interoperability standard. It works alone, but can be used in concert with popular transport protocols such as Dante and Ravenna.

One good example of this integration is the Simple-IP-8 from Arrakis Systems. The 1RU device is powered by Dante and is AES67-compliant. From a form-factor perspective, the Simple-IP-8 is loaded with 8-mono or 4 stereo inputs and outputs connected through RJ-45 jacks. This allows a studio to launch itself into the AoIP world with an IP-based transport management system that is compliant with AES67 gear anywhere on earth.

AES67 is heralded as well in live sound and music and post-production circles. Imagine a scenario where a fixed or touring live sound system is in place, a broadcast truck rolls in and a recording rig shows up. If all three entities have AES67-compliant AoIP gear, the setup time is greatly reduced and the show goes on with less routing headaches. Each system plugs into a central IP switch and instant magic happens.

Another standard you may hear more about in the near future is AES70, a scalable, control protocol for professional media networks. AES70 addresses device control and monitoring only; it does not define standards for streaming media transport (that's AES67's role). It will work in conjunction with AES67 as well as Ravenna and Dante.

AES67 is a groundbreaking advancement. It frees up purchasing and installation restraints. If an installer wants to use WheatNet-compatible consoles, Telos Hx6 talk show systems, Orban processors and Comrex codecs, he can, and they all operate together with newfound interoperability via AES67.

This was a dominant theme at NAB Show in Las Vegas, and AES67 certainly won't be confined there.

The Need for Automatic Alignment Of HD Radio Diversity Delay

by Alan W. Jurison

The following is an abridged and edited version of a paper presented as part of the Broadcast Engineering Conference of the 2016 NAB Show.

Audible blending artifacts are the top complaint from auto manufacturers and consumers regarding the HD Radio experience. The majority of the problems can be traced back to individual broadcast stations. While our industry has long relied on manual management of diversity delay and time alignment, results in the field often have shown that stations set manually have been known to "drift" over time.

There are a myriad of potential problems that can cause drift, many of which are out of control of any individual device that has been traditionally installed in the broadcast chain. What is needed is a systems approach to this problem.

In this paper, we will discuss the implementation of various combinations of hardware to provide continuous monitoring and adjustment of diversity delay in real-time to reduce or eliminate the objectionable blending artifacts impacting listeners.

WHY DOES IT MATTER?

HD Radio is here to stay and growing rapidly. The biggest area of growth is with factory-installed radios in new automobiles. Ten years ago, the broadcast industry wondered when these digital radios would show up. They are here now, and listeners have them.

In 2015, DTS reported that over 35 percent of new automobiles came with HD Radio as standard equipment. In 2013, that number was about 33 percent. Millions of HD Radio receivers have been sold and are being used, and millions more are added each year. Should these trends continue for the rest of the decade, it will soon be hard to buy a new vehicle without HD Radio. The digital experience of a radio station is something broadcasters should be paying attention to today, because within a few years, whether listeners are aware of it or not, an HD Radio will become the primary radio.

Market-based research conducted by DTS shows that, in many of the largest metro areas, 15 percent or more of vehicles registered on the road are equipped with HD Radio, and in a few markets, that number is nearly 20 percent.

Let that number sink in: One-fifth of the audience could be listening to an HD1 signal instead of analog FM. Those listeners may not necessarily know that they have HD Radio, or be seeking out HD Radio content, but the acquisition of a vehicle installed with HD Radio means they will listen to this content.

If your station is not precisely aligned all of the time, the transition will sound bad, whether from analog to digital, or back from digital to analog when the HD Radio digital signal fails. Just how objectionable this is to listeners depends on how far off the time alignment is and what type of programming is currently broadcast on the station.

My experience, gained from listening to hundreds of stations, is that music formats with light audio processing and spoken-word formats seem to be more susceptible to noticeable audible problems, even with a small offset in samples.

On loud, densely processed music formats, the effects of being slightly out of spec can get buried in the program density to a point. But keep in mind, even these stations have periods of less density that are important, such as talk-intensive morning shows and commercials.

Many broadcasters may think, "Well, the radio blends once every 8

Fig. 1. There are plenty of spots to expect blending, as shown in this set of field measurements.

seconds after it tunes to the station, so it skips once — why does it matter that much?"

Perhaps they think of the blend as an initial acquisition; then you keep digital forever. But that is not always the case. Receivers of all types lose digital lock at some point.

The easiest way to think about this is in the car. The blend point has traditionally been thought of as occurring when someone is driving out of a station's market. At some point on the highway, their receiver loses digital lock, it blends to analog, and eventually as they go out farther and farther, the signal is lost into noise.

Unfortunately, that is not the typical blending experience for listeners because most do not leave the market or the station's signal coverage each day.

Let's consider the station's 60 dBu coverage contour, which is where many FM band HD Radio stations with digital sidebands at –20 dBc tend to start to lose digital lock. If a listener lives and works in that area they can experience the constant drifting in and out of digital lock, causing the radio to blend frequently.

Let me give you just one example of what I mean. I recorded measurements for WNIC, Ann Arbor, Mich., as seen in Fig. 1. (Green indicates good signal; red, bad.) If you lived and worked in the vicinity of the University of Michigan campus, you'd hear blending often as you drove from where you work to where you live to where you do your errands.

AUTO COMPANIES HAVE TAKEN NOTICE

Diversity delay blending issues are the number one HD Radio-related complaint from auto manufacturers.

I can independently vouch for this because I work closely with many

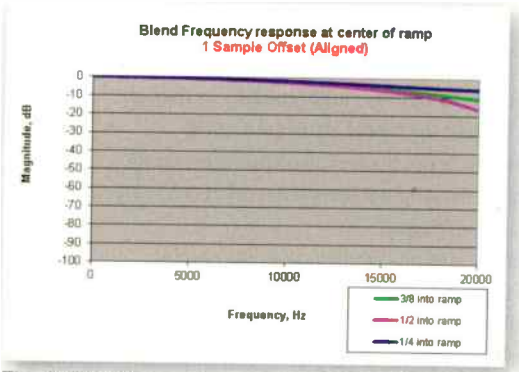


Fig. 2: Blending artifacts at 1 sample offset.

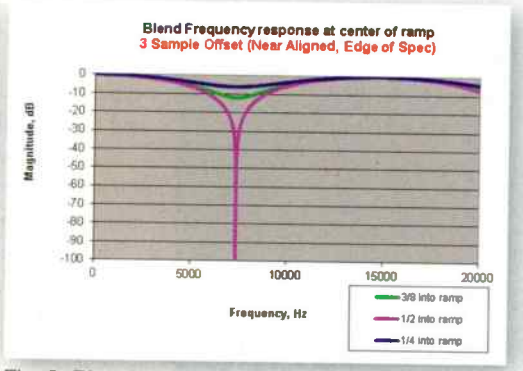
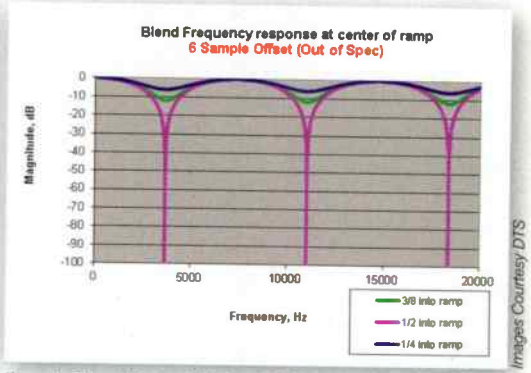


Fig. 3: Blending artifacts at a 3 sample offset.



Images Courtesy DTS

Fig. 4: Blending artifacts at 6 sample offset.

automotive companies. I have had emails, phone calls and idle conversations over lunch about this problem with their engineers. I have been in vehicles with these same engineers when they hear stations skip, and often they ask me to help fix it.

General Motors temporarily removed HD Radio in some vehicle models to help fine tune their implementation to address consumer feedback about HD Radio blending. Their customers have been complaining to them about this for a long time. Instead of calling up the radio station to complain about it, the customer takes the car back to the dealer, thinking there is a problem with the radio.

This customer feedback is not unique to GM vehicles. Automotive designers are sensitive to this problem, and it is my experience that most of the problems come back to issues on the broadcast side.

The official specification from DTS is that the analog and digital signal time alignment should be 0 samples, plus or minus 3 samples. One sample refers to 1 out of 44,100 samples per second in the 44.1 kHz digital audio bit stream.

What exactly is objectionable for an average listener? DTS has performed research, and found there are various, objectionable blending effects, that depend upon the sample offset. Figs. 2, 3 and 4 show the effects

of small sample offsets and the impact on the audio. The aural impact of not being within spec quickly gets out of hand, with only small sample errors. A very noticeable "comb-filter" effect is heard in the audio. Larger errors create more problems; for example, there are 23 deep nulls created by a 50-sample offset.

We've identified the problem and seen how it important it is to solve. Now we turn to real world examples that can create the issues.

EXPORTER LOCATION AND NETWORK DESIGN

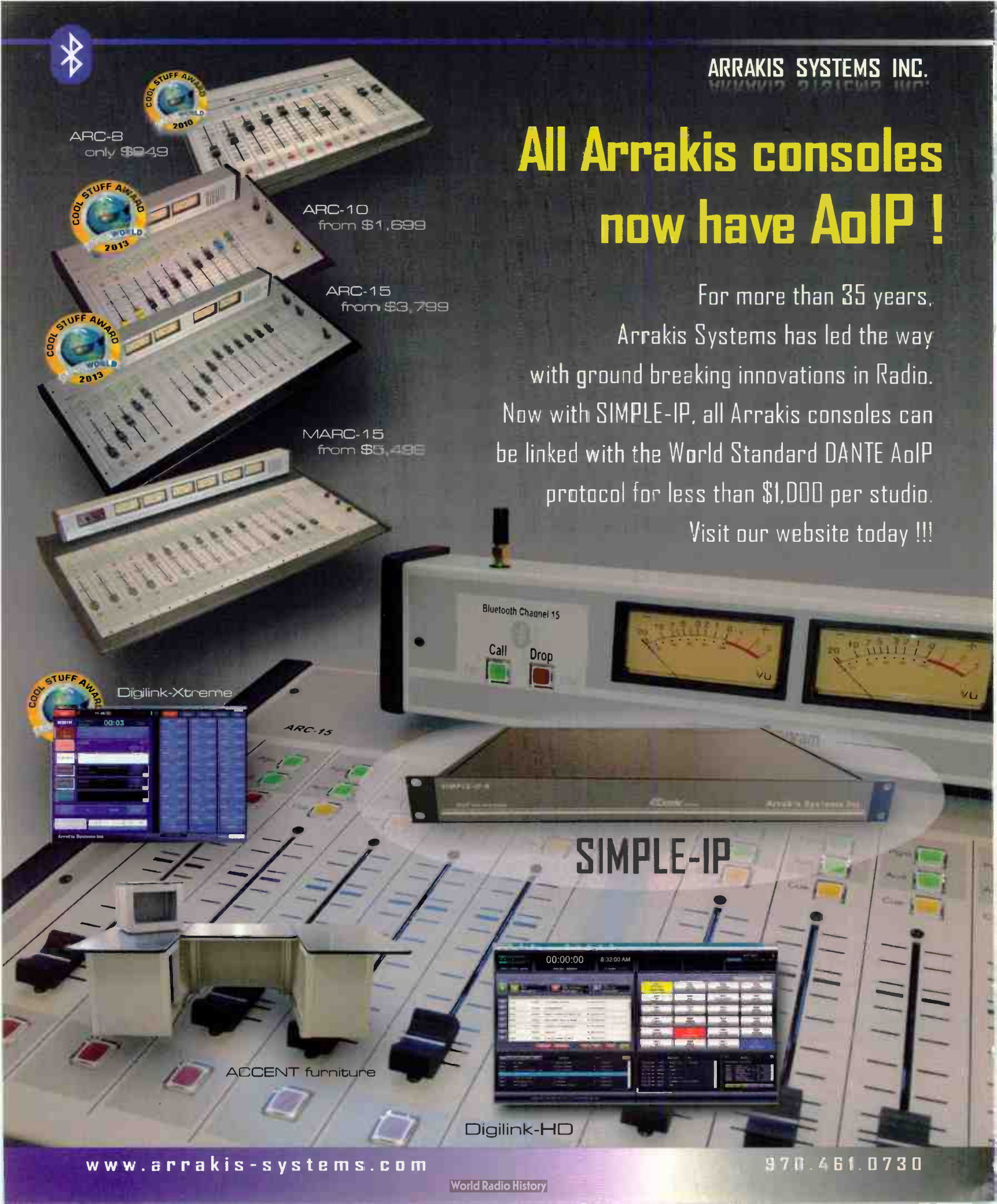
FM broadcasters demanded flexibility in equipment placement, and thus the Exgine system was born.

Earlier implementations of HD had the entire system located at the station's transmitter site; there was little to go wrong then. Those who have implemented and studied more than a few stations have always known that locating the Exporter at the transmitter site produces the most stable results; still, many in the industry pushed to move the Exporter back to the studio. (By necessity, the exporter must have a GPS reference.) However, when the Exporter is located at the studio and connected to the exciter across a LAN bridge, problems can be introduced, such as wide variations in the diversity delay shift over time. The installation of a GPS-disciplined 10 MHz reference source at the transmitter site, as a time-base for the Exciter, mitigates this problem, but does not completely eliminate HD Radio delay drift.

The variable latency on these Ethernet links generally creates jitter conditions far beyond the jitter design tolerances of the Exporter to Exgine (E2X) connection. Another related issue plaguing the industry is that many of these extended Exgine networks are not properly isolated; I have discovered networks where the Exporter and the exciter are on the same network as many other different devices.

Some networks I found even had automation systems and standard end-user workstations on the same subnet as the Exporter at the studio and the exciter at the transmitter site. A Wireshark analysis of these networks will show you that your E2X packets are competing with broadcast traffic that is inherent on large networks, such as the Address Resolution Protocol. I have seen some large networks attached to these bandwidth-limited LAN bridges that the remote connection is nearly saturated with broadcast traffic.

The Exgine network should be isolated on its own subnet, and there are several ways to accomplish this. One is by creating a physically different network for the E2X link that just has these two components on it. The more advanced method (and more commonly accepted practice with larger corporate network environments) would be to create a separate VLAN for this network and use a virtual router in a Layer 3 switch. If a VLAN trunk is established between


ARRAKIS SYSTEMS INC.
All Arrakis consoles now have AoIP !
For more than 35 years, Arrakis Systems has led the way with ground breaking innovations in Radio. Now with SIMPLE-IP, all Arrakis consoles can be linked with the World Standard DANTE AoIP protocol for less than $1,000 per studio. Visit our website today !!!
ARC-8
only $949
ARC-10
from $1,699
ARC-15
from $3,799
MARC-15
from $5,495
COOL STUFF AWARD
2010
2013
Bluetooth Chagnel 15
Call
Drop
VU
Digilink-Xtreme
ARC-15
SIMPLE-IP
ACCENT furniture
Digilink-HD
www.arrakis-systems.com
970.461.0730
World Radio History

NEW...

ARRAKIS SYSTEMS INC.

ARC-8 Blue

Bluetooth, wireless, Cell phone interface & Stereo streaming

NO Hybrid required

long life switches,
conductive plastic faders,
Socketed ICs for fast on site repair.

- Eight channels
- Stereo Program output
- 2 mic, 4 stereo line, PC, & Phone in
- USB interface for play and record from a PC
- Mix minus in-out for an external Telephone hybrid
- BOTH balanced and unbalanced inputs and output for flexibility

The BEST of both analog and digital. With the NEW Bluetooth built in, the ARC-8 features a wireless Cell phone interface for telephone talk shows and wireless audio streaming from any Bluetooth device such as an MP3 player. The ARC-8 Blue also features a built in USB sound card to play and record in digital directly from both Windows & Apple *PCs. With BOTH balanced and unbalanced inputs and outputs, the ARC-8 works out of the box in any Radio application.

Fast, easy installation:
- RCAs for unbalanced IO,
- Cat5s for balanced inputs,
- XLRs for mics & Program output

Bluetooth enabled !!! The #1 selling ARC-8 advanced Radio console has gone 'Blue'... Bluetooth enabled that is! This means that Channel seven on the console can be paired to any Bluetooth enabled audio device such as your Cell phone, MP3 player, MP3 recorder-editor, and more. Just pair your cell phone to the ARC-8 and answer your incoming calls with the 'Call' button and drop them with the 'Drop' button, just like a standard phone hybrid. The Caller receives the console bus mix ('minus' the caller audio) so there is no feedback. OR... you can pair any Bluetooth enabled audio device such as an Ipad, Tablet device, or MP3 player and stream full bandwidth, high quality stereo (A2DP) audio to channel seven on the console. If a paired Cell phone call comes in, then the stereo stream is dropped and the call can be answered. While an external hybrid is not needed, Arrakis does all of this while still allowing an external phone hybrid to be connected if desired. Your imagination is the only limit with this amazing console !!!

list price $1,099

*USB sound card supports USB HID compatible PCs

the two ends, make sure the bandwidth needed for all traffic is adequate, and configure VLAN priority so that the VLAN accommodating the E2X packets has the highest priority.

The reality is, in present day third- and fourth-generation hardware, the exporter belongs at the transmitter site if you want to remain in 0 ± 3 samples specification that DTS has defined as "perfect" alignment.

POTENTIAL PROBLEMS

Exporter or exciter reboot. Third- and fourth-generation HD Radio transmission hardware is far more reliable than the earlier generations, so the need to reboot due to a hardware or software lockup is typically lower compared to the past.

Still, there are circumstances that can cause reboots, such as power interruptions to the exporter or exciter. These can be mitigated during power failures or switchover from utility power to generator and vice versa by installing an Uninterruptable Power Supply to increase reliability. The Exgine system in its current design does not have deterministic startup; so, at every reboot, the exporter can start at a different time reference with respect to the receiving Exgine interface in the exciter. The manufacturers have worked with DTS on this issue to some degree, but it is not perfect.

Front panel of the Belar FMHD-1

Improper clocking configuration. It would be impossible to cover every Exporter and exciter clocking configuration in the scope of this paper. Suffice it to say that you must follow the proper configuration for your exporter and exciter installation as recommended by your manufacturer. Make sure you are on current known-stable firmware and software builds from your manufacturers.

GPS synchronization. There is a common misconception or myth that exists among broadcast engineers that says if the Exporter is located at the transmitter site, GPS synchronization is optional. This couldn't be further from the truth. GPS-disciplined oscillators are a requirement for long-term stability of the station to maintain the 0 ± 3 sample spec. Additionally, many exciters use the GPS reference to make sure their oscillators, sampling and 10 MHz subsystems are disciplined and fall within acceptable operating tolerances.

Hardware failures or defects. Sometimes components in these systems fail or need to be recalibrated due to age. These can be tricky to troubleshoot in the field if the engineer has little experience with the hardware. Often times, loaner or spare Exporter or exciters can be used to help troubleshoot the issue; sometimes it is be best to send them back to the factory for analysis.

Separate audio processors for FM and HD Radio. The once-embraced tactic of implementing a separate audio processor for analog FM and the HD1/MPS digital audio has caused blending headaches that this industry did not have imagine thirteen years ago when systems were first implemented.

The processing requirements for analog FM and HD Radio are radically different. Because of these differences, separate processing was at first encouraged as a best practice for stations adding HD Radio. It was not until about 2005 or 2006 that the audio processor manufacturers started offering devices with FM+HD processing integrated in to a single box. Use of these single box processors has become the accepted practice for the new installations of HD Radio.

When using separate processors, and even if a station achieves perfect alignment with no drift whatsoever, the blends between analog and digital often do not sound good. Ultimately, the industry may find that it must eliminate separate audio processors for analog and digital, and implement integrated processors to achieve blends that are not objectionable to listeners and automotive companies.

SOLUTIONS

For years, broadcast engineers have been working with iBiquity (and now DTS) along with transmitter hardware manufacturers to resolve the alignment problems discussed in this paper. Progress has been made, and some of the issues that cause drift have been addressed. However,

as I have transitioned from a traditional broadcast engineer to an HD Radio implementation specialist for iHeartMedia, I have discovered there are many variables beyond the control of all the individual parties involved; too many in fact. The set of issues I have mentioned isn't even complete.

There needs to be an industrywide push for updated, precision and continuous diversity delay measurement systems and automatic corrective systems. iHeartMedia and other broadcasters have been asking for products and solutions in this area, and we have seen the industry respond in the last few years. At the 2015 NAB Show there were many solutions introduced to the marketplace. (Even more were present at NAB Show in 2016.)

The correction devices take one of two forms. The two-device system pairs a monitoring receiver that can measure the diversity delay offset, and subsequently sends a correction offset to a device that is active in the analog air chain (an audio processor, delay unit or Exporter). If the station has some of these products already, this could make a lot of sense. By upgrading firmware on existing devices, it may be possible to put together two pieces of hardware to come up with an automated hardware solution.

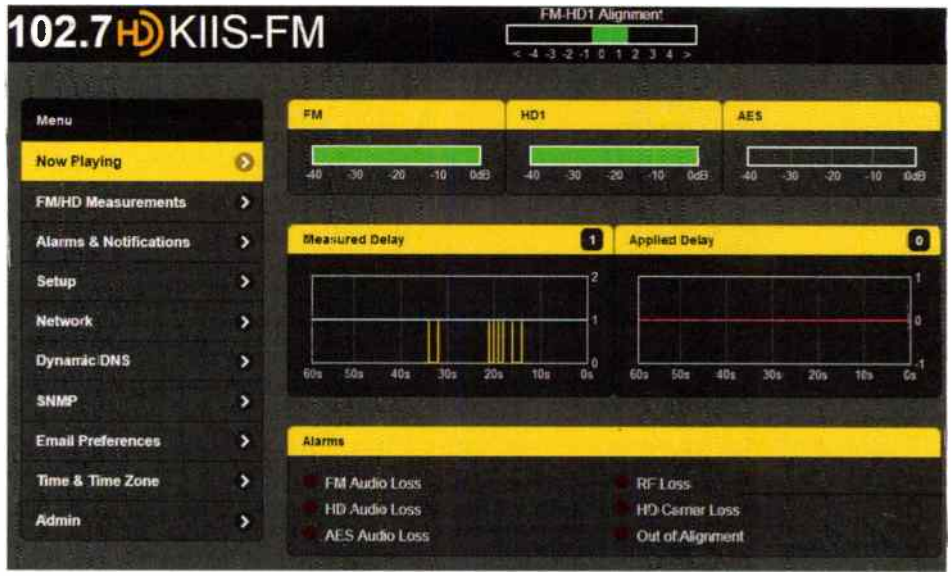
Some stations may choose to implement a single device system that measures and corrects the diversity delay in a single device. The single devices have an integrated receiver to make the measurements of delay offset, and can be inserted into either the analog or digital air chain to make delay adjustments. A simple antenna or RF sample (in FM+HD) with the appropriate amount of attenuation and is used to drive the device.

That is not the typical blending experience for listeners because most do not leave the market or the station's signal coverage each day.

Many engineers with whom I've spoken are most comfortable with the device right before the exporter, so that any adjustments it makes to the delay are contained to just the digital audio, leaving the analog plant untouched. In that implementation, the existing diversity delay in the analog chain is increased to a larger number than previously needed; then, the device will makes up the difference in the digital chain. For example, if the analog processor is performing the delay at eight seconds, this could be increased to ten seconds. The automatic correction device in the digital chain would add two seconds of additional delay to the digital chain to match the larger delay in the analog chain. The advantage of

going in this direction is that the devices can then correct the digital audio level and provide level alignment between analog and digital. This configuration will not work for any station that has to eliminate all delay for live programming and enter what is commonly referred to as "ballgame mode." I have compiled a list of products that can help stations monitor and manage diversity delay. I have not personally tested each solution; the list should not be construed as a product review or endorsement. Also, this is an evolving space; check with each vendor about pricing and delivery schedules for the devices under your consideration.

Belar FMHD-1. This broadcast monitor receiver makes a variety of HD Radio related measurements, including continuous measurement of diversity delay. The correction offset can be sent to a variety of devices, such as products from GatesAir, Nautel, Omnia, Orban, 25-Seven and Wheatstone. For devices which jump to the correction delay value, the FMHD-1 has an optional ramp function which sends the correction in user defined incremental steps. After a recent software release, the FMHD-1 can now scan up to six station presets and send correction codes to supported delay devices. The latest versions implement the most recent measurement filtration techniques developed in fall of 2015 by DTS. Belar is actively releasing new software for this device, so look for the latest version.



Online view of Justin 808 measurement dashboard

Delay offset corrections are made in the analog chain. For GatesAir or Nautel Exporters, the station may be configured in two different methods: You can employ the traditional Exporter delay model, configuration option "GatesAir FM" or "Nautel FM" meaning the analog air chain is looped through the exporter, providing the full analog diversity delay (7-10 seconds).

There is a newer configuration with options "GatesAir HD" and "Nautel HD" that includes a fixed analog delay in another device, such as an audio processor in the analog air chain at a high fixed value (i.e. 10 seconds). The engineer then loops the HD1/MPS digital input through the exporter's delay to increase the HD1/MPS delay 1-3 seconds to match the HD1/MPS to 10 seconds on the analog.

Broadcast Electronics XPi10esp Exporter. This Exporter has a built-in diversity delay alignment feature. The Exporter can be provided with audio of the analog and digital from a receiver running in split mode, and configured to measure and maintain diversity delay. Note that the station must be configured to have the analog diversity delay fully provided by the Exporter for this feature to work.

DaySequerra M4DDC. This is a single-box solution, inserted in the AES path for either the analog or digital air chain perform, where it makes the corrections necessary for time alignment, level alignment and phase reversal correction. It has a web GUI and can send alarms via GPIO, SMTP (email alarms), or via SNMP. The web GUI can show you how well the device is working over a period of time in a graphical fashion. The latest version implements the most recent measurement filtration techniques developed in fall of 2015 by DTS. DaySequerra is actively releasing new software for this device, so be on the lookout for the latest version. This is an FM-only device; an AM version with slight hardware variations is expected in the future.

DaySequerra M4.2 TimeLock. This broadcast monitor receiver makes a variety of HD Radio-related measurements. It continually measures delay diversity, which is helpful for aligning stations manually. In addition, it supports automatic diversity delay correction with many of the Nautel, Omnia and Wheatstone audio processing products listed below. Support for delay controls in the GatesAir HDE-200 Exporter, Nautel Exporter Plus, and Omnia 11 audio processor is planned soon. The latest versions implement the most recent measurement filtration

CONTINUED ON PAGE 38

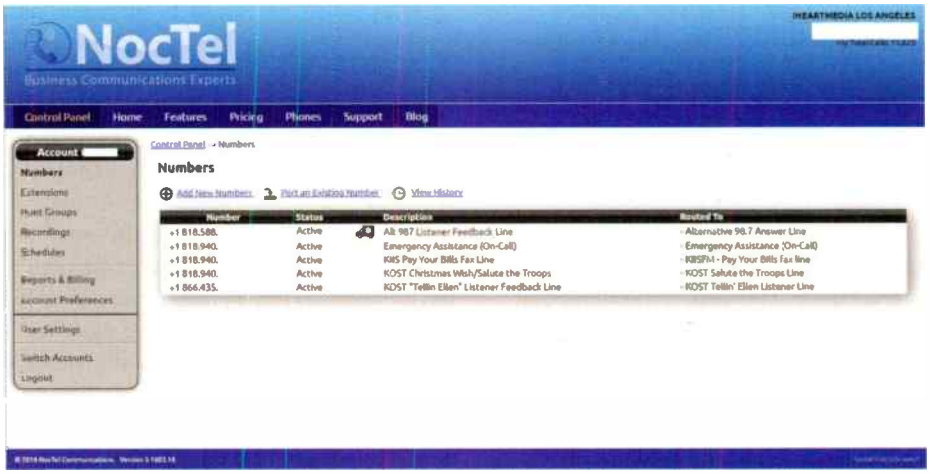
Use Hosted Solutions to Improve Results (and Save Money in the Process!)

by Clint Sago

As an IT manager in the radio industry, I'm regularly tasked with challenges that extend outside of the traditional world of information technology. These challenges span many areas of technology — from audio and video streaming, telecommunications, media delivery, studio DAW design, automation system integration, security — you name it, management views it as part of information technology. For those of us who enjoy challenges, this can be an exciting aspect of the job, as exposure to new ideas and technologies will likely come into play.

One of the smaller but interesting tasks I've repeatedly encountered over the years was finding the best way to capture listener feedback ("leave a message after the beep") for after-the-fact on-air usage. It's a detailed process, from capturing the best possible audio quality, to making that audio available to the editing staff automatically, to ensuring 100 percent availability and uptime.

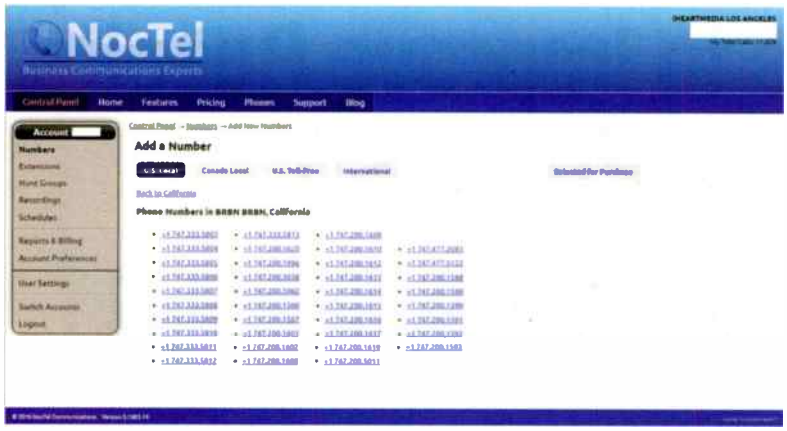
Another consideration is the message volume; we need to ensure the caller volume won't affect the day to day operation of the office telephone system. While there are dozens of ways of approaching this, the methods can be costly, tedious to manage, difficult to integrate — and still result in audio quality that will make you cringe.



The NocTel web interface affords the user an easy means in keeping track of numbers announced to listeners; descriptions of said numbers; and finally, personnel to whom they are routed.

I can honestly say that all the means we used to address this task (prior to the one we are using now) had major limitations. The product used when I arrived at the job was managed by folks in a separate department. It was an answering machine in a production studio that had the speaker rewired to an input on the board. While being a somewhat creative solution, the limitations were many.

The second method was a step in the right direction, but actually resulted in lower quality audio due to the way it was captured. This method used a PC with a voice modem and specialty software built to capture audio across an analog phone line. The software was very functional and allowed multiple file formats as well as options for local or network storage which



Adding new numbers for listener feedback purposes is greatly simplified.

helped alleviate any sort of long term retention and storage space limitations. It also allowed for simple outgoing message management and even handled multiple lines on one computer.

Unfortunately, the audio quality captured by a voice modem didn't have the same clarity as the answer machine method. Additionally, the software and computer would need regular monitoring to ensure they were operational and doing what you needed them to do.

Yet another method was the integration into the local office telephone system using a voicemail box. As expected, audio quality improved, and some of the problems associated with using a singular PC were eliminated. While a move in the right direction, this method had one very unfortunate downside: The call volume of some of the larger shows was too much for the system to handle, which resulted in a hard crash of the entire office phone system. After this happened twice in a short period of time, it was determined this solution was not worth the cost of affecting an entire facility's ability to make and receive calls. We moved back to the PC-based solution.

Listeners have migrated to mobile phones almost entirely and have stopped calling from land lines. This minimized the effectiveness of the PC voice modem method to the point it was being phased out. Again, we needed a better solution.

VOIP

We began to dig into the world of VoIP to learn about more options. While meeting with potential partners and learning more about what technologies were available, the concept of hosted solutions came into the conversation.

While this isn't what we're using for the office system, the capabilities of a hosted solution sparked my interest as a potential replacement for our listener feedback lines. I then met with Cory Schruth of NocTel, who manages hosted solutions for businesses of all sizes. It seemed almost too good to be true; for every question I had, Cory supplied the right answer; and NocTel allowed us an opportunity to test out their service to see if it would suit our needs.

The initial benefits of using a hosted solution were many.

We had a large range of numbers from which to choose, which made finding something useful in relation to the station frequency a simple process. The audio quality was drastically improved from every prior method and the delivery of the audio can be through a web page or directly delivered by email as an attachment (in

Access to the recordings couldn't be easier. One person can easily "filter" them for content prior to passing them on to the production department for further use.

multiple formats). The caller volume was now irrelevant, as the hosted solution could receive an unlimited number of callers simultaneously, so the folks who chose to call and interact with the station were never turned away by a busy signal. This resulted in more messages to use, which resulted in better results in our on-air product. The production folks were also happy, as this method allowed for delivery to someone who can filter through the messages ahead of time and forward only the ones that programming deemed worth using. It really did save time and effort across the board.

If those results weren't enough to sell you on the concept, the cost improvement should be.

Gone are the costs of hosting a traditional phone line, a toll-free line or some sort of software licensing. The time saved in ordering and setting up phone lines, computers and in maintenance of these systems by the technical staff is also pretty much completely eliminated.

Using the hosted solution is as easy as going to a website and working through a simple yet effective interface with a deep number of options we never had before. The outgoing messages and delivery can now be set on a schedule, so the system can be used for multiple dayparts. The ability to change where the messages are delivered or to add a new number rapidly is impactful. The last time I added a new line for one of our morning shows, it was operational in less than five minutes from the moment I reserved the number.

We are now using more listener feedback lines than ever before at a fraction of the cost of all of the previous methods. The standard cost for one of our listener feedback lines is based on a flat monthly rate. In addition to the pricing benefit, the ability to make immediate changes and the enhanced features, we also have the ability to gauge usage as the call details are all logged. We've begun to use the system for other purposes such as an off-hours rotating on-call emergency line and a contest fax line with digital delivery, further eliminating clunky solutions to old problems. I've been truly impressed with the capabilities of what can be done with a modern hosted phone system.

In an industry where time, money and results are key, it's rewarding to find solutions that make you happy and that you can rely on for the unforeseen future. I recommend trying out a hosted solution for your own stations and finding out just how simple and effective they are!

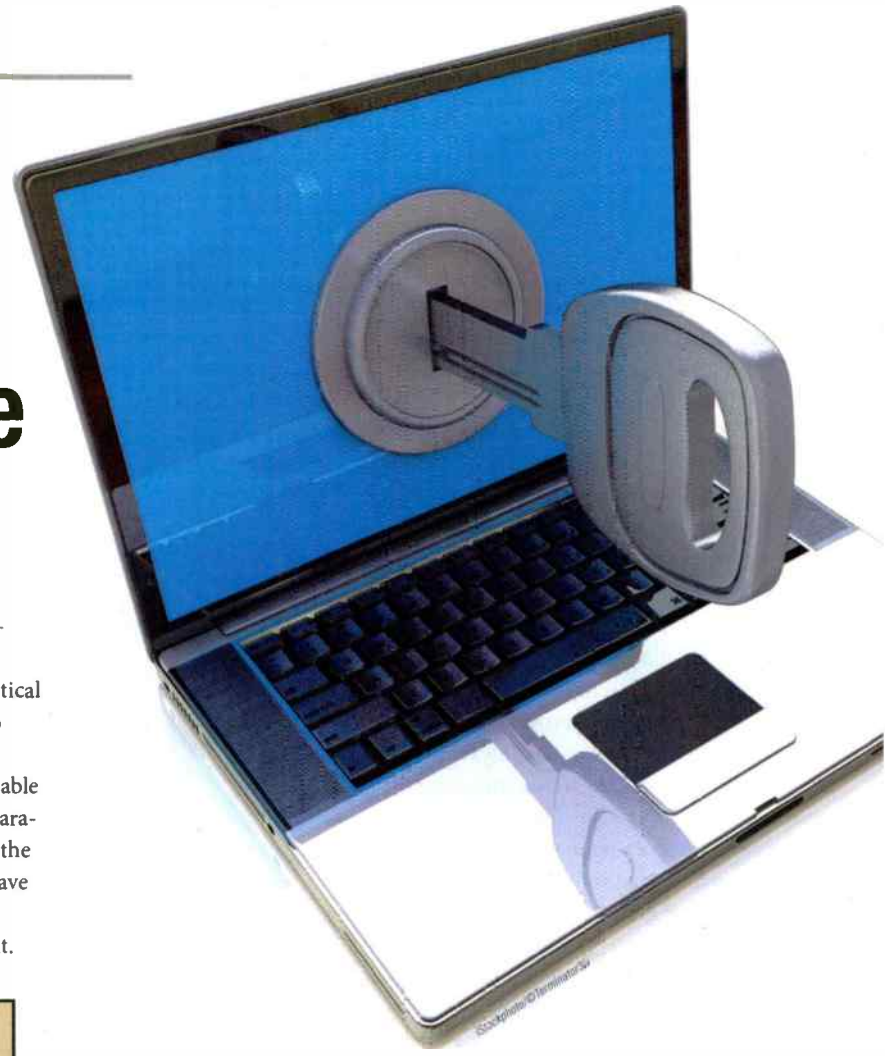
Sago is the director of IT for the iHeartMedia Los Angeles group of stations.

MORE INFORMATION

503-764-4300
https://www.noctel.com/voip/home.php
support@noctel.com

The Default Is No Longer Acceptable

by Chris Cottingham



Recent cyber attacks targeting the radio industry have directed my attention to security.

We all have engineering networks that run our most critical systems. Are they protected? Just how far should I go to protect them?

I think the answers really depend on the level of risk that is acceptable to you for your network. How well do you sleep at night? I am very paranoid, so I watch just about every aspect of my network, starting with the actual switches and ending with application and web monitoring. I have touched on this in a previous article.

Is this overkill? Probably, but I sleep very well at night because of it.

Let's take a look at these attacks and what you as the responsible engineer can do about it.

DEFAULT SETTINGS

The attacks that hit some Midwest stations recently are the result of poor passwords and lack of firewalling. Any device that is critical to your operation deserves to be protected by a secure password and firewall. We get busy setting up devices that we need to use and then forget about them. This is the worst thing an engineer can do.

Most devices have default passwords that are easily discovered by hackers that are looking for access. That is exactly what happened to the stations recently targeted. All of the devices that were compromised were left with default passwords or passwords that were easily guessed. The devices that were compromised were either not behind a firewall or were not properly secured by a firewall.

We need to be diligent in our implementation of security for our networks. The days of installing devices in a default configuration and forgetting them are over.

PASSWORDS

Passwords need to fit certain criteria: at least eight characters long with mixed case and symbols, add some numbers too if you want. Anything that creates complexity is good when dealing with secure passwords. I'm not advocating the use of a 50-character randomly generated password, but we need to be a bit more creative and use passwords that are not easily guessed.

An example would be Lock@Load. This is a great password that cannot

ARRAKIS SYSTEMS INC.

'AWARD WINNING' Consoles

ARC-8
only
$849

USB
play &
record

Bluetooth
Cell phone &
Audio Streaming
options

ARC-10
from
$1,699

Merging
analog & digital
technologies to
bring you the best
of both worlds

ARC-15
from
$3,799

go to the arrakis
website for
details

www.arrakis-systems.com

970.461.0730

be easily guessed. It is nine characters long and has mixed characters. Another example would be WnBc45y3ars! This one has almost all the best features of a secure password.

Any device that is critical to your operation deserves to be protected by a secure password and firewall.

FIREWALLS

Firewalls are your friend. Most engineers shy away from parking audio devices behind them due to latency issues, but this is really a non-issue in today's environment.

The latency caused by utilization of a decent firewall is negligible. However, I have seen latency issues with cheap firewall routers from Linksys and Netgear. These consumer routers just do not have the horsepower or the reliability to deal with critical audio streams. If a firewall is to be utilized in a mission-critical environment, spend a few dollars more and get a Cisco, Sonic Wall or similar high quality device.

Another issue with firewalls occurs with opening ports for pass-through.

Most audio devices are web-configurable but use alternate ports for the actual audio streams or data streams. Therefore, you do not need to open the web console port on the firewall. Just open the ports for the data that needs to go over the internet and manage the device from within your engineering network. The devices compromised in the recent attack were behind a firewall but had the web console port open to the internet. Bad idea.

Parking your devices on a dedicated internet access circuit would not have fixed the problems exploited recently. The hacker had access to the device either way and could change the audio feed source. That was the real issue.

The audio feed was redirected, and the device played alternate audio until the engineer unplugged it. In this case, some of the devices were located at transmitter sites, and it took many hours for the engineer to get there and shut it off. Sometimes we cannot easily fix what has been compromised.

RANSOMWARE

Ransomware attacks have also crippled some radio markets recently.

These attacks encrypt all the data on your networks and offer to sell you the unlock key for a price.

Imagine that all of the audio files that your production people use

daily and the audio files of the automation systems are suddenly encrypted and unreadable. You would pay almost any price to get them unlocked.

The ransomware virus actually scans your network for shared drives and will encrypt any data that it has access to. Because of this, I keep a backup of my network on an offline NAS storage device. I physically plug in the backup device, make my backup and then unplug it.

Paranoid I know, but effective.

Sometimes, engineering solutions are extreme and manual. The backup method might be a little old school, but that is better than losing everything to a ransomware attack.

Imagine that all of the audio files that your production people use daily and the audio files of the automation systems are suddenly encrypted and unreadable.

INTERNAL THREATS

Firewalls and passwords will do little to protect your station if you have end users that utilize the internet for work.

I have users who access the internet for show audio files and FTP downloads of shows. They are always clicking on something that causes me grief. This is where the ransomware attacks come into play — they need a user to click on the wrong item to get started.

We are not going to get away from our end users needing internet access on our engineering networks; so I redirect all internet traffic to a proxy server and lock out Port 80 traffic from all other computers. This allows me to filter all web-based traffic that goes through my engineering network.

I also disallow administrator access to any engineering systems. All the users are standard non-admin users. This keeps the user from causing too much damage to the computer itself. Individuals can destroy their own accounts but cannot do anything to kill the machine (usually).

Almost all of the recent infamous ransomware attacks were successful because the machine that was infected allowed standard users admin control.

MAKE IT A PRIORITY

Security is often the last thing we consider for our engineering networks. We get so busy with all of our other duties that we just do not have the time or energy to really give it the attention it needs.

We need to change this attitude. We are under constant attack from all kinds of different sources on the internet.

Engineers need to have security procedures, firewalls and good passwords on their networks. If you have these three things under control, then your network probably won't get hit with some of these recent types of attacks.

If you don't, or can't institute these things, then try to find someone who can help you locally.

Call a local network consultant and get some help before you are the victim of one of these attacks. There are companies dedicated to helping you with security. "White hat hackers" will test your network, try to break in electronically, and assess all the areas where your network has a weakness. The cost for this service varies, but in larger markets it is worth it.

If you do not have the resources to hire a security consultant then take some time and do your own research. Unsurprisingly, there is a lot of information on the 'net that will help you.

Cottingham is a Cisco, Microsoft and CompTIA instructor with 25 years experience in IT and radio engineering. He's also the chief engineer of KFMK in Austin, Texas.

2016 BEST of SHOW Radio

Introducing the 2016 winners of the NewBay Media Best of Show Awards from Radio magazine. Exhibitors at the spring NAB Show submit new products for consideration and pay an entry fee; winners are then selected by a panel of judges consisting of engineers and editors. To see all of the nominees submitted to the participating publications, visit the Best of Show Program Guide, found online at

radiomagonline.com/bos2016

(Photos by Chris Wygal)

From left: Don Landels, Brian Frankson and Curtis Macheck receive the plaque from Doug Irwin.

CLOUDCAST SOFTWARE

Cloudcast Software's **Broadcast Logger** is a new way for stations to capture, store and manage audio logs. Logs are stored in the cloud and accessed through a password-protected web portal that makes it easy to access audio logs on the go and anywhere in the world. The software records both audio and station metadata; every element going on the air in the automation system can be logged, along with program audio feed and mic closures.

According to the company, just install the software on a Windows utility computer with internet access, program audio feed and set your automation system to send metadata to the Broadcast Logger APL. The export tool allows users to select any one or more parts of audio logs, both by metadata and time of day, to combine into a single audio file and send it where it's needed.

Steven Bell (left) and Doug Irwin present Brian Way (center) with the award.

ESE

ESE's **ES-410** is a Global Positioning System-based frequency standard that generates a stable source of 10 MHz and 1 PPS using satellites as a reference. The unit provides 10 MHz in both sine wave and square wave (5-volt logic) form. Four sine wave and four square wave outputs are provided. The 1 PPS output is a 50 percent duty, 5-volt logic signal, positive-edge coinciding with the UTC seconds change. An ESE TC90 timecode output is also provided for driving remote time displays. Two front-panel LEDs indicate when the unit is locked to GPS and when power is supplied to the unit.

Rich Redmond, left, and Keyur Parikh right, accept the award.

GATESAIR

GatesAir has expanded its Intraplex family of intelligent IP networking solutions with the **IP Link MPX**, a new audio codec built specifically to solve the problem of transporting analog FM composite multiplex signals over IP networks. The IP Link MPX is a full-duplex product built for studio-to-transmitter link applications for FM broadcasters.

The company says it is especially ideal for broadcasters who lack the network bandwidth to distribute a full AES192 digital FM composite signal, which typically requires 5 MBps of bandwidth from studio to the transmitter; and/or lack AES192 signal-receiving capability in their legacy exciters.

Todor Ivanov proudly holds both of the DEVA award plaques.

DEVA

DEVA won two awards from the magazine at this spring's convention: The company was recognized for the **Band Scanner 2** FM monitoring tool and the **DB910** full duplex IP audio codec.

The company says Band Scanner 2 is the updgraded, more versatile version of the company's original Band Scanner tool. It assesses FM broadcast band congestion and measures RF level, MPX deviation, left and right audio levels, RDS and pilot injection levels. Measurements are stored in a log file, which can be converted into KMZ format and visualized in Google Earth. With the Band Scanner 2, users can view the playlists of competitor stations and also save and export them into an Excel file. Free Windows software sweeps the receiver across the FM band and generates a spectrum display of carrier level versus frequency. Each carrier is analyzed and a station list is created, and the list of stations with an RDS presence is then refined to show all radio data groups transmitted. Spectrum plots can be saved as either JPEG or BMP files.

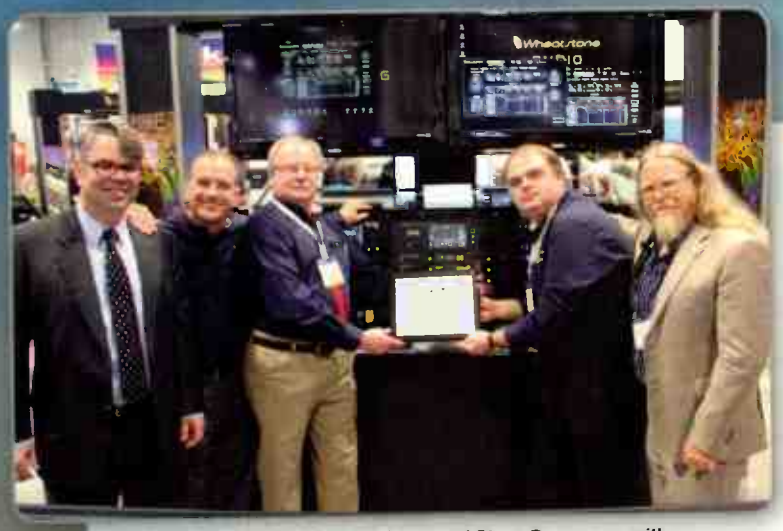
The DB910 enables users to send and receive audio at the same time. Where two-way transmission is not required, it may be used as either an encoder or decoder, as it is fully compatible with DEVA's IP audio codecs. The DB910 can be used for a range of professional audio applications, including broadcast, internet radio, studio to transmitter link and VoIP. With several backup audio sources incorporated, the DB910 will switch between sources when audio is lost and return to the main source when audio is restored without user intervention. Combining the compact form of the DB90 and some of the features of the DB9000 line into one product, the DB910 is equipped with two-way GPIOs and RS-232 serial communication.

INOVONICS BROADCAST

Inovonics' 525N AM modulation monitor is a third-generation product and the successor to the Inovonics 525 AM modultation monitor. It offers IP connectivity with full SNMP support and a web interface, giving total remote control of all setup parameters, metering, alarms with logging and streamed audio monitoring.

The 525N maintains full wideband response for measurement, and it also features user-selectable audio monitor cutoff characteristics to mitigate noise or to simulate the response of consumer radios. A proprietary phase-locked synchronous detector provides precise demodulation, rejects interference and recovers only the AM component of HD Radio hybrid transmissions. The 525N is also compatible with power-saving MDCL operation.

From left: Gary Luhrman, Jim Wood, Ben Barber, Josh McAtee and Zach Calden are recognized by Doug Irwin.



Jay Tyler, Jeff Keith, Mike Erickson and Steve Dove pose with the award.

WHEATSTONE

Wheatstone says the company has put a whole new set of advanced audio control algorithms behind the touchscreen of the AirAura X1 digital audio processor. Users can make an adjustment on the screen and complex scripts go deep into processor parameters to make multiple inter-related adjustments to push the sound in the desired direction. A library of presets is supplied to keep some users in safe territory, while more advanced users can use the professional GUI to refine the sound even more.

The company sums up the product as "established Vorsis technology at a midrange price."

WORLDCAST SYSTEMS

WorldCast Systems' **Audemat Control** is a new remote control system offering a reliable, feature-packed platform that supports a number of input and output connections in a 1RU enclosure.

WorldCast introduces this product as a replacement for the Relio, compatible with existing installations.

Audemat Control provides 64 digital inputs, 64 digital outputs and 24 analog inputs, four serial ports, two Ethernet ports, four USB ports, one audio output, one audio input and one modem. The unit offers I/O termination panels with screw terminal connectors to enable connection to real-world signals.

New features include an extractible modem and removable SSD card to ensure ease of maintenance. The voice modem also offers DTMF capabilties for traditional remote notification and control. The unit includes ScriptEasy software as standard.

Kevin Campbell, Doug Irwin, Tony Peterle, Christophe Poulain, Nicolas Boulay and Grégory Mercier mug for the camera.

Get Immersed In Audio

AES Los Angeles 2016

141ST AUDIO ENGINEERING SOCIETY INTERNATIONAL CONVENTION

Network With Audio's Best

The Latest Gear

Tutorials, Workshops, and Dialog

Los Angeles Convention Center,
Los Angeles , CA

TECHNICAL PROGRAM: SEPT. 29 – OCT. 2, 2016

EXHIBITION: SEPT. 29 – OCT. 1, 2016

#AESLA

Audio Engineering Society

Facebook.com/AESorg

For more information visit our website at: *www.aes.org*

For exhibition and sponsorship opportunities contact **Graham Kirk**: *graham.kirk@aes.org*

If It's About *AUDIO*, It's At *AES!*

CONTINUED FROM PAGE 26

techniques developed in fall of 2015 by DTS. DaySequerra is actively releasing new software for this device, so keep an eye out for the latest version.

GatesAir HDE-200 Exporter. This device can receive correction information from the Belar FMHD-1. Future support for the DaySequerra M4.2 TimeLock is planned. With Belar's latest software, the exporter's delay corrections can be placed in either the analog or digital chain.

A systems approach, with continuous monitoring and real-time adjustment of diversity delay, will reduce or eliminate the objectionable blending artifacts impacting listeners.

Inovonics Justin 808. This is a single-box solution that is inserted in to either (AES) analog or digital airchain and makes the corrections necessary for time alignment, level alignment and phase reversal. It has a web GUI and can send alarms via GPIO, SMTP (email alarms), or via SNMP. The web GUI can show graphics on how the device is working over a certain time period. The latest versions implement the most recent measurement filtration techniques developed in fall of 2015 by DTS. As of this writing, development of the Inovonics firmware is stable, and new features are being considered. Check for the latest firmware before proceeding. This is an FM-only device; there are no current plans to make an AM version.

Nautel Exporter Plus. This device can receive correction information from the Belar FMHD-1. Future support for the DaySequerra M4.2 TimeLock is planned. With Belar's latest software, the exporter's delay corrections can be placed in either the analog or digital chain.

Omnia .7, .9, .11. Any of these audio processors can work in conjunction with the Belar FMHD-1 to automatically adjust the analog diversity delay. The Omnia.11 requires version 1.6 firmware or higher. At the time of this writing, the DaySequerra M4.2 TimeLock integration was available with Omnia.7 and Omnia.9 processors, with support for the Omnia.11 planned for the near future.

Orban 8600, 8600S, 8500, 8500S, 5700 and 5500. Each of these audio processors can work in conjunction with either the Belar FMHD-1 or the DaySequerra M4.2. Orban notes that even the non-HD versions of these processors make diversity delay available for stations running separate analog FM and HD Radio digital audio processors.

25-Seven Precision Delay. This device can be inserted in the analog air chain to achieve diversity delay and supports automatic correction adjustments from either the Belar FMHD-1 or the WorldCast/Audemat Golden Eagle HD.

Wheatstone AirAura X3, FM531HD, FM-55, AM-55 and VP8ip. Each of these audio processors can work in conjunction with the Belar FMHD-1 or the DaySequerra M4.2 TimeLock.

WorldCast/Audemat Golden Eagle HD. Golden Eagle HD is a broadcast monitor receiver that makes a variety of FM and HD Radio related measurements, including diversity delay. It can work with the 25-Seven Precision Delay for automatic diversity delay correction. Also, it can be configured to monitor diversity delay alignment and send alerts if alignment (or other parameters) out of specification. All alignment measurements are available via SNMP for use by third party equipment.

The experience of over 10 years of HD Radio transmission has shown that the majority of the problems with blending artifacts can be traced back to individual broadcast stations. That's in no way meant to demean the efforts of engineers out there; even the stations with the most diligent adjustments will still drift, for reasons not in control of station personnel. A systems approach, with continuous monitoring and real-time adjustment of diversity delay will reduce or eliminate the objectionable blending artifacts impacting listeners.

ADVERTISER	PAGE	PHONE	WEBSITE
Acoustics First	33	888-765-2900	www.acousticsfirst.com
Arrakis Systems	11, 22-23, 31, 43	970-461-0730	www.arrakis-systems.com
AudioScience	24	302-324-5333	www.audioscience.com
Bay Country Broadcast	26	877-722-1031	www.baycountry.com
BDI	35	914-737-5032	www.broadcast-devices.com
Belar Electronics Laboratory	10	610-687-5550	www.belar.com
Besco Internacional	40	321-960-4001	www.besco-int.com
Broadcast Electronics	5	217-224 9600	www.bdcast.com
Broadcast Logger	13	844-684 8880	www.broadcastLogger.com
Broadcast Software Int'l	7	888-ESI-JSA-1	www.bsiusa.com
Broadcasters General Store	17	352-622-7700	www.bgs.cc
CircuitWerkes	39	352-535-6555	www.circuitwerkes.com
Deva Broadcast	12	855-428-7272	www.devabroadcast.com
Digital Jukebox	27	702-487-3336	www.digitaljukebox.com
DM Engineering	40	800-249-0487	www.dmengineering.com
Enco	1	800-ENCO-SYS	www.enco.com
ESE	20	310-322-2136	www.ese-web.com
Gorman Redlich	40	740-593-3150	www.gorman-redlich.com
Graham Studios	16	866-481-6696	www.graham-studios.com
Henry Engineering	28	626-355-3656	www.henryeng.com
Inovonics	21	800-733-0552	www.inovonicsbroadcast.com
Lynx Studio	19	714-545-4700	www.lynxstudio.com/radio
Mager Concepts	30	602-791-0045	www.magerconcepts.com
Mooretronix	40	800-300-0733	www.mooretronix.com
Nautel Electronics	9	902-823-5131	www.nautel.com
Paravel Systems	18, 39	877-447-2728	www.paravelsystems.com
Phasetek	39	215-536-6648	www.phasetekinc.com
Radio Systems	32	856-467-8000	www.radiosystems.com
RCS	25	914-428-4600	www.rcsworks.com
Shively Labs	15, 39	888-744-8359	www.shively.com
Sierra Automated Systems	29	479-876-7250	www.sierramultimedia.com
Studio Items	38	815-669-2070	www.studioitems.com
Transcom Corp.	39	800-441-3454	www.tcnamtv.com
V-Soft Communications	40	800-743-3684	www.v-soft.com
Vocal Booth.com	14	866-330-6045	www.vocalbooth.com
Wheatstone	2-3, 44	252-638-7000	www.wheatstone.com

This advertiser index is a service to readers. Every effort is made to ensure accuracy, but *Radio* magazine cannot assume responsibility for errors or omissions.

Gain the World, Lose Your Soul?

by The Wandering Engineer

Old days, old ways. Before radio stations became a commodity, it was commonplace to have local news production. "Cost-effectiveness" eventually became more important than the needs of the community.

When this broadcast thing started, there was a social contract: Broadcasters would serve the mass communications needs of localities and bring people together. In return for providing a platform for the public interest, safety and convenience, we could sell some of that access to pay for the staff, power and equipment. If you didn't serve your community, someone else could get that license.

For the longest time, a station was sellable only for the sum of its assets and a little "good will."

Then the government regulation went away, consolidation kicked in, and stations were sold on ever-increasing multiples of cash flow. Limits on ownership became fewer and fewer. Once all radio was local; now, not so much.

Broadcasting was never a great place for making money, though for a couple of generations it was good enough. There are lots of self-published memoirs about good careers way back when.

I am unaware of anywhere in the world where broadcasters are given so much and with such a free hand.

Today, even as automated as our industry is, the days are still long and the work consuming. Today, making "a living" as a broadcaster sometimes means second jobs, food stamps and things which are basically government subsidies reserved for the fast food industry.

What changed?

I am unaware of anywhere in the world where broadcasters are given so much and with such a free hand. Freedom of speech exists to balance and enhance the public discourse. While radio has been a unique (arguably much more than TV) source of good throughout the world, it has, on occasion, been a force for not-so-good.

Whether you believe that U.S. radio is living up to its potential or not, it's hard to argue that the big decisions and directions that used to come from those close to the community now, more often than not, come a very small group, serving the needs of the shareholders.

Hard-drives in racks of servers spit out MP3s of tunes and liners and national talk shows are retransmitted every few miles by overlapping stations. Many a cluster doesn't have so much as a working local studio. I don't know what the phrase "all broadcasting is local," even means anymore.

TV's repack is the ultimate recognition of who now owns the spectrum. In the old days, if the Federal Communications Commission needed the frequency, or thought someone else ought to use it, the FCC merely moved you or failed to renew your license. No one sent you a check for the inconvenience. Today, they pay a station to give up "their" frequency.

Looking back, it seems that the regulation that the industry pushed back against might have had its best interests at heart all along.

Arguably, the value of the radio industry has been stripped away by rounds of sales and profit-taking that lined the pockets of many investors and bankrupted others as they traded in the value that is the license. Somehow the privilege of having a license to use the airwaves was replaced by the right of private parties to sell the no-longer-public airwaves.

Is it possible that when broadcasting is all about profit, it loses its soul? Will the relevance of radio continue to diminish in our communities? Maybe, when this cycle of big business broadcasting has completely cashed out, community interests will once again reign and radio will regain its soul.

In a community, once in a while, someone stands upon the broadcast soapbox and speaks to everyone at once.

The Wandering Engineer is an industry stalwart who has been in broadcasting since the days of Marconi and Tesla. He gives his thoughts on the current state of broadcast engineering and the broadcast engineer.

ARRAKIS SYSTEMS INC.

'ALL' Arrakis Consoles are now AoIP !!!

under $1,000

DANTE enabled

SIMPLE-IP

Simple-IP is a one rack unit AoIP box using the world standard DANTE ethernet AoIP protocol. It is plug and play with CAT5e wiring to all Arrakis ARC or MARC series analog consoles. And Simple-IP isn't just a proprietary AoIP solution, it is plug and play with more than 600 products from over 200 other manufacturers from mics to speakers. For under $1,000 per studio, you too can be AoIP from the world leader !

Simple-IP solves wiring problems in old and new facilities alike !!!

Better by Design...

www.arrakis-systems.com 970.461.0730

THE INTELLIGENT NETWORK

SONICUS MAXIMUS
COSTICUS MIDIMUS

Golden Ears Sound at a Midrange Price

We've put a whole new army of advanced audio control algorithms behind the touchscreen of this new processor. Make a simple adjustment on the screen, and complex control scripts go deep into processor parameters, making multiple interrelated adjustments to push the sound in the direction you want it to go.

A library of supplied presets keeps everyday users in safe territory, while the advanced professional GUI lets experienced "golden ears" refine the sound as much as they want.

AirAura X1. It's where you'll find your signature sound.

AIRAURA ONE

THE ALL NEW AIR AURA X1
DIGITAL SPECTRAL AUDIO PROCESSOR

AirAura X1 is the recipient of NewBay Best of Show Awards from Radio World and Radio Magazine

2016 BEST of SHOW Radio

2016 BEST of SHOW RADIO WORLD

Wheatstone
BROADCAST AUDIO PERFECTIONISTS®

phone 1.252.638-7000 | wheatstone.com | sales@wheatstone.com