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February 2007
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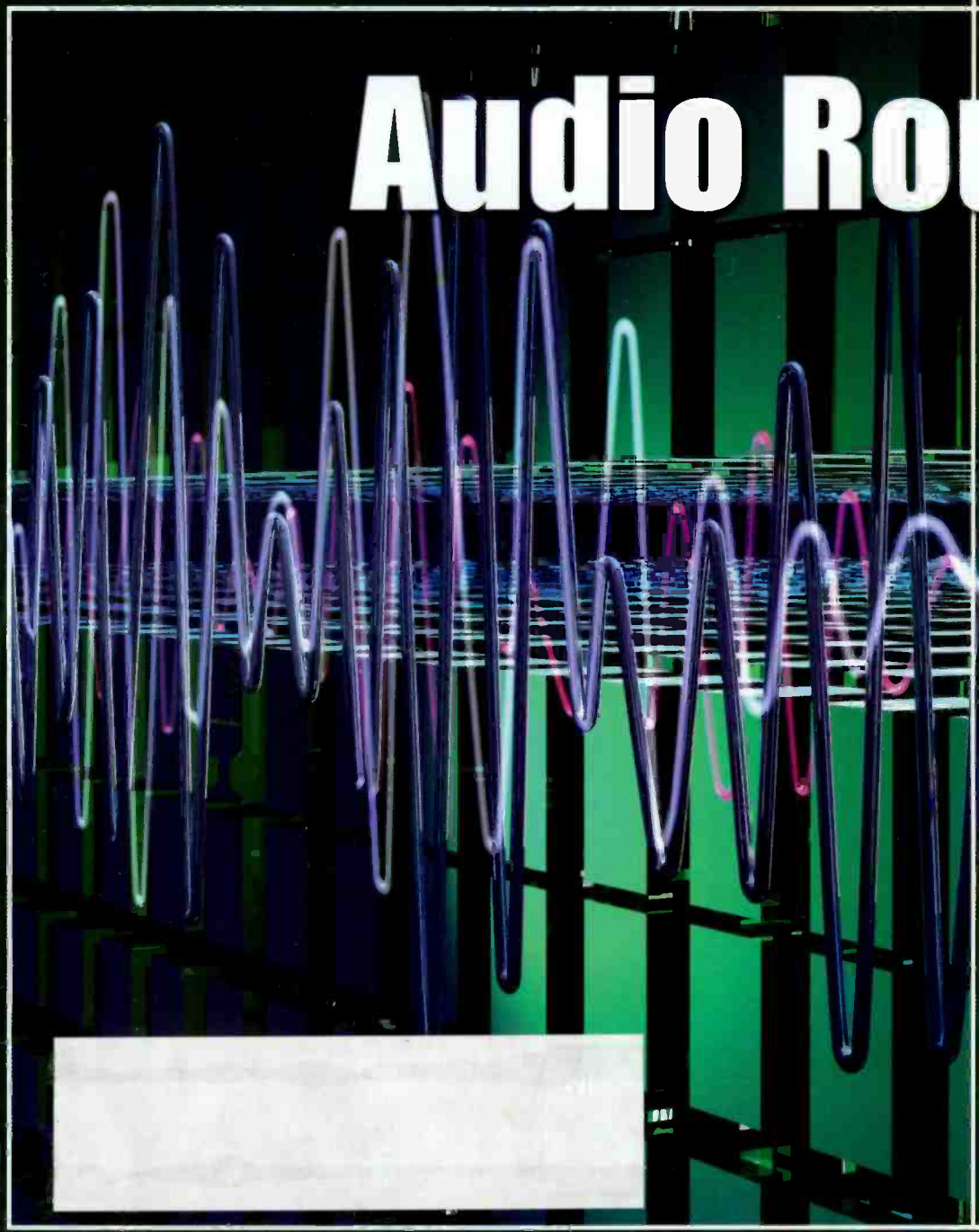

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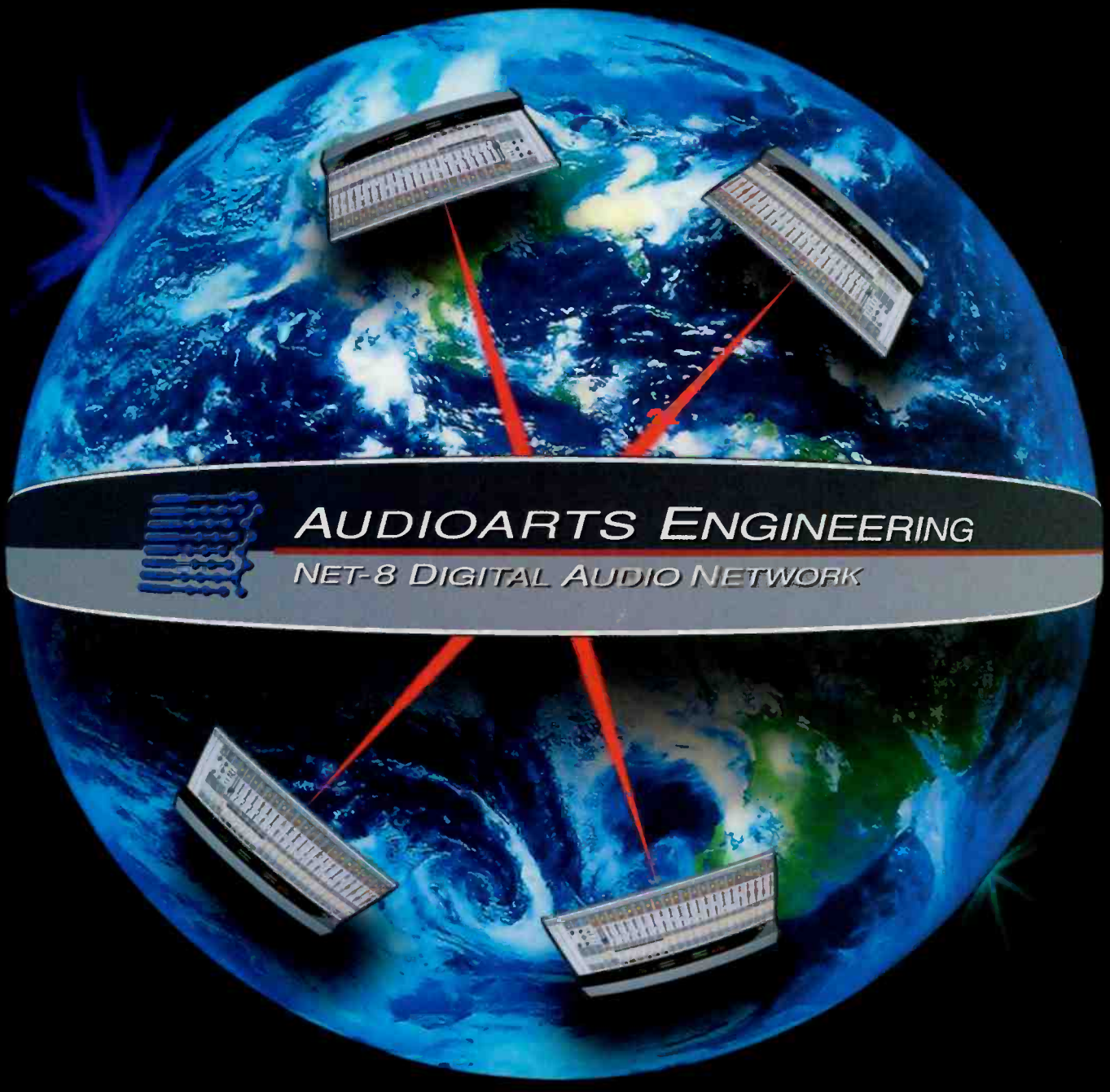


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### ON THE COVER

The current wave of audio routing expands beyond multipair cables and distribution amps to provide the most flexible routing and control. Cover design by Michael J. Knust.

# Wireless Broadband Internet Remotes

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# Currents Online

Selected headlines from the past month.

## Accredited Houston PPM Moves Forward

The Media Rating Council has accredited the Portable People Meter radio ratings data in Houston, and now Arbitron will meet with ratings survey users to determine an electronic schedule.

## Quantegy to Discontinue Various Magnetic Tape Products

No more GP9, 400 series, 600 series, ADAT, DAT and DAU tape from Quantegy, which leaves Netherlands-based RMG, the manufacturer of Emtec tape products, as the sole provider.

## Public Radio Engineers Seek Award Nominations

The Association of Public Radio Engineers will present the first annual Engineering Achievement Award at NAB2007.

## Jeff Keith Joins Wheatstone Team

Keith will head the Vorsis audio processing design department. He was previously employed by Telos and Omnia for the past seven years.

## RCS and Prophet Systems to Merge

The two Clear Channel technology units become RCS. Philippe Generali, president of RCS will lead the combined company.

## FCC Extends Comment Window for Birds and Towers Rulemaking

The new deadlines to file comments and reply comments on the Notice of Proposed Rulemaking about migratory habits of certain birds (WT Docket No. 03-187) are April 23, 2007, and May 23, 2007.

## BE to Host HD Radio Seminar at NAB2007

The seminar will be held at the Las Vegas Convention Center on Saturday, April 14 from 2 p.m. to 4 p.m.



# Site Features

## Every Issue Posted Online

Everything you read in *Radio* magazine is available online, and you can find it by issue, by subject or with our search engine.

## Online Extra

Look for the Online Extra notes in every issue to lead you to more in-depth information.

## Currents Online

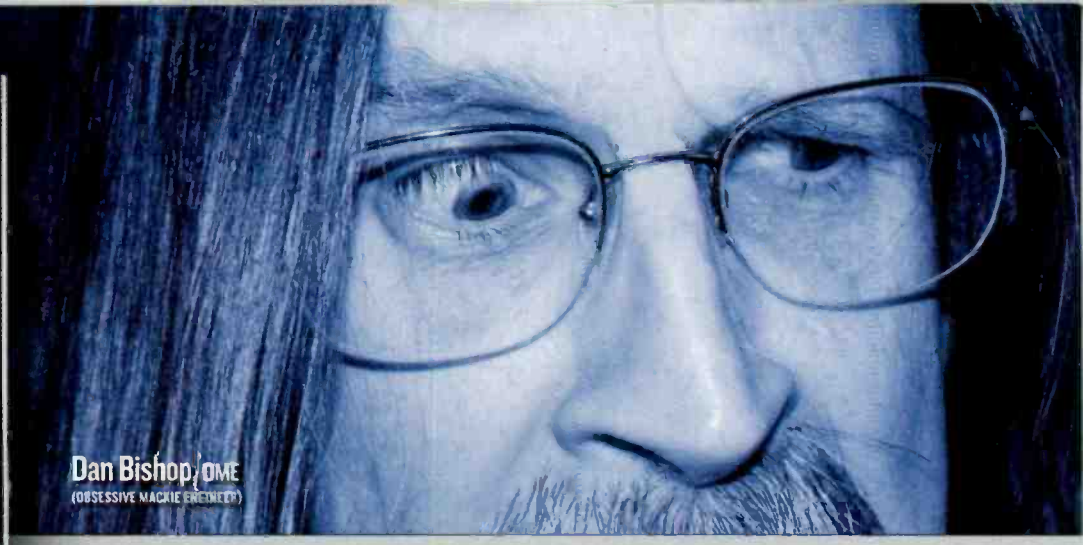
We update all the news of the radio industry throughout the day every day.

## RSS Feeds and More

Customize all the content from the *Radio* magazine website and read it through your favorite RSS reader.

## More E-mail Newsletters

Digital Radio Update comes to you twice a month with all the news about IBOC, satellite and more. Also look to the NAB Insider in March and April to get the latest info to help you prepare for NAB2007.


# This man could use a vacation.

## Take advantage of his obsession with the New VLZ3s.

We didn't think we could improve on the original VLZ mixers... at first. Then an over-achieving engineer decided to try it. First he made a more musical 3-band EQ. Then he came up with the new XDR2 mic preamp, one with more consistent frequency response across the entire gain range. We figured that was it. Didn't hear from him for awhile. Then he burst in showing how his new summing bus lets you add more signals together without running into clipping. OK, OK we thought. Give it a rest! But he couldn't be stopped. He started doing things like rounding off corners, building a clever handle right into the mixer...he even made the silkscreening on it EAS ER TO READ. It got so out-of-hand, our HR department advised us to make him take some time off. So we did. But not before we put all of his improvements into the new VLZ3 mixers.

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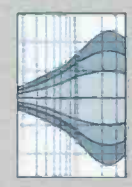

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# The consumer view of digital media

I attended the Consumer Electronics Show at the beginning of January. I saw lots of digital TVs, home appliances, computers, gaming systems, cell phones, robots and other technologies in addition to the radio-related devices I sought.

Set adrift in the sea of gadgets and gizmos, my main quest was to gauge the presence of HD Radio at the convention. I was not sure what to expect, especially given the lackluster showing of HD Radio at previous conventions.

Last year I had to search for any trace of HD Radio. It was there, but in many cases, the HD Radio receiver being shown was tucked into a corner of an exhibitor's booth and no one could tell me anything about it.

This year, I started at the Ibiquity booth and found a card listing all the exhibitors that had something related to HD Radio on display. This was an encouraging start. Ibiquity also had two large displays of HD Radio receivers in its booth, although some of them were not working.

When I visited the exhibitors with HD Radio displays I found that many of them had signs, flyers and obvious visual displays for HD Radio, and the booth staff actually knew something about the technology. It seems that HD Radio has finally arrived. There were even products that were showing more than just a basic radio receiver, such as the Visteon HD Jump and Delphi's demo of the recording capability of an HD Radio receiver.

There was one session that detailed the current standings of HD Radio and satellite radio. Both sides of the delivery systems were presented by the panelists, although the satellite side certainly pressed its marketing hype more strongly than Bob Struble and Peter Ferrara did on the HD Radio side. At one point, Struble said that within 10 years, all radio receivers will have HD Radio, XM and Sirius capability built-in. I'll add that I believe that Wi-max and other to-be-developed systems will be included as well.

At another point, Peter Ferrara noted that the consumer does not have to make a conscious effort to buy an HD Radio receiver; it's just built in. That's not true for every radio receiver today, but like I said in last month's Viewpoint, it is the step that will make HD Radio succeed.

HD Radio was visible in about 20 booths. This sounds like a good showing, but remember that there are about 2,700 exhibitors at the convention. While the HD Radio showing was good, it was still buried among the endless displays of other technologies.

Naturally, satellite radio continues to hold a large presence.

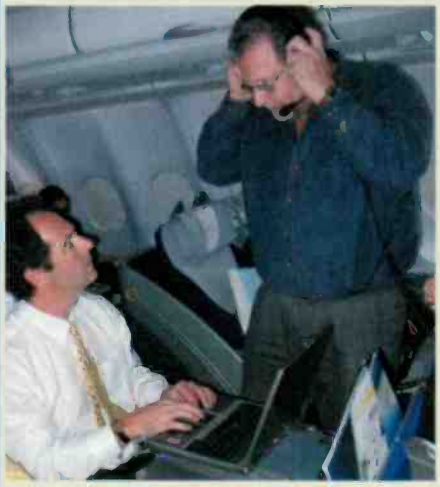
And everywhere I looked I saw something that interfaced or related to some type of media player, if not specifically the Ipod or the new Microsoft Zune. Granted, media players have evolved beyond simply providing an audio stream, but their prime use still appears to be audio-based.

I also saw a lot of computer networking products and several IP audio stream players—which is just a fancy name for an IP radio. Two IP radios I saw were the Com One Phoenix and the Cambridge Consultants Iona. While devices that can play an IP stream from an Ethernet connection have existed for some time, such as the Roku Soundbridge, the Phoenix and Iona are Wi-fi receivers. They have bridged the gap between IP delivery and a wireless connection. It's obvious that radio is not the leading technology anymore.

Even the exhibitors with an HD Radio interest are developing other technologies, such as the ability to connect a media player, play MP3 (and other formats) files, and attach USB storage devices. These are all aimed at other methods of delivering an audio stream to the listener. HD Radio may have arrived, but it's still a small part of the consumer experience.

# Internet remotes... there's been talk.


## Live from 37,000 Feet—No kidding—Live Broadcast from a Lufthansa flight!



... successfully aired his three hour talk show from a commercial airplane [using ACCESS] at 37,000 feet on a regularly scheduled flight between Frankfurt, Germany and New York, US.

*Peter Greenberg---Host of the syndicated radio program Travel Today*

*For the complete story visit*
*http://remotebroadcasts.blogspot.com*

## Radio Free Asia—Live from the Himalayas

"The results [with ACCESS] were especially reliable considering that Dharamsala has one of most "problematic" Internet infrastructures that we have come across."
—David Baden, Chief Technology Officer Radio Free Asia

*For the complete story visit*
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## Ski Mountain Remote

This picture, really demonstrates what ACCESS is about. This product truly has the ability to cut the wires.

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## JAMN 94.5—Walk for Hunger

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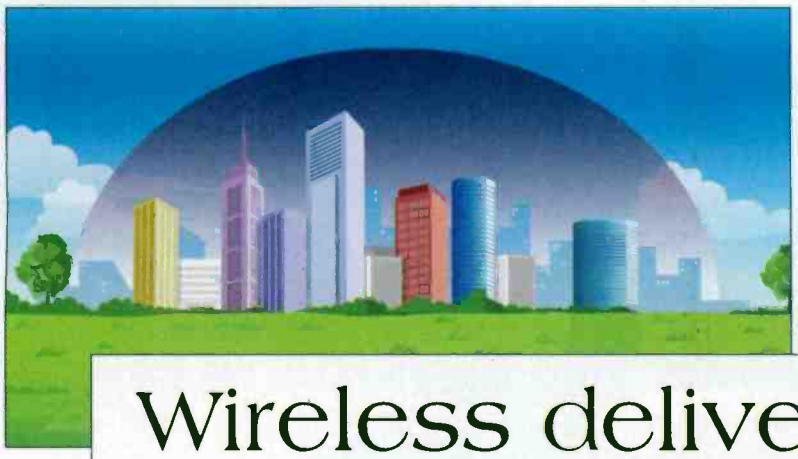


# Wireless delivery alternatives

By Kevin McNamara, CNE

The proliferation of wireless access in our country will soon reach a point of surpassing wireline delivery. Many people have cancelled their plain old telephone service and now exclusively use wireless mobile phones. Wireless hotspots are popping up everywhere; in fact, many of these are provided free of charge in stores, restaurants and other public areas.

The fact is that wireless delivery platforms are becoming faster, more reliable and cover a greater range than anyone would have imagined only a few years ago. Along with the improved performance, the cost to deploy these systems has fallen into the range where most people can afford to convert. For broadcasters, these alternatives can be applied to a wide range of program and data transmission applications.

## Wi-fi

Wi-fi is defined as the IEEE 802.11x standard. It was first introduced by Lucent and NCR in 1991. The first standards for 802.11a and 802.11b were ratified in 1999. The "a" version operates in the allocated 5GHz spectrum and provides data rates up to 54Mb/s, while the "b" version uses the 2.4GHz spectrum and delivers a maximum 11Mb/s. In 2003, the enhanced 802.11g standard improved the performance of 802.11b, permitting increased data throughput to 54Mb/s on the 2.4GHz spectrum. The ranges on all of these versions were specified to a maximum of 30 meters.

The 802.11n standard is currently being drafted. It defines a method to dramatically increase the performance of all previous 802.11 versions. Data rates are increased to a maximum of 540Mb/s and the range increases up to 125 meters (line of site outdoors). Several other versions of the 802.11 standard are currently with various working groups. These new versions will provide additional features such as extended range, interoperability with cell phone technologies and even a specification to support using Wi-fi in a mobile environment.

## Wi-max

Perhaps the most exciting technology for broadcast applications is called Wi-max, which is an acronym for Worldwide Interoperability for Microwave Access. The IEEE standard designation is 802.16x. This technology, while compatible with 802.11x equipment, is designed to deliver high-speed broadband coverage over a wide area, or to provide last-mile coverage to areas not served by wireline carriers.

Wi-max requires significantly more bandwidth and power than Wi-fi, which means that Wi-max needs to operate in other spectrum than that allocated for 802.11x. The current Wi-max specification (802.16e) does not specify particular frequencies where it will operate; rather, it specifies a large range of frequencies (about 2GHz to 60GHz). The lower frequencies are intended to support a mobile network, similar to that of a typical wireless telephone carrier.

I think Wi-max will have some interesting applications in a broadcast environment, perhaps as a replacement to the station's RPU system or even an STL link. It should be possible that a single Wi-max system deployed on a multi-station transmitter facility could more than support the needs of every station using the site.

To expand this concept, consider that the same system might also support remote broadcasts, including two-way communications with the studio.

## Mobile data networks

Most wireless telephone carriers offer some form of dedicated data delivery. Current third-generation (3G) wireless networks can use either of two systems—CDMA 2000 or UMTS. The current CDMA2000 version, called 1X EV-DO (Evolution-Data Optimized), can provide 154kb/s uplink and 2.5Mb/s downlink rates.

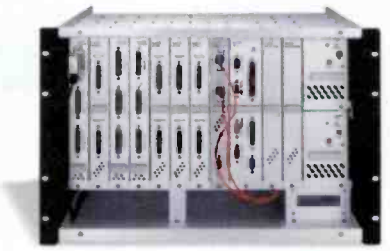
# "The South has a lot of 'favorites' including barbeque, football and great hospitality. I'm adding Logitek to my list."

"Logitek was the solution for our consolidation in Birmingham. We wanted a system that was flexible and reliable. The most flexible systems are based on router technology, and after looking at the choices, I picked Logitek. Logitek lets me makes changes fast and seamlessly. It manages my satellite feeds, 'talks' extensively to my Prophet system and lets me add sources and outputs without ever changing a wire connection. My operators love the ability to get any source anywhere, too.

"When we built this facility we had four FM's and an AM. Suddenly, I had four additional HD streams to incorporate into the system. Logitek let me add the additional stations with a minimum of frustration.

"Logitek may not be as high on my list as great barbeque, but it gets my vote for a great audio platform."

Bob Newberry
*Market Engineering Manager*
Clear Channel – Birmingham



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The Universal Mobile Telecommunications System (UMTS) is the successor to the second-generation GSM systems. Typically, UMTS uses the Wideband Code Division Multiple Access (W-CDMA) interface to provide mobile data services with rates currently available to 3.6Mb/s in the downlink.

You can see that the performance of the currently available mobile data networks can deliver data rates far below that of Wi-max, which is why companies see a significant market for higher-speed data options and have bid billions of dollars for the rights of the frequencies intended for the advanced wireless services.

In the future, wireless mobile telephone carriers will implement the fourth-generation (4G) technologies that will be primarily based on the Internet Protocol (IP), which will allow it to work with a number of existing and emerging technologies such as Wi-fi and Wi-max. The predicted data rates for 4G networks could be in excess of 1Gb/s and permit seamless roaming between different networks/technologies.

Equipment for remote broadcasting featuring wireless mobile data radios has been available for a few years. I am sure we will see exciting new remote applications that capitalize on these new network technologies, perhaps allowing a laptop to become a complete portable studio.

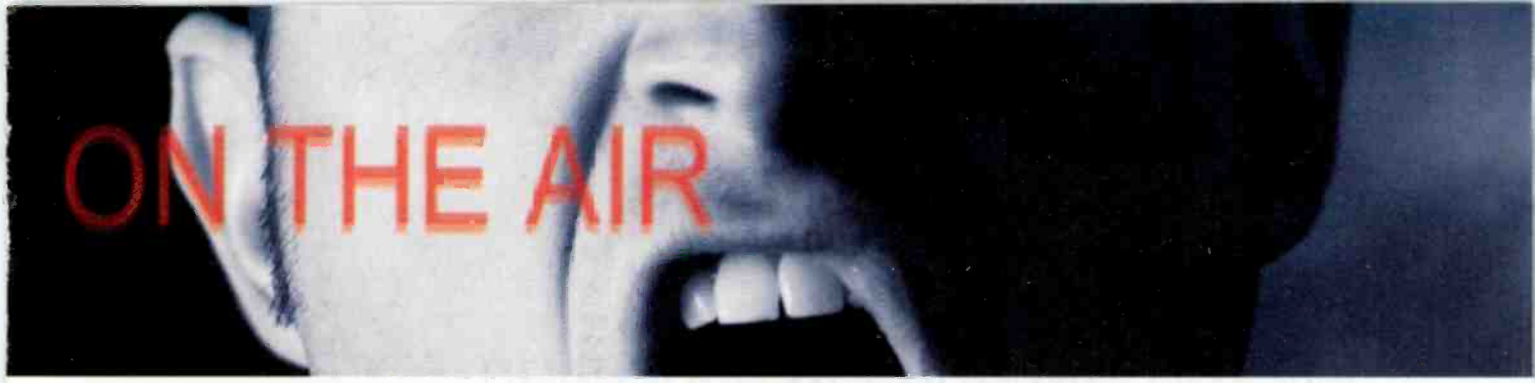
## RSS

While not a wireless technology Really Simple Syndication (RSS) is considered a Web-feed format intended to deliver stored or real-time feeds to enabled Web browsers or delivered to an external MP3 device. The content can be a newsfeed, podcast or blog and could take the form of text, audio or video broadcast. When combined with existing and emerging wireless delivery methods, RSS will take on an increasing role in the broadcasting of information and other program content.

As a broadcaster, you should be thinking of new ways to exploit these technologies to enhance the listener experience, open new opportunities for revenue generation and perhaps save some money in the process.

*McNamara is president of Applied Wireless, Cape Coral, FL.*

This article, like all the content on the *Radio* magazine website, is available as an RSS feed.

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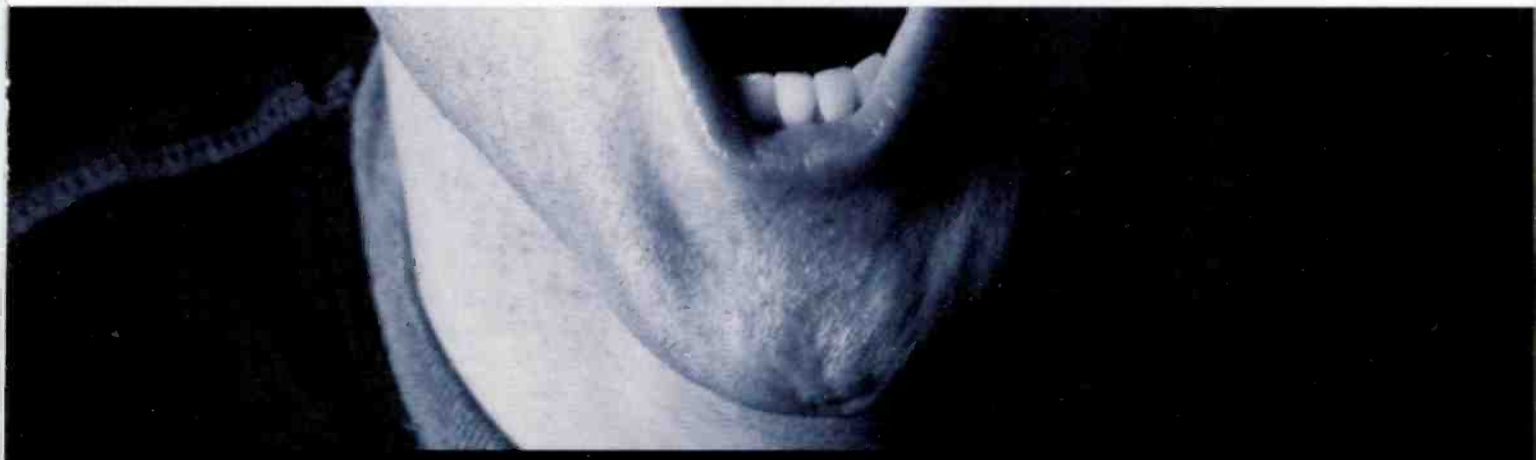

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Whatever your size, whatever your format, you can't expect to protect the integrity of your air and the foundation of your business without an Eventide Broadcast Delay in your rack.

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# More on AM and FM allocation rule changes

By Harry Martin

In November the FCC adopted rules to change the way in which it authorizes changes to the community of license of AM and FM stations. *FCC Update* covered the major elements of the new rules in the January issue of *Radio* magazine. Here are some clarifications of the matters previously covered as well as some new insights into the FCC's order.

First, as previously reported, the commission will permit the submission of minor modification applications by AM and FM licensees (commercial and noncommercial alike) seeking to change their community of license as long as the proposed daytime facilities are mutually exclusive with the station's presently authorized daytime facilities. Such applications can be filed once the rules have become effective. The effective date of the new rules is Jan. 19, 2007.

## Making the change

When a minor change application proposes a change in community of license, the applicant must provide a detailed exhibit demonstrating that the change in the community of license will result in a preferential arrangement of allotments, and that there will be a "net service benefit" under the commission's well-established policies on allotment priorities. The commission is planning to issue a new Form 301 that will provide a format for submitting such information, but a new Form 340 for noncommercial applicants will not be adopted until later.

The applicant will need to demonstrate that the proposed city is a community for allotment purposes. A demonstration of "community-ness" typically includes showing that the community is recognized in the U.S. Census (even if only as a "census-designated place"), that it has its own government, post office, public services and that it includes businesses and other institutions usually found in communities.

Further, the commission is still insisting that a proposed change in community of license cannot result in the removal of a community's sole operating local service unless the proponent can demonstrate a compelling public interest benefit for such a move.

## On the AM side

Any AM licensee that received its license through the comparative process in an auction window will have to include, in any change of community of license application, a showing that the city it is moving to would have also been the dispositive choice among the mutually exclusive parties.

Finally, the commission will require that notice of any requested change in community of license first be published in the Federal Register. The Media Bureau will then be prohibited from processing the application for at least 60 days thereafter.

In light of these changes, the commission deleted the FM Table of Allotments from the rules, and, instead, will maintain a list of vacant allotments on its website. Parties will still be required to file petitions for rulemaking to propose new drop-in allotments, but all other technical parameters will be maintained in the commission's Consolidated Data Base Search system. The commission will also now permit petitions to be filed through its electronic filing system.

A flood of minor modification applications was expected on Jan. 19, the effective date of the new rules. A number of those applications will conflict with simultaneously filed proposals. But the commission previously has decided that mutual exclusivity among minor change applications are not to be resolved through auctions, but will instead be resolved through voluntary technical amendments. Should a large number of unresolved conflicts occur, the reconsideration process (leading to possible auctions) may be used to change the rules so as to permit resolution of such conflicts.

*Martin is a past president of the Federal Communications Bar Association and a member of Fletcher, Heald & Hildreth, Arlington, VA. E-mail martin@fhhlaw.com.*

## Dateline

Radio stations in Texas must file their biennial ownership reports on or before April 2, 2007.

Also on April 2, radio stations in Delaware, Indiana, Kentucky, Pennsylvania, Tennessee and Texas must place their 2007 EEE reports in their public files and place them on their websites.

All radio stations must place their first quarter issues and programs lists in their public files by April 10.

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# Designing an audio

It's time to design a facility. You need to route and control audio and its related control functions. Today you're faced with a choice: stand-alone consoles or an audio network. It isn't the point of this article to review how radio studios were designed and organized in the old days, but it will be instructional to go over those techniques briefly so that the benefits of newer technology are more clear and evident.

It used to be that you would first decide how many studios were needed on a per-station basis. Typically the answer would be one on-air studio, one production studio, and perhaps another combination studio that could be used as a backup for the on-air room and for less complex commercial production features (such as dubbing agency spots and adding tags). If you had "n" radio stations, you usually just multiplied the number of studios by "n" to get the final studio count.

Based on the studio requirements, you picked a console of the appropriate size.

Typically a production console was more suited to that function. Often they were larger, with more inputs, more output buses and so on. All the equipment that was needed for the particular studio was located in that particular studio—everything from tape machines to CD players to DAT machines to DAWs.

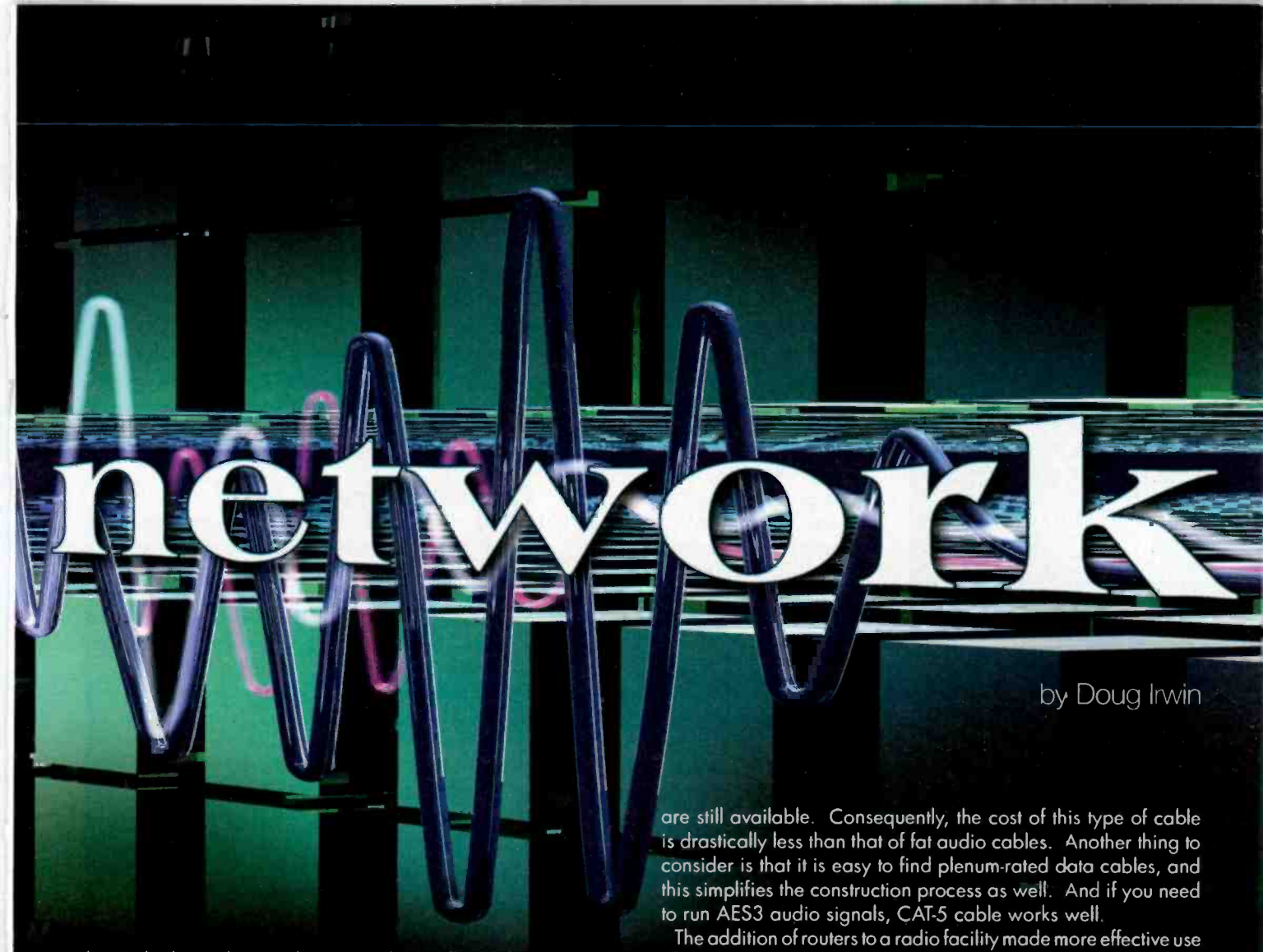
Invariably there was rack space somewhere in the facility that was effectively a terminal for all the studio programs, and likewise a jumping off point to the transmitter site.

After the Telecommunications Act of 1996, more and more radio stations were crammed in to the same space; and for this reason, more and more equipment was shared between stations under the same roof. In the early 1990s ISDN codecs came in to their own, and often landed in the terminal area racks so that they could be shared. Because those codecs had to receive and send audio, sharing them between stations required complex audio switching. Their inherent delay necessitated a mix-minus feed, which complicated things even further. More and more stations started taking satellite feeds for chunks of the day—and those satellite receivers were typically located in the terminal room racks as well.

As facilities grew larger with more stations, the old way of sharing audio resources—such as using DAs and audio switches that were either push buttons or relays—became more cumbersome. New facility builds often included audio routing switchers that, while expensive at the outset, simplified the construction and later provided new levels of convenience and performance that had not been obtained before.

But even with the "older" type of audio routers, radio stations were pretty much built the same way: using a spoke and hub topology. Any studio would be a mini hub with most of the equipment needed on a daily basis located in it. The terminal rack room would be the major hub with cable runs (spokes) going out to all the various studios. The spokes would consist of fat multipair cable that was expensive to buy. Each end of the spokes typically terminated on blocks—many times the ubiquitous 66 blocks or something more modern such as ADC Icons or Krone blocks. A large part of the labor going in to any facility build was the installation of these cables and punching down both ends. The design of a studio was typically to overbuild, because the last thing you wanted to have happen was for all the spoke (trunk) pairs to get used up. That was bad.

One of the final parts of the facility construction was the addition of cross-connects to connect the various pieces of equipment to



# network

by Doug Irwin

the trunks themselves, making everything talk. Making changes later during the life of the facility involved literally moving wire pairs or adding new ones so that equipment was physically connected to where it needed to be.

## Fast forward

The future is here and instead of building individual radio stations we now consider what is known as an audio network. This new term reflects not only the function, but the methodology as well.

With the explosion in computer networking over the last 10 years, audio equipment manufacturers have taken notice of the new ways in which information (whatever that information consists of) is moved from one point to another. The most basic change is that one pair of wires is no longer just assigned to one static function. In the old days, one pair of wires might be used to carry audio from a DA output that was assigned to a remote broadcast line to the on-air studio. With each pair of wires performing only one static function, hundreds of pairs needed to be purchased, installed and punched down.

In an audio network, one twisted pair can literally carry hundreds of signals, whether they consist of digitally encoded audio, or control or other ancillary data.

Because communication between nodes of an audio network is done in a digital format, CAT-5, CAT-5E, CAT-6 or even fiber is used for the actual communication. This type of cable is produced on a massive scale, unlike the fat audio cables that are still available. Consequently, the cost of this type of cable is drastically less than that of fat audio cables. Another thing to consider is that it is easy to find plenum-rated data cables, and this simplifies the construction process as well. And if you need to run AES3 audio signals, CAT-5 cable works well.

The addition of routers to a radio facility made more effective use of many of the wire pairs that were originally installed—and the coming of digital audio routers doubled that efficiency yet again (after all, an AES data stream includes left and right channels).

Equipment manufacturers then saw the inherent efficiency of computer networking, and began looking at moving audio around the radio station facility in a similar fashion via fast data streams (in synchronous or non-synchronous modes). What is known as the physical layer in the language of computer networking—the cable types, the connectors and patch bays—could also be used in the transmission of these high-speed data streams.

At least one manufacturer actually makes use of Ethernet to move audio and control signals around. And the era of the audio console might well be coming to a close because many manufacturers now offer control surfaces that, while they look like consoles, are simply human user interfaces for a remotely located routing switcher.

## Spoke and hub topology

The spoke and hub remains the logical topology for an audio network. It is one of the most basic methods of communication between multiple locations. This method is used by airlines, the post office, the phone company and many others.

Radio stations still need separate studios to carry out specific functions, such as on-air and commercial production. Most stations have a rack room or some other location that is the heart of the facility, as shown in Figure 1. This is where the audio network hub (in the spoke and hub context) is located. Several

# Designing an audio network

manufacturers make use of a peer-to-peer variant on the spoke and hub idea, by use of a device commonly known as an audio engine. This is a device that handles the cross-point switching and other functions that would heretofore have been accomplished in a router. A unit such as this would be at the hub (in the spoke and hub context) but also, in some cases, in a studio. Most units such as this are mainframes, and as such have I/O cards to receive and send audio signals, in the analog or digital formats; logic I/O cards; DSP cards for audio processing (including mixing); and finally specific cards for communication with other audio engines (peers) or peripherals (spokes) in the audio network such as control surfaces. Shared audio devices (such as a satellite receiver) located in a rack room would connect to an audio engine located in the same room.

**Which would you rather connect? Both can be used to carry multiple signals.**

The studios themselves still have specific items that are needed locally (such as a CD player, for example). To avoid a wire run all the way back to the master control room audio (because after all, that was part of the reason for the network, right?) an audio I/O device still needs to play the role of interface between the audio network and the local device itself. Some manufacturers make special I/O devices and some simply specify that a stripped-down version of an audio engine be located in the studio. In some cases, an audio engine located in a studio has specific plug-in cards that allow it to work in conjunction with a control surface located in-studio, thus providing all the necessary and familiar console functions. Each audio engine, whether located in a studio, a rack room or some other place, is a peer. Essentially they are all functionally equivalent, and they communicate with one another. Their specific inputs and outputs become available throughout the entire network.

## The audio engines

AEQ's offering is the BC 2000D, a mainframe (and hub of the system) that is built to house the various plug-in modules associated with the typical audio network: I/O cards and DSP boards. The control surface for the AEQ system is made up of combinations of the Arena DM (five input modules plus a monitor module) and an Arena D10, which has 10 input modules.

Axia's approach is perhaps the one that is most like a computer network. All signaling is routed via Ethernet. The heart of the audio network is an Ethernet switch that ties all the spokes together. Elements that communicate via Ethernet through this switch include the Axia Studio

Insight to IBOC
February 2007 Part of the *Radio* magazine DAB Answer Series

# The HD Radio Network

*By Tim Anderson*

The advent of HD Radio is requiring the broadcast industry to take a closer look at its station's networking system and infrastructure. Minimizing network-related issues that can induce dropouts must be a prime consideration in any successful HD Radio implementation. A network that performs quite well for day-to-day data traffic may be significantly challenged by the near-real-time, isochronous demands of the HD Radio stream. The key issues that appear to be causing station engineers and IT personnel the most difficulties are traffic management, bandwidth provisioning and reference timing synchronization between the various HD Radio components across the network.

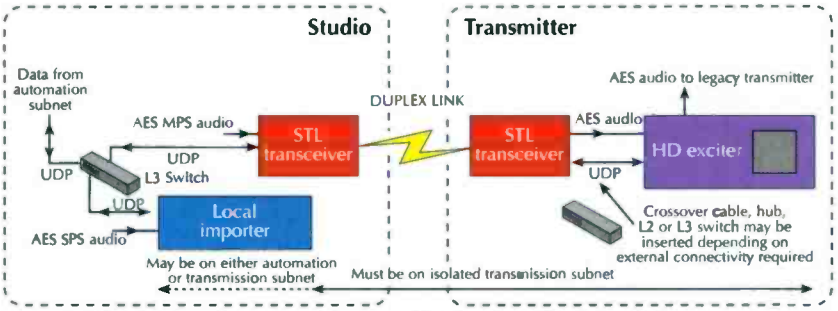



**Figure 1: Studio importer connection over bi-directional (duplex) STL.**

There are two distinct physical configurations that the station may implement for deployment of AAS for multicasting on the HD Radio system:

1. Importer to exciter (I2E)
2. Exporter to exgine (E2X)

Figure 1 shows the studio importer connection over bi-directional (duplex) STL.

The I2E configuration connects an importer to an exporter/exgine via a bidirectional Ethernet connection. Only the Advanced Applications Services (AAS), such as multicast programming and data services, are transported by this link, which is not concerned with the main program digital service. A bidirectional link is required to accommodate the command and response nature of the I2E configuration.

In this configuration, even with moderately bad network conditions (up to one percent packet loss and 100 millisecond latency) the system continues to perform well. The key is to provide adequate bandwidth overhead to allow the system to recover lost packets through TCP packet retransmission.

For a station running MP1 mode with 48kb/s of AAS, the average utilized bandwidth will be 54kb/s, requiring at least 90kb/s to be available through the STL. A 128kb/s LAN/WAN extender or two

## Open Mic
### The NRSC Releases Paper on Surround

*By Chriss Scherer, editor*

The National Radio Systems Committee (NRSC), the cooperative effort of the National Association of Broadcasters and the Consumer Electronics Association, has been involved in evaluating radio broadcast technology and establishing standards for the benefit of all broadcasters and receiver manufacturers. The Digital Radio Broadcasting subcommittee has been active in recent years as IBOC, and the Ibiquity HD Radio system in particular, is developed.

The Surround Sound Audio Task Group (SSATG) was created to evaluate the available surround technologies and provide some insight on to how surround can be implemented on digital and analog terrestrial radio broadcasts. The group's latest effort is a paper that discusses surround on radio. The Task Group is co-chaired by Steve Fluker, director of engineering of Cox Radio Orlando. *Radio* magazine talked with Fluker about the forthcoming paper to gain some insight to its content and what it provides to broadcasters.

**Radio**: Give us an overview of the paper, including the reasons for its creation and the benefit will provide to radio stations.

**SF**: The paper was created to provide an informational and

*continued on page 3*

**Inside**



*A special supplement to* Radio
THE RADIO TECHNOLOGY LEADER

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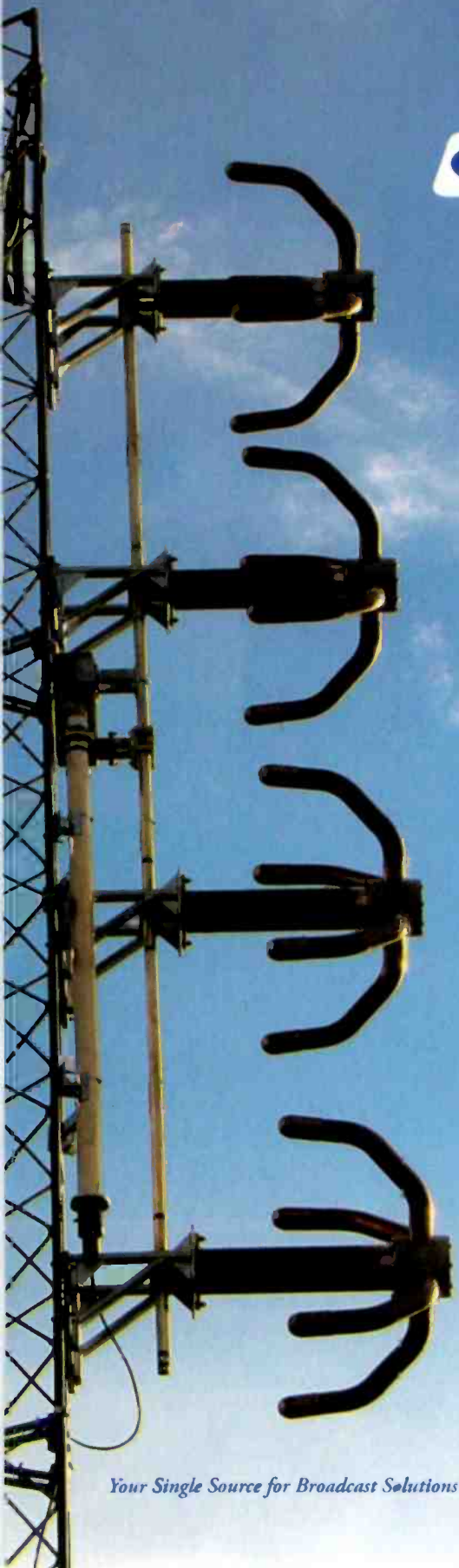

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vide sufficient bandwidth for any MP1 configuration. For the maximum MP3 extended hybrid configuration of one SPS at 48kb/s and a second SPS at 24kb/s, the minimum bandwidth required of the STL/WAN link is 156kb/s, requiring three DS0s for 196kb/s.

## Exporter to exgine (E2X)

Figure 2 shows the exporter to exciter configuration.

The importer-to-exporter-to-exgine (E2X) configuration is the most bandwidth-efficient method of deploying an HD Radio multicasting data network. With this implementation, a single data stream may be conveyed to the transmitter site over the STL/WAN link, which contains all of the MPS information as well as the Advanced Applications Services from the importer, such as SPS and associated data.

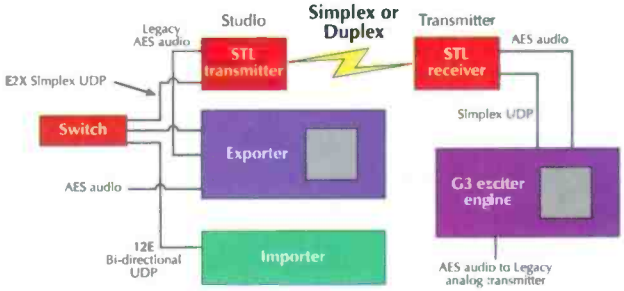


**Figure 2: Importer to exporter to exgine configuration**

Studio-to-transmitter transport of the E2X data stream is currently supported only as simplex (one-way) UDP and can operate over most unidirectional STL systems of sufficient bandwidth and robustness. With UDP transmission, the loss of a single packet results in the loss of the entire audio frame of which it is a part. The resulting outage will last for the duration of that single audio frame: 1.48 seconds.

A 128kb/s LAN/WAN extender or two DS0s will provide sufficient bandwidth for any MP1 configuration. For MP3, 256kb/s or four DS0s should be considered. Packet loss across the link becomes a critical factor and must be kept below $10^{-5}$ for successful operation due to a lack of error recovery inherent with UDP. It is not uncommon for wide-area networks and STL systems considered healthy, to deliver only $10^{-3}$ performance or one dropped packet in every 1,000, which will result in poor HD Radio system performance when running E2X.

## Managing HD Radio network traffic

Because the STL system is usually the tightest bandwidth bottleneck in the HD Radio network, it is imperative that broadcast, multicast and other extraneous traffic be kept off the network path to the transmitter site. All HD Radio devices—importer, exporter and exciter—should use statically assigned IP addresses within their own subnet. This subnet must be separate from the rest of the facility through the use of VLANs or physically separated networks. The only way to be

## Open Mic

*continued from page 1*

educational document for broadcasters to use as a resource. It covers a broad range of information, starting on a basic level. It answers the common questions: What is surround? What are the issues involved with using it? What are the available systems?

**Radio**: As a review, what are the systems available systems today?

Fluker

**SF**: There are four companies or groups developing systems. All four can be placed into one of two categories: composite and component. The composite systems include matrixed systems (SRS Circle Surround and Dolby Surround) and watermarked systems (Neural Audio). The only component system is the MPEG Spatial system.

**Radio**: Give us an overview of the contents of the paper.

**SF**: There are five main sections in the document that was approved by the NRSC at its meeting at CES in January. The sections cover the systems available and their differences; implementation of surround; cross-compatibility of the various systems; multicasting; the effect of surround on an analog signal, with particular attention to multipath; and testing and monitoring. In addition, there are five annexes in the paper. The first four are provided by the system developers to describe their own systems. The fifth annex provides greater detail on the multipath evaluation from the main portion of the paper. In all, the main paper spans about 30 pages.

**Radio**: Does the paper apply to AM and FM or only FM?

**SF**: Because AM is only capable of transmitting lower bit-rates, the paper only covers information applicable to FM and its 48kb/s or higher bit-rate.

**Radio**: The question "which system is the best?" has been debated for some time. What is the view of the SSATG?

**SF**: While the component system—MPEG Spatial—provides the most accurate reproduction of the surround field, it requires a full 5.1 backbone in the facility. The encoding must be performed at the end of the air signal chain to sync the surround data stream with the stereo audio. Currently, automation systems are not designed to store a stereo signal

*continued on page 5*

The *DAB Answer Series* is an ongoing series of supplements that covers the technology of digital audio broadcasting.

*Insight to IBOC - a supplement to* Radio *magazine*, February 2007,

## Open Mic

*continued from page 3*

and a synchronous data stream. It's difficult to do right now.

**Radio**: Where does a station begin if it wants to transmit a surround signal?

**SF**: The most basic implementation is to install one composite encoder in one studio and use it to downmix all surround content to stereo. The next step would be to modify a production studio to create surround mixes for promos and commercials. This studio could also be used to manually downmix surround to stereo.

**Radio**: The two tradeoffs are perfectly accurate reproduction of surround vs. cost of conversion. The most accurate system (MPEG Spatial) requires the most extensive facility modifications. The least expensive approach provides a quality surround reproduction that may slightly degrade the surround field.

**SF**: My recommendation is to build a new studio today with 5.1 bus and backbone. When a station wants to implement surround, it can do so easily without major changes. The majority of existing studios have already gone through consolidation and are built with a stereo backbone. After spending so much money on constructing new studios in one building, it's difficult to ask the stations to come back and rip out the infrastructure to change it to accommodate 5.1. I don't see that happening. Converting one or two rooms slowly and using a composite system will be the more common way to implement surround sound.

Now that the surround paper is complete, the SSATG is on hiatus until its next project is decided. The surround paper is expected to be released in February. When it is available, a link to it will be posted on the *Radio* magazine website.

## Online Extra:

A podcast of portions of the interview with Steve Fluker is available online. Access it and other *Radio* magazine podcasts at beradio.com.

## Radio Sherpa Lists Multicast Stations

Ibiquity Digital has signed a marketing agreement with Radio Sherpa to promote content available from HD Radio multicasts. Radio Sherpa's online guide for HD Radio (www.radiosherpa.com) is currently available in Boston and New York and will expand nationwide in the coming months.

Radio Sherpa is a real-time electronic program guide (EPG) and search engine for HD Radio broadcasts and Internet radio. The company has its origins in the MIT Media Lab and the original Napster.

# HD Radio

sure that no extraneous traffic is traversing the STL link is to place the entire HD Radio system on its own IP subnet. Figure 3 shows a recommended network deployment of subnetting using VLANs.

The exciter should always be on the WAN subnet, which it may share with the exporter and importer, or the importer may be placed on program automation subnet. Except for equipment that may be necessary to build the infrastructure—that is, routers and switches—no other station equipment should be on the WAN link subnet.

The implementation of VLANs or connection of devices through a dedicated physical network will substantially reduce packet loss and data collisions. Monitoring the traffic across the WAN with a network protocol analyzer or packet sniffer such as Ethereal is essential if a problem is suspected.

## Provisioning the STL/WAN link

For a TCP data stream to function properly under adverse conditions, the link that carries it must have reserve bandwidth above and beyond the data rate of the stream. For TCP, the STL/WAN link must have a minimum of 40 percent reserve bandwidth. This is necessary to accommodate the temporarily higher data rates that occur when the stream recovers from packet loss. If a TCP WAN link is provisioned such that the aggregate data stream, including VNC, utilities and other extraneous traffic, occupies no more than 60 percent of the WAN link's available bandwidth, then the installation should be successful under all but the most adverse network conditions. For UDP, the total traffic across the link should be no more than 75 percent of the provisioned bandwidth to allow for network contention.

Additional bandwidth beyond these guidelines allows operation under poorer conditions, but with diminishing returns. In general, bandwidth should not be used to adjust for a poor network.

If other traffic is going through the WAN, the link should have class of service, QOS or other prioritization techniques employed to ensure that the HD Radio traffic has the necessary bandwidth.

## Reference timing synchronization

While not specifically a networking issue, reference timing between the importer, exporter and exgine are

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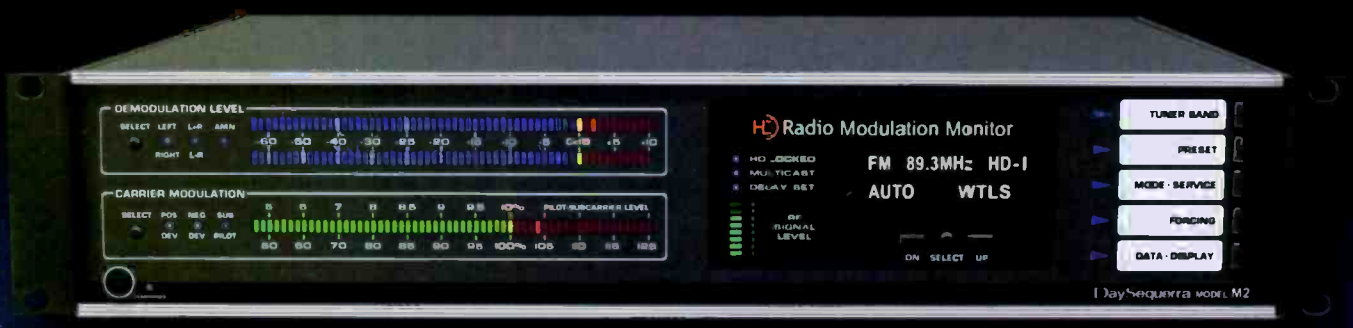


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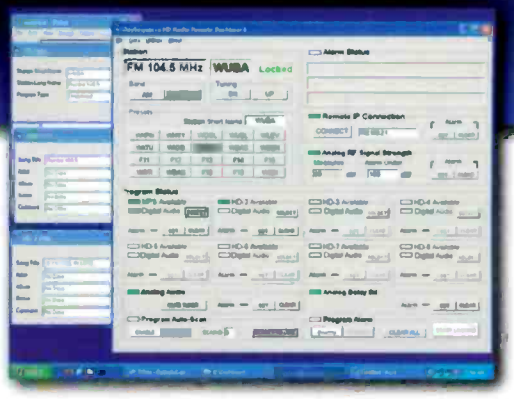


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## HD Radio

*continued from page 4*

not maintained across the network infrastructure. The use of GPS as a timing reference for the importer, exporter and exgine to precisely lock their respective clocks in step eliminates the phase and frequency issues and is highly recommended. Without GPS, or some other method of providing absolute frequency lock between the exporter and exgine, buffer underflow in the exgine or data overflow of the exporter's audio cards will eventually occur resulting in data frame misalignment, eventual audio dropout and significant diversity delay slippage on the main HD program channel. Without the use of GPS as a 44.1kHz timing reference for the station's AES audio chain or at least to the importer's audio cards, any difference in the importer's audio clock frequency and the exporter's 10MHz reference will result in the eventual underflow or overflow of the importer audio cards, which will result in occasional audio dropout of the SPS channels. The frequency of these dropouts will be directly proportional to the frequency disparity of the two references.

For more information on HD Radio and networking implementation, several white papers are available on the Ibiquity website at www.ibiquity.com/broadcasters/quality_implementation/iboc_white_papers.

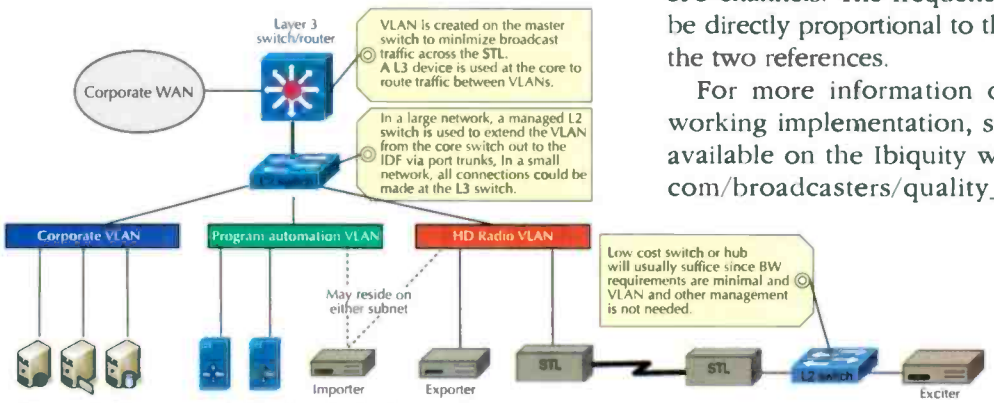



**Figure 3: Recommended network deployment**

*Anderson is president of TBA Communications and a contract engineer for Ibiquity Digital.*

# Sample and Hold

## Anticipated worldwide digital radio growth

*by Chriss Scherer, editor*

While HD Radio is the leading terrestrial digital transmission system in the United States, there are other forms of digital radio in use around the world. A recent In-stat study that examined the status of the digital radio roll-out shows a steady trend to date and an optimistic outlook for the future of digital radio receiver sales.

The report, titled More Consumers to Tune Into Digital Radio in 2007, claims that the worldwide market for digital radio receivers will grow from five million units in 2005 to almost 25 million unit shipments in 2010. The report attributes the expected growth to falling receiver prices, an increase in the amount of compelling digital programming, significant boosts in promotion and advertising of digital radio, and enhanced functionality of digital radio receivers.

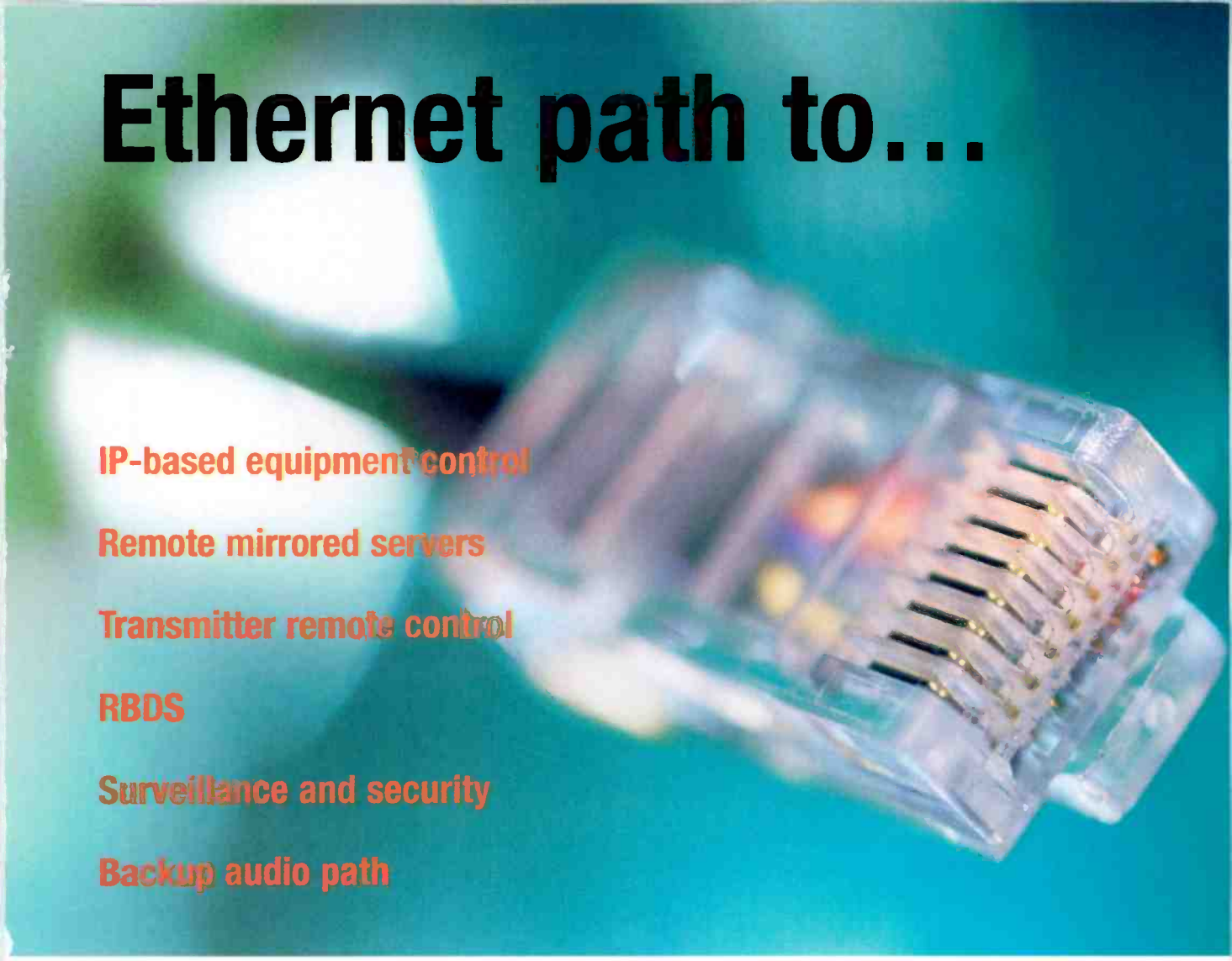

**Worldwide unit shipments of digital radio receivers.**

At the Consumer Electronics Show in January HD Radio, Sirius and XM all had strong showings. For HD Radio, the presence was the largest ever seen with at least 20 manufacturers displaying products related to HD Radio. There were only a handful of HD Radio products shown at CES 2006, and some of the companies displaying the products in 2006 had no information about HD Radio. The knowledge base of the exhibitors in 2007 shows that HD Radio is being understood and more effectively marketed. The In-stat survey shows that 73 percent of the respondents were aware of HD Radio on some level.

Looking ahead to 2010, the report shows that the number of digital radio receivers is expected to be 2.5 times that of the estimated receiver sales in 2006.

*Data courtesy of In-stat, www.instat.com.*

# Ethernet path to...



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Engine, which is a 2RU device that uses DSP to accomplish all the mixing functions given it via the Smartsurface. The Smartsurface is the user-interface that looks and functions like an audio console.

Harris offers the Vistamax system. It starts with a mainframe that is loaded with the appropriate analog and digital I/O cards and communications cards, and will

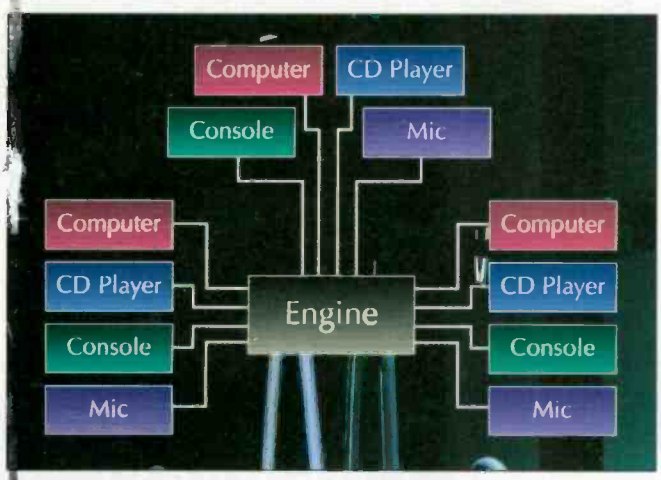


**Figure 1. The basic spoke and hub network places the audio engines in a central location, such as a rack room.**

typically be installed in the rack room. Rack room sources are integrated into the audio network at this location. This particular frame would then make peer-to-peer connections with other frames throughout the facility.

Klotz Digital has recently introduced the Vadis 212, a fanless mainframe with 10 freely assignable slots for interface cards accommodating analog or digital inputs and outputs. With the appropriate DSP cards installed, the unit can perform mixing functions along with real-time audio processing functions such as EQ, compression and limiting. Like the other audio engines mentioned, the Vadis 212 operates in conjunction with a control surface, for example the Vadis DCII. (It should be noted in this case that the communications between the DCII and the Vadis 212 is via a proprietary digital interface.)

Logitek is a long-term player in the audio networking game. Its Audio Engine is a rack-mount main frame that offers the capability of direct connection to multiple control surfaces, and other Audio Engines as well, via fiber. In addition, the Audio Engine is a full A-Y router, and acts as the heart of the audio network. Under commands from the control surface, it performs all the normal console functions, such as mixing, channel on/off and cue. A fully configured Audio Engine can handle as many as 128 mono (64 stereo) inputs and outputs by way of plug-in analog or digital I/O cards. Control, programming and analysis can all be done via a TCP/IP connection.

Sierra Automated Systems offers the 32KD—its digital audio router that performs the requisite routing functions, and others as well, such as mixing, level control, intercom, IFB and mix minus. A single 32KD frame can accommodate 512 inputs and outputs, and multiple frames can be connected together via a fiber-optic link. Separate plug-in modules handle digital inputs, digital outputs, analog inputs, analog outputs and serial interfaces.

Studer offers the Route 5000 digital router system. The core of the 5000 is the mainframe into which the multichannel audio digital interface (MADI) cards are installed. Each MADI input or output card accommodates 28 AES data streams. In addition to the normal routing functions the 5000 offers DSP capability. It communicates with the PC that is the control server via a fiber-optic link. Other control workstations or XY controllers communicate with the control server via Ethernet. The 5000 can communicate with a Studer digital console via a MADI link.

Wheatstone offers the Bridge, an audio engine and routing system that works in conjunction with control surfaces remotely located in studios. The Bridge is a mainframe into which all the necessary cards are installed: analog and digital I/O cards, DSP cards, serial data cards and even one that supports 16 audio streams. Multiple Bridges can be connected via fiber or CAT-5 cables.

## To the other end

Turning attention to the opposite end of the spoke, Wheatstone offers, in addition to the Bridge, a satellite router frame that is a scaled-down version of the Bridge. It lives in a studio. This unit holds the I/O cards that are

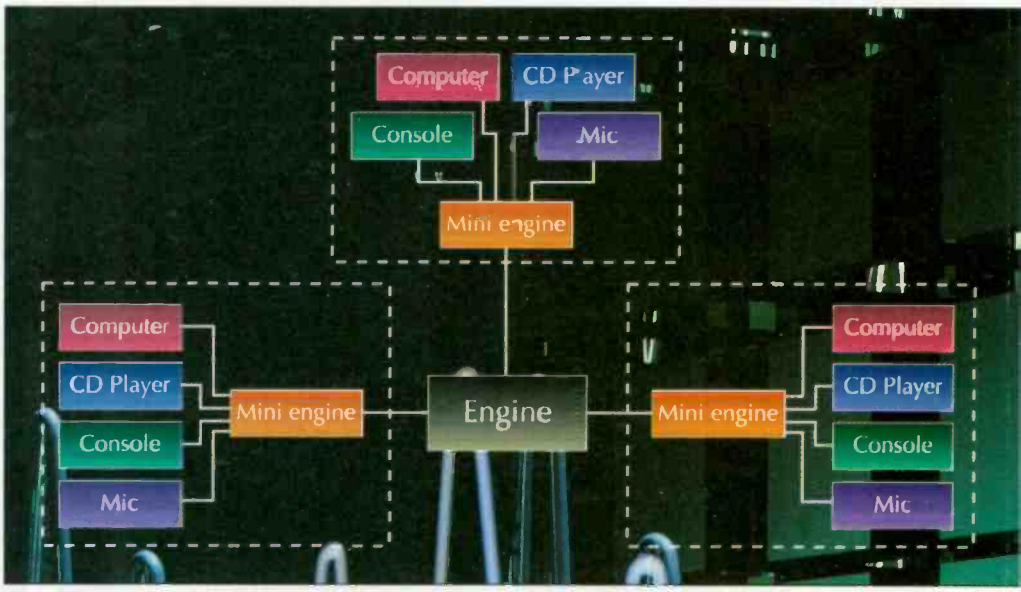


**Figure 2. A mini-engine or other I/O device can be used in a studio to further reduce the cabling needed to attach sources to the audio network.**

# Designing an audio network

studio-specific; audio peripherals such as CD players, DAWs and monitor amps get their audio inputs and outputs from this device. It will also work in conjunction with a control surface located in the studio. Connections from the satellite to other Bridges are formed via fiber or CAT-5 cable. Once that connection is made, all the peripherals become part of the network.

In the Studer 5000 router system, studio-specific peripherals are first connected to an I/O frame such as the D19M series. Individual I/O cards (such as four-input 24-bit A/D converters, four-output 24-bit D/A converters, dual-input AES or dual output AES) are plugged into this satellite frame, and are then added to the audio network by way of an MADI connection back to the 5000 router core.

SAS offers the Riolink—a device it calls an extension cord for the 32KD. This device is installed in a studio and serves as the audio and control I/O for the room. The Riolink is actually connected between the SAS control surface (known as the Rubicon) and the 32KD itself. The Riogrande, a new offering from SAS, works in conjunction with the Riolink and can change the Riolink in to a small 32 x 32 mixer in the event of a loss of the 32KD. Connectivity between the Riolink and the 32KD is formed with CAT-5 cable and RJ-45 connectors.

Logitek's approach to the studio-specific I/O is to use another audio engine; all of its power and features are thus available locally. One audio engine in a studio, plus the corresponding control surface, provides the user with the normal console functions plus complete access to the audio network.



## Resource Guide

***Manufacturers of audio networking systems***

***AEQ***
800-728-0536
www.aeqbroadcast.com

***Audioarts Engineering***
252-638-7000
www.wheatstone.com

***Axia Audio***
216-241-7225
www.axiaaudio.com

***Harris***
800-622-0022
www.broadcast.harris.com

***Klotz Digital***
678-966-9900
www.klotzdigital.com

***Lawo***
+49 7222 1002 0
www.lawo.de

***Logitek***
800-231-5870
www.logitekaudio.com

***Studer***
818-920-3212
www.studer.ch

***Wheatstone***
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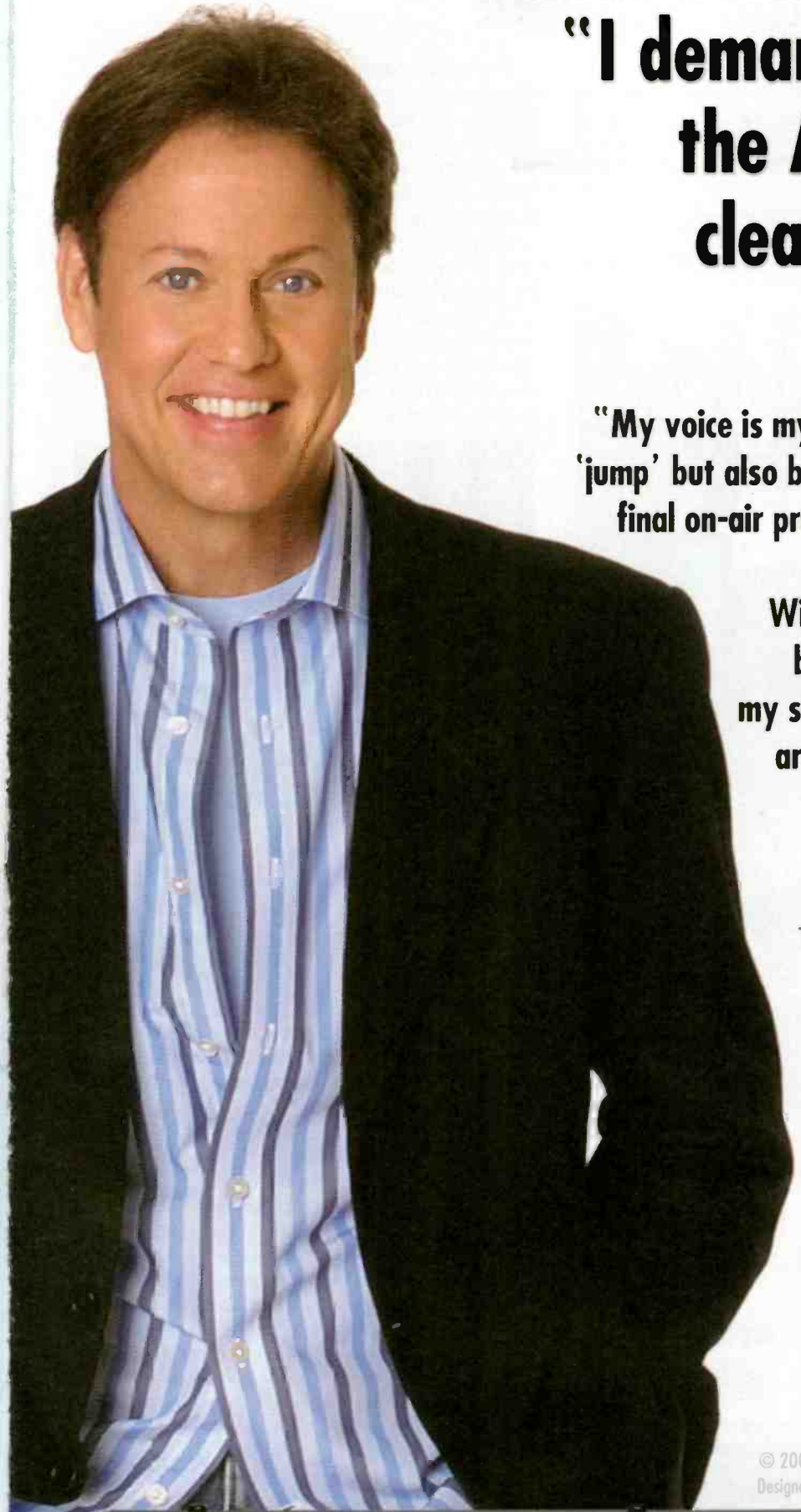
www.wheatstone.com



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If you demand the best for voice processing, demand the Aphex Model 230.

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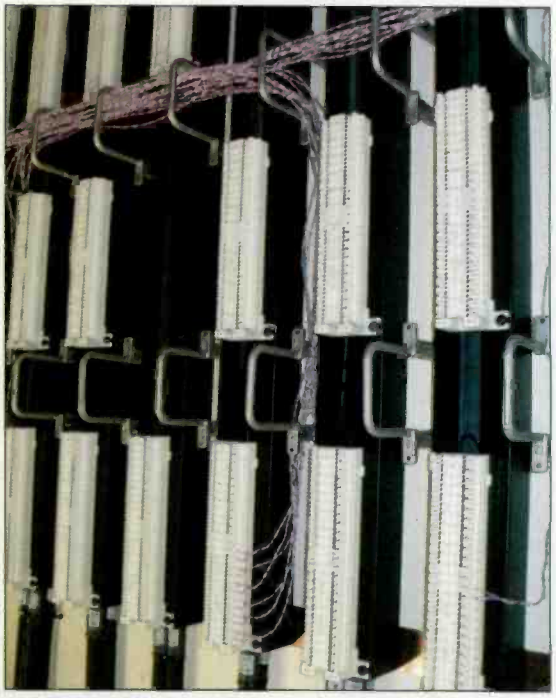
# Designing an audio network

Klotz uses a similar approach for the studio I/O. For example, a Vadis 212 frame would be placed in a studio, then connected to a control surface, making up (as far as the user was concerned) a console and at the same time adding all that studio's equipment to the audio network.

The Harris Vistamax system has a unique approach to the studio I/O aspect of the audio network. A Vistamax frame can be located in a studio, providing the appropriate I/O and functionality therein. Alternatively, one of Harris' digital consoles can also serve as a node, or peer, in the network. This provides scalability and allows the system to be integrated with legacy equipment.

Axia's approach to the audio network is to have all the spokes communicate with one another via Ethernet by way of a network switch that is effectively the hub of the spoke and hub topology. Axia offers function-specific 1RU devices it calls nodes that perform functions such as microphone amplification; analog I/O; AES digital I/O; router X-Y control; and finally control I/O. These nodes live in studios or other locations as needed. These nodes, in conjunction with the Studio Engine, the Smartsurface and the Ethernet switch, make up the audio network Axia-style.



**While multiple cable runs may still be necessary with an audio network, the number of cross-connects and distribution points are reduced.**

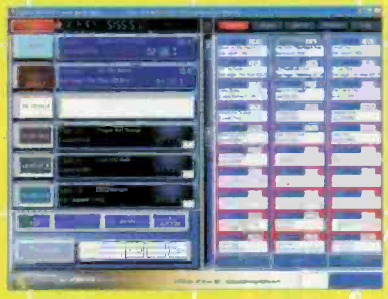
AEQ's system uses satellite BC2000 frames linked to other frames in the system for local studio I/O. In conjunction with the modular DM/D10 control surface, the console functions are completely handled, while all sources/destinations become integrated into the audio network.

The explosion of computer networking over the last 10 years has had an effect on the methodology and technology of radio station construction. The appropriate concepts, physical layer materials and devices have been borrowed from the computer network and modified and used completely in others to make up what is now known as the audio network. It's time to take what you have learned about computer networking and apply it to audio, especially if there is a studio build or upgrade on your horizon.

*Doug Irwin is the chief engineer of WKTU-FM, New York City.*

# Arrakis Systems inc.

www.arrakis-systems.com
970-461-0730



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1200-10s
analog console
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Radius-XP
$2 995 msrp

## Radio Consoles

12K18-12
analog console
$4,995 msrp

## Studio Furniture

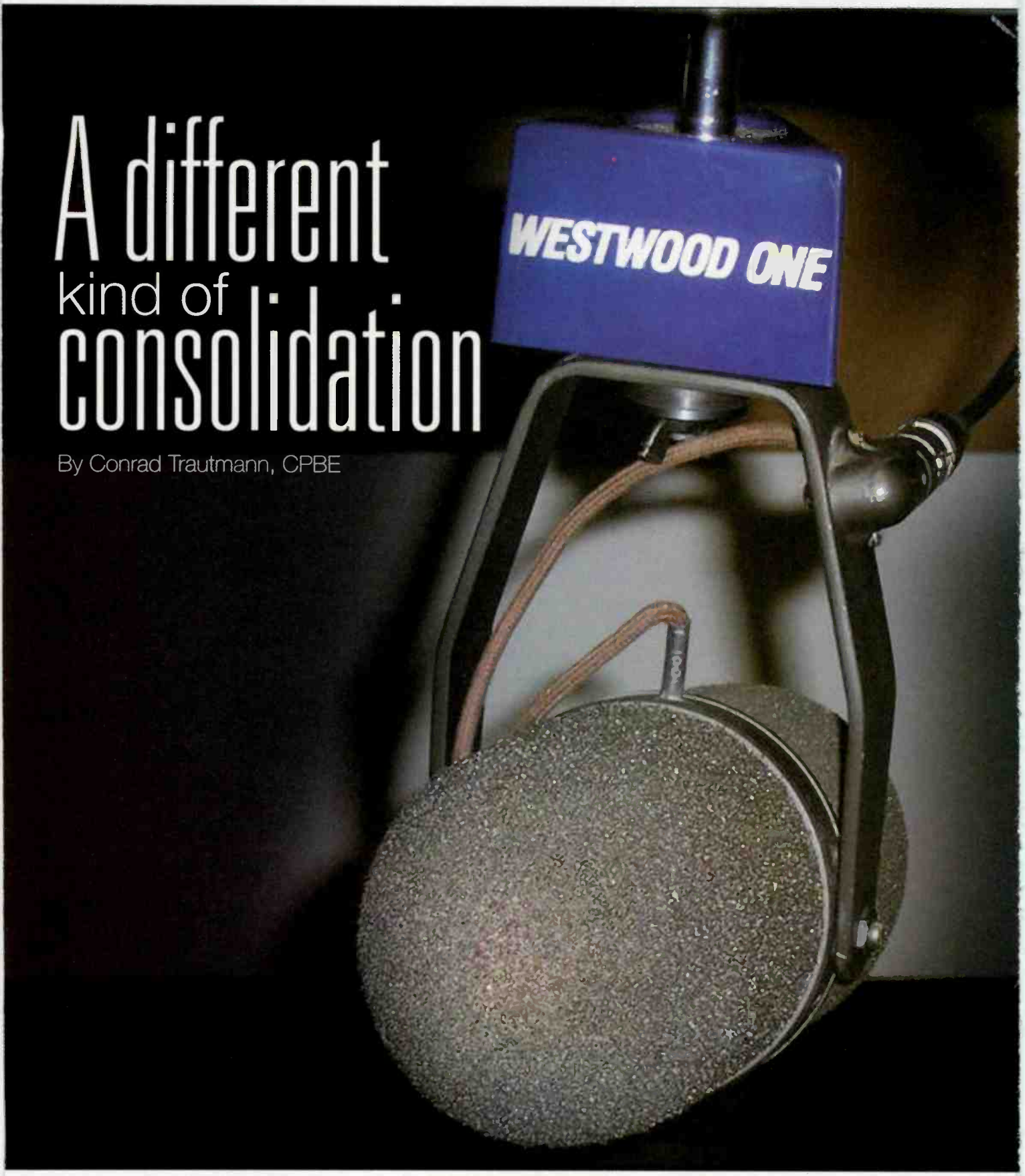
Modulux
Flex-studio
$4,995 msrp

X-Mixer digital console
$5 495 msrp (10 ch)
$6 995 msrp (14 ch)

6604 Powell St, Loveland, Colorado 80538

# A different kind of consolidation

By Conrad Trautmann, CPBE



In July 2006, Westwood One moved into its newly renovated studio facility located in Culver City, CA. It took many months of planning and five months of execution to finish the project. Home to the nationally syndicated programs *Loveline* and *The Tom Leykis Show*, there was a lot we wanted to accomplish that we were lacking in our old facility. A router-based console system was a must. We also wanted auxiliary power so California's rolling blackouts wouldn't roll our shows right off the air. And we wanted studios that sounded good and were versatile.

**Top photo: Control Room 1 for the producer and board op. Middle: Control Room 2 can be used as a back-up for CR1. Bottom: The computer monitors include call screening, Internet and producer/host communication.**

# A different kind of consolidation

The project began with Westwood One owning four buildings in Culver City but only occupying three. The fourth had been occupied by CBS Radio's KTWV until CBS consolidated all of its stations into the Wilshire Blvd. location in 2005. KTWV moved out and left a well designed, but used radio station building empty. This building was across the street from Westwood One's two buildings that housed the administration and sales offices and Metro Traffic's studios.

About a mile away from the neat little annex of buildings were the radio network's studios and operations. Inconveniently located and worn around the edges, it was time to update the 26-year-old building and equipment. It seemed to make sense to everyone to move the studios closer to the rest of the operation and renovate the former KTWV building to meet the network's needs. Then, we could manage a clean transition rather than trying to renovate an existing space while people were trying to work in it.

## Getting started

It was a pleasure to renovate a building that was designed as a radio station in its previous incarnation. Studios were already built with sound walls and doors, an auxiliary generator and UPS were already in place and a rack room existed with wire trays to the studios. Design was easy; we simply changed the floor plan by removing a few offices and adding a new main control room and studio. Everything else was reused: the offices, kitchen, bathrooms and existing studios.

Most of the renovation budget was spent updating the old infrastructure. New mechanical controls were needed for the air conditioning system because most

## Equipment list

360 Systems Instant Replay
ADC punch blocks
Aphex 230 mic tube preamp
Dell PCs
Denon DN-C635
Enco DAD 32
ESE master clock system, GPS sync
Genelec 8030A, 7050B
Harris Intraplex T-1 equipment
Middle Atlantic racks
O.C. White mic arms
Omnirax furniture
OMT Imedialogger
Rane HC6
SAS 32KD, Riolink, Rubicon
Shure SM7B
Tascam 102MkIII
Te os Zephyr Xstream, Delta 100
Whirlwind Headphone interface box

# 400 ~~250~~ studios already?

Time flies when you're having fun!

Hard to believe, but we passed the ~~250~~ 400 studio mark recently. We're told that it's a major milestone, but we prefer to call it a good start.

In fact, our clients have made Axia the **fastest growing console company** in radio, To you, we say "thanks" for your trust and enthusiasm. And to those of you who aren't yet clients: we're ready when you are.

Okay, back to work now. (Consoles don't build themselves, you know.)

AXIA
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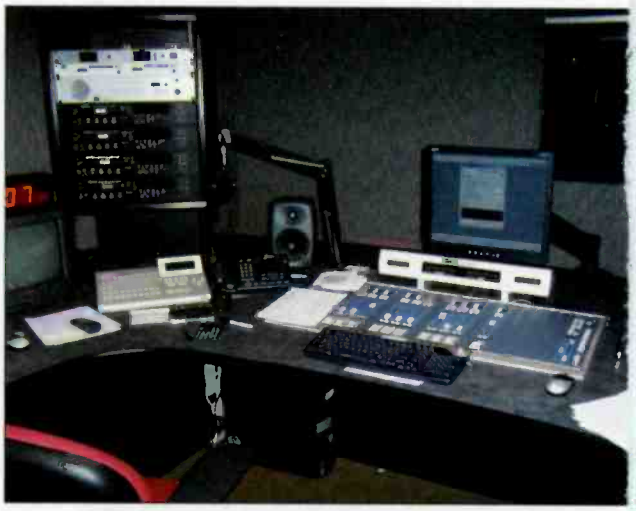
www.AxiaAudio.com

# A different kind of consolidation

of them no longer worked. New air conditioners were added for additional cooling. New fixtures in the bathrooms were installed as well as new carpet and paint throughout the space. The local building department required upgrades to the fire alarm system and we needed to add fire doors and renovate egress paths out of the building.

The rest of our budget was allocated for new studio furniture and equipment. We started by updating the inventory of equipment in our old building and then developed a wish list of what we wanted in the new building. If anything from the old building could be re-used, we removed that from the wish list. What was left was a long list of new items that we needed to purchase, because not much could be moved. We



broke our list into three categories: furniture, broadcast equipment and console/routers. We sent our needs in each category to the appropriate vendors and built our budget from there.

Deciding on the console and routing system was a challenge. The available products have matured to the point where there are a lot of good choices with virtually unlimited flexibility. Pricing was competitive. We spent a lot of time talking to other customers and checking references. We looked for a track record of solid support from the

**Control Rooms 3, 4 and 5 are primarily used for editing. Rooms 3 and 4 share a common voice booth for recording voice tracks, too.**

vendor, as well as system reliability and up-time. And we looked at features to ensure the product could do the work. Any complex system will have expected bugs and problems that need to be ironed out by fine tuning configurations and using the correct hardware. What's important is the follow-through from the manufacturer to help get those bugs worked out after the initial installation.

After all of our research, we still had three vendors to choose from. We selected Sierra Automated Systems (SAS) over the others for a few reasons. First was SAS' proximity to our offices. With its factory in Burbank and our offices in the Los Angeles area, we knew getting parts and support would be easy. Secondly, we already had a 32KD router at the Metro Networks office across the street. With a fiber run through a conduit running between the buildings, it would be easy to tie the two routers together and share sources and studios. With that one fiber run, we essentially could double our studio capacity. And finally, our history of reliability, up time and support with SAS has been outstanding. We've used its routers at our larger Metro Networks offices throughout the United States for many years.

## Setting a foundation

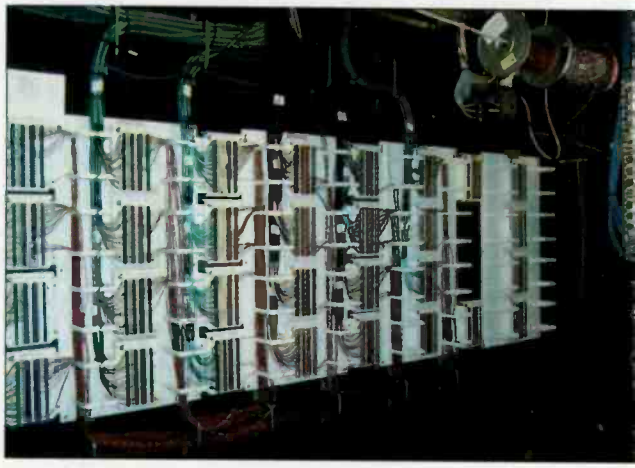
After that decision, we focused on furniture. Omnirax was selected for two main reasons. The most important factor to us was customer service. David Holland, Omnirax's lead salesperson, was on top of every detail. He worked with our architect and traded CAD drawings of the furniture to make sure everything would fit together. The other reason was that Omnirax was price competitive for a custom-designed system. Getting great customer service at a

# A different kind of consolidation

competitive price was a win-win.

Broadcast equipment was the final piece of the puzzle, and a lot easier to decide than the router and furniture. We bought new Zephyr Xstreams for ISDN and 360 Systems to replace some older units, and we repurposed our Enco Olympics equipment to use for sound effects, production beds and on-air spot delivery for our talk shows.

Audio editing is a primary function of the facility when it's not on the air for a live show. Shows that we compile and edit in Culver City include *Off the Record, In Concert, Out of Order, Beatles Brunch* and *Beatle Years and more*. We started with all new Dell computers. We upgraded the CD-ROM drives to Plextor models because we've had better results with those writing masters than stock CD drives. We added a lot of hard drive space, upgraded the audio cards and purchased the latest version of Wavelab 6. Wavelab 6 has been the editing software of choice at the facility; everyone was used to it and it does the job. So rather than force Pro Tools or Adobe Audition on the staff, we simply upgraded what they already felt comfortable with, which has worked well.



**ADC Icon blocks are used to cross-connect the audio sources and destinations and control in master control.**

With all the decisions made on the equipment, space plan and renovation, we received approval for our budget and then began the next phase of the project. Equipment lists were finalized and equipment was ordered at the beginning of April 2006. Our first construction meeting was at the end of April, where the demolition plans were confirmed with our general contractor. We had to coordinate carefully with the contractor a good time for an engineering crew to be on site to cable the space. We needed a time near the end of the demolition but before construction got too far along. That time was about the beginning of June. We sent in our team of company engineers to install all new home runs of Cat 5e cable and audio cables. The number of audio cables was significantly reduced from previous station builds we've completed with the selection of the SAS router-based system. Because the interconnects between the studios and the main router use Cat 5e, there's hardly any need to put audio on a dedicated pair. Our team also pulled all new cable for the phones, computers and building alarm systems as well.

The cable runs and certifications of all the computer cables were completed by the end of July, which timed well with the town signing off on our electrical contractor's work.

Our second crew of engineers arrived at the beginning of July. Their job was to assemble the furniture in the studios, install the router, consoles and all of the ancillary equipment, and then test it. We purchased, as part of our package with SAS, support time to configure each studio and the router. While we mimic many of the functions of a radio studio, we also have many unique tasks for the network that a radio station normally wouldn't have. In a radio station installation, for instance, it's common for all sources in and out to be stereo and the program feeds to be stereo. At the network, we have many mono distribution feeds so we need to be able to send and receive mono feeds to T-1s, ISDNs and other links.

## A graceful move

An advantage of moving a network facility is that typically the studios are not in use 24/7 like a radio station air studio. This provided flexibility when deciding the transition date. We began by moving a few of the production studios during the last week of July.

Then we picked a weekend to move the main talk studios.

The link between California and our main uplink and network operations center in New York is handled with Harris/Intraplex T-1 equipment. We took the opportunity to move our main program feed to a linear path, which has significantly improved the sound quality of our live broadcasts by reducing transcoding effects of multiple audio compression paths. We have a linear path in both directions, which has also helped with voice-overs and interviews conducted on both coasts. We also added a DS64-NC card with an Ethernet adapter that allows our Enco networks to trade files in both directions.

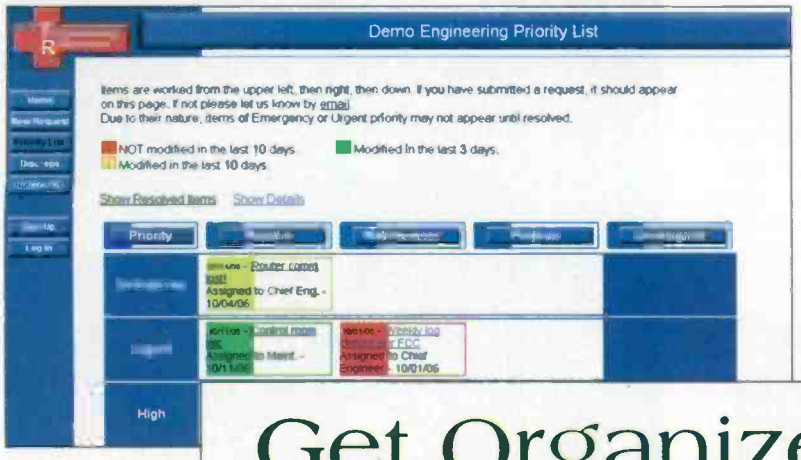
**A look at master control with Cat-5 connects, SAS router, OMT logger, GPS lock and NAS drives for network audio storage.**

Once everyone was moved and all of the bugs were worked out, we hosted a visit by Genelec. We purchased 8030A self-power speakers for our studios and in the larger control rooms we added a 7050B subwoofer. Liveliness and frequency response was measured and adjusted by the Genelec representative. We were happy to find that the studios have flat response and behave well. After all, audio is our business and we wanted to know that we were starting off with the best product we can for our affiliate stations. The other advantage of stepping through this exercise is that we balanced all of the rooms so that they are as close as they possibly can be to each other. If you've ever worked in a radio station where there are different brands or even different models of speakers, the producers and talent always seem to have a favorite room. People will line up and wait for the favorite room to be free rather than use the empty room with the "bad" speakers. We did our best to make all of our rooms as equal as possible.

Westwood One's Los Angeles operation is now positioned for the future. We have flexible routing, we have room to grow and we can accommodate anything we can think of today.

*Trautmann is senior VP of engineering and technology, Westwood One, New York.*

**Online Extra**
More photos and a floorplan of the Culver City facility are posted with this article online at beradio.com.




# Get Organized with a Database

By Steve Epstein, CPBE CBNT

With consolidated facilities and reduced staffs, everyone picks up chores that aren't really in our job descriptions. For many stations, having the engineer double as the carpenter, painter and carpet layer is part of the culture. Certainly we all want to help out, but when painting the lunchroom prevents us from timely routine transmitter maintenance, something has to give.

Get organized by writing down your priorities. It should be easy to discern that being on the air is the number one priority. Number two might be the ability to get commercials and programs to the transmitter. Three could be news or the streaming servers. Once you identify (and get management to agree) to those written priorities, it is a simple matter to show that many of the tasks you are asked to do are low priority. By definition, anything not on the list has to be a low priority.

Another way to look at it is how soon will the problem adversely affect what is on the air (your number one priority). Anything that is currently causing on-air problems is definitely an emergency, such as tone bleeding through or unscheduled silence. Problems that will make it to air in the next 10-15 minutes are also right up there. Slightly lower are problems that are an hour, day or week out. Obviously, the less time sensitive the problem is, the less urgent it is to find a solution.

Beyond documentation and paperwork, the typical workload for engineers consists of three main items: repair, maintenance and projects. Repair is fixing things that break, maintenance is preventing things from breaking, and projects typically consist of making things better. The less time you spend on maintenance, the more you will spend time on repair. If you take the time needed to repair something well, the less likely it is to break again. Identifying why something failed, and how to prevent that failure in the future will likely provide you with some new items for your maintenance list. Projects can be used to find ways around older pieces of equipment that require large amounts of repair or maintenance time.

**(Above) The Priority List shows the status of all pending projects at a single glance.**

## Technology to the rescue

Tracking work is traditionally managed through paper work orders. Carbonless forms work well, but with today's electronic-based information systems, it is much quicker to have the work orders in electronic form. Properly implemented, work orders can be kept in a database and tracked by any number of parameters. There is a multitude of software available for tracking work orders. Much of it has been developed for proprietary applications. Many of the commercially available products are built around the help desk concept. Help desks work well for many applications, however, they assume a dedicated person, or group of people, is on the phone or at their computer throughout the day. Broadcast facilities don't work that way.

Instead, a system built around a Web server works well in today's facilities. With a Web server you can get to a server on the Internet or the company's intranet from any computer on the network. Access a site with any browser, and the interface is fairly consistent. With the proper log-in script, the site can have varying degrees of security. By adding a form of group management, different parameters can be allowed based on the log-in. Behind the scenes, any machine running a Web server will most likely have e-mail and time-based services running. All of these can be combined to form a sophisticated workflow management application.

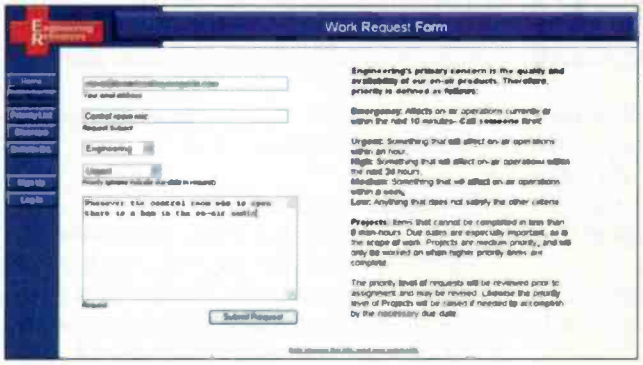
For those interested, creating your own in-house system is not that difficult, and is a great exercise in Linux/Unix systems. If you have never worked with a Linux/Unix system I heartily recommend it. However, if you want to keep your facility 100 percent Windows, you can do the following on a Windows system, but many of the Unix-based

time functions will have to be adapted.

You need three key components, an http (Web) server, a server-side application and a database that integrates well with the other two. I recommend Apache, PHP and MySQL. Apache is an open source Web server that is used in many mission critical applications. PHP is an open-source module that provides an interface between Apache and MySQL. MySQL is a relational database that is available free of charge for non-commercial applications.

## Putting it all together

Teaching you all you need to know to code an application is beyond the scope of this article. However, in short, you will need to consider all or most of the following: entry forms, status pages, automatic processes based on time, e-mail or some way to communicate with users, security and access from outside the facility. Entry forms need to cover the basics including the name/e-mail of the requester and a detailed description of the problem. Time and date can be added automatically. Status pages should make it clear how far along the project or repair is, and possibly where it is in the overall priority list. Automatic processes can be used to generate reports and add recurring maintenance tasks to the




**Station personnel can use the Work Request Form to report problems.**

list. E-mail is an easy way to automate communications back to requesters so they stay in the loop and know that their item is getting attention.

Finally, consider access from outside the facility. Many times people will think of something after they leave. Having the application available on the outside lets them add items. It also makes it easy for you to update from home instead of having to add items at 3 a.m. after an emergency call on a Saturday night.

As time goes on, your database will hold a wealth of information about what failed, how it was corrected and how long it took. That becomes a powerful tool when it comes time to discuss next year's capital and expense budgets. It also provides considerable ammunition when it is time to add to your staff, or likewise, to reduce your staff for budgetary reasons. In the event you like these ideas, and would like a tool like this, but have neither the time nor interest to build one, take a look at www.broadcastbuyersguide.com/ER.

*Epstein is owner/editor of BroadcastBuyerGuide.com and an IPTV engineer for Centurytel in Columbia, MO.*


# Edirol UA-1EX

By Chris Wygal

Sometimes a mistake can result in the purchase of a really neat product. Such is the case when Victory FM (home of the Liberty University Flames Sports Network) bought a laptop to use for field recording and audio playback. I hadn't thought much about specifics as far as the laptop was concerned, so when the GM asked for ordering specifications I only mentioned hard drive space and processor speed.

The laptop came out of the box with the expected 1/8" mini plug jacks on the integrated sound card. However, there were only two jacks: microphone in and line out.

"How am I supposed to connect this thing to a mixing board?" I asked myself. Sure, some creative in-line pads and matching devices would have allowed me to use the microphone input, but the idea didn't sit well. The key to solving this problem lay in the handy USB jacks on the side of the laptop. I had heard of several USB audio interfaces that were on the market. Luckily, I found a really great solution for a really great price.

## Performance at a glance

USB connectivity

Analog and digital I/O

Up to 24bit/96kHz audio

Two operating modes

Plug and play

Small size

I chose the Edirol UA-1EX from Roland for getting clean audio in and out of the laptop. Connecting to a PC or Mac through a USB port, the UA-1EX is about the size of a dollar bill, and about 1/2" thick, so it fits nicely in a laptop carrying case. It comes equipped with a built-in USB (also the power source) cable and RCA jacks for stereo analog line-level in and out connections. A 1/8" microphone jack provides a 3.3V for using a miniature condenser microphone. The system also accepts digital optical input and output connections, with the 1/8" mini output jack doubling as a stereo headphone output.

### Buttons and knobs

From a buttons and knobs perspective, the interface is simple to use. An input volume control adjusts levels from the microphone and RCA line-level jacks, and a headphone volume control adjusts the headphone levels. A mode select switch allows it to operate in advanced mode, which uses drivers specific to the UA-1EX, or standard mode, which uses audio drivers specific to PC or Mac operating systems. On the backside of the device are a set of five dip-switches for making various changes to settings, such as recording and playback sampling rates (from 32kHz to 96kHz), changing the headphone and line output monitoring setup, and selecting between the digital or analog input sources. A solid green indicator shows USB connection to the PC or Mac and flashing green lights show input and output audio levels.

As mentioned earlier, the unit can be operated in advanced mode or standard mode. In the advanced mode, audio between the UA-1EX and the computer can be transferred at 16 or 24 bits and sampled between 32kHz and 96kHz. When using sequencer software that supports ASIO drivers (such as Cubase VST or Logic) the UA-1EX is best used in advanced mode. In fact, Edirol suggests that the advanced mode setting be the default for normal use. Standard mode uses the audio driver provided by the specific computer operating system and makes only 16-

bit resolution available at frequencies between 32kHz and 48kHz.

The unit is shipped with a driver's CD and user's manual (which also fits nicely into the laptop carrying case). The equipment can be used with Windows 98, ME, 2000, XP and Macintosh operating systems. The interface is truly a plug-and-play item because no batteries or power supplies are needed (it's powered by USB).

When the UA-1EX is plugged into a USB port the computer automatically recognizes it and it becomes the default audio device, essentially canceling the on-board soundcard. On one rare occasion, I had to manually tell the laptop to make the UA-1EX the default device. By and large, it plugs in and runs like a champion. The unbalanced analog inputs (via RCA jacks) handle transients and overshoots well and preserve original program material perfectly. The output (also unbalanced) is clean with no bizarre noises or hums and buzzes. Latency has never been an issue thus far in my experience, but latency adjustments can be made as necessary when using the interface in advanced mode.

The user's manual graciously offers meticulous settings instructions, feature highlights and how-to's for different situations. Installing drivers and connecting hardware (especially for audio and video applications) on any machine inherently comes with its own possible setup issues, and Edirol addresses many popular snags that users may encounter.

A troubleshooting section in the manual is helpful and the appendices offer many useful tips to Window and Mac users alike. The manual is full of flow charts and diagrams to assist in everyday setup techniques or even more complex setups involving optical connections to DAT players, for example.

When looking for a cost-effective solution to interfacing audio with a laptop or even desktop computer, the Edirol UA-1EX does the trick. It is easy to install, travels well in the laptop bag and takes the stress out of capturing audio for non-linear editing on the fly.

**Edirol**

**P** 360-594-4273

**W** www.edirol.com

**E** sales@edirol.com

*Wygal is the programmer, engineer and Web designer for WRVL in Lynchburg, VA.*

Editor's note: Field Reports are an exclusive *Radio* magazine feature for radio broadcasters. Each report is prepared by well-qualified staff at a radio station, production facility or consulting company.

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# Nautel V5d

By Walt Gander

WXPR had been on the air since 1983 with a CSI 12000F tube transmitter, which was upgraded to a 20000F in 1992. It fed a 10-bay Phelps-Dodge antenna of the same 1983 vintage. This setup provided steady, reliable service but aside from the tubes, spare parts were getting difficult or were impossible to acquire and we needed a new linear transmitter to transmit an HD Radio signal.

As a 100kW class C1 FM, we chose the space combining method with an interleaved antenna on our 400-foot tower. We decided this would waste the least amount of electricity and heat. Another attractive aspect of space combining is that the digital transmitter can serve as a backup analog transmitter if the analog needs to be off-line for any significant period.

We selected an eight-bay Dielectric antenna for analog and the four-bay equivalent for digital. Calculated antenna gain and line losses meant we needed 27kW TPO analog. With the digital antenna providing a gain of 2.1 we only needed 500W from a digital transmitter to reach our ERP of 1kW (1 percent of analog).

## Performance at a glance

Display-based user interface

100-event troubleshooting log

Redundant, hot-pluggable modules

62 percent overall analog efficiency

30 percent overall digital efficiency

Broadband amplifier design

Six operational presets

We started evaluating transmitters last spring. All the familiar names were in the running by the time we sent requests for bids. Most manufacturers responded with products we were comfortable with, but we decided on Nautel. Besides the company's solid reputation, our CE influenced part of the decision. As a retired U.S. Army Signal Corps officer, he appreciated Nautel's years of experience manufacturing to military specifications. In addition, as stewards of a community public radio station, we recognized that we were building for the future, and planning for the next 25 years doesn't necessarily mean going with the lowest bidder.

### The final decision

We chose the Nautel V5d for the digital signal. Achieving 27kW analog power meant going with the Nautel Q30 that combines outputs of a standalone Q20 and V10 (20kW and 10kW respectively). Both the V5d and the Q30 use a Nautel M50 exciter, and the SC1 controller handles the balancing of the Q20 and V10's outputs into the combiner.

At the end of July 2006 we placed the order. By early September, Nautel notified us that the shipment was ready. This was a surprise, being three weeks ahead of the date specified in our original bid request.

The shipment consisted of 13 wooden crates weighing almost 4,300lbs. The delivery truck hired in Nova Scotia by Nautel did not have a lift gate, but that turned out to be a blessing in disguise. We had the load transferred to a local moving company at its warehouse, and were glad to have the moving company's equipment, expertise and muscle when unloading the equipment at our site.

Great attention to detail was evident in preparing the containers for shipping. Besides three transmitter cabinets, the crates contained the reject loads, main and spare power modules, main and spare power supplies, exciters, exporter, importer, a variety of connectors, hardware, sections of hard line, wiring assemblies, cable sets, combining kits and a complete set of technical manuals. Every part or component inside each crate was either bubble-wrapped or foamed and sealed in boxes. There was no unpadded or unfilled space in any crate.

Once unpacked, assembly began. The importer, exporter and V5d exciter communicate through three ports of a provided four-port hub. We supplied a rack shelf, KVM switch, keyboard, monitor, mouse and a number of AES-3 cables for audio routing.

An extensive set of manuals accompanied the shipment. The V5d, Q20, V10, exciters, importer and exporter each had individual manuals with sections addressing installation prep, step-by-step installation instructions, operation, maintenance and repair. Nautel owners can join the Nautel Users' Group and have access to all of these manuals and more online.

Individual power supplies and power modules

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were unpacked and installed. The V5d has one IPA module with its own switching power supply, and four RF power modules each with an individual power supply. Each power module consists of four discrete circuit boards that mate to BNC-type connectors at the rear of their slides within the cabinet. Power and control are applied through a fifth interface board in each module.

**Nautel**

**P** 207-947-8200

**W** www.nautel.com

**E** info@nautel.com

Parts and connections were meticulously documented and labeled. Detailed drawings and photographs showed the layout of the cabinets, plumbing and electrical connections. Removable tags in the enclosures guided us to locations where components belonged. Bagged hardware was labeled for specific applications and frequently attached where needed. Ample quantities of spare hardware were provided—all stainless steel.

**A look inside the V5d with the amplifier modules on the upper left and the power supplies along the bottom.**

Assembly, RF plumbing, final electrical and grounding work, and other small but important details took place over several weeks. Our pledge drive was scheduled for the end of October and the tower crew, OK Tower of Medford, WI, was booked for the following Monday, Oct. 30. That week we began the changeover. We would broadcast with our old transmitter at low power from a temporary antenna rigged on another tower on our site.

## The transition

As fortune would have it, the CSI transmitter chose this time to fail so we ran a spare RPU extension from the analog STL receiver in the old building to the new, swung the temporary antenna feed line into the new building and commenced broadcasting with the Q30 at low power.

By the middle of the first full week in November the tower crew was finished. The tower was unrigged and the analog increased to full power. However, the new digital STL had less headroom than predicted by the path study and the V5d still languished on the sidelines.

As a work-around, we applied replacement audio from the Danagger Plan B silence eliminator directly to the V5d, and then powered it up. With that, we became the first station in north-central Wisconsin to broadcast an HD Radio signal.

Meanwhile, a 10W STL booster amplifier was ordered. It solved the headroom problem, and five days after reaching full analog power the V5d was simulcasting our main program service at 500W on HD1. An HD2 service is in the works for the spring of 2007.

The V5d performs effortlessly. Reject power behind the circulator is on the order of 2.5W or 3W. Reflected power is barely measurable. We had an initial issue with fail indicators on one of the intermediate power amplifier modules, but it was promptly diagnosed and replaced by Nautel customer support.

I expected to have minor snags and bumps in the road in a project of this scope. There are ancillary parts and devices you don't know you need, and nothing ever goes completely as planned. But that wasn't the case with anything supplied by Nautel. We're extremely pleased, and so are our listeners.

Dan Roberts of Broadcast Connection was the supervising contractor on this job. WXPR Chief Engineer Elmer A. Goetsch, contract engineer Jim Zastrow of Zastrow Technical Services, and broadcast engineer Bob Gorjance were also instrumental in all stages of this project.

*Gander is the operations director of WXPR, Rhinelander, WI.*

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## Researching correspondence schools

*John Battison received this letter from a reader:*

Dear Mr. Battison,

I am a historian of education at the University of Delaware. I'm studying the history of correspondence schools in America from the 1890s through the 1930s. The National Radio Institute (NRI) was one of the largest and most reputable specialized schools with enrollments of approximately 12,000 students in the 1920s. I am eager to find out if there are any NRI primary sources—letters, memoranda, annual reports, sales records, and so on—from those decades. The traditional online search engines for archives turn up nothing, unfortunately. For several other home study schools, I've contacted children and grandchildren of founders and officers (for instance, the granddaugher to the founder of the U.S. School of Music had a 200+ page memoir written by David Kemp).

Do you know if any descendants of James Smith or Mannie Haas might have their papers? Do you have any records from those early years?

Historians have overlooked the history of home study, and I am trying to fill that gap in our knowledge.

*Robert Hampel*
*professor and former director, School of Education*
*University of Delaware*
*hampel@udel.edu*

*John Battison was the director of education for the NRI from 1952 to 1954, and he has provided Mr. Hampel with some additional information about the school. Since contacting us, Hampel has located some NRI archival records at the Radio and Television Museum in Maryland. Any additional information about the NRI can be sent to Hampel.*

## 101 innovations

*The December 2006 issue featured a list of 100 innovations that have shaped radio broadcasting. That list was selected by a panel of Radio magazine contributors and readers from a longer list of nominations submitted by readers. Narrowing the wide range of products and ideas to 100 was bound to leave something out, and as we expected, we received letters with thoughts on items that did not make our list. —CS*


Great research on the article. One item I was looking for, though, was Marti RPU equipment. Marti has over the years become virtually synonymous with any wireless remote broadcast. I think Marti would have been good addition to the list.

*Laverne Siemens*
*director of engineering*
*Golden West Radio*
*Altona, MB*

## Wait for it

Good points in your December Viewpoint re: HD Radio. Everyone seems to want it to take off instantly. It's like the old Heinz ketchup ad said: "Good things come to those who wait."

*Lloyd Collins*
*KWIX*
*Moberly, MO*

# Watching

The cares for the beginning and end of Daylight Saving T me change in 2007 so that the period begins earlier and ends later. DST previously began on the first Sunday in April. It now begins on the second Sunday in March. DST ended on the last Sunday in October. It now ends the first Sunday in November. The change is observed in all provinces n Canada and al states in the U.S. except Arizona. ndiana will now obse ve DST. Mexico observes DST, but will not acopt the new schedu e.

With so much broaccast equipment re ying on internal clocks to function, many of these devices will neec to be updated so the change to and from Daylight Saving Time take effect on the correct days.

With the assis ance of Barry Thomas and Eric Schecter of the Lincoln Financial Grcup, we have compiled a list of equipment and the steps needed to implement the changes for ecuipment that uses a real-time clock.

***Broadcast Tools time products***
All Broadcast Tools products al ow the user to enter the times and dates for DST.

***Broadcast Warehouse processors***
Current software does not change fo DST

***Burk Arc-16 product line***
DST dates are configurable on the Arc-16 Plus. Arc-16 time activities are handled by the Auto Pilot software, which uses the PC clock as a reference. The Arc 16 Web interface can be updated through the configuration settings.

***Burk EAS***
Time is referenced to UTC. DS can be configured by the user.

***Burk GSC3000 and VRC2500***
Firmware to update DST dates will be available by March, 2007. It will be included with Lynx 5, a free upg ade from any other 5.x version. Older versions may be configured to remain in standard time to disab e cutomatic DST adjustment. The GSC/VRC Web Interface can be updated through the conguration settings.

***Burk Lynx software***
Data logged in Lynx 4.x and later is recorded in reference to the PC time with a time zone offset, if configured).

***Chrontrol XT***
Details will be posted to the Chrontrol website soon.

***Circuitwerkes Sicon-8***
The unit does not change for DST. Schedules can be entered to account for the time change.

***Digital Radio Express FM Extra***
Encoders run Windows XP, which can be updated with a patch from Microsoft.

***ESE 102 master clock system***
ESE will release a new EPROM. The company will contact customers when it is ready. It is expected that the ESE ES-185 and ES-185U GPS master clock systems will have the same resolution.

***Gorman-Redlich EAS***
No patch is available yet, but an Eprom change would be requ red.

***Ibiquity HD Radio equipment***
The HD Radio system is locked to GPS.

***ITC audio router***
This system can be synced to a master clock

***Microsoft Windows***
Microsoft has released a patch. See Microsoft Knowledge Base article 928388 or www.Microsoft.com/windows/timezone/dst2C07.mspx

***Nortel telephone system and voice mail***
Manual adjustment of system time will be needed unless patch is released. Same with clock on vo ce mail system.

***Omnia audio processors***
DST dates can be changed by the user w th the equipment inte face.

***Orban 8500/9200 audio processors***
DST dates can be changed by the user with the equipment interface.

***Sage Endec***
No upgrade path has been released from Harris at this time. Most likely fix will be an EPROM upgrade or similar.

***SAS 32KD router***
Automation events are determined by a clock n a Windows-based PC, so the Windows patch should suffice.

***Starguide satellite receivers***
Time base is controlled by network uplink.

***TFT EAS 911***
According to TFT: "We will release a new version of software for the Daylight Saving Time change, plus several improvement changes. The anticipated release date for this software chips set will be around the first part of February."

***Westwood One/IDC satellite receiver wit audio record HDD***
System time is based on the uplink servers. Referenced to GPS-based UTC.

# the clock

By Chriss Scherer, editor

So far, our investigation shows that all the automation system manufacturers rely on the PC clock or a time server to handle the DST change.

Don't forget to check some less obvious devices. Generators, sprinkler systems, security systems, HVAC and other devices may have internal clocks that need to be adjusted. In addition, there are some devices that may not be accessible to station personnel, such as peak-demand timers from electric service providers.

While the effective dates of DST have changed, it is only by a few weeks. In most cases, equipment will function normally except that a time stamp may be off by an hour. In the case of the EAS encoder/decoder, the operation of which is part of a station's operating log, its time is noted as UTC, DST or Standard Time. For the change to DST in March, the situation will correct itself in April. The law also states the the schedule can revert to the old times if Congress so deems it.

Do you have additional information that is not on our list? Let us know at *radio@prismb2b.com.*

***Online Extra:***
Read the Energy Policy Act of 2005 at this link. The details of the DST change are in section 110.
http://tinyurl.com/d87wb

by Kari Taylor, senior associate editor

## Networked audio system
### Wheatstone

**E-6:** The E-6 Surface, the E-series Studio Satellite and the E-series Network Switch combine to create a networked audio system. Each studio operates independently yet can share all the sources and mixes through the E-series Network. Switch without traffic limitations, audio latency or machine control delays. The E-6 Surface features event recall, bus-minus and mix-minus and four aux mixes—all with dedicated talkback systems. The system also features four monitor outputs and standard EQ, dynamics, panning and mic processing on all channels. It supports multiple arrays of programmable input channel and master panel switches for customized functions.

**252-638-7000; www.wheatstone.com**
**sales@wheatstone.com**

## Lighted switching module
### DM Engineering


**Mic Pro:** LED lighted "mic on" and "mic off" buttons enable and disable the mic channels on this module. More than one mic input can be controlled simultaneously. Monitor speaker muting is also controlled via the relay pack, and on-air or recording signs are controlled by a solid-state relay pack. The module is attached to the mixing board with the supplied hook and loop fastener system or double-sided tape to the production board.

**805-987-7881; www.dmengineering.com**
**info@dmengineering.com**

## Audio coding algorithm
### APT

**Apt-x Live:** Apt-x Live enables the streaming of digital audio in real time over a wireless link. Designed for live performance situations, this audio algorithm offers a delay under 2ms.

**800-955-APTX; www.aptx.com; info@aptx.com**

## Tower light
### Dialight

**Red-white beacon:** A LED medium-intensity red-white flashing beacon, this light is designed to overcome vibration and extreme weather conditions. It is a 20,000 candela flashing white light combined with a 2,000 candela steady or flashing red LED obstruction light. Operating temperatures range from -55 to +55°C and it can withstand conditions including direct sunlight, wind blown rain, high wind speeds, high humidity and salt fog.

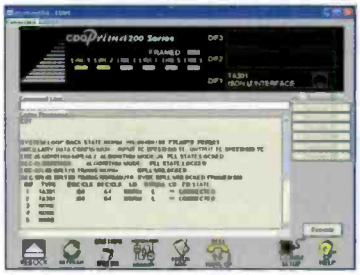
**800-835-2870; www.dialight.com**
**info@dialight.com**

## Loudspeaker
### ATC

**SCM20SL:** The ATC Passive 20 features the same woofer and tweeter as the active SCM20ASL and are are housed in a conventional black box. The low-frequency section is a hybrid design incorporating a 150mm bass cone with a grafted 75mm soft dome for mid-range assist. The woofer magnet assembly reduces third harmonic distortion to help reveal mistakes and details.

**702-307-2700**
**www.lasvegasproaudio.com/atcstmo.html**
**sales@lasvegasproaudio.com**

## Software for Windows
### Musicam USA



**Universal Remote Control:** The program automatically detects each connected CDQ Prima, Prima LT, Prima LT Plus, Team or Super Link and displays a picture of the unit on the screen. Click any function or digital interface module to fully configure each module. The program runs on any Windows-based PC and connects via serial port or telnet over IP (Team and Super Link only). Internal connections can be made or changed easily. Commands can be entered manually, and the unit's responses can be viewed.

**732-739-5600; www.musicamusa.com**
**sales@musicamusa.com**

## In-line network tester
### Fluke Networks

**Net Tool Series II:** This system shows the actual traffic between the network and end devices such as PCs, VoIP phones, access points, printers and copiers. In-line testing allows identification of device and network configurations and performance issues, reducing troubleshooting time. Users can verify link readiness during pre-deployment planning, as well as troubleshoot problems on active networks by monitoring real-time VoIP traffic. Net Tool can negotiate with Ethernet-based power-sourcing equipment, acting as a powered device and displaying voltage and current delivered over the cabling.

**800-28-FLUKE; www.flukenetworks.com**
**info@flukenetworks.com**

## CD, DVD cleaning fluid
### Kenneke Communications

**Kenwash:** This cleaning solvent removes smudges, dirt, fingerprints and other types of contaminants from discs. The cleaner works with all manual and automatic disc cleaning systems. It works with CDs and DVDs, including CD-R, CD-RW, DVD-R, DVD-RW, DVD+R, DVD+RW and double-sided discs.

**541-619-6490; www.kenneke.com; kenneke@kenneke.com**

## IP intercom
### Barix Technology

**Annuncicom 100:** This intercom can be deployed over a standard IP or Ethernet network infrastructure to any number of locations. It can connect directly to a PC or function autonomously with other Barix products. The device can connect to one of eight preset radio stations. It can also connect to an unlimited number of stations in a point-to-multipoint configuration. Target stations can be addressed over a standard Web browser, contact input or a serial interface. The unit is equipped with an Ethernet interface and communicates over existing TCP/IP networks. All network-connected devices can be controlled from a single central command station. Each device comes with its own integrated Web server that allows it to be configured over a standard Web browser.

**866-815-0866; www.barix.com; info@barix.com**

## Audio switcher
### Dixon Systems

**AS428:** This stereo audio switcher can be used as two 4x1 stereo switchers or as an 8x1 (in a single rack space) with two identical outputs. Designed to add inputs and additional monitoring capability for the NM-250 MKII Newsroom Mixer, the switcher can be used anywhere a locally controlled stereo switcher is required. Use the device's A/B function at the transmitter site. The switcher features unity gain and balanced operation.

**416-261-3773; www.dixonsystems.com**
**helpdesk@dixonsystems.com**



## Facility monitor
### Flash Technology

**FTW171, FTW172:** The 171 provides an inexpensive method of monitoring a facility. The 172 includes additional features that allow the user to gather more detailed information through Flash Technology's proprietary Eagle system. The units provide real-time data, and can monitor and manage non-IT-based equipment such as HVAC units, back-up generators, security access, exterior lighting and cooling systems.

**615-503-2000**
**www.flashtechnology.com; flash.info@dielectric.spx.com**

## Cardioid mic
### Marshall Electronics

**MXL Model 604:** A cardioid condenser pressure gradient microphone with an interchangeable omni-directional capsule, the MXL 604 features a -10dB attenuation switch that enables the microphone to better handle high sound pressure levels. The mic offers a selectable low frequency roll-off capability to compensate for proximity effect or to eliminate wind noise during outdoor recording. Its transformerless design provides a solid bottom and an open top end sound. The microphone is internally wired with Mogami cable. The mic features a satin silver finish with etched engravings.

**800-800-6608; www.mxlmics.com; sales@mxlmics.com**

## IP audio system
### Digital Juke Box


**Remoteware VoIP:** This software enables radio stations to broadcast live remotes from any location with any type of Internet connection as long as there is 10kb bandwidth. Features include 100ms delay, works with any Internet connection, no port forwarding, and a hole punching technology to get past firewalls. Use this system in a laptop with a microphone for a live remote. The software is full duplex and users can talk from studio to remote location.

**888-ONAIR-99; www.STLware.com**
**sales@digitaljukebox.com**

## Portable FM and SCA receiver
### Mid-Atlantic RF Systems

**BSC98-20-D:** This FM/SCA receiver receives pre-delay audio to communicate with and queue talent in the field without the eight-second delay inherent in the digital FM broadcast. The receiver is a TCXO-referenced phase lock loop-controlled receiver that operates in the FM band. It demodulates the main channel audio as well as the standard 67kHz or 92kHz subcarrier audio. The front panel also provides connections for a headset jack for monitoring the received signal. The rear panel features connectors for antennas, dc power and audio line output, which is not gain controlled.

**410-893-2430; www.midatlanticrf.com; info@midatlanticrf.com**

## 12-channel cable
### Clark Wire and Cable

**Audio snake cable:** This is a plenum grade, 12-channel audio snake cable. It is manufactured with the company's quick-strip method, which means the foil and jacket are easily removed as one unit when stripped. Each pair is color-coded.

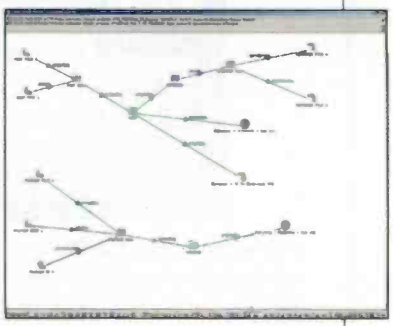
**800-222-5348**
**www.clarkwc.com; sales@clarkwc.com**

## Two-way compact loudspeaker
### JBL Professional

**Control 1 Pro:** With monitor-grade high- and low-frequency drivers, this speaker's updated crossover network design provides steeper crossover slopes for improved consistency throughout the listening area. Sonic Guard overload protection has been enhanced to provide better full-range protection of the transducers and network against power surges from the amplifier. The speaker's enclosure houses magnetically shielded transducers, making it well suited for use with magnetically sensitive equipment. The speaker is available in black or white finishes.

**800-852-5776**
**www.jblpro.com; info@jblpro.com**

## Network audio operating system
### Digigram



**Visiblu:** Visiblu combines audio processing and networking technologies by unifying the Ethersound protocol with audio IP streaming into an engine that runs under Windows and Linux. The system allows users to develop audio and data routing, transporting, encoding and processing systems across local facilities and wide areas. The system features bi-directional Digipro audio IP transport management with low latency forward error correction; automatic clock drift management; sample rate conversion; and stream resychronization. The system supports a wide range of audio formats such as PCM linear, and MPEG 2 and MPEG 3 encoding and decoding.

**703-875-9100**
**www.digigram.com; input@digigram.com**

## Automatic mixing controllers
### Dan Dugan Sound Design

**Model E:** This mixing system fits eight channels into a half-width 1RU package. Two Model E units can be mounted side-by-side in one rack space. The unit connects in two ways: to a mixing board's insert jacks with standard TRS cables, or through an eight-channel ADAT optical interface. When analog I/O is used, the ADAT connectors can link multiple units up to 64 channels. Mute and bypass buttons are provided for each channel. An internal Web server downloads a Java applet that provides real-time control and monitoring of the controller from the user's browser. Power is 9 to 24Vdc, either polarity, or 9 to 18Vac.

**415-821-9776; www.dandugan.com**
**dan@dandugan.com**

## Audio restoration software
### Magix AG

**Magix Cleaning Lab 11:** This software restores music in just a few seconds. One-click functionality restores and digitizes music, recovering and remastering old music from a record, CD, MP3, LP and tape collections and converting them into music files with surround sound effects. Add more detail and layers with 40 studio effects, including surround sound, surround reverb, transition effects and advanced MP3 surround sound. Audio ID technology makes recognizing songs easy by automatically assigning title, artist and album information to tracks so you don't have to enter the names manually.

**305-642-6300; www.magix.com; mailmaster@magix.net**


## Right-angle phone plugs
### Neutrik

**PRX series:** The PRX series expands the PX series of 1/4" phone plugs with a right-angle version. The new plugs incorporate a diecast shell in a slim design with a compact barrel. The plug's rivetless one-piece tip contact prevents hook-up in a socket or break-off at the tip. Other features include improved strain relief for reliable cable retention; nickel or gold plating for durability and conductivity; and mono and stereo plugs for cable assemblers.

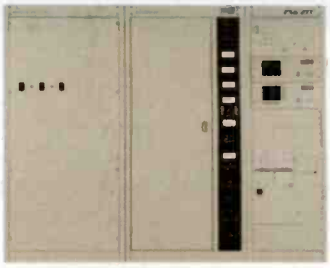
**732-901-9488; www.neutrikusa.com; info@neutrikusa.com**

## Telephone hybrid, screener system
### Thum + Mahr GmbH/Yellowtec


**Yellowtec B-line:** B-line combines a POTS and ISDN telephone hybrid with call screener for use in talk shows. The audio connections to the mixing console or audio workstation are equipped with balanced studio level and AES/EBU interfaces. The integrated digital signal processing includes echo cancellation, AGC and expander. Plugging in a telephone handset allows off-air screening. In ISDN mode, two callers can be managed simultaneously and switched to air independently. Features include GPI/O with programmable relays and TTL inputs and outputs, a DTMF option to initiate calls, sending DTMF tones over existing connections or decoding incoming DTMF tones as well as an RS-232 interface for external control by a PC running Talkmaster software, or for connection of the B-line keypad.

**+49 2173 967 336; www.yellowtec.com; info@thummahr.de**

## Tube transmitter
### Broadcast Electronics



**FMI-T series:** This tube transmitter for HD Radio offers power levels for low-level combined operations. The FMI T Series consists of three models (FMI 17T, FMI 21T and FMI 25T) with up to 25kW FM+HD Radio operation. All models include BE's FXI FM+HD Radio exciter. This series includes a folded half-wave cavity that eliminates troublesome and unreliable DC plate-blocking capacitors and all sliding RF contacts.

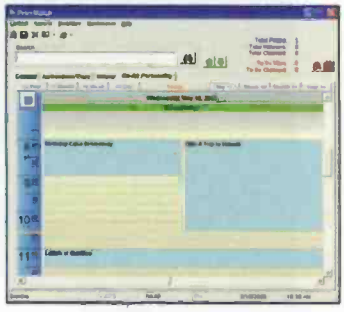
**217-224-9600; www.bdcast.com**
**bdcast@bdcast.com**



## Prize inventory software
### Prophet Systems Innovations

**Prize Watch:** Prize Watch creates station contests, tracks prize inventory and is a central location for winners and their electronic confirmation signatures.

**877-774-1010**
**www.prophetsys.com**
**sales@prophetsys.com**



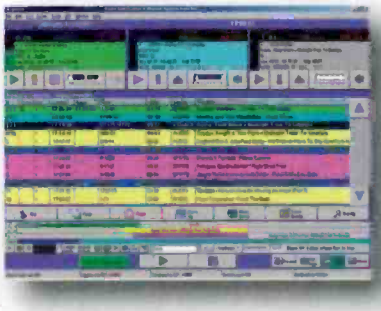
## UPGRADES and UPDATES

***HHB*** has expanded the Flashmic range with the introduction of a new cardioid version, the Flashmic DRM85-C, to accompany the original, omnidirectional Flashmic DRM85. (www.hhbusa.com)...***Davicom*** is now shipping the Next Generation Davicom Mac transmitter remote control that supports up to 128 metering inputs, 256 status inputs and 256 relays. (www.davicom.com)...The ***SE Electronics*** SE USB2200a is a USB microphone built on the SE2200a capsule. It provides a 16-bit or 24-bit output at a 48kHz sampling rate to a USB output. (www.seelectronics.com)■

# Broadcast Software

1-888-274-2721
www.bsiusa.com

## Radio Automation

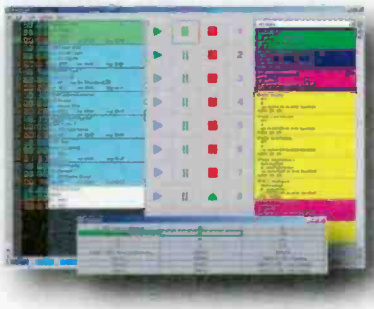


**Simian** - radio automation and digital play out system

## Instant Audio

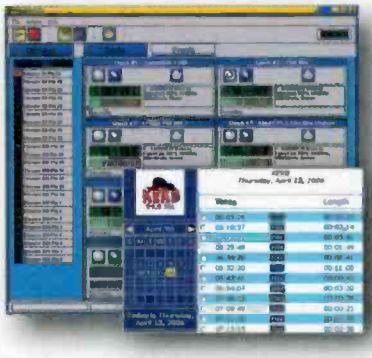
**Stinger**- instant acess to 288 'rapid fire' audio files

## Digital Cart Player



**WaveCart** - the original on-screen cart machine

## Audio Logging

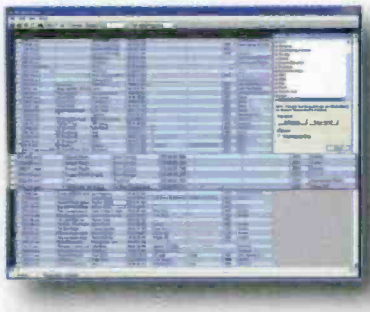


**SkimmerPlus** - professional audio logging and skimming

## Full PC Systems

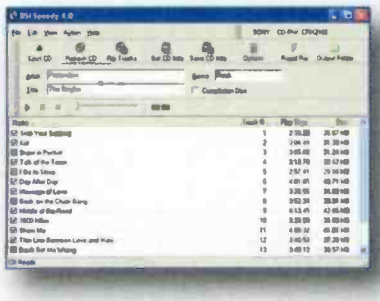
**Complete PC systems** - with hardware and music

## Music Library



**MusicStore** - over 55,000 ready to play (tagged) songs

## CD Ripping



**Speedy**- professional CD to PC ripping and file tagging

## Sound Cards


**AudioScience** - built for broadcast, pro sound cards

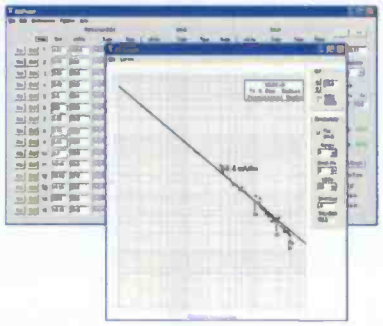
## Remote Control

**Trigger & Relay Devices** - for GPI/O & remote control

**Broadcast Software International**
**503 E. 11th Avenue**
**Eugene, OR 97401 USA**
**Direct: 541-338-8588**
**Fax: 541-338-8656**
**www.bsiusa.com sales@bsiusa.com**

BSI

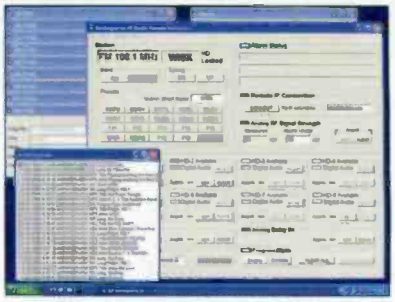
## Radial analysis software
### Au Contraire Software



**AM Proof:** With this software measurements are graphically analyzed in the GUI environment and finished, ready-to-file field strength graphs and tabulations are produced on the system printer. Radial measurement data is entered from field notes for reference and directional patterns. The reference proof can be non-directional, making the program useful for full or partial proofs. A log-log graph is produced wherein the user can graphically analyze the measurements, adjusting the inverse distance line for the best fit. Experiment with conductivity curves in the GUI environment and then print ready-to-file exhibits.

**303-489-3454; www.aucont.com**
**info@aucont.com**

## Software
### Day Sequerra



**Remote Dashboard v1.2:** The Remote Dashboard software v1.2 is now available for M2.2 HD Radio modulation monitors. When used with the M2.2's Ethernet interface, the Windows XP application provides remote control and monitoring of AM and FM HD Radio broadcasts as well as alarm capabilities. The application allows a remote M2.2 user to simultaneously monitor HD Radio program availability and digital audio presence for HD-1 and all multicast HD-2 through HD-8 broadcasts, along with analog audio presence, analog delay bit and RF carrier signal strength. The complete HD Radio PAD and SIS data package including station descriptions and program song title, artist, album, genre and comments, can also be simultaneously displayed, each in its own window.

**856-719-9900; www.daysequerra.com**
**info@daysequerra.com**

## Wireless mic system
### TOA Electronics

**200, 300 series:** The new 200 and 300 Series are complete wireless system packages. The WS-200 vocal system includes a hand-held dynamic microphone and receiver. The WS-300 presentation system comes with an omni-directional condenser lapel microphone with bodypack transmitter and receiver. System features include 10 hours of operation from a single 9V battery and four switchable UHF frequencies.

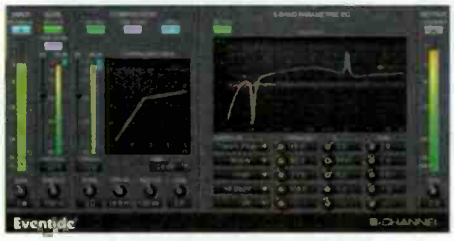
**650-588-2538; www.toaelectronics.com**

## FM bandpass filter
### ERI-Electronics Research

**955 series:** This RF filter for IBOC and low power analog FM applications protects from undesirable cross-modulation products and can also be configured as a branch combiner for combining two or three analog or IBOC transmitters into one antenna. The filters are rated at 3kW average power and can be tuned for any FM operating channel between 88MHz and 108MHz. The filter cavities are sized to provide low insertion loss resulting in minimal temperature rise and reduced transmitter power loss. The individual cavities are loop coupled so that each filter bank can be optimized for the particular application required and can be retuned in the field if necessary.

**812-925-6000; www.ERIinc.com; sales@ERIinc.com**

## Plug-in bundle
## Eventide




**Anthology II:** Anthology II features 15 plug-ins. Included are two 48-bit double precision vintage equalizers: EQ45 and EQ65. Equalizing capabilities are expanded with the EQ45. The EQ65 Filter Set recreates the sound and function of the vintage analog filter set. Two new configurable channel strips provide tracking tools: E-channel and Ultra-channel. E-channel is a channel strip with a configurable signal path. Ultra-channel offers users a more comprehensive channel strip. Mic phase alignment is easier with the Precision Time Align plug-in, and the Quadravox plug-in features four voices of diatonic Harmonizer pitch shifting. Anthology II also features the nine plug-ins that comprised the original Anthology bundle.

**201-641-1200; www.eventide.com**
**audio@eventide.com**

# CLASSIFIEDS

## FOR SALE





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# Contributor Profile

**Meet the professionals who write for *Radio* magazine.**
**This month: Field Report, page 44.**

***Walt Gander***
***Operations Engineering***
***WXPR-FM***
***Rhinelander, WI***

Gander began in radio in 1975 with a brief stint at WFHR in Wisconsin Rapids, WI. He subsequently left radio to pusue a career as piano technician, furniture builder and professional musician.

Gander returned to radio in 1990 as a reporter and features producer at NPR-affiliate WXPR Public Radio. He assumed the position of operations director in 1995, and has been gradually migrating to the engineering side of broadcasting.

Radio
THE RADIO TECHNOLOGY LEADER

**Written by radio professionals**
**Written for radio professionals**


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# ADVERTISER INDEX



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

by Kari Taylor, senior associate editor

# That was then

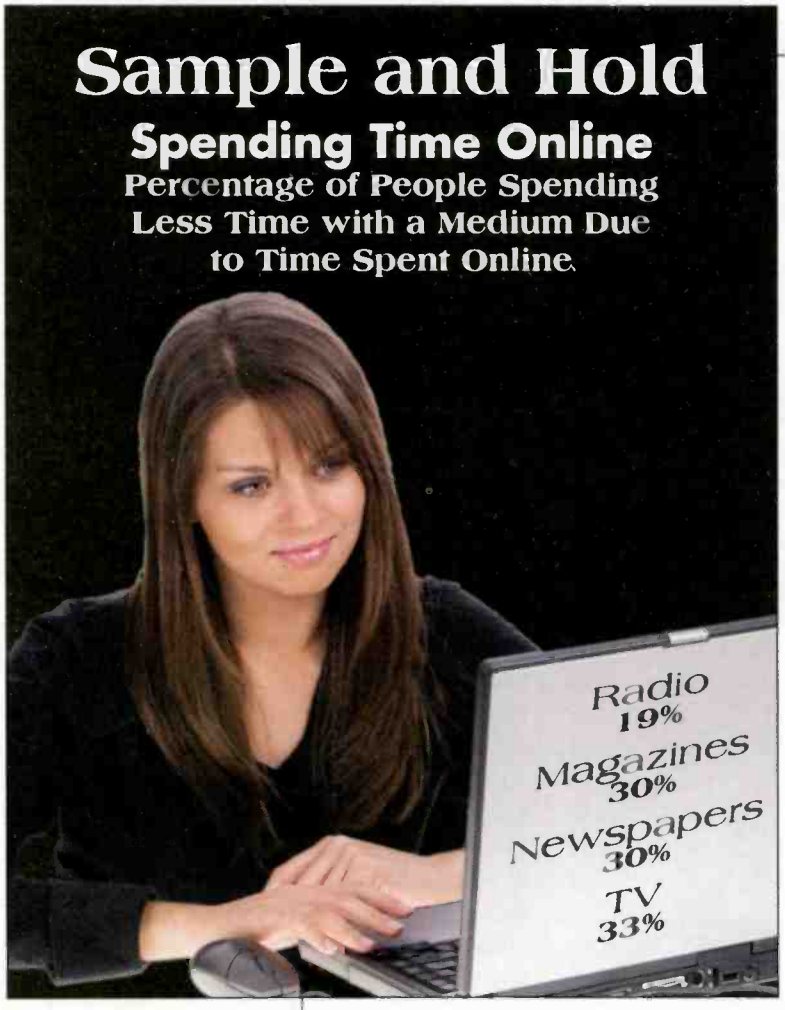
This ad for the Concertone 800 reel-to-reel tape recorder was published in 1965. The unit was manufactured with six heads instead of the standard three. The six heads allowed the user to record or play four-track stereo tapes in both directions—without reel turnover. The device's Reverse-o-matic technology provided continuous music programming at the push of a button. The 800 was self-contained and featured twin speakers, two microphones, echo control, sound on sound and center capstan drive—all for less than $400.

*Photo courtesy of Phantom Productions, reel2reeltexas.com.*


# Sample and Hold

## Spending Time Online

### Percentage of People Spending Less Time with a Medium Due to Time Spent Online




*Source: Arbitron/Edison Media Research, Internet and Multimedia 2006: On-Demand Media Explodes.*

# Do you remember?

The Shure SM5 unidirectional dynamic boom mic was a fairly new product in July 1965. Its two-stage mechanical isolation silenced wind and boom noise from fast boom swings. No transformers or inductors were used so it could be used in extreme electrical hum fields. The classic styling from more than 40 years ago is still recognized today.

# Condition your Signal

with the New Vorsis® HD-P3

## What Is It?

A four-band parametric equalizer feeding a three-band limiter with adjustable crossover points, AGC and selectable filters for FM, AM or streaming audio formats. The HD-P3 includes a variable de-esser, an expander and dual digital outputs (one with user selectable HD latency FM delay), plus high pass, low pass and notch filters, *and* a signal de-correlator to optimize bass content. All this controlled by an ethernet protocol computer interface that lets you run one or many HD-P3s from your office or internet based locations.


## What It's For:

Processing for your new HD signal, improving your existing FM or AM signal chain, preprocessing streaming audio-over-internet, a standalone HD processor or a realtime DJ monitor feed—and finally—a KILLER studio production tool.

## What's It Like?

"PERFORMANCE WITH OVERDRIVE"

VORSIS® It's What's Next in Processing

# THE TOOLS HAVE CHANGED...


## BUT THE *MISSION* REMAINS THE SAME

**Today's audio control surface** has evolved to a very high degree. Yesterday's wish list is today's feature set: total router integration, routable audio and logic, total show recall, and a complete set of DSP audio processing are under the hood of this G7...

All in a package of stainless steel and aluminum designed for years of 24/7 service, with a familiar look and feel that will ***help your talent make years of great radio.***

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