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Contents

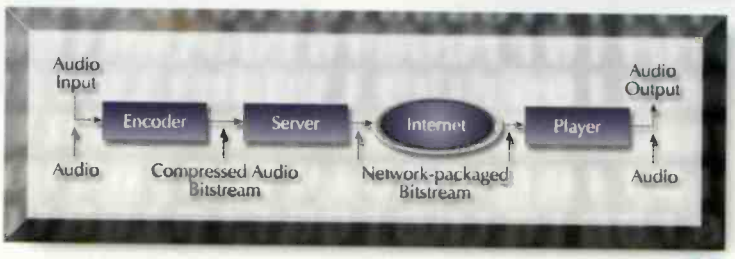
BE Radio
www.beradio.com
April 2000
Volume 6, Number 4

FEATURES

08

16

DEPARTMENTS



42

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60

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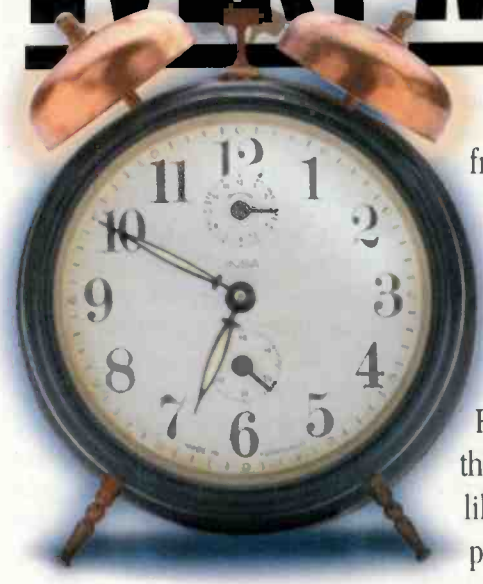

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Being connected

The transition from an analog world to a digital one has certainly proved to be a slow process. Sure, some segments seem to have been conquered overnight, but even the introduction and acceptance of the compact disc took a few years. The CD has shown an incredible longevity in the technology arena where technology can become outdated before it is even introduced to the marketplace.

As technologies come and go, some stick around and make a mark. Others fade away. The digital compact cassette did not make it. The MP3 format, on the other hand, is proving to be big a winner. The Internet as a whole has also proved its metal for those that use it and those who do business with it.

Being online is almost a given. It is unusual to meet someone who does not have an e-mail address. Today, we wonder how anyone can survive without e-mail, when only a few years ago none of us had e-mail. Now, I have six e-mail addresses that can be used to get in touch with me. (Two of them are listed on this page). Some people would be unable to function without a cell phone and pager. I cannot function when I have to go more than one day without checking my e-mail.

It's no longer a question of whether or not you are online. Now it's a question of how you are connected. The availability of high-speed access services in homes has grown considerably. Fast POTS modems are a good start, but ISDN, DSL and cable modems really get the data moving and can spoil you quickly.

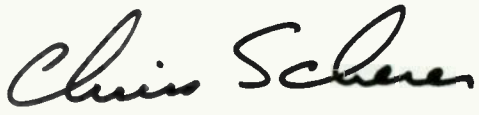
The ways to get online vary. In most offices, the Internet connection is through the computer network and a very high capacity line like a T1. Dial-up modems are still the most popular for home use. In the U.S., cable modems have a much larger market share of broadband services than DSL. Surveys have shown that DSL use is on the rise. While more consumers are familiar with cable modem service than DSL, the marketing efforts for DSL services are increasing.

Online streaming media continues to grow in popularity. Listening to a radio station in another part of the country is common. The issue of download rates becomes very important for high-quality listening, especially for audio. It's interesting how our eyes can adjust to choppy or skipping video, but we cannot tolerate any kind of audio drop out. Higher capacity access is required to enjoy high-quality audio reliably.

The next step in wired access is integration of all services to one vendor. Telephone, Internet access, and video and audio entertainment will one day all come from one wire. There have already been attempts at this by telcos that want to provide cable service and cable companies that want to offer telephone service. So far, these endeavors have been unsuccessful. As the focus shifts away from discrete services (e.g., telephone, cable, radio) and toward aggregate bandwidth, all-in-one services will move in.

The key will be in the convenience of services. We like discrete appliances. A radio works very well as a radio. A desktop computer may be able to provide the same function, but waiting 10 minutes for it to boot, log in, access the audio server and begin the streaming download is not very efficient. It is also not very economical to use a $2,000 piece of equipment to do the same job as a $20 table radio.

What is needed is operational simplicity like that of a telephone for phone calls, a radio for audio entertainment and a TV for video. To take advantage of these integrated services, Internet-capable appliances need to become accepted. The service can be integrated, but the interface needs to be unique to the application.



Chriss Scherer, editor
chriss_scherer@intertec.com

On the road:

Chriss will be presenting at the NAB convention on Wednesday, April 12 at the SBE Ennes Radio Workshop. Chriss will deliver opening remarks on Internet Broadcasting for the afternoon segment in room N250.

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Handheld computers

By Kirk Harnack

Palmtop and pocket-sized computers help engineers with everyday tasks. Many broadcast engineers now use handheld computers to work more efficiently and manage larger workloads. How can one of these devices help you?

Handheld beginnings

The Apple Newton was perhaps the first effective handheld computer. In addition to the usual *personal information management* (PIM) functions, this early-1990s device offered e-mail, faxing, Internet connectivity and IP networking.

The early promises of those first units are easily made good for engineers today. Moreover, today's computers are more convenient and less expensive to implement than they were seven or eight years ago. The original Apple Newton's design was so effective that many of today's handheld computers are styled in a similar fashion.

Numerous versions of handheld PCs are available. All offer considerable power in a small package.

Handhelds for today

As with other computing hardware, the capabilities of handheld computers are spiraling upward while their cost is coming down. This makes handhelds affordable, efficient work tools for engineers. Soon we will wonder how we ever functioned without them.

Basic PIMs are available for well under $100. These devices are useful for keeping telephone numbers and addresses as well as for noting "to-do" items and keeping a calendar. However, the most useful features and the ability to run custom applications only appear on handheld computers — those with recognized operating systems. These devices usually cost from $200 to $900 and come equipped with basic hardware and software for PC synchronization.

Many broadcast engineers have chosen 3Com's Palm series handheld computers. These *personal digital assistants* (PDAs) are both affordable and powerful. Surplus Palm Pilot and Palm III units are available for well under $200, while the more powerful Palm V, Vx and VII models come at a more premium price, up to about $500.

The software and applications included with a Palm device are quite powerful and convenient to use. The standard features alone, like an address book, appointment calendar, calculator and memo pad, make them useful. Using a PDA simply for routine functions makes them valuable tools.

Handhelds can also be synchronized with desktop PCs. This synchronization capability is arguably the most powerful and useful feature with any PDA. For Palm PDAs, third-party sync software is available. However, the software included with a Palm computer is impressive and easy to set up.

One desired consequence of frequent synchronization is the creation of a portable data backup. Last year, my laptop computer was stolen from my vehicle — and with it all of the information stored in Outlook. However, my Palm V was not stolen, and I simply synced it with a new laptop. The data was restored, saving countless hours of typing and note taking.

Outside the box

Full-function handheld computers are most helpful in performing tasks beyond those of a PIM. For the Palm series of PDAs, there are literally thousands of commercial, shareware and freeware applications available.

Many of these applications are improvements over those included with the device. Some are "front ends" for sophisticated PC applications, making them more usable on a handheld computer. Other applications are more specific to certain job functions, such as those found in broadcast engineering.

Of particular use to engineers are terminal emulation programs that allow command and programming of serially controlled broadcast devices. Using a program written for the Palm operating system (OS) such as TermPilot, AccessIt or Dicon, an engineer can connect a Palm PDA to serially controlled equipment. Devices such as satellite receivers, programmable interface boxes and programmable button boxes are becoming commonplace.

One may use the interface and charging cradle that comes with a Palm PDA, or an optional, smaller serial interface cable may be used for the physical connection. Terminal software is then invoked to send commands to the controlled device and display responses. Using a Palm PDA can be much more convenient than connecting a desktop PC or even a laptop PC, especially in cramped quarters or remote locations.

Groups of engineers can stay coordinated using a program such as PalmTask. This program enables

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management and coworkers to delegate and manage their task workloads. It synchronizes tasks through Windows 9x/NT workstations and Palm devices via the HotSync Manager. Engineering managers can create and deliver tasks for others with details, priority, due date and location; they can also keep informed of task status.

Handheld computers can be used for basic data storage and serial data control.

It is always handy to have reference information close by. Rather than carrying an electronics reference book, there are Palm applications and databases designed to locate and show the information you may need quickly. PocketEE is one such collection of electronics analysis and design tools. It includes a voltage divider, capacitor code, op amp gain, and resistor color-code calculator.

Do you have a GPS receiver? If it offers a serial data output, you may be able to interface it to map data stored in a Palm PDA. Atlas and MapBook are two applications designed to display maps using GPS data. With Atlas, add a map appropriate for the Palm, plug in the GPS receiver, and Atlas directs you to your destination by pinpointing your position and scrolling the map in real time. Atlas also allows you to add your own reference points. With some tweaking and interfacing to a database program, the combination of GPS and a Palm PDA could make AM and FM field-strength readings easier and more accurate.

No wires, no RF

One added convenience several handheld PDAs offer is being equipped with an Infrared (IR) port. Data, programs, address, contacts and to-do lists can easily be shared in a few seconds. This information can be shared among PDA users as well as transferred to a host computer. With the right software, a Palm can even be programmed to act as an IR remote control, albeit a rather expensive one.

Handheld PDA technology has reached a point where it is stable, useful and affordable. Most, if not all, engineers can benefit from the convenience and productivity Palm and other PDAs offer.

Kirk Harnack, BE Radio's consultant on contract engineering, is president of Harnack Enginering, Cleveland, MS.

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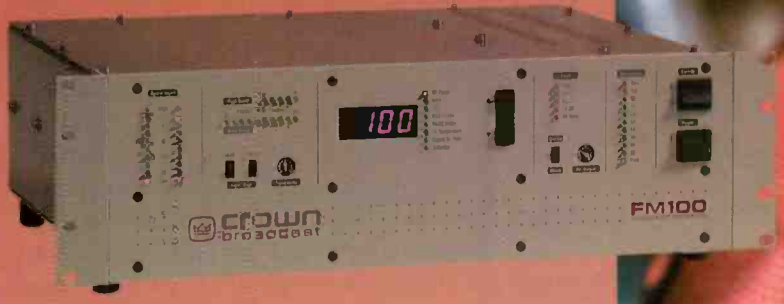

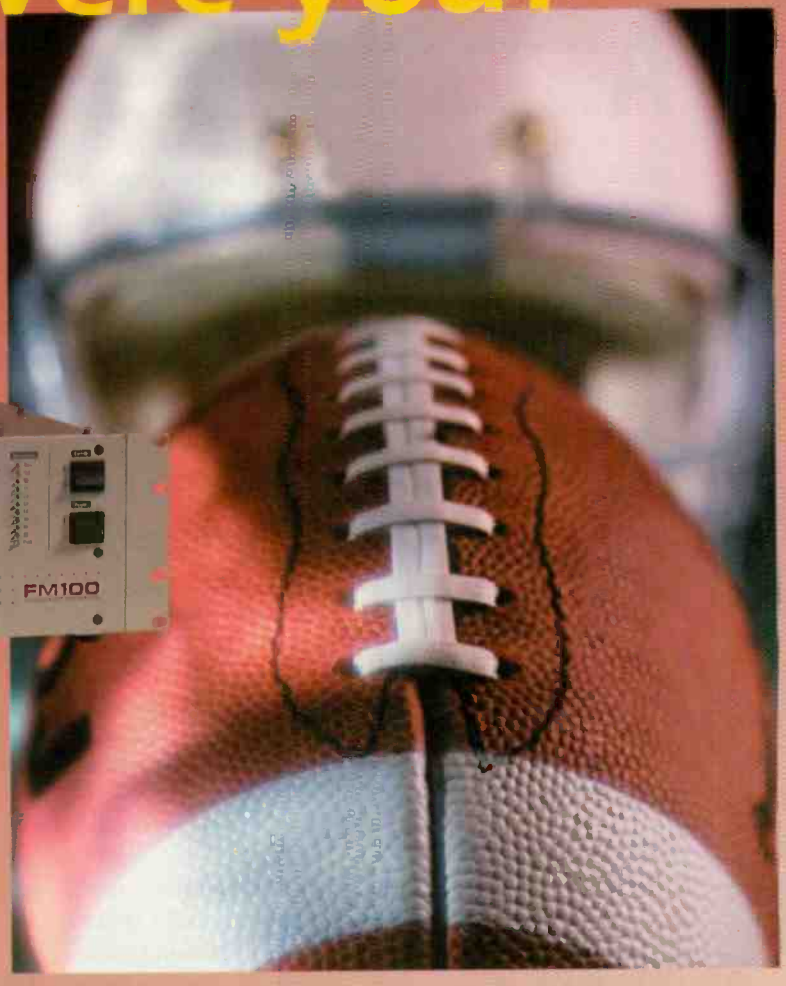

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Making money on the Web

By John Caracciolo

Attention radio executives: Wake up, get your heads out of the sand and pay attention. This new medium is about to compete with you for local and national advertising dollars. You must find out how to embrace this new broadcast advertising technology and make money for your radio stations with the Web.

Radio can actually profit from and still compete with the Internet. Unlike television and print, radio and the Web can coexist. The two can realize increased revenue and partnership possibilities while promoting each other and growing into the new millennium. Stations with active formats such as modern or alternative rock, Hot AC or Top 40 stand to benefit the most from the Net. In most of these active formats, P1 listeners are on the Net.

Banner ads are just one way stations can generate additional revenue.

To click or not to click

Are any radio properties really making big money using the Net yet, or are traditional advertising radio dollars simply being shifted to this new form of "station promotion"? Here's an easy way to tell: If your account executives are still offering the Net as "added value" to clients with a radio schedule, put an end to this practice. As a general manager for three active stations, I know firsthand that it is difficult to establish a value for something you have been giving away for free.

Once you stop giving your product away, you can make money using the Net. Consider the following facts. More than 1,047 radio stations in the U.S. are streaming audio on the Net, and just about every station on the dial has some form of presence on the World Wide Web.

Radio stations that do not immediately get on the Net stand the chance of being left in the dust; the decision is analogous to sticking with an eight-track tape deck in your car. Assuming your station has a presence on the Web, there are three basic ways to make money with your website: Sell display advertising space on the page; sell classified ads on the page; and conduct some form of e-commerce on the page.

Wave the banner

First, do what you already know how to do, which is selling advertising on the site. However, do not expect your current AEs to add this new technology to an existing client's order with the hope of increasing that order by 20 percent. Most of the time, the AE will look for the easy way out and bonus the Internet ad to close the radio advertising. Remember, our goal is *new* revenue.

Instead, have your new media account executive make a separate sales call. Our NMAE specializes in event and nontraditional revenue opportunities for existing and new clients. Our existing clients are given the courtesy of first right for a promotion or banner space on the site, with a small discount for being a radio-station client. The NMAE does not pitch radio, but concentrates rather on selling the Net. Clients are offered a package that comprises event marketing opportunities and the Web. Radio is handled separately by the station's AE. Because the Web sale is currently a smaller dollar value than the on-air sale, we avoided competition between the NMAE and the radio station AE by adjusting the NMAE commission structure so it is more of a flat rate.

Classified information

Selling classified ads is an opportunity that can be realized with a small amount of effort, and it can be run in-house by the Web staff. The target for this sale is the newspaper classified ads. Most stations immediately target the biggest local daily newspaper and try to steal all of its classified advertising. This is the wrong approach. Instead, start with the area weekly publications or the monthly trade or specialty magazines, such as a car-buyers weekly.

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Classified ads in these publications are usually expensive considering the number of people they hit. However, these ads are extremely well-targeted to a specific audience. You can achieve this same form of *specialization targeting* by using your secret weapon: the radio station. A couple of well-placed promos and spots will drive the desired traffic to your own Web classified section.

Near Valentine's Day, we ran a small schedule that targeted listeners looking for a new love. The spots encouraged the listeners to visit our personal classified section on our station site. The spot ran on all of our stations; a link on each page connected them to one classified section. The ads were placed and the revenue was generated without an account executive leaving the building. The site had more than 450,000 hits in a two-week period.

Internet advertising is expected to rise 23 percent by 2003. The good news is that radio advertising is also expected to rise.

E-storefronts

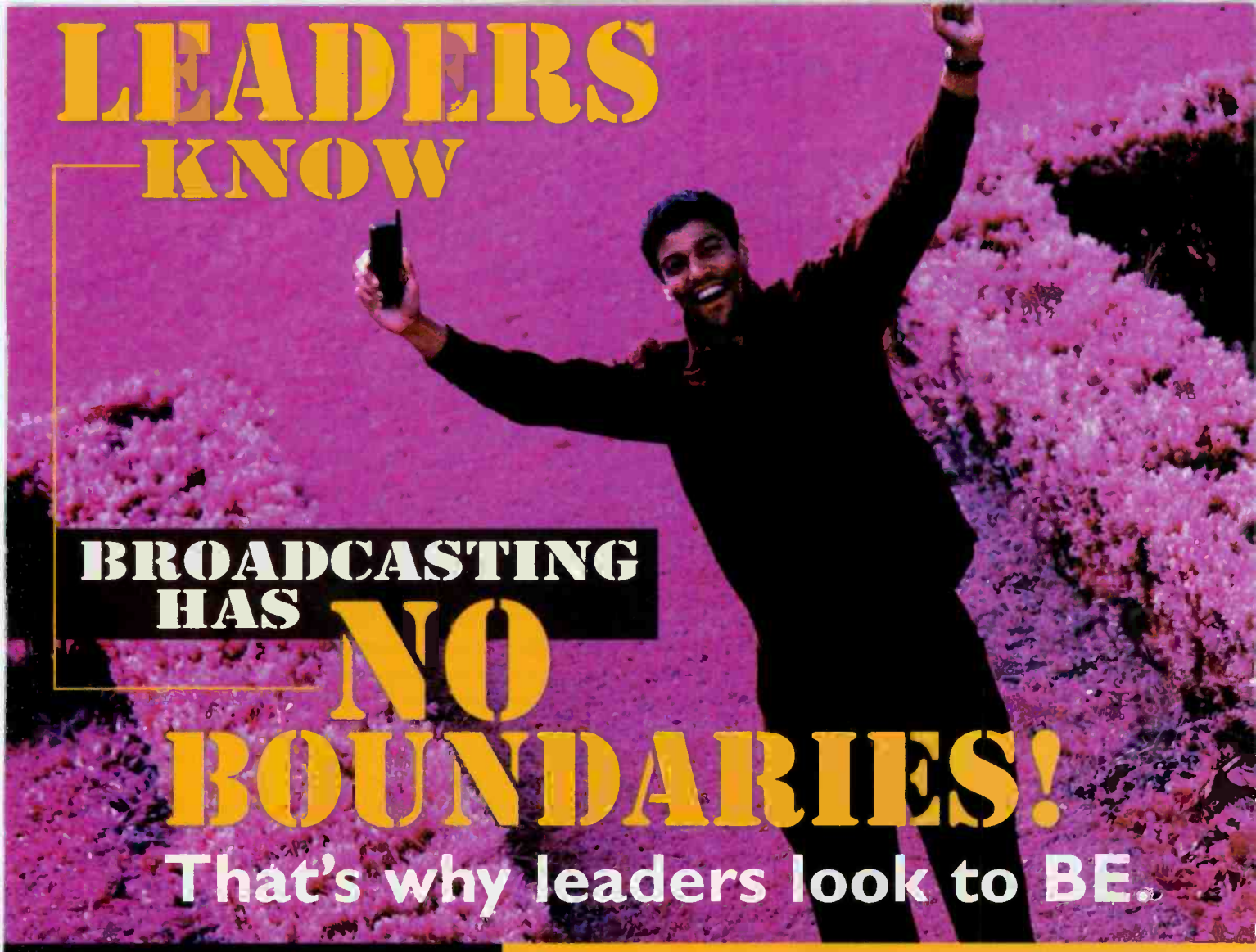
E-commerce is becoming a major new source of revenue for radio stations. It is easy for stations to form partnerships with major organizations that help the stations develop Web content and virtual malls to offer station products and other items for sale to their listeners. E-commerce can be developed in-house as well, but this approach will require a staff for order processing and delivery. The cleanest solution is outsourcing.

The future of radio?

Will the Internet completely wipe out radio? Though it is unlikely, the growth of online advertising reaffirms the potency of the medium as an outlet for advertisers. Internet advertising is expected to rise 23 percent by 2003. The good news is that radio advertising is also expected to rise. With the partnership of the Internet and radio, radio has its first opportunity to exceed advertising revenue of other, traditional forms of advertising. There is a strong synergy between radio and the Net. The strength of radio, image and awareness branding, plus driving traffic and influencing sales, added with the Net's strengths of strong visuals and details, combine for an unstoppable advertising monster.

As broadband, high-speed hookups become commonplace in American homes, the Internet will certainly cut into the listener pie that every radio station longs to dominate. However, it will also transform office listening and give radio the visual component it has never had. We are the medium of choice for this new technology. Let's use and profit from this medium, not run and hide.

John Caracciolo is vice president and general manager of Jarad Broadcasting Company, Long Island, NY.



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Erratic monitor points

By John Battison, P.E., technical editor, RF

When a directional antenna system is operating properly and an FCC-type approved antenna-monitor system has been installed, monitor-point measurements are not required on a regular basis. However, if an approved system is not in use, measurements must be made at intervals not exceeding 120 days.

In these days of simplified paperwork, the average station license usually consists of a postcard renewing the expired license. This can sometimes make life difficult for a chief engineer new to the station. FCC Rule 73.61(a) no longer requires regular monitor-point measurements and supersedes monitor point schedules required on licenses issued prior to January 1, 1986. However, it does not necessarily supersede endorsement or requirements on licenses issued after that date.

Be sure that all the station parameters are correct before taking monitor-point readings.

The commission still practices inserting specific monitoring and logging requirements on licenses, and it behooves an engineer to examine the actual piece of paper that constitutes the technical operational requirements of a license.

If the station only has a file of postcard license renewals, it should obtain a copy of the last full license. This license spells out the authorized method of operation and the parameters and procedures to follow. The license will prove useful because one or more monitoring points will eventually be out of tolerance.

Bringing points within limits

Assume you have just taken over an existing station and, as part of your organized assessment of the operation, you have checked that the common-point impedance is correct and agrees with the licensed value. Common-point current is correct and power output agrees with the license. The antenna monitor indicates that all parameters are within limits. However, on making monitor-point measurements, a monitor point in one of the nulls is high. If the field-intensity meter is in good condition and shows a recent calibration date, it is probably safe to assume the meter is reading correctly. Nevertheless, it is a good idea to check the meter against someone else's just to be on the safe side. If the field intensity meter has not been calibrated more recently than within the last two years, it should be recalibrated before you rely on its readings.

Your next actions depend on the condition of the station records and their accuracy. Does the last monitor reading by the previous engineer show that the point was in? If, on examination of the logs, you find that the point has been out consistently for a long period of time, go back as far as you can to try to find the date when it was last in. Did the point suddenly change or was it a slow increase that was ignored? Did everything else remain within limits? If not, what was the change and when did it come back into limits?

It is common in cases like this to find that the old logs show all monitor points to be consistently "in" and all readings to be the same, or very close, all the time. It is unusual for monitor points to read the same all the time — unless the measurements were made in the engineering office. If the old logs show the same value over a long period ending with the last chief's departure, be a little suspicious, unless the former CE is a person you trust.

First actions

Before making final, preadjustment monitor-point measurements, recheck to be sure the array is correctly adjusted. All phases and ratios as well as common-point current must be correct, and verify common-point impedance. Record all dial settings to closest values and log all meter and antenna monitor readings.

Physically examine the monitor point itself. Are there any new metallic structures in the immediate vicinity? Are there any changes in water levels, ground moisture or temperature? Is the point identified correctly and are the surroundings the same as shown in the monitor-point photograph? Which way does the FIM point when adjusting for maximum field? Does it still indicate maximum when aligned on the transmitter's azimuth?

If maximum field strength is found when the FIM is pointed away from the transmitter, look for a reflector or

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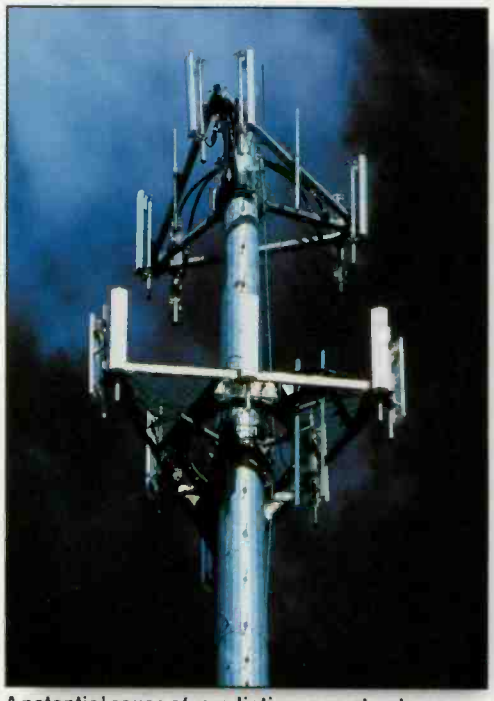
reradiator. You may find a cell phone tower that has mushroomed overnight. Make a partial proof on the radial using the original or latest proof or partial proof.

If the adjacent measuring points are within limits, assume a drastic change has occurred in the monitor- point electronic environment. If this change can be identified and it is permanent, you will need to specify a new monitor point.



A potential cause of reradiation, new structures can affect monitor-point readings.

Analyze the partial proof radial by averaging the ratio of old/new DA values without the questionable point. If this is close to and not over 1.0, the radial is all right and the DA operation is probably also satisfactory.

If the radial checks out, the next step is specify and file for a new monitor point. Section 73.158 describes the required FCC procedure for doing this, and it is a relatively simple operation.

There is, however, a caveat. If the temperature is very low, expect all radial measurements to be high. Occasionally, a specific cold spot can produce a high field strength at a particular point. There is the possibility that one of the antenna system parameters is wrong because of a faulty meter indicating that the system is set up properly when it is not.

Elevated radial

The conductivity along a radial can change. It may become lower because concrete, buildings and roads have replaced higher-conductivity field soil. More commonly, new power lines or other metallic reradiators are the cause of high points.

If the whole radial is up, all the antenna system parameters are correct and there are no obvious reradiators, the problem could be in the antenna system itself. Check the base current meters for accuracy by connecting them in series with a very low-voltage supply, preferably against a second standard.

Verify that monitor loops, if used, are intact and still correctly oriented in the same direction and on similar legs on all towers. Check antenna monitor input circuits by switching the sampling loop lines around.

On standard arrays, a tolerance of ±3 degrees for phase and ±5 percent for ratio is acceptable accuracy. Investigate to see if going to extreme variations, within limits, will correct the situation. Sometimes this approach works because small physical changes in the array have moved in the same direction and put the array out in one direction — but be sure to record all phasor readings first. You can also run the vector check described in the *Directional Array Details* (*BE Radio* August 1999, p. 64). This article explains which vectors, and hence towers, have a maximum effect on the problem monitor point.

Unfortunately, a new chief arriving at an older station may find that one out of limits monitor point leads to a new partial proof or, at worst, to a full new proof.

E-mail John at batcom@bright.net.
Photo on page 16 by Tracey Liston.

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DSL and DOCSIS: ABCs of broadband

By Kevin McNamara, CNE

Widely recognized in the telecommunications industry, the term *broadband* might well become one of the most important engineering terms of the next few years. The actual definition of broadband seems to change with advances in technology. We will consider it as a transmission medium that can handle the end-to-end delivery of high-speed data, telephone and hundreds of video and audio channels, both digital and analog. Broadband services are currently delivered via telephone line, cable TV service and wireless. As broadcast engineers, we need to be aware of the new and emerging broadband technologies as they affect the broadcast industry.

Service	Speed	Switched or Dedicated	Availability
POTS	up to 56kb/s	Switched	High
Switched 56	56 Kb/s	Switched	Medium
ISDN	up to 128kb/s	Switched or Dedicated	High
Fractional T1	Up to 1.544Mb/s (in 64kb/s slots)	Dedicated	Medium
T1	1.544Mb/s	Dedicated	Medium
ATM	up to 155Mb/s	Dedicated	Low
ADSL (most common form of DSL)	Up to 3Mb/s downstream and 64kb/s upstream	Dedicated	Medium
Cable Modem (DOCSIS)	Up to 384kb/s (typical downstream speed)	Dedicated	Medium
LMDS	Can provide several Mb/s of throughput	Dedicated	Low

A comparison of the various types of broadband data services by capacity, mode and availability.

Wire-line broadband

Throughout the country, telephone companies, otherwise known as *local exchange carriers* (LEC), have been spending millions of dollars to upgrade their systems so they can provide high-speed data access to business and residential customers over ordinary, twisted-pair telephone wires. ISDN is an example of a switched high-speed data service that broadcasters have been using for several years. Until recently, the transmission of data at most locations throughout the country was limited to only a few choices: modem over a POTS line (~56kb/s), switched 56 (56kb/s) and ISDN (up to 128kb/s) digital switched services, direct point-to-point T1 (1.54Mb/s or a fraction thereof) and dedicated frame-relay connections (up to 1.54Mb/s.)

There are other choices for faster connections, but in general these are too costly for broadcast applications. The 128kb/s data rate that is possible with ISDN finally permitted the operation of true real-time digital audio transmission on demand. Although ISDN services can be purchased as a "full-time" connection, most users opt for a "dial-in/out" switched connection in order to confine the operational costs to only those times when needed.

Asynchronous Transfer Mode, or ATM, is another high-speed data service capable of delivering data throughput of up to 155Mb/s, supporting unshielded (or shielded) twisted-pair cable, fiber and coaxial media. ATM is compatible with several other data transport standards, such as DS3 or SONET, a high-speed fiber networking protocol.

ATM, once thought of as the high-speed data transport method of choice to businesses and homes, has been upstaged by a new service called *digital subscriber line* (DSL). DSL is a digital-to-analog technology similar to the modems that are common today, except that, rather than using POTS lines, DSL uses dedicated "dry" copper pairs to the central office. The "losses" presented by using copper pairs limit the usable distance between modems of about 18,000 feet with a bidirectional data throughput of 160kb/s and can handle voice and data applications. DSL service is available in different types. The most common is called *asymmetrical DSL* (ADSL), which provides speeds up to 3Mb/s downstream and up to 64kb/s upstream. *Symmetrical DSL* (SDSL) and *high data rate DSL* (HDSL) essentially provide a means to transmit T1/E1 data over a DSL network. *Very high data rate DSL* (VDSL) is a version of ADSL that sacrifices line length to increase data throughput. DSL is widely available in most large metro areas in the country. However, the distance limit prevents its deployment to locations within about 3 miles of a central office.

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Cable TV services

Cable TV was the first service to offer true broadband capabilities to the home. Since its introduction, the technology behind cable TV allows the delivery of nearly 1GHz of bandwidth to a home using fiber optic trunk cables and coaxial stub into the customer premise. These "hybrid" systems provide enough capacity to deliver 80 analog TV channels, 200 compressed digital TV channels, voice and 50Mb/s of data. Many of the larger cable systems even provide optional high-speed/low-cost Internet access along with their TV services. The service is typically asymmetrical in nature, with the speed of data from the cable system to the customer (downstream) being significantly faster than the speed of data from the customer to the cable system (upstream).

The actual data speed varies with the particular system and the amount of users sharing the service, but downstream speeds in excess of 384kb/s are typical. The standard created to ensure interoperability between cable modems and cable system "headed" equipment is called the *data over cable service interface specification project* (DOCSIS). The specification defines a method that can provide 27Mb/s to 39Mb/s downstream within a 6MHz channel and 10Mb/s of data upstream within a 3MHz segment. The DOCSIS specification defines specific modulation types and protocols for the transmission of bidirectional signals over a cable TV system. Specialized "cable modems" are supplied by the operator of the cable system providing the service.

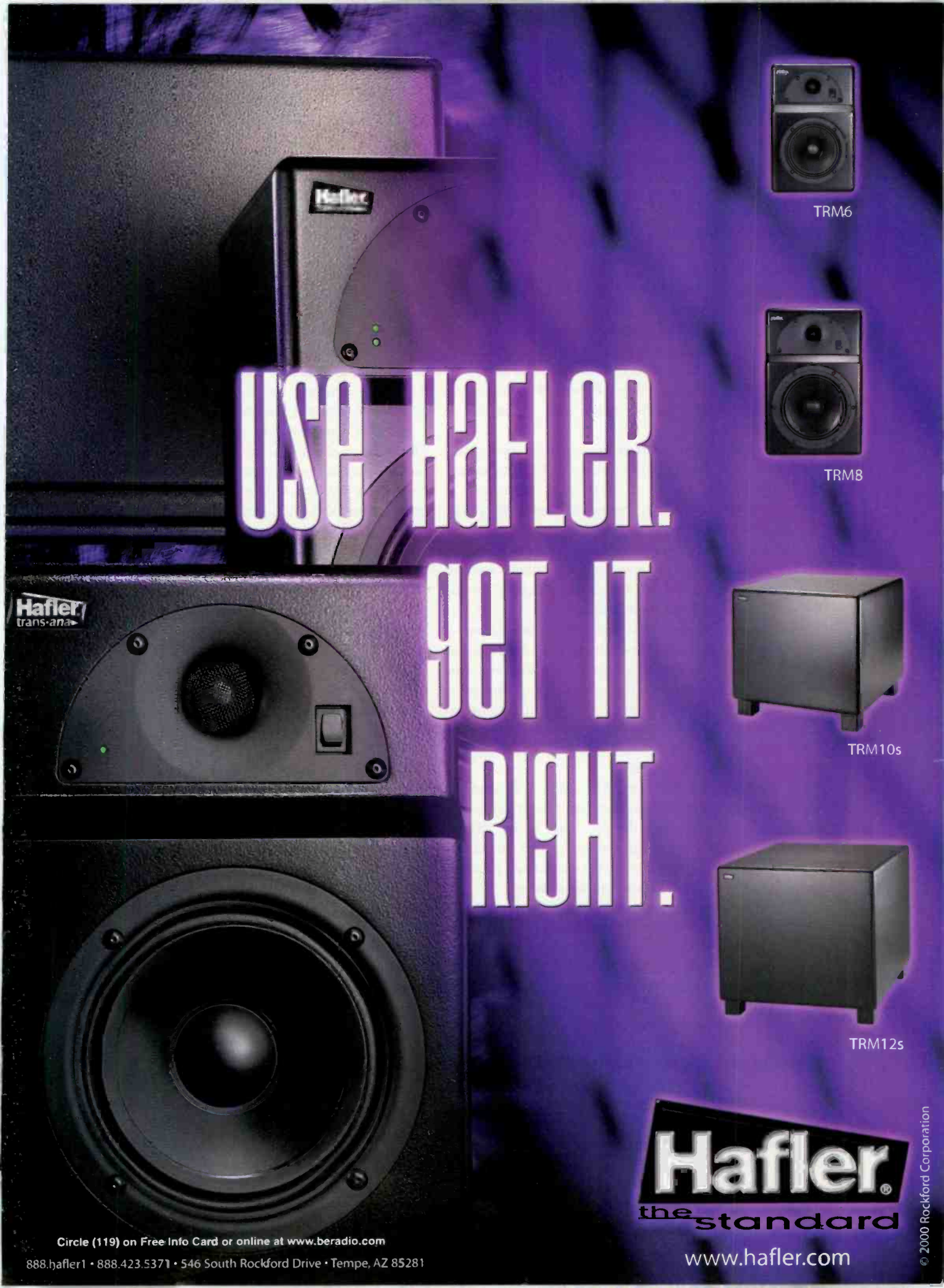
The actual data throughput of DOCSIS-compliant cable networks can be severely reduced as traffic increases because of the nature of DOCSIS to "aggregate" data. DOCSIS is also limited by the connection bandwidth that the cable system uses as its point of presence to the Internet.

Wireless broadband delivery

Broadband wireless access can eliminate some of the "last-mile" problems that plague wire-line services. The auctions of a significant portion of spectrum by the FCC along with recent technological advances allow the bidirectional transmission of high-speed data, either fixed point-to-point or mobile operation. *Local multipoint distribution service* (LMDS) is a fixed broadband wireless service that can deliver digital voice and data services to business and residential users. Presently, companies like Teligent and Winstar, the winners of several LMDS licenses, are providing this type of service to multi-tenant buildings in major metropolitan areas.

As the price points drop for suitable customer-premise equipment, LMDS will compete with the wire-line companies on all levels. A service familiar to broadcasters, MMDS or multichannel multipoint distribution service, once a supplemental TV broadcast medium, is now finding use as a high-speed data wireless delivery service in several locations.

Kevin McNamara, BE Radio's consultant on computer technology, is president of Applied Wireless, New Market, MD.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Webcasting now!

By Harry Martin

In a recent article in *The New York Times*, a computer-literate radio fan who prefers to listen to the radio on his iMac warned that radio stations need to wake up and start streaming. Although it is a newcomer among electronic media, Web radio has the potential to permanently change the way we listen. Indeed, Web radio soon will deliver better-than-FM audio with thousands of listening choices.

By its nature, two factors have limited radio: the station's power and the listener's distance from the transmitter. Neither limitation applies to Web radio. Because it is transmitted over telephone, fiber or cable lines, Web radio does not have geographic restrictions. Further, because of the enormous storage capacity of computers, it is easy to archive any number of programs and offer them for access at any time. Moreover, the Web is not regulated by the FCC, so anyone can set up a Web radio site.

Most webcasters operate like traditional radio stations — by "streaming" their over-the-air broadcasts on the Internet. Yet some are taking advantage of this FCC-free medium to broadcast music that appeals to an alternative audience or other programming that is too extreme to play over the air. Also, keep in mind that, in the new cybermilieu, traditional radio's ties to a specific region or city may become a handicap.

According to manufacturers, Web radio will soon be wireless. The goal among manufacturers is to provide small, inexpensive receivers that do not have to be directly connected to a modem and can be placed anywhere. General Motors and Daimler-Chrysler are already planning to put Internet receivers in the cars they make.

Considering the development of these new wireless receivers coupled with the almost limitless options for listeners on the Internet, it is only a matter of time before Web radio becomes a significant threat to over-the-air broadcasting. In response to this threat (or, better, this opportunity), radio stations that have not already done so should come up with streaming strategies now.

Beware of copyright screening restrictions

Stations streaming their over-the-air broadcasts on the Internet must be careful not to violate new copyright laws. Under the 1995 and 1998 copyright laws, sound recording copyright owners were granted new performance rights for digital audio transmissions of their recordings, subject to certain limitations. Among the limitations was the creation of a new compulsory license for nonexempt, noninteractive, digital subscription services. The scope of the license was expanded further in 1998 with the passage of the Digital Millennium Copyright Act (DMCA) to cover the public performance of sound recordings by means of eligible nonsubscription transmissions (Internet transmission) and transmissions by any preexisting satellite digital audio transmissions (CD Radio and XM Satellite Radio).

The DMCA restricts how music can be broadcast if it is being streamed onto the Internet. For example, many radio stations play hit songs repeatedly because listeners want to hear them. By DMCA standards, doing so may place the station over the limit on playing the hit song. To come into compliance, the station would have to remove the song from the air for discrete periods of time. Similarly, stations that are streaming can no longer have an all-Rolling Stones weekend if their signals are also carried on the Internet. These issues will become increasingly pressing as radio streaming becomes the delivery mechanism of choice.

Website privacy

Protecting the privacy of radio listeners is an important part of maintaining a website. Listeners can obtain benefits from the station by providing personal information, although they may be leery of doing so. Therefore, it is imperative that stations have a website privacy policy stating exactly what the station will do with any personal information it receives. By showing listeners that the station cares about their privacy, more useful information can be obtained while retaining trust and loyalty.

Typically, a Web privacy statement covers the following matters: a description of the information recorded each time a visitor logs onto the site; how any private information that is volunteered is kept confidential; how to take your address out of any station database maintained within the site; how the website proprietor uses information; and the techniques used to ensure the security of credit card account numbers.

Harry Martin is an attorney with Fletcher, Heald & Hildreth, PLC., Arlington, VA. E-mail martin@fhh-telcomlaw.com.

Dateline

On or before June 1, 2000, stations with five or more full-time employees must elect in writing between the two types of FCC EEO recruitment schemes (rule-specific or alternate) included in the new EEO rules. Annual employment reports (Form 395-B) will be due September 30.

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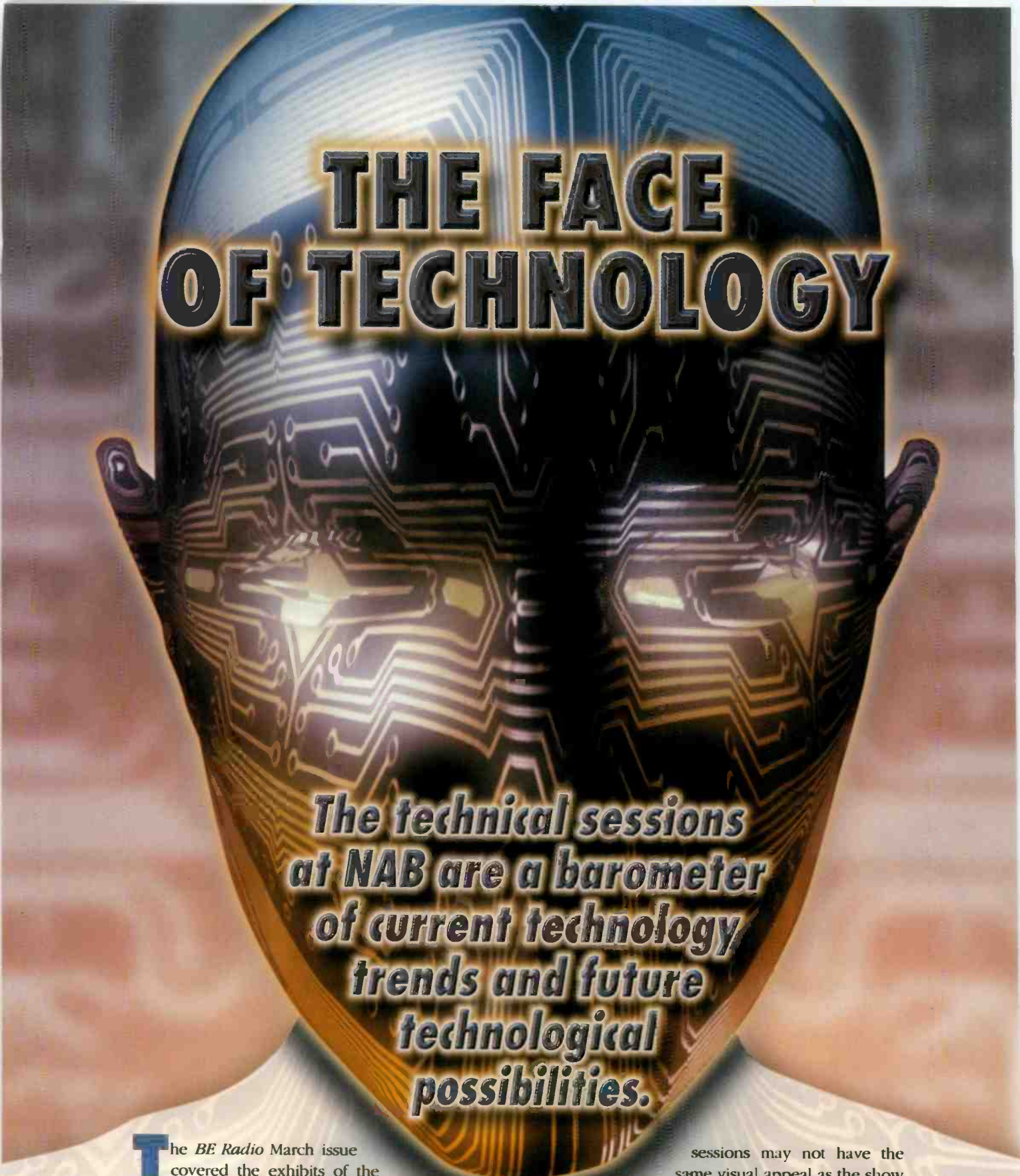

The technical sessions at NAB are a barometer of current technology trends and future technological possibilities.

By Chriss Scherer, editor

The *BE Radio* March issue covered the exhibits of the NAB con-vention and included a glimpse of some of the new products being unveiled, the Radio Hall map and the FASTtrack booth listings. However, the exhibits are only half of what the convention has to offer. This month, we will look at the show's technical sessions. Although the sessions may not have the same visual appeal as the show floor, the information they provide is just as important as seeing the latest products.

The sessions cover several different program areas. No matter what your involvement is in broadcasting, there is bound to be a session of interest to you.

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Industry overview

Looking at the topics presented in the sessions will give you a quick overview of what is going on in our industry. The addition of the multimedia sessions in recent years has opened up an entirely new realm of topics and discussions. While the multimedia topics extend far beyond audio and radio applications, certain elements have strong ties to radio.

The radio management and sales and marketing conferences often have sessions that present technical concepts to a predominantly non-technical audience. Since radio is a business based on technology, there is a fine line between the business and engineering sides of the operation. This line is often blurred as engineering becomes involved in the station's economics and management relies on the technical capabilities available to maintain or supplement the bottom line. Topics that

Session Highlights
Broadcast Engineering Conference

Sunday

9:30–12:00
DAB Worldwide Perspectives
LVCC N250

1:00–5:30
Implementing DAB and the future of radio
LVCC N250

Monday

10:30–12:00
Ask the Consultant
LVCC N250

1:00–4:00
Broadcast Towers: Prime real estate for the digital age
LVCC N250

4:00–5:30
FM Receiver Studies: Surfing the ocean of interference
LVCC N250

Tuesday

9:00–12:00
The Foundation of Radio: The physical plant
LVCC N250

1:00–5:00
Radio: Optimizing the signal
LVCC N250

Wednesday

9:00–5:00
SBE/Ennes Radio Workshop — Broadcasting: Getting the word out
LVCC N250

9:00–12:00
Regulations: Keeping pace with broadcast technology
LVCC N253

12:00–1:30
Technology Luncheon, Presentation of the Engineering Achievement Awards
LVH Barron Room

Thursday

9:00–12:00
RadioTransmitters: A practical workshop
LVCC N247

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# of Audio Processing Bands	5	5	4
Available in colors	yes	no	no
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cover DAB, the evolution of technology, webcasting and Internet profit possibilities are all part of these sessions.

On the regulatory front, LPFM and IBOC are two topics that stir a range of emotions. These two items will likely be heavily discussed everywhere you go, not just in the business, law and regulation conferences.

The broadcast engineering conference is always full of worthwhile and in-depth information about new technology and new applications of existing technology. The conference is so

Radio Engineering Achievement Award Winner

Michael Dorrough
Dorrough Electronics, Woodland Hills, CA

Michael Dorrough is the founder of Dorrough Electronics of Woodland Hills, CA. Dorrough is best known as the creator of discriminate audio processing which he developed in the early 1960s. The technology has been widely embraced by radio, television and film industries and is the basis of most audio processors manufactured today.

A former recording engineer, Dorrough started manufacturing the DAP310 discriminate audio processor in 1972. In the following years, he traveled throughout the country teaching the techniques of quality audio to a myriad of radio engineers and station managers. Dorrough's audio-processing device allowed stations to achieve high audio quality in the days of radio loudness wars. His pioneering work allows broadcast audio to sound just as good on small radios as it does on the most expensive home and automobile systems.

In addition to his work in the field of audio processing, Dorrough invented the Dorrough Loudness Monitor with a patented technology developed to give broadcast and recording engineers a true indication of loudness as perceived by the human ear. The audio loudness monitor is now in use worldwide in radio production, motion picture production, posting, music mixing and dubbing applications.

BE Radio congratulates Michael Dorrough on his achievement. The award will be presented at the Technology Luncheon on April 12 beginning at 12:15 in the Las Vegas Hilton Barron Room.

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big that it begins on Sunday and goes until Thursday with a full schedule nearly every day. Topics range from hands-on subjects like transmitter and antenna maintenance, and facility design and construction to upcoming technologies like IBOC and S-DARS.

Session Highlights
Radio Management and Sales & Marketing Conference

Monday
10:45–12:00
From Razor Blades to Hard Drives
LVCC N240

Tuesday
9:00–10:15
ABCs of DAB
LVCC N240

10:30–11:45
What Streams May Come: Audio on the Internet
LVCC N240

3:30–4:45
Dos and Don'ts for Building Your Web Page
LVCC N241

Upon arrival, it's easy to head straight for the show floor. Be sure to include some sessions in your plans.

DAB

The subject of digital radio will get extensive coverage in several different sessions. The first heavy dose comes on Sunday in the broadcast engineering conference. The entire day's sessions look at DAB around the world from many angles. In the U.S., IBOC is coming close to its final form. Representatives from Lucent Digital Radio, USA Digital Radio, NRSC, NAB, FCC, Sirius Satellite Radio and XM Satellite Radio will all

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Focus on Technology: Automation

Radio automation continues to evolve and grow. In a short time, the cart machine, once a vital part of any radio station operation, has almost completely disappeared from use. The early product offerings in computer-based automation systems were limited in form and function but have grown to fit applications for a single, stand-alone station, to wide area networked applications linking stations that are great distances apart.

The computer industry is leading the way in current technology, and their advances are quickly integrated into uses for radio. Enhancements to network functions, multiple-drive storage systems, file sharing, cross-manufacturer file exchanges and integration with digital audio workstations (DAWs) have made automation systems a necessary element in radio-station operation. Operating systems typically include DOS or Windows. With the proliferation of LINUX, some companies have begun developing versions that will benefit from the inherent LINUX advantages.

The following companies are exhibiting at the NAB convention. (Booth information current as of March 5)

Company	Booth	Company	Booth
A-Ware Software	R2691	Mediatron	R3995
Arrakis Systems	R1574	On Air Digital USA	R694
Broadcast Electronics	R3682	Pristine Systems	R1161
Broadcast Software International	R562	Prophet Systems	R3189
Cartworks/dbm Systems	R3489	Radio Computing Services/RCS	R3457, L3627
CBSI-Custom Business Systems	R4086	Register Data Systems	R3468
Computer Concepts Corp	R1069	ScheduALL by VizuAll	S4537
Dalet Digital Media Systems	R1096	Scott Studios	R4093
ENCO Systems	L6524	SMART Technologies	M9057
LPB	R2370	Smarts Broadcast Systems	R3491
MediaTouch	R374	Sony Electronics	L12107

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Consumer Electronics Manufacturers and Retailers Experience iDAB

IN THIS ISSUE

USA Digital Radio continues to take aggressive steps to commercialize its In-Band On-Channel Digital Audio Broadcast technology – iDAB™. In January, USA Digital Radio participated in the Consumer Electronics Show (CES) in Las Vegas to demonstrate the benefits of iDAB to many of the show's 126,000 attendees.

Retailers, manufacturers and press at the show were interested to learn how radio – the most widely used information and entertainment medium in the US – will soon join other consumer electronics devices in the digital world. Visitors to USA Digital Radio's and Kenwood's booths had the opportunity to hear the crystal clear sounds of an actual on-air digital audio broadcast. Using the company's iDAB technology, a live digital broadcast was transmitted from Clear Channel's Las Vegas station KWNR-FM. After hearing the KWNR-FM broadcast in both digital and analog, Rob Hephner from *AutoMedia* magazine wrote that, "The difference is, as one would expect, incredible. It was amazing to notice that the analog signal sounded clean until I listened to the digital signal, then the difference was almost unbearable when we went back to analog."

Many receiver and auto manufacturers were also given a ride in USA Digital Radio's test van, where they experienced first-hand the clarity of a digital audio broadcast in a mobile environment plagued with multipath. Satoshi Soma, vice president of the product division, Alpine Electronics of America, said that during his ride, "The digital sound was very good in comparison to the analog. The multipath was drastically reduced. It was noise-free."

> "The difference is, as one would expect, incredible."

Visitors to the USA Digital Radio and Kenwood booths saw iDAB's data capabilities demonstrated on a concept digital AM and FM receiver designed by Kenwood. The receiver was the size of a typical car radio with an enlarged screen that displayed not only the station frequency and call letters, but also the song title, artist name, CD cover, local weather forecast and traffic conditions, and scrolling advertisements and information about local events.

Kenwood's iDAB concept radio debuted at CES

New Additions Strengthen Coalition

Since December, USA Digital Radio has added twenty-one organizations to its coalition to make AM and FM digital radio a reality.

Fourteen more companies have invested in USA Digital Radio: Allbritton New Media, Bonneville, ComVentures, DB Capital Partners, Flatiron Partners, Grotech Capital Group, H & Q Venture Associates, J. H. Whitney & Co., J&W Seligman, Riggs Capital Partners, Saga Communications, TI Ventures, Waller-Sutton Media Partners, and Williams, Jones & Associates.

USA Digital Radio took another key step in the iDAB receiver development process by signing Analog Devices, Inc. (ADI) as its second semiconductor coalition member. ADI, in addition to Texas Instruments, will design iDAB chips for radios and transmission equipment.

The company also signed joint technology and marketing agreements with four additional equipment manufacturers: Armstrong Transmitter for transmitters, Dielectric and Jampro RF Systems for combiners and filters, and Moseley for studio transmitter links.

In big news announced December 14, Digital Radio Express (DRE), one of the three proponents of IBOC DAB technology, joined USA Digital Radio's coalition, making three proponents two and moving the industry closer to consensus for a single IBOC DAB solution.

USA Digital Radio is also taking steps to address the international market, given that iDAB is ultimately a worldwide product. To help ensure that iDAB will work anywhere in the world, USA Digital Radio is collaborating on a worldwide standard for AM digital radio with Digital Radio Mondiale, an international consortium of broadcast industry organizations.

Experience The Difference

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Digital and Audio Enthusiasts Eagerly Await Arrival of iDAB

Digital and audio enthusiasts are "eagerly awaiting" the arrival of iDAB digital radio, particularly for the enhanced sound quality of FM radio, according to a study conducted by Polk Verity for USA Digital Radio.

The study revealed that nearly 66% of digital and audio enthusiasts are interested in iDAB digital radio in order to receive enhanced FM audio quality. 25% are "strongly" interested in having their AM stations sound more like FM.

These enthusiasts are also interested in the data applications of iDAB. More than half of the sample surveyed indicated interest in receiving data about the songs being played on the radio, such as song title, artist name, and album title. 45% said that they would be willing to pay up to 30% more for a radio in order to receive advanced data features such as email and Internet access.

Digital means "better quality" to digital and audio enthusiasts.

The survey suggests that some enthusiasts would spend more time listening to radio if they had digital radios in their cars. 21% of the sample said that they would play CDs less in their cars if they had digital radios and their FM stations had CD-quality sound.

When digital and audio enthusiasts hear that something is "digital," their perception is that it is better quality than the non-digital version. In response to the question – "What does digital mean to you" – 32% responded with "Better Sound Quality and Clarity." When asked to indicate which attributes were associated with the word *digital*, the most frequently chosen response (59%) was "State of the art technology." The second most popular attribute associated with the word *digital* was "Better quality compared to non digital".

Polk Verity, a consumer marketing information company, conducted the study by interviewing 1,038 audio enthusiasts and 1,005 digital enthusiasts. Audio enthusiasts are defined as being highly motivated by high quality music and considered themselves active music listeners. Digital enthusiasts are defined as being highly motivated by newly developed digital technology and tended to embrace digital products sooner than other groups in the US. To gage interest across a wide spectrum, various age categories were analyzed ranging from 16 to 55+. As a group, these digital and audio enthusiasts make up 13% of the U.S. population, or 36 million people.

Digital Profiles: Steve Shine, *Owner of WSHI-FM and EASE member*

Steve Shine, Owner of WSHI-FM and EASE member

Steve Shine, the owner and operator of WSHI-FM (106.3) in Fort Wayne, Indiana and a lawyer with Shine & Hardin, was one of the first stations to register as an EASE member when the program was initiated in June 1999.

Steve has been at the forefront of radio for most of his life. He caught the radio bug at the young age of 10 when he attended the popular Don McNeil's Breakfast Club radio show. By junior-high, he had a stint as an on-air personality, which he continued through law school. During college, Steve applied for a permit for a new FM station in Bloomington, Indiana. By the time the permit was finally awarded to him in 1979, he was practicing law in Fort Wayne. For ten years, until selling the station in 1989, Steve split his time between overseeing the album-oriented rock station and the practice of law. In 1997 when an FM station came up for sale in Steve's hometown of Fort Wayne, he jumped at the chance to get back in radio. After buying the station, Steve changed the format from alternative to adult standards to meet an unserved market. It was a smart move. WSHI-FM is now the number one station with the 35 and older crowd on the weekends and ranks second out of 17 stations during the workweek.

Steve took the lead again when he was one of the first to join USA Digital Radio's EASE program. "Radio must implement digital," says Steve. "It's the only way radio will stay competitive. We must have equal or better quality than our competitors – satellite radio, CDs, Internet, and cable TV audio channels."

"I joined the EASE program because I want my station to be ready to implement digital when the okay comes down from the FCC. USA Digital Radio's guidance will be critical to our implementation."

EASE for Broadcasters

The EASE program was established by USA Digital Radio to engage broadcast managers and engineers in the rollout of iDAB. EASE is open to all radio stations in the United States. There is no cost to register and participation does not obligate stations to purchase or adopt digital radio technology. Benefits of membership include free station assessments, early access to transmission equipment manufacturers, advance announcements of key milestones, and representation through an iDAB Broadcaster Rollout Advisory Board.

How Can You Join?

To join EASE, register online at www.usadr.com/broadcasters. To receive more information and a registration packet, send an email to ease@usadr.com, fax a request to 410-872-1531, or call Scott Stull at 410-872-1578.

A Transmitter Manufacturer's Perspective on IBOC DAB

An Interview With Jim Woods Of Harris Corporation

Jim Woods
Vice President – Radio Systems, Harris Corporation, Broadcast Communications

As head of Harris' Radio Systems business unit, Jim Woods is leading the development of Harris' digital radio broadcasting efforts while expanding the company's leadership position in the current analog radio marketplace. Mr. Woods joined Harris in 1983 as a marketing and sales representative. He progressed through the levels of increased responsibility in domestic district sales management for radio and television, international area sales management for Europe and Africa, and product line management responsible for the radio studio product line.
Mr. Woods is currently responsible for all of the division's products, systems and services for the radio broadcast industry.

Why should broadcasters care about going digital?

Jim: Radio broadcasters are at risk of operating the last analog radio service unless they go digital and begin the transition soon. With business as good as it is today, it is possible to be blind to the threats we face. New and emerging services – satellite and Internet among them – are more than ready to define digital radio and to establish expectations for consumers unless radio broadcasters move quickly.

There are many reasons why now is the right time for broadcasters to define digital radio and to establish IBOC as the world standard. Today's radio broadcasters enjoy an enormous barrier to entry, and any new system planning to compete for our current listeners will have to match and beat what radio delivers today. By transitioning to digital, broadcasters not only will raise that entry barrier, but they will have the opportunity to define the market.

Do you believe an IBOC solution is the best approach for U.S. broadcasters?

Jim: It is clearly the most direct path to an all-digital system. IBOC protects the millions of legacy receivers in the market, minimizes the disruption to station's existing operations and businesses, and allows some time for stations to experiment with new services and business models. There are really only two choices for establishing a digital radio service – transition the current infrastructure to digital via IBOC or allocate additional spectrum for a new service. While IBOC certainly has its share of technical and regulatory challenges, they are far simpler and less disruptive to the radio broadcast industry than establishing a new spectrum service.

Will broadcasters that implement a digital broadcast system early on have a competitive advantage?

Jim: We believe they will. Those who do implement early will have the advantage of being able to experiment when there are few receivers to hear "mistakes." They will also have the opportunity to define new business models and revenue streams and to stake their claim to unique local opportunities.

You've been a strong proponent of a single IBOC standard. Why do you feel so strongly that this is necessary?

Jim: I believe that history has proven that without a single FCC-endorsed standard, broadcasters will not embrace IBOC or convert on a nationwide basis. Without ubiquitous coverage, receiver manufacturers will not sign up and launch sufficient numbers of different types of receivers, and IBOC will fail. The standard needs to be set on the transmission side and the receivers will follow.

My concern about the ongoing competition is that we are wasting precious time "tweaking" competing systems instead of finishing a "best of the best" solution. Harris' position is that it would be better for our industry for this to occur now, bringing the combined resources of both proponents to bear on the remaining technical problems and speeding the regulatory process.

USA Digital Radio has used Harris transmitters in some of its field-testing. How do you feel about the results of those tests?

Jim: We feel very good about the tests. It has been a great opportunity to start the education process with our engineering and product staffs and to begin thinking about the challenges of designing integrated IBOC products. By working with the USADR engineering staff, we have learned a great deal about the IBOC waveform and optimizing our products to pass it. We have also been able to see first hand some of the challenges that broadcasters will face by implementing IBOC in the real-world environment of existing transmission facilities.

> *...now* is the right time for broadcasters to define digital radio and establish IBOC as the world standard.

What efforts is Harris planning to make to ensure its equipment is compatible with IBOC DAB?

Jim: Harris is already working very closely with both IBOC proponents to understand how our products perform today passing the IBOC signal. Our DX and Gates® AM transmitters were proven several years ago to pass "IBOC like" signals. And through our work with USADR, we have not only passed the digital IBOC signal through our Z FM transmitter, but have developed modifications which enhance the performance of the transmitter in a "common amplification" mode.

The work we are doing today will allow us to be ready with products and programs to assist the "early adopters" with integration. It is also enabling us to start the process of defining our IBOC product lines. We cannot wait until there is a standard to start the design process. The more we can think through and define now, the sooner we will get products to the marketplace.

SoundBytes wishes to express its appreciation to Jim Woods for this interview.

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The USA Digital Radio Newsletter

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Inside... ***Jim Woods, VP of Harris, shares his perspective on IBOC DAB***

Regulatory Process Moves Forward

The regulatory process for IBOC DAB is moving ahead quickly. Reply comments to the FCC's Notice for Proposed Rulemaking (NPRM), issued on November 1, 1999, were filed on January 24, 2000, with reply comments filed on February 22, 2000. A number of industry organizations and companies filed comments, including CEA, NAB, Sony, Visteon, Infinity, Hispanic Broadcasting, NPR, among others.

The comments overwhelmingly support the FCC's efforts to introduce digital radio in the United States. The Consumer Electronics Association ("CEA") wrote that, "DAB [digital audio broadcasting] is poised to revolutionize radio broadcast service in the same way that digital television is revolutionizing the broadcast of television services." Infinity Broadcasting echoed many broadcasters' comments when it cited competitive forces as a key reason that today's radio must be allowed to go digital: "Analog broadcast radio faces significant competitive challenges from the high fidelity offered by media that utilize digital technology; therefore, terrestrial broadcasters must be provided the opportunity to offer at least equivalent digital service to the public."

Broadcasters expressed agreement with the FCC's statement that "...a workable IBOC system would be superior to a new-spectrum DAB system in several respects." The National Association of Broadcasters ("NAB") identified ease of implementation as one reason IBOC is the most realistic DAB method. "An IBOC DAB system would provide the public and existing broadcasters with the quickest transition...IBOC DAB systems would allow broadcasters to use existing infrastructure to make the transition and would result in less overall cost."

National Public Radio ("NPR") referred to the audio quality of USA Digital Radio's iDAB system as a reason for the FCC to pursue IBOC DAB implementation. "NPR supports development and standardization of DAB technology that provides significantly better audio quality and mitigation of transmission artifacts commonly associated with analog AM/FM transmission. Indeed, we are encouraged by recent mobile demonstrations of IBOC FM systems, which have shown promise towards achieving this goal within the existing bands and channel assignments. At the 1999 NAB Radio Show in Orlando and the January 2000 Consumer Electronics Show in Las Vegas, USADR demonstrated that the latest generation of IBOC FM DAB technology has dramatically improved ..."

Going forward, USA Digital Radio will be working closely with broadcasters and the FCC to get final approval for IBOC later this year.

To view comments, visit the FCC's website at **www.fcc.gov/e-file/ecfs.html** and enter "99-325" as the proceeding number.

The exhibit floor is only half of the convention.

share information on the testing, evaluation or implementation of the various systems of IBOC and S-DARS technology. Additional presentations will look ahead to some topics concerning the implementation of IBOC.

For those that have not been keeping up with the current events in DAB, the radio management conference will include a session on the basics of IBOC. Since it is being held on Tuesday, those who feel the Sunday session is too advanced will not be able to first gain a basic exposure to the topic.

With all the radio changes in progress, including LPFM, the business, law and regulation conference session on Monday morning (*The FCC Retunes Radio*) will provide an excellent opportunity to gain information from several points of view on IBOC, S-DARS and LPFM. These topics encompass a broad range of viewpoints and, as changes are made, questions continue to be raised.

Session Highlights
Business, Law & Regulation Conference

Monday
10:30–11:45
The FCC Retunes Radio: What's going on with low-power and digital radio
LVCC N232

Tuesday
4:00–5:00
Regulatory Dialogue
LVCC N257

Real radio

Not every session deals with theoretical issues for the future. Several sessions focus on the current state of radio technology, providing real answers for everyday situations. Monday's radio management session, *From Razor Blades to Hard Drives*, will provide an update on the current state of radio production. Presentations in the broadcast engineering conference will discuss issues concerning the transition to digital and provide some application examples from several facilities around the country.

RF has always been a vital part of radio. One popular session, the *Radio Transmitter Workshop*, is held on Thursday. The role of the radio engineer continues to change, and fresh talent may not have the same opportunities to learn valuable RF skills. This session as well as

the Tuesday afternoon session (*Radio: Optimizing the Signal*) are good introductions for the junior engineers and give experienced engineers some new information.

The entire facility operation is covered in some way during the sessions. With so much emphasis on what will be the standard tomorrow, it is refreshing to have some presentations that look at the basics and intricacies of current radio operations. Until the new technology is available to the world, or your facility adds the new technology to your operation, traditional radio equipment continues to be used and must be maintained.

On-air and online

As always, the Internet will play a major role at NAB. The show floor is full of products and services related to conducting business and using technology online. The sessions also offer this same outlet. By now, every radio should have some kind of presence online. A URL is expected everywhere you look and radio stations already carry a strong brand impression. The Internet can be used in a variety of ways. The station presence may range from a simple site with a few links to a fully integrated element of the broadcast operation that provides its own revenue stream. With audio streaming, online stations can operate just like their wireless counterparts.

The Internet-related sessions range from website layout tips to streaming media application primers. This important element of broadcasting (and commerce in general) should be a part of your NAB plan. Streaming will continue to improve in quality. Methods of Internet listening will also become more convenient and reliable. Radio stations will need to stay competitive in this new medium to stay alive in the future.

The NAB convention offers a substantial amount of information. Many sessions, besides those mentioned here, may relate to your facility or situation. Be sure to read the complete session information at the show to ensure you do not to miss anything. However, if you can't see or do it all, don't worry. The *BE Radio NAB Wrap Up* is just around the corner, in the June issue.

Session Highlights
NAB Multimedia World Conference

Saturday
10:00–5:00
Weaving Your Web: A primer for current and aspiring Web professionals
Venetian 501

Sunday
10:00–5:00
Streaming Media — The new wave in broadcasting
Venetian 501

Wednesday
10:30–12:00
Convergence 2000 — Where on the air are we?
Venetian 501

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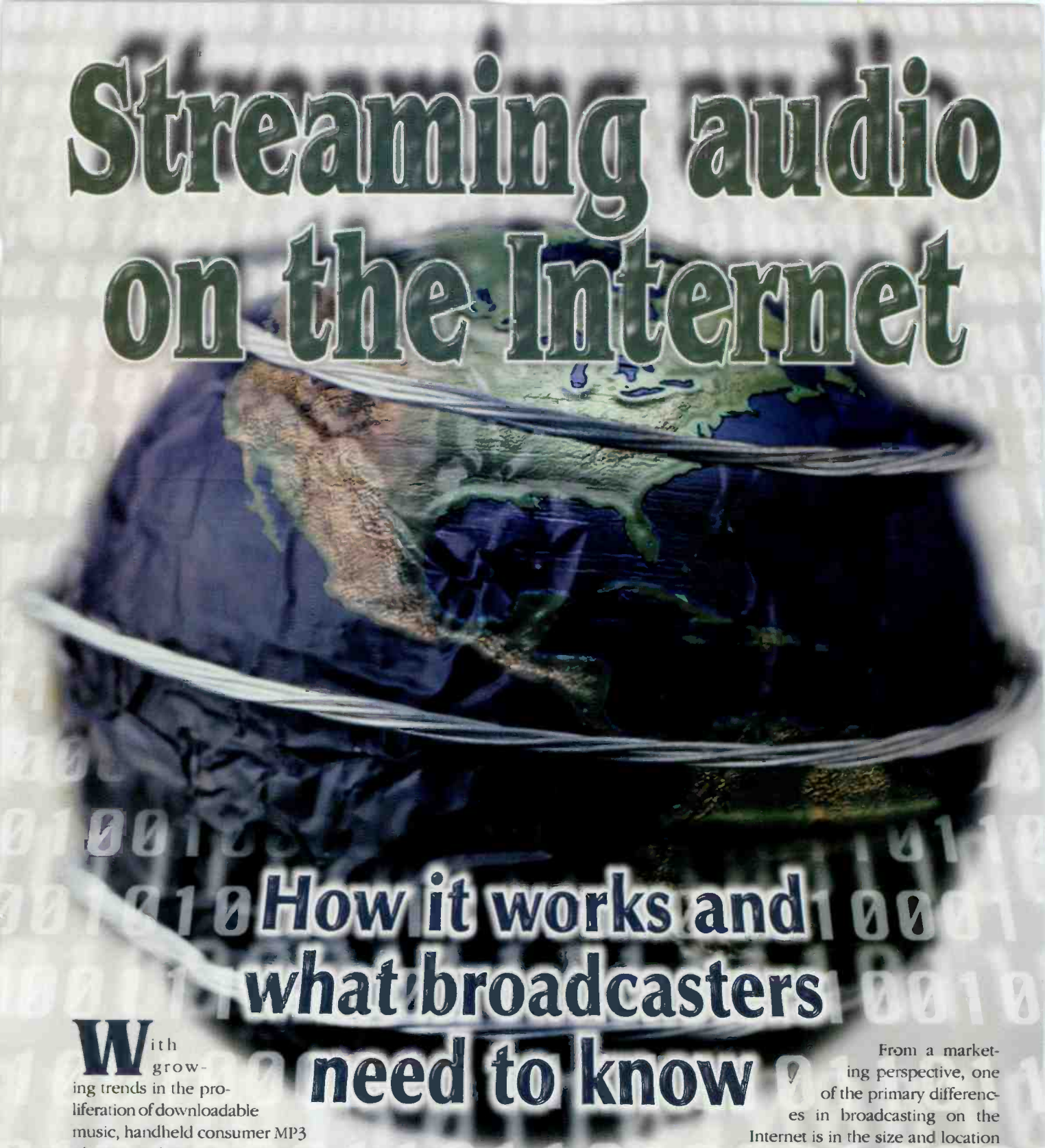

How it works and what broadcasters need to know

By Ken Nosé and Kevin Nosé

With growing trends in the proliferation of downloadable music, handheld consumer MP3 players and increased record-company involvement, the Internet is fast becoming a major delivery system for audio. Conventional radio broadcasters are already positioned to be key audio content providers on the Web, and streaming audio technology is an essential component in making that transition. While the territory may seem familiar, there are a number of differences in broadcasting on the Internet that are worth noting before making the jump to going "on the air" with streaming audio.

From a marketing perspective, one of the primary differences in broadcasting on the Internet is in the size and location of your audience. Until smart broadcast technologies like IP multicast are widely supported, for most broadcasters it will not be economically feasible to support more than a few hundred or a few thousand simultaneous listeners. Another difference is that your potential audience includes listeners from all over the world, a very exciting prospect but one that may be of limited appeal to local advertisers.

For station engineers, the new technologies involved mean

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Streaming audio on the Internet

that station engineers will need to become network engineers as well. Station engineers will have to become conversant in the language of Internet service providers as the service provider's network becomes part of the station's signal chain to the Internet.

The listener experience is also fundamentally different, particularly as it is tied to a PC or set-top box and not the familiar, relatively inexpensive and portable radio. Despite widely debated claims of FM quality, the sound quality for most dial-up users is still relatively poor compared with FM. This situation will improve as higher throughput technologies such as DSL or cable modems find their way into more homes. On the plus side for the user, there is literally a whole world of "stations" to choose from, often very specialized by style of music or content. You want the latest news from Seoul in Korean, or ambient techno trance as opposed to ambient tribal trance? You will probably be able to find someone who is streaming it. While this is good for the listener, it also means increased and fundamentally different competition for you as a broadcaster.

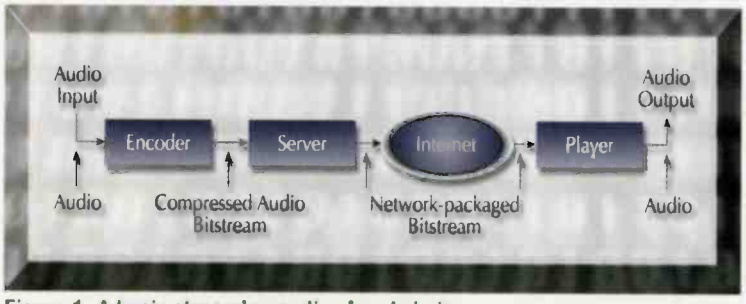

Figure 1. A basic streaming audio signal chain.

Basic signal chain

So how does your audio get from your studio to the speakers on someone's PC? What does the basic signal chain for an Internet streaming audio broadcast look like? Although there are different live streaming audio systems available from a number of vendors, they all consist of the same basic components: the encoder, the server, the Internet itself and the player (see Figure 1).

The encoder is responsible for translating the original audio signal to a compressed bitstream in real time. Some popular compressed formats in use today are Real Audio G2, Windows Media Audio (WMA) and MPEG 2 Layer III (MP3). The encoder itself can be a piece of software running on a PC or a dedicated hardware encoder. In some cases, more than one software encoder can run on the same computer.

The compressed audio bitstream is sent from the encoder to a server, typically via a network connection or serial link. In some cases, the server and encoder can run on the same computer, but that often isn't the case for high-capacity servers or encoders running at higher bit rates.

The server is responsible for repackaging the bitstream for delivery over the Internet, and it can send the same bitstream to multiple listeners. Some solutions make use of proprietary schemes for the delivery format, while others take advantage of open standards such as HTTP, the same protocol used between Web browsers and Web servers.

The Internet provides the connection between the server and the player and is the part of the signal chain where you have the least amount of control. The Internet also represents the weakest link in the chain, as Internet technologies were not originally designed with real-time or streaming applications in mind. In normal operation, Internet connections between a listener and your server may suffer from network congestion or delays that translate into intermittent or unplayable audio. Increasingly faster connection rates and improvements in infrastructure will make this less of an issue as the Internet grows in capacity and becomes more multimedia-friendly.

At the far end of the Internet connection lies the PC running the player application software. The player could also be implemented in dedicated hardware like a set-top box or some other less computerlike "Internet

New ways to look at the dial

By Neil Lewbel

Audio streaming from the listener's perspective

Advances in computers, software and networking have given us a range of ways to view and work with studio and transmission equipment. Over the years, there have been many developments in the user interface for broadcast equipment. However, end users (our listeners) have had few changes in their user interface. Now, the Internet is providing listeners with a range of new methods for selecting radio stations. A quick look at some of these new user interfaces, often called tuners, may offer some insight into how audiences of the future may choose the stations or programs they want to hear.

One of the most popular user interfaces for playing streaming media on the Internet is RealPlayer software from Real Networks (www.real.com). RealPlayer includes the software for receiving audio and the user interface for selecting program sources. The user interface includes a channel selection display, called the content panel, which shows the logo and a brief description for selected content providers. Showing the logo enables quick and easy selection of well-known organizations, such as CNN, ESPN or

The Real Player from Real Networks.

continued on p. 56

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appliance." The player unpacks the streaming data from the server, recovers the compressed audio bitstream and decodes it back into an audio signal. Typically, the player application is invoked from a Web browser so that all the listener needs to do is click on a multimedia link on a webpage to get the audio.

Setting up a stream

Important considerations for setting up a system are at what point and how to incorporate emerging technologies. One technology of particular interest is IP Multicast, which has exciting implications for multimedia applications on the Internet. The key feature of IP Multicast that makes it attractive for streaming audio is that it allows you to support a potentially unlimited number of listeners, without any additional cost to you. Your server sends a "multicast" stream out to the network, and any number of listeners can tune in to that stream.

This is in contrast with the nonmulticast model, where each listener connects directly to your server, and your server has to send out a separate copy of the audio bitstream for each listener. Because each additional listener takes up more bandwidth on the connection from your server to the Internet, you need to build capacity to support more listeners. This means you have to pay for additional bandwidth and server horsepower if you wish to increase your audience size. In the multicast model, your bandwidth needs are trivial. You only need enough bandwidth to send a single bitstream from your server out to the Internet.

The major platforms such as Real Audio and Microsoft's Windows Media currently support multicast, so why not use multicast now? Unfortunately, multicast is not supported out to the user in all cases yet, but ideally it will be in the near future. In the meantime, multicast is best suited for Intranet applications where you have control over the network out to your targeted listeners. Most likely, the first practical wide-scale applications of multicast will be by large service providers that are also content providers, like MSN or AOL, since they can guarantee multicast support on their networks out to the user.

Until IP Multicast is more widely supported, the main consideration in setting up a streaming audio system is the number of simultaneous listeners the system can support. The number of listeners you can reach is determined by the amount of bandwidth that you have to the outside world and the server horsepower you have. If you want to support more than a few dozen simultaneous listeners, the ongoing costs of bandwidth will quickly become the most expensive part of your system. Therefore, instead of asking how many listeners you can support, the first question you really need to ask is how much bandwidth you can afford.

Internet service providers use a number of different models in charging for bandwidth. How you physically access that bandwidth will have an affect on cost as well. You can pay

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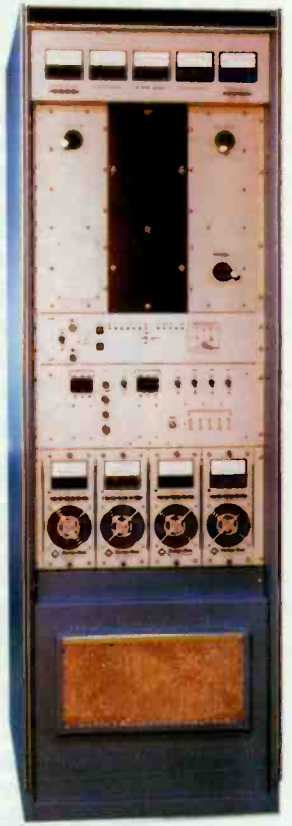

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Streaming audio on the Internet

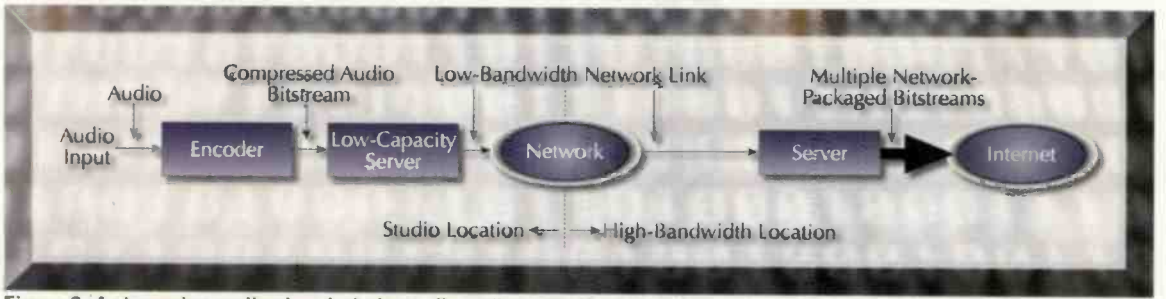

Figure 2. A streaming audio signal-chain configuration with the network encoder and audio server in separate locations.

for a dedicated high-bandwidth connection directly to your facility but, in most cases, it is substantially cheaper to locate your server or multiple servers at the service provider's location. For example, a dedicated 1.5Mb/s T1 link to your facility may cost you around $1,000 per month and will only get you around 83 modem-rate listeners (assuming an 18kb/s stream). A dedicated 45Mb/s T3 link will get you around 2,500 modem-rate listeners, but with typical costs of more than $10,000 per month.

One of the cheapest alternatives is co-hosting or co-locating, in which your server is located at the service provider's facility and it shares some part of the ISP's very high-speed connection to the Internet with other clients of the ISP. Typically, costs for this type of service are less than $1,000 per month per server. In some cases, you will be allocated a fixed amount of bandwidth; in others, service providers offer full access to their high-speed connection as part of the co-hosting service. In this case, the limiting factor for the number of listeners you can support will be your server. You will want to make sure up front that your agreement for full access is not subject to change when the audio streams from your server begin to eat up a substantial amount of bandwidth on a regular basis.

For most server platforms, the maximum number of simultaneous listeners that a single server can support is advertised at somewhere over 1,000 listeners. If you want to have the capacity for more listeners, you will need to add more servers. The major server platforms all support some means of sharing a bitstream between multiple servers, so adding more servers does not affect your signal chain much beyond plugging in another server at the ISP. More servers mean more bandwidth needs, so you will have to pay the additional co-hosting fees as well.

Again, you will want to design your

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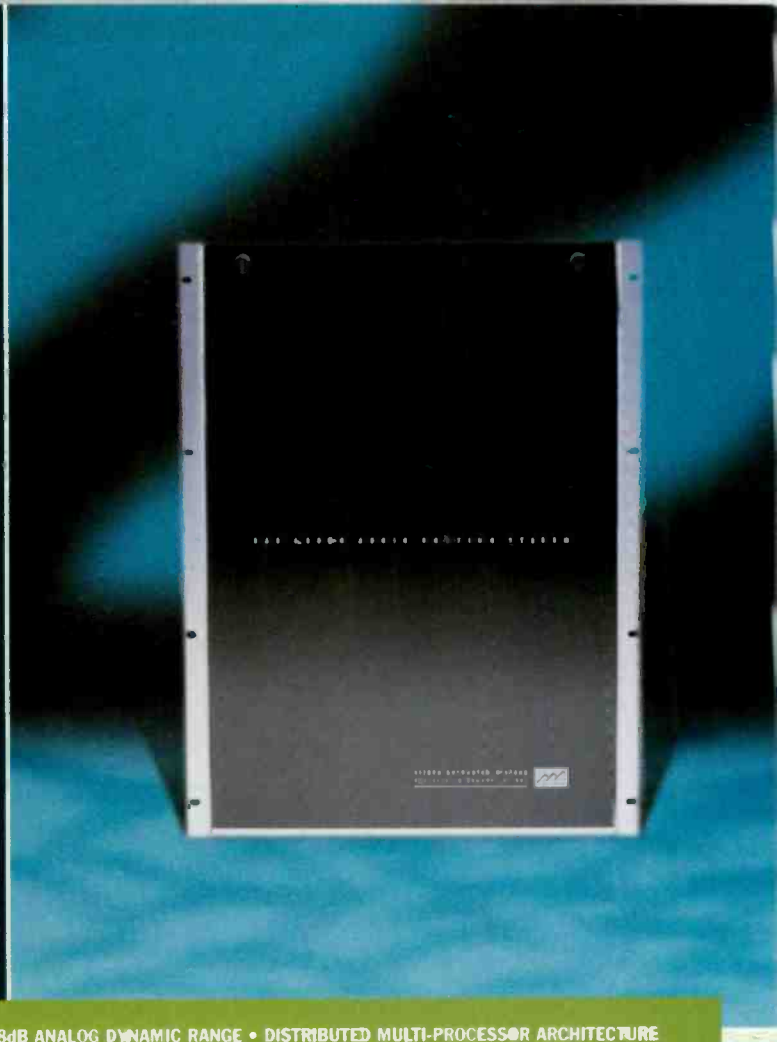

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Streaming audio on the Internet

system keeping in mind that, within the next few years, IP Multicast will be available to the user in most cases. At that point, it will no longer be necessary to have massive bandwidth and multiple servers to support a large number of listeners. Switching to a multicast solution in the future will simplify your server and bandwidth needs, while the rest of your signal chain should remain essentially the same.

Bit baggage

Another consideration in how you set up your system is what bit rate to use for your compressed audio stream. You should choose a bit rate based on the type of Internet connection you expect your target listeners to have. In general, it is good to support the lowest common denominator first, so a 28.8 modem bit rate of 12kb/s to 20kb/s is a good starting point. Lower bit-rate streams are also less likely to suffer from dropouts on congested or distant network connections.

If you want to have a higher-quality audio stream for listeners with faster network connections, it is a good idea to offer a high bit-rate stream in addition to the low bit-rate stream. In this way, users who have problems connecting to the high bit-rate stream may have better luck trying the lower bit-rate stream. If you are targeting users with 56K modems, ISDN or faster connections, you may consider using a bit rate in the range of 32kb/s to 48kb/s. Supporting even higher bit-rate streams may become desirable as DSL and cable modems become more common.

Keep in mind that for every bit rate you wish to support, you will need an additional encoder and an additional link from your encoder to your server. Further, in a nonmulticast system, your maximum number of listeners will go down as the bit rate of your stream goes up. To get some idea of how many listeners you can support at a given bit rate, take the numbers for the total bandwidth you have to the outside world and divide by the bit rate you wish to support.

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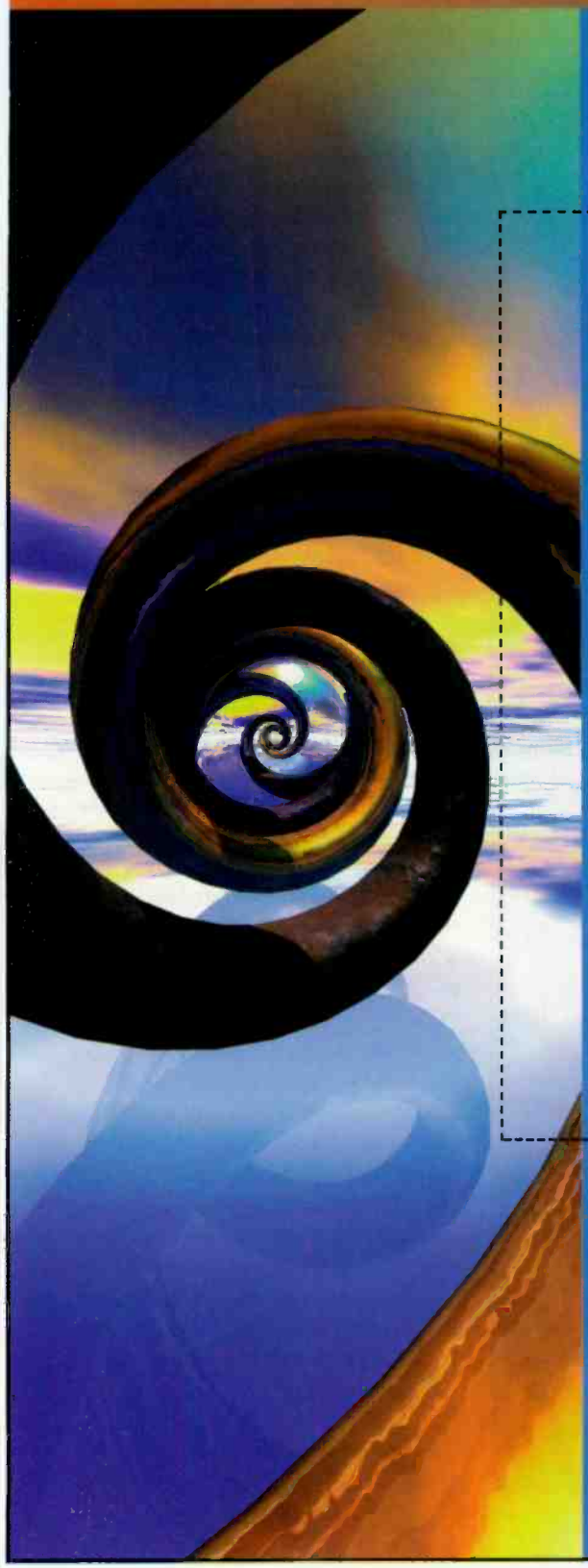

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Streaming audio on the Internet

Getting audio to the server

In most cases, your server will not be in the same physical location as your audio source. What is the best way to get the audio from your studio out to the server site? The answer will depend on the type of connections your studio has to the outside world.

If you have a dedicated, low-bandwidth network connection at your studio, you can take advantage of it to send an encoded bitstream to the server site. In terms of the simplified signal chain described earlier, the connection between the encoder and the server would be through your studio's dedicated network connection. Some server platforms may require that the encoder and server have a close network connection or direct serial link, in which case an additional component is required in the signal chain. In this case, you would have the encoder connected to a low-capacity server at your studio with a connection from the low-capacity server to the server at your high-bandwidth site through your studio's network connection (see Figure 2). If your network connection is through the Internet, you need to make sure that the Internet connection from your studio to the server site is reliable and not subject to fluctuations due to other network traffic across that connection.

Another option would be to make use of a dedicated audio link between the studio source and the server site. You could employ more traditional STL-like broadcast strategies to send your audio to the server site, where the encoder would be located (see Figure 3). The disadvantage of this approach is that the dedicated audio link will be more expensive and may cause a reduction in audio quality.

If you do not have any other means of getting audio to the server site, the cheapest alternative is to use your on-air signal. You could use a conventional radio receiver at the server site, and feed the audio signal from the receiver into the encoder. This approach assumes the server site is within the station's broadcast range. One major limitation is that the live streaming audio signal must be the same as the on-air audio, complete

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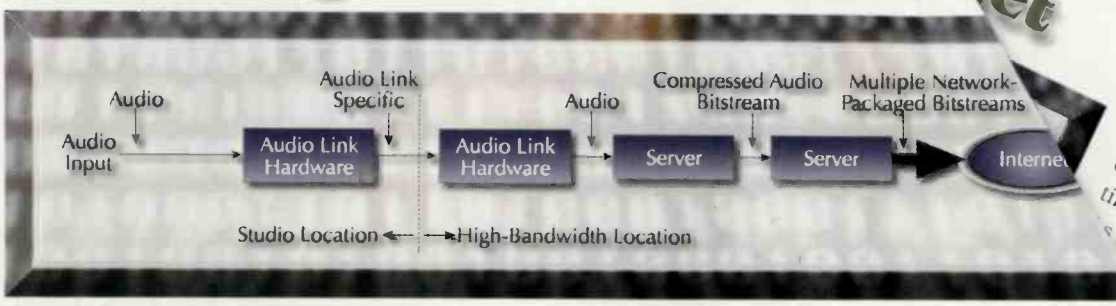

Figure 3. An extended audio streaming signal chain with an STL-like audio link.

with processing, which may not be desirable or appropriate for your encoder. Additional problems include the potential for noise due to interference or bad reception.

Putting it all together

Although essential technical considerations should be taken into account when deciding which vendor's streaming audio system to use, your primary focus should be on the listener's experience. Try to make it as easy as possible for anyone to listen to you. To that end, you should look at the vendor's player support. The player should be something the listener already has or one that is easy to download and install. It should be easy to use and unobtrusive in normal operation.

Another thing to take into account in deciding which streaming audio solution to use is price. Some vendors charge more based on the number of listeners that the server can support. If you plan to support a large number of listeners, you may find that it is better to go with a vendor that does not use this model.

While building capacity to support larger numbers of listeners is the biggest hurdle to overcome today, the price of entry for a basic streaming audio setup is inexpensive and

will only get cheaper as time goes on. more Inter- only au-

on content and oth your Internet presence yond just putting your s dio on the Internet. As new ogies and ways to take adva the medium fall into place, th lenge for the broadcast industry be in how to put it all together. role of broadcasters will need evolve with the new medium.

Kevin Nosé is president and director of engineering, and Ken Nosé is chief software architect of Neosonic Industries, Cleveland.

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Listeners are tuning into Internet-based radio stations for their favorite music and news broadcasts.

This month **Media Central®** brings you a Special Section on **the trend of radio stations trading airwaves for bandwidth.** Working in conjunction with *BE Radio's* April, "Making Money with the Web" report, Media Central features online **expanded coverage of the future of broadcast radio and its expansion to the web.**

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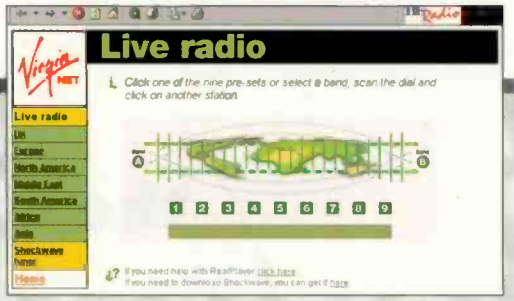
Streaming audio

continued from p. 44

Bloomberg. Drop-down menus are available for locating and selecting other program sources.

Besides the RealPlayer software, which can be downloaded for free, Real.com offers a variety of related software packages for producing and playing many types of media over the Internet. Several of the other Internet tuners provide enhanced user interface functions and use RealPlayer software to receive the signals. These user interface functions may include improved or different graphics and different methods for station selection.

The Rocket Radio tuner (www.rocketradio.com) provides a colorful screen with simple icons for selecting a station, homepage or chat function. Clicking on the icon marked "tune-in" produces a three-column screen that allows the user to select a station. The first column is for selecting the desired program format. The second column lists stations with that format and the last column provides a station description, including its location, over-the-air frequency and details about the programming.



VirginNet's tuner uses a Shockwave plug-in.

A selected station is clearly displayed on the main screen, which also includes eight preset buttons. Assigning a station to a preset is easily accomplished by placing the cursor over a preset button and holding down the mouse button until the station's name appears under the preset button. From the main screen, you can also view a station's webpage or enter its chat room while listening to that station.

The Virgin Net ShockWave tuner (www.virgin.net/radio/shocked/index.html) uses a world map divided into vertical segments for selecting a station. As the cursor moves over each segment, a corresponding station is shown in a bar below the map.

To increase the number of stations offered, there is a band switch feature enabling the single row of segments to represent one set of stations when the user clicks on band A and a different set of stations when the user clicks on band B. The background color changes to show which band is selected. A series of nine preset buttons is also available. Some other tuners offer more stations and features; however, the ShockWave tuner provides an example of how to keep the screen simple and uncluttered with minimal selections and controls.

EarthTuner software starts with a globe that can be rotated in any direction (www.earthtuner.com). Globe rotation is easily controlled with the mouse. The region of interest is selected with a click of the mouse. Then a list of stations from that region appears on the screen. This station list is organized in a treelike structure, similar to Windows Explorer, that can be expanded or collapsed to show different levels of detail. When fully expanded, the listing shows program types, stations

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and even the different services each station offers. Typical service choices include the station's homepage, audio feeds at one or more data rates and some video and special-purpose services. Some stations offer audio feeds at four different data rates, while others offer separate feeds for mono and stereo. Besides the globe, there is also a search function that can identify stations based on location, format, call sign or any other criteria. The search function uses four fields: description, location, format and link type.

Selection process

When selecting a station, today's listener typically tunes across the dial by frequency or needs to read through large amounts of text on the Internet. When moving across the dial, the listener can easily be distracted by the most powerful signal and has no way to determine where the station is based. An Internet listener often needs to read through cluttered screens and long text-based lists of stations. In both situations, finding local programming or other specific content can be time-consuming and complicated. The user-interface functions Internet tuners provide will change the process.

A key point for broadcasters is that the listener's first selection can be the station's location, call sign or program type. Program or service type and signal quality can be selected with a level of accuracy and detail that was not always possible in the past. Listeners can easily find local programming, which could be a big plus for stations that have invested in local origination. This capability also enables listeners to select from a range of local programming, such as news, sports, travel and music. Stations within a particular market could focus on narrowly defined demographics for advertisers, audience and programming.

The future

Probably the most interesting aspect of Internet tuner software is that it illustrates the potential for new and diverse methods of selecting stations. It also raises the question of what other demographics, criteria or methods could be used by listeners to select a station, program or service. Another point to ponder is whether these selection methods could be used in an over-the-air receiver. Some combination of software, firmware, liquid crystal display and RDS or subcarrier data on location and program type would make this possible. Individually, these features can be found in receivers already on the market. Developing the right combination is technically possible in the near future. The challenge for broadcasters will be competing and programming in a world where listeners can select what they want with increasing accuracy and detail.

Neil Lewbel specializes in new product introductions and has worked in both broadcast and data communications. He is based in Dublin, OH.

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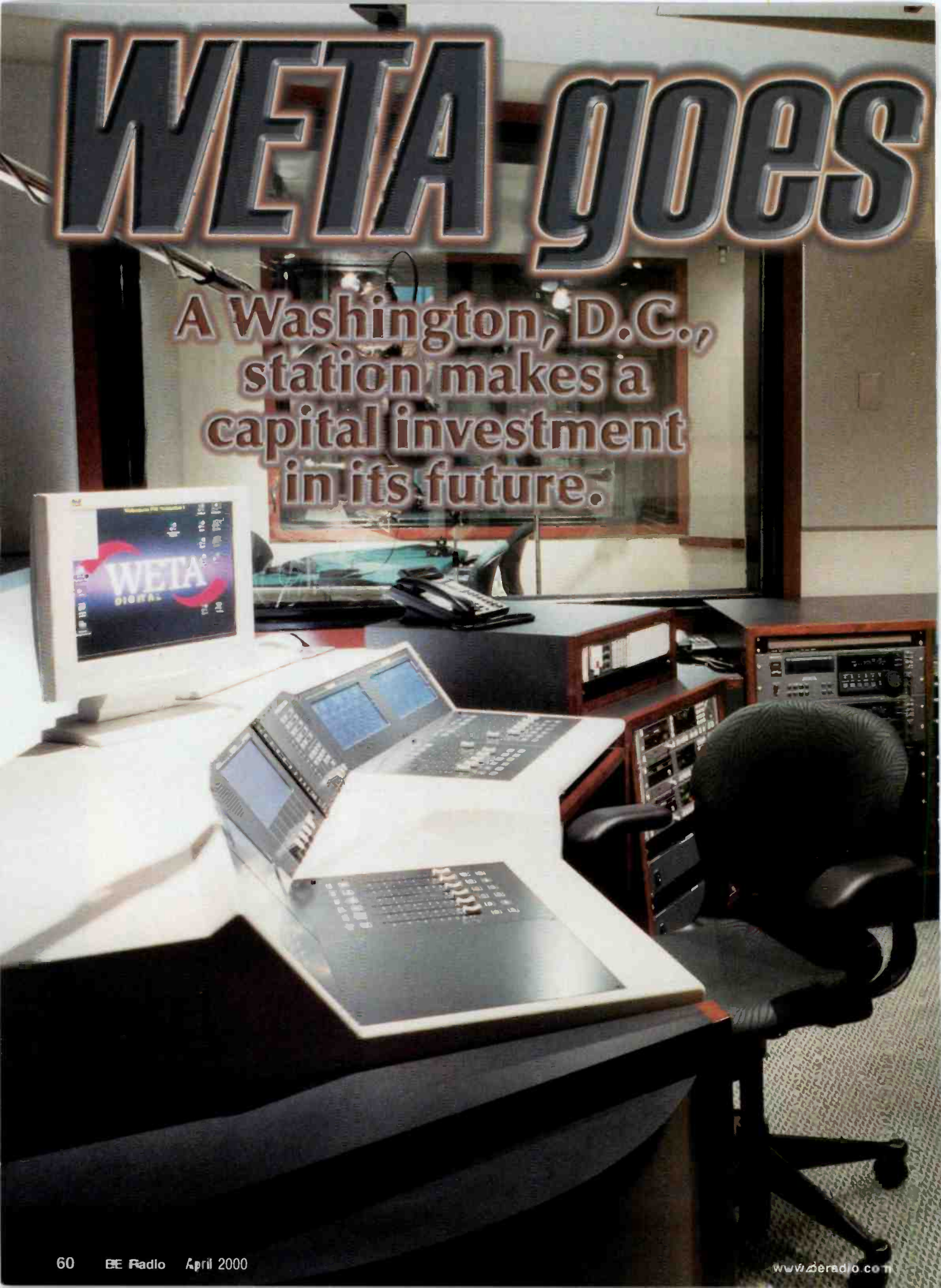
WETA goes

A Washington, D.C., station makes a capital investment in its future.



all-digital

By Matt Cheplic

Greater Washington Educational Telecommunications Association, known by its NPR radio listeners and PBS member TV viewers as WETA Washington, D.C., undertook a significant endeavor when it decided to move around the corner from its prior location into a six-story building in Arlington, VA. The goal of the move was to consolidate and update the radio and TV technical facilities to create a space that would support the company for the next 20 years. With the move to the new building, the company hoped to get in on the ground floor of something big.

Photo: One of the WETA-FM production control rooms

To help meet these goals, WETA worked with architect Walters-Storyk Design Group, Highland, NY, and Communications Engineering Inc, Newington, VA, a turnkey TV and radio engineering and integration firm.

Because it initially intended to occupy the first floor of the new building, the station made plans for accommodating group tours. The first-floor plans included an on-air production studio and production control rooms as well as large exterior windows that would give spectators outside of the building an exceptional view of the interior space (along the lines of NBC's *Today Show*). After these plans had been made, however, the station found out that the tenant occupying the ground floor did not intend to leave. Therefore, WETA had to reassign ground zero to the second floor.

The heart of the station, the WETA-FM on-air studio is ergonomically designed to ensure employee comfort.

This decision did more, however, than deprive the citizens of Arlington of an opportunity for voyeurism; it also introduced a design obstacle. The second floor had a ceiling height of only about 11 feet, whereas the ground floor's floor-to-ceiling height spanned more than 16 feet. To overcome this setback, the design approach had to be revised. For example, technical spaces were built with a raised floor level of only 4 inches, since the ceiling-to-floor height was so limited.

As originally intended, the facility still nicely accommodates visitors. Standing in the ISO A room, for example, one can look through five adjacent rooms into ISO B on the other side of the floor. Guests can also look directly into the on-air studio once they step off the elevator.

On the practical level, the second floor received substantial acoustic

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Another view of the WETA-FM on-air studio.

treatment to address the location of the building; it is next to a major interstate highway and a helicopter path to and from the Pentagon. Internally, adjacency to noisy mechanical areas such as elevators and machine rooms had to be addressed. The walls were supplied by Whisper Walls, and Kinetics provided the flooring.

Prepared for anything

The 30-year-old station records live music performances such as folk programs and a fair amount of symphony orchestra recordings at the Kennedy Center and other venues. As an NPR station, WETA offers such programming as *Morning Edition*, *All Things Considered* and *Marketplace*.

To accommodate WETA's TV needs, hangers were included in the ceiling of the radio studios for TV lighting. At present, the radio studios are not used for TV programming, but the station wanted to be ready for this scenario. This thinking follows a credo of being prepared for whatever production opportunities or needs may arise. The company's credo also guided several technology purchases. Most prominently, WETA's migration helped solidify the station's move to digital gear. The centerpiece of this strategy is Studer's OnAir 2000 digital console. Production B features this console, as do the three edit rooms and the on-air studio. Because the console is software-configurable, operators can easily tap into settings like equalization and reverse phase. If the need arises to broadcast from a production room, recalling the on-air studio's settings is simple.

Production room A features, in contrast, a Soundtrax Virtua computer-based console, which allows for surround sound and multitracking mixing. This mixer also offers a simple stereo console, which means the room can become as basic or advanced as needs dictate. While radio does not yet have a need for multichannel sound, high-definition television does, and WETA is preparing for HDTV promo music, among other things. The station's field work will most likely be recorded for surround sound beginning next fall. A

Digital field recording just got professional.

"The new recorder is a big leap forward from the music-centric consumer MD portables that have been adapted for professional use."
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- Built in mic and speaker
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And because safety in recording is so critical, the PMD650 also includes two special features –

- Dual mono mode. In this mode a single input is recorded onto two tracks, with the second track 15dB lower than the first. This gives you a back up track in case of level overloads on the first track.
- Record-memory cache that continuously captures 5 seconds of audio before the record button is pressed.

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Bryston Audio amplifier and B&W monitor speakers complete the surround-sound monitoring.

The station chose Studer CD players. For mics, the station uses Neumann U87s. Neumann TLM 103s are used for guest positions. A variety of Neumann, Schoeps, AKG and other mics find their way into the field (recording an entire symphony orchestra tends to use up mics quickly).

Previously, when WETA recorded NPR programs that required a delay, they were recorded directly to DAT. But in keeping with its new location and direction, the station now records to Broadcast Electronics' AudioVault hard-disk system. The station still uses Sony and Tascam DATs for archiving shows, but hard disk has taken over the reins for short-term storage. The AudioVault features 72GB of storage (more if you count the backup RAID array drives). Incidentally, there is not a cart machine to be found in the building. The station is also converting all field equipment to digital. Currently, recording in the field is accomplished with 24-bit Tascam DAT machines, but signals are routed through an analog console, which is likely to change.

The windows in production B provide a clear view of several other studios.

Editing is done on a Microsound workstation from MicroTechnology Unlimited. The same computer in the production rooms also runs the AudioVault software for storage and playback of the completed productions.

The switcher at WETA is a Grass Valley AES, designed for up to 256 × 256. Presently, 128 inputs and 64 outputs are employed. In addition to routing for the satellite receivers, every DAT machine is routed to the switcher, so copies can all be run off from the same source. Naturally, the station has its share of computers. In an unusual configuration, all hard drives are on the ground floor (in an area the aforementioned tenant was not occupying at the time of the move). Only keyboards, monitors and mice are upstairs in the studios; all are routed to the downstairs hardware via Cybex extenders. Having

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Doug Lane, owner and GM of WWDL (FM), WICK (AM) and WYCK (AM), Scranton and Wilkes Barre, PA says he "saves more than $45,000 per year with Scott Studios' Voice Trax automation. While the investment was major for a small family company like ours, *the pay back was fast and real*. And the savings are year after year after year.

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Normally, each announcer records a fresh show every day. Scott's exclusive Voice/Music Synchronizer guarantees every song plays only with the correct voice track. If a jock gets too busy and doesn't do their show in time, Scott's unique Voice Trax System automatically airs evergreen standbys that sound right! Doug says, "No one but Scott Studios has this great fail-safe feature. Scott Studios' System provides a separate specific generic Voice Trax for every track for every hour and every day of the week in case someone can't track their show in time."

Scott's Voice Trax recorder is the industry's easiest to use: most tasks are done with just one button. The mouse and keyboard are seldom touched. Voice Trax take only seconds per cut to record. Scott's AutoPost makes announcers sound better and minimizes Voice Trax re-cuts. Experienced jocks don't waste time checking their work because they hear their voice and surrounding music and spots in context while recording.

Doug Lane, Owner and GM, WWDL, WICK and WYCK, Wilkes-Barre and Scranton, PA

Doug's stations have used Scott Studios' Voice Trax systems for many years.

The Scott System is radio's most user-friendly. You get instant airplay or audition of any song simply by spelling a few letters of its title or artist. You see when songs played last and when they'll play next. You also get voice tracking while listening to music in context, hot keys, automatic recording and graphic waveform editing and scrub of of phone calls, all in one computer!

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After a year of trouble-free operation, Doug Lane says, "It was fun to get five calls at the studio over the Holidays from out of town PD's and GM's wanting to speak with me because they heard me 'on the air'. Guess what? I wasn't even there! They were amazed at our Voice Trax and Scott's accurate Time Checks too. Actually, they were 'very impressed'!

Doug is now installing Scott's automated temperature announcer. He says, "Scott's features are great. The savings are even better! I wouldn't want to run my stations without Scott Systems!"

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See Scott's NAB Radio Booth R4093 and Video Booth L2506 at the LVCC.

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the equipment downstairs allows it to be kept cool without chilling out the human operators; it also keeps noise to a minimum in the studios.

For wiring, WETA relies on 75Ω coaxial cable rather than 110Ω twisted-pair. The consoles were ordered with 75Ω inputs, which eliminated the need to convert. More importantly, as sample rates move to higher frequencies, coax can accommodate that growth (as evidenced by its prevalence among video facilities).

Outdoors, WETA depends on a Caterpillar 450kW generator, which powers the TV and radio facility. The station has a downlink for NPR's satellite system, via a 3.8-meter Comtech dish. That signal is brought to Comstream receivers on the first floor. A fiber optic link made by Ortel prevents a grounding problem and carries the information more efficiently between the roof and first floor.

The edit rooms are smaller than the other studios but just as functional. Each of WETA-FM's three edit rooms is built around a Studer audio console.

There is an unusual element to the satellite system: When the station moved into its new home, it was told the audio system was at -20dBfs, the station's standard reference level. Upon further inspection, it proved to be -14dBfs, which means the network channels are 6db hotter than the rest of the plant. A Ward-Beck sample rate converter adjusts the level.

WETA was fully up and running on time and on budget. All in all, it's a fully digital signal through conversion to RF. With its move to the new facility, WETA will continue to reach its diverse Washington, D.C., audience, and it will be poised to deliver that audience the latest broadcasting innovations.

Read more on WETA-FM in the Studio Spotlight www.beradio.com

Matt Cheplic is a freelance writer and former associate editor for Millimeter.

Thanks to radio chief engineer Eric Hoehn, Walters-Storyk Design Group and Communications Engineering Inc. for their contributions to this story. Photos: Pages 60, 64 and 68 courtesy of Communications Engineering Inc; pages 62 and 66 by Wolsch/Pollara Photography and courtesy of Walter-Storyk Design Group.

TieLine POTS codec

By Mike Rabey

POTS codecs have revolutionized remote broadcasts for many radio stations. These ubiquitous boxes have made good-sounding remotes possible without exorbitant line charges or unmanageable lead times. Although they are extremely versatile, these boxes have yet to challenge the sound quality of their upscale brethren, ISDN codecs.

But that situation may be changing. The TieLine codec uses Lucent Technology's PAC audio coding algorithm to provide audio quality that raises the bar for POTS remotes.

A better mousetrap

Much of the unit's impressive performance is due to its improved modem. The unit's designers built their own modem around a new modem chip. The codec circuitry talks directly to the chip, speeding connection times and improving data transfer rates. Audio stuttering and dropouts are greatly reduced. Also, the connection is rock-solid, without any unanticipated line drops. The unit establishes a phone line connection in less time than other units I have seen. It is reassuring to know that the TieLine will not drop the line unless it is commanded to do so by the user at either end.

Performance at a glance

- Improved modem
- Lucent PAC coding
- Constant display of connection quality
- Remote control from both ends
- Free software upgrades
- Excellent sound quality
- Manual or automatic control of data rate
- Optional PC control software

Once the connection is established, the unit constantly monitors the line, automatically incrementing the data rate upward, if possible. The data rate can be adjusted manually as well. The front panel provides a constant readout of connection quality as a percentage as different data rates are selected and implemented (the conversion takes less than a second). The modem automatically chooses the best of four digital access arrangements to optimize the interface with central-office equipment.

Does all this technical wizardry translate into better sound? My answer is yes. The TieLine sounds bright and smooth on music, and punchy and crisp on voice. Both high and low frequencies have superior extension and definition. I was tempted to compare the sound with a mono ISDN codec, but the highest frequencies exhibit that familiar swirling sound that suggests aggressive bit reduction is taking place. This effect was more apparent on music than on voice. The voice quality is very good.

There is always a downside; in this case it is delay time. The transmission delay seemed to be about double that of other POTS codecs, on the order of one full second. This may or may not be a problem with some applications.

The specs

Like most POTS codecs, one unit can both send and receive. Two packages are available, a tabletop remote version and a rack-mount studio version. Each can be used for either application. The remote unit seems quirky at first, with its large rotary-switch pushbutton control knob, but the operation is intuitive and straightforward once you get used to it.

If the air talent at the remote site is nontechnical, you can lock out the controls on the remote unit and make all adjustments from the studio unit. The remote unit can activate two relays (expandable to eight) in the studio unit for remote control, and a low-speed, 170b/s serial port is included. Two audio inputs can be either mic or line level, and levels are clearly displayed on the multisegment level meter. All the input and output connections are on the back of the remote unit.

Overall, the TieLine earns high marks for stability, sound quality and features in the competitive POTS codec market. If you are considering buying one of these versatile boxes, this feature-laden import from Australia deserves careful consideration.

Mike Rabey is president of Indy Audio Incorporated, Indianapolis.

Editor's note: *Field Reports are an exclusive* BE Radio *feature for radio broadcasters. Each report is prepared by well-qualified staff at a radio station, production facility or consulting company. These reports are performed by the industry, for the industry. Manufacturer support is limited to providing loan equipment and to aiding the author if requested.*

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MP-4	4	800W	3.3	$1,280
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MP-3-5	5	3,000W	4.1	$2,270
MP-3-6	6	3,000W	5.2	$2,740

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Model	Bays	Power	Gain	Price
GP-1	1	2,000W	-3.1	$350
GP-2	2	4,000W	0	$1,350
GP-3	3	6,000W	1.5	$1,900
GP-4	4	6,000W	3.4	$2,600
GP-5	5	6,000W	4.3	$3,150
GP-6	6	6,000W	5.5	$3,700

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SGP-2	2	8,000W	0	$2,690
SGP-3	3	10,000W	1.4	$3,595
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Computer integration in radio stations: The next level

By Conrad Trautmann

Computers play a key role in radio — beyond audio storage, editing and playback.

The integration of computers into radio stations is nothing new; many stations could no longer stay on the air or do business without them. But the integration of systems, hardware and software continues to evolve every day. More than ever, there is a need for computers and digital systems to not only talk to each other and share commands and files but also on a larger scale.

For some time, computer networks have been used in radio stations for business applications, and now they are becoming mainstays on the operations side of the building. The number of networks that allows storage and retrieval of archived information and sharing of files around a radio station is growing. Furthermore, networking on a grander scale, using wide area networks (WANs), is allowing radio stations to share this information among multiple locations. In addition, the Internet has become a necessity for communication and research, and its use continues to expand in the radio-station environment.

In short, computer equipment integration is increasing on the individual station level in many ways. Similarly, a rise in such integration between stations allows multiple locations to operate more efficiently. Moreover, the Internet is playing a more prominent role in the operation of radio stations.

Studio integration

At the level of individual stations, equipment manufacturers are addressing the need for sharing of

files and information between their own systems and those of other manufacturers. Orban, for example, has developed its RIFF/cart extension standard, also called cart chunk. (For more information on the cart chunk, see *A bridge between systems: The cart chunk proposal*, August 1999, p. 41). When you examine the process once involved in dubbing a produced piece from a multitrack digital editor to a digital audio delivery system, you probably wonder why the process cannot be made easier. The editing system saves the file on a hard drive and the delivery system pulls the information off a hard drive, so why can't the editor simply dump the file to the delivery system? This approach would avoid the conversion process back to analog to run through a console (for those of us who don't have digital consoles in production yet) and then back to digital.

Orban offers one example of this integration. Network support exists for the Audicy multitrack audio editor. With the addition of the cart-extension technology to the latest software revision, the production created on the editor can be transferred directly to the ENCO and Broadcast Electronics on-air delivery systems. Prophet and Scott Systems are not far away. While this prospect sounds good in itself, it gets even better: Entering data such as cut information, including titles, cut numbers, artists, run dates and time, onto the production itself saves a step. The on-air delivery system then reads and interprets this data. The file is transferred to a directory on the network that the digital audio delivery system can read and then move to the proper place.

Another good example of this process in action is WHTZ, Z-100's studio in New York. Chief Engineer Josh Hadden recently hosted the New York Chapter of the Society of Broadcast Engineers for a tour of the new facility. (Look for Z-100 in a Facility Showcase in an upcoming issue of *BE Radio*.) This facility's integration of digital equipment is exemplary. The Harris DRC-2000 main studio console acts as a control surface for the ENCO DAD Pro32 digital audio delivery system and the Sierra Automated Systems switcher. The interface between the console and automation system includes remote control and tallies as well as serial data, which enables the information for the loaded audio cut to be displayed on the alpha-numerical display on the fader. Similarly, the console acts a control head for the SAS 64000 audio switcher to select which source is assigned to each fader.

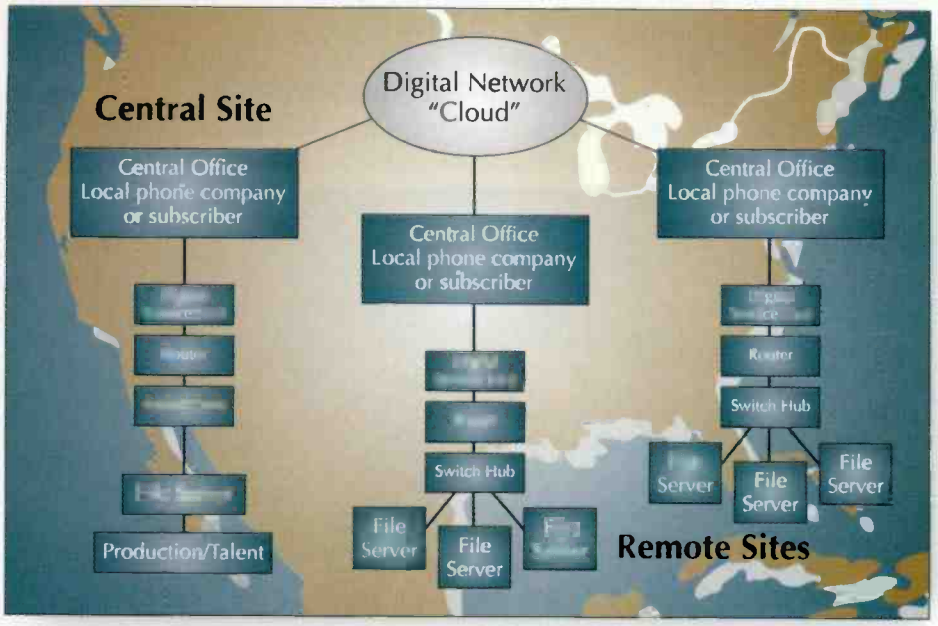
These configurations are important, since the console is programmable for different fader and source configurations for production or on-air. Depending on the selected configuration, all of the associated equipment has to follow.

Networking integration

As networking technology embeds itself in the operations side of the

radio station, we are beginning to see growth in the use of that technology to connect multiple locations. WANs, once used primarily for business applications in larger companies, are now becoming more common in the operations side of the radio business.

The AMFM Radio Group distributes audio across its WAN to supply small-market stations with large-market talent. The company maintains audio production head ends in Austin, TX, and in Ft. Myers, FL. Announcers can voice track entire shows from these locations. The audio is then distributed from these locations via the WAN to the intended stations. Although this concept is not necessarily new, it is becoming more widespread. The need for broadcast engineers to know large-scale computer networking is more important than ever. To strengthen its engineers' computer-networking skills, AM/FM provides training at no charge for Novell (CNE) and Microsoft (MCSE) training.



Achieve greater resource sharing with computer LAN and WAN integration.

Internet integration

Have you had to deal with MP3 files yet? If not, you will soon. According to a recent report, MP3 has become the most searched-for item on Internet search engines. Evidence for the format's popularity abounds: AltaVista just redesigned its search page, adding a tab dedicated solely to MP3 and Cox Interactive Media, a division of Cox Enterprises, which also owns Cox Radio, has entered into a partnership with mp3radio.com.

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Indiana University recently banned students from using Napster (www.napster.com), an Internet application used for searching and playing music in the MP3 format. According to the university, the activity accounted for 55 percent of the traffic across the college's computer network. This statistic provides hard evidence of MP3's popularity. If this trend in the format's popularity continues, those of us in the radio community could feel its effects in many ways.

Toward this end, my station has already had an experience with MP3. A commercial was delivered by e-mail to our station in MP3 format. No one knew how to accept this form of delivery. A chain of events started, which eventually led to the engineering department for resolution. Fortunately, one of the studios had an Internet-capable computer with a sound card wired to the board. We had to install an e-mail client and an MP3 decoder to play back the file. Having done this, the file began its course through the station's on-air delivery system.

We currently have Internet-ready computers in a few of our station's production rooms to allow the staff to download audio cuts for on-air playback. However, these computers may be insufficient in the near future. If commercial distribution via MP3 continues to grow, we will be forced to consider an Internet-ready, audio-ready computer in every room. In most cases, these computers would be in addition to a multitrack digital audio editor and a workstation for the digital audio delivery system.

Another application for these Internet-ready computer systems is the new song releases only available online in MP3 format. One recent example was the debut of a song from Jimmy Page and the Black Crowes. There are also applications for posting audio files to our station's website.

Streaming audio integration

In the rush to upload a stream to the Internet, most stations simply bridged a feed off their program line to the transmitter. Now, with the ability to split audio from the same digital audio delivery system, it is not difficult to send a separate Internet feed. Music can be duplicated, but IDs, promos and commercials can be customized for use on the Internet. This is all the better, since major manufacturers take the Internet and streaming audio seriously. (For more on streaming audio and Internet tuners, see *Streaming audio on the Internet*, p. 42.)

At the receiver end, you can tune in your favorite Internet radio station with more than just a computer. Kerbango has announced an Internet radio that offers an easy user interface to listen to audio from the Net without a computer. According to the company's website, the radio will connect to the Internet via a network card or modem. Internet radio stations will be displayed by category, and stations

will be selected with a tuning knob. The radio will also receive AM and FM signals. The user will need an Internet connection, but there is no charge for the service.

Other companies now provide similar devices with a low-power transmitter and receiver combination so you can tune the station in at your computer and bring the portable receiver anywhere in your home to give you mobile freedom.

Another indication of the increased attention to webcasting is the introduction of audio processors designed specifically for this purpose. With advances in audio quality of the various codecs, it has become necessary to process the signal to offer a competitive sound. Take into account that the computer listening environment is typically low-quality, which presents a new challenge in audio processing. Different bit rates require individual attention. One advantage in processing for the Internet is that relative loudness is not as much of a factor across the Internet. Listeners are not yet comparison listening. As a result, you start with better quality.

Equipment access and control

Computer access of equipment cannot be overlooked. It is amazing what you can do with a laptop computer from your living room these days. Probably the most common piece of equipment at the radio station that people access with a computer is the transmitter remote control. Nearly all of the remote-control manufacturers have software packages that allow dial-in access to their systems. It is possible to view tower site parameters and control equipment from your keyboard. This access also makes setting the parameters and labels much easier. Some remote-control systems offer the ability to set up macros that will follow a sequence of events based on a time or an input. Pattern and transmitter switching are two examples of how such macros can be useful.

Besides conventional AM and FM signals, the Kerbango tuner receives webcasts.

Other manufacturers have followed suit, offering custom software access their systems. Belar's latest line of modulation monitors will allow you to attach a modem and dial in to view the latest modulation, pilot injection and SCA injection. You can adjust the modulation remotely. For those with a composite clipper at the tower site, Belar offers two composite loop-through ports that allow you to adjust the input to the clipper and the output while viewing the results in real time.

Audio processing is another area where manufacturers have developed computer access and control, and remote dial-in and control are available. Probably the biggest advantage is that settings can be stored on the processor and on your computer. Changes can be made with confidence because original settings can be restored. Another advantage is that changes can be made from any listening environment you choose, rather than at the tower site or in a small rack room at the studio, where conditions may be less than ideal.

The next level

Many of the on-air digital audio delivery systems offer dial-in access from a remote location. Remote access programs like Symantec's PC Anywhere make it possible to take control of the studio from a remote location and control the audio, possibly eliminating the need for a board operator. Dial-in access can also help in trouble-shooting the system if there is a problem.

Generator manufacturers offer dial-in access, too. An option on some transfer switches these days is a dial-in remote control board for remote monitoring and control. The uninterruptible power supply is another device that comes with its own monitoring software. One manufacturer, APC, has paging capability built in to page a network administrator when it has switched to battery power. With a serial connection to the server, it is possible for the UPS to send a command to the server to properly shut down before the power is exhausted.

Most rack-room equipment can be externally accessed or controlled.

Unlimited connectivity

Anything that can be accessed remotely has the potential for moving to the Internet permanently. It is not unreasonable to think that transmitter remote control manufacturers will soon design equipment with network cards and TCP/IP capability. When these features become the standard, transmitter control and monitoring could be accomplished from any Internet connection.

Once studio integration reaches a peak, manufacturers being to think globally, building systems that work together beyond the local studio, linking all of these highly integrated studio locations together to allow seamless operation from any location. More manufacturers will take the lead to create new standards that will allow this to happen. If you think about where the last 10 years has taken us, it is truly exciting to see what's waiting around the corner.

Thanks to Jeff Littlejohn, VP engineering of AM/FM, Glenn Sanders at Zaxcom, Clark Novak at Cutting Edge/Telos, and Al Salci at SAS for their assistance in preparing this article. Photo credits: Page 78 courtesy of RDA Systems.

Conrad Trautmann, CSRE, is chief engineer and IS manager for Cox Radio, Long Island, NY.

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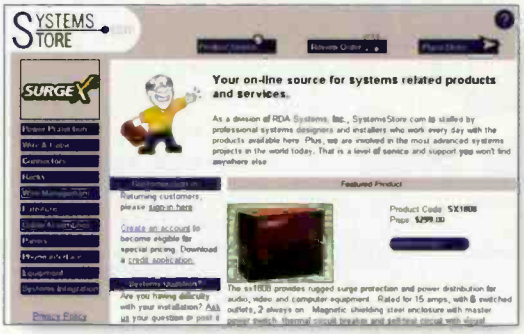

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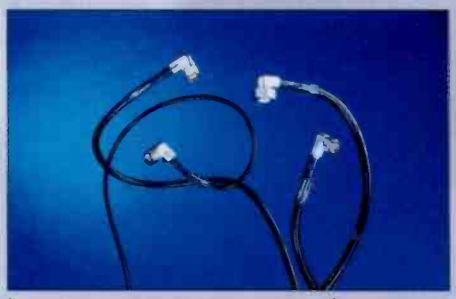

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Digital audio studio system
Broadcast Electronics/Booth R3682

Vault 2: From the makers of AudioVault, this system maximizes existing resources and talents to collect, manage and deliver content to their audiences. Offers complete flexibility to fit in any environment. Uses a completely open system, nonproprietary format with robust LAN/WAN and Internet capabilities.

217-224-9600; fax 217-224-9607; www.bdcast.com
bdcast@bdcast.com
Circle (258) on Free Info Card

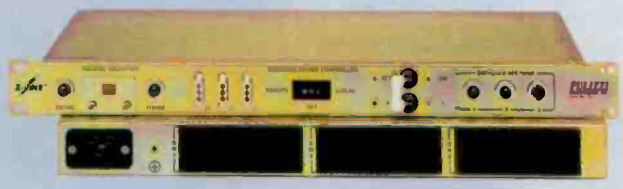
Expanded feature set
360 Systems/Booth R3163

▼ **TCR/8:** The TCR/8 synchronous master recorder is a hard-disk digital audio recorder designed to provide multichannel audio acquisition and playout for broadcast and production applications. Provides a measurable 20dB improvement in SNR and dynamic range over conventional designs and offers bit-for-bit reproduction of 24-bit PCM, Dolby-E and AC-3 recordings. Recordings can be stored on a 9GB internal hard disk, 250MB zip disks or DVD-RAM, all standard equipment. Includes a DVD-RAM drive. DVD-RAM disks will hold up to 10 hours of uncompressed 24-bit audio with random access. Has the ability to play back selected tracks in real time. Now also features direct file interchange of WAVE and SD-II files, multi-machine sync for up to 64 tracks, complete time-code implementation, P2 VTR emulation, cut-copy-paste editing, and hard lock to Digital Betacam for tight sync during scrub-edits. Available in a version that offers 96kHz and 88.2kHz sampling.

818-991-0360; fax 818-991-1360
www.360systems.com; info@360systems.com
Circle (264) on Free Info Card

New Products

Remote on/off and EPO option
Pulizzi Engineering/Booth S3433



▲ **Latching control circuit:** The latching control circuit for remote on/off and emergency power off (EPO) requirements is now available in all applicable power distribution systems and mating remote control panels. Shown above, the TPC 2364 with latching.
800-870-2248; fax 714-641-9062; www.pulizzi.com; sales@pulizzi.com
Circle (266) on Free Info Card

compact bi-amplified monitor
JBL Professional/Booth M8632

LSR 25P: Features a 5¼-inch woofer (100W) with non-woven carbon fiber composite cone and a 1-inch titanium composite diaphragm tweeter (50W) providing an accurate reference for workstations and edit suites. Bi-amplified design with 80W of low-frequency power and 40W of high-frequency power. Has front-panel volume and power controls, integrated mounting points for horizontal or vertical orientation, and is shielded for use next to video monitors. Includes a built-in high pass for use with the optional subwoofer.
800-852-5776; fax 818-830-1220; www.jblpro.com; info@jblpro.com
Circle (268) on Free Info Card

Multitrack recorder software updates
Otari/Booth L9741

▼ **Radar II HDR Series:** Version 2.07 software upgrade includes several useful new features. The revision enables the display of waveforms for audio levels above the Wave Noise Floor defined in the project and preference menus. These can be viewed in detail using new zoom and scroll keys defined for the RE8-II remote. A Zoom Solo feature allows zooming to nonsequential track groupings. This feature can be used incependently of track soloing or the Solo Zoom Aucio preference can be enabled. In this mode, only tracks selected for Zoom Solo will be heard.

800-877-0577; fax 818-594-7208; www.otari.com; sales@otari.com
Circle (254) on Free Info Card

Correction:

In the February New Products section, the Vocalist VR from DigiTech was identified as a Natural-sounding harmonizer. The DigiTech unit should have been identified as a Natural-sounding harmony processor. The term Harmonizer is a registered trademark of Eventide Inc. and only Eventide manufactures products under the Harmonizer brand.

New Products

Power conditioning system
Staco Energy Products/Booth L5205

Trolgard: The conditioning module is enclosed in a 19-inch, 2RU enclosure and operates as a full-time, stand-alone, power conditioner providing regulated output voltage and frequency, harmonic filtration, plus sag, surge, electrical noise and brownout protection. Equipped with two ports for remote communications. If an application requires blackout protection, the addition of an optional battery pack and the rear-panel selection of UPS operating mode converts the unit into a full-featured UPS. A simple factory modification provides frequency conversion capabilities in either the power conditioner or UPS operating modes. Available in 1kVA to 3kVA ratings, 120V or 240V.

937-253-1191; fax 937-253-1723; stacoenergy.com
sales@stacoenergy.com
Circle (250) on Free Info Card

Network cabling solution
Belden/Booth L8478

Integrity: Jointly developed by Belden and Panduit Network Connectivity Group, this cable is designed and tested to surpass TIA/EIA standards. These channel solutions are tested to provide 100-percent throughput with IEEE-compliant network electronics. Integrity UTP solutions improve upon CAT-5e and CAT-6 standards in terms of PowerSum ACR, Return Loss and PowerSum ELFEXT. Four main channel solution packages are being offered; all come with all cabling and connectivity products required for successful installation.

800-BELDEN1; fax 765-983-5294; www.belden.com
info@belden.email.com
Circle (257) on Free Info Card

Multifunction audio processor
Lectrosonics/Booth L5812

DSP4/4: A four input, four output processor with 12 filters per channel for EQ, notch filtering, high and low pass filters, feedback extermination, compressor/limiter and 182ms of delay per channel. There are eight memory presets and the unit can be controlled via RS232.

800-821-1121; fax 505-892-6243
www.lectrosonics.com; sales@lectrosonics.com
Circle (272) on Free Info Card

Audio press-feed system
Opamp Labs/Booth L10073

A-48/B: This 1-in (mic/line) balanced/48-out (mic/line) balanced audio press-feed system features a line input impedance of 10kΩ and a mic impedance of 200Ω as well as XLR connectors. Transfer bandwidth is 30kHz to 20kHz (±2db). Mic gain is up to 90dB; line gain is 0dB to 30dB.

323-934-3566; fax 323-462-6490
www.opamplabs.com; bel@opamplabs.com
Circle (267) on Free Info Card

New Products

AES router
ADC Telecommunications/ Booth L10982

Envoy7256: Available in synchronous, asynchronous and time-code configurations. 256×256 AES router in 14RU. Input expansion is in blocks of 16, output blocks are by 16. Optional redundant power supply and control card. Controllable by the ENVY control system and other major control systems. Expandable to 1024×1024 without input distribution amplifiers (sync only). Modules can be hot-swapped.

800-366-3891; fax 612-946-3292; www.adc.com
Circle (265) on Free Info Card

Powered monitor speaker
Yamaha

▶ **MSP5/10**: Features high-performance built-in biamplification. Has a 120W power amplifier for the low/mid driver and a 60W power amplifier for the tweeter. The driver's 8-inch woofer and 1-inch titanium dome tweeter are new designs that feature advanced magnetic structures that achieve exceptionally low distrortion. The tweeter operates in conjunction with a unique waveguide horn that achieves broad, uniform high-frequency dispersion for optimum balance regardless of listening position. Advanced driver and enclosure design also ensures smooth, uniform dispersion across the system's full reproduction range.

714-522-9011; fax 714-522-9522; www.yamaha.com/proaudio
Circle (274) on Free Info Card

Standalone CD duplicator
Discmatic

◀ **Onyx**: This multidrive unit features a proprietary autoloading mechanism. It is a 100-disc machine that supports up to four 8× drives. Offers on-the-fly CD-to-CD copying, batch copying and the option of adding a dedicated CD-ROM reader. Equipped with four 8× drives, it can duplicate 24 full CDs (74min of audio/650MB of data) per hour.

800-422-6707; fax 516-894-9700
www.discmatic.com
Circle (275) on Free Info Card

Carry-on equipment case
Porter Case/Booth M8947

1504 Elite: Designed to roll under an airline seat. Has softer 4-inch ball bearing wheels, padded 43-inch triple extension handle and combination lock. Available in 4 models: Standard Elite, Computer Elite, LCD/AV Elite, and Foam Elite.

800-356-8348; fax 219-289-2747
www.portercase.com;garypond@portercase.com
Circle (273) on Free Info Card

New Products

Large-diaphragm capacitor mic
Audio-Technica/Booth R2970

▼ **AT4047/SV:** Features a transformer-coupled output and uses dual, gold-plated and aged large diaphragms for extended frequency response (20Hz to 18kHz), low self-noise (9dB SPL), a wide dynamic range (140dB, 1kHz), and the ability to handle high SPLs (up

to 149dB, 1kHz at 1 percent THD). Delivers a warm, natural sound without sacrificing high-frequency performance. Includes a switchable 80Hz hi-pass filter and 10dB pad.

330-686-2600; fax 330-686-0719; www.audio-technica.com; pro@atus.com

Circle (269) on Free Info Card

Instant shelter
E-Z UP International/Booth R3395

▲ **Hut:** Known for its large graphics area, the shelter helps stations establish a market presence for on-site locations, remotes and broadcast events with screen-printed station logos, graphics ad slogans. Features a patented, scissors-action truss system with a unique new gabled-top design that increases visibility. Also features a white powder-coated frame that sets up in seconds on any surface without the use of ropes or poles. Available in four sizes (8' × 8', 10' × 10', 10' × 15', and 10' × 20').

800-45-SHADE; fax 909-781-0586
www.ezup.com; info@ezup.com

Circle (251) on Free Info Card

Digital stereo monitor
Genelec Oy/Booth R1393, M7672

▶ **2029B:** An XLR, AES/EBU 24-bit/96kHz version of the 2029A. The monitor supports the same modes of operation, including use in monitoring systems with a Genelec 1091A subwoofer. Ideal for direct connection to online and off-line editing systems. Comprised of one right master speaker and one left slave speaker. Stereo level adjustment is controlled by a single volume knob on the right master speaker. Designed to accept either AES digital audio data through an XLR connector mounted into the right master speaker or conventional analog audio inputs.

+35 87 71 33 11; fax +35 81 78 12 267; www.genelec.com

Circle (276) on Free Info Card

New Products

CD-R duplicator/printer
MediaFORM/Booth M7670

▼ **CD-3706P:** Simultaneously duplicates six CD-Rs and then automatically print your custom image with a thermal transfer printer. The unit has the capacity to duplicate and print up to 200 CD-Rs unattended. Provides simple operation and delivers exact bit-for-bit copies of your data or pro-audio CDs. Detects defective blank media and places them in a separate reject area. The internal thermal transfer printer will automatically print on any surface CD-R, creating custom, professional CDs.

800-220-1215; fax 610-458-9554
www.mediaform.com; info@mediaform.com
Circle (259) on Free Info Card

Turntables
Denon Electronics

▶ **DP-DJ150 and 100**: Two new quartz synthesized direct drive turntables. The DP-DJ 150 is equipped with a S/PDIF coaxial digital output, which enables direct recording to a digital storage medium (MD, CD-R, DAT, hard disk) while preserving the highest sound quality. The DP-DJ100 uses a bidirectional servo control direct drive motor with single-body construction to deliver a startup torque of 12.25 pounds per inch.

973-575-7810; fax 973-396-7459; www.denon.com
Circle (277) on Free Info Card

Audio hard-drive playback system
On Air Digital USA/Booth R694

Linux-based RadioSuite: Features software MPEG Layer 2/3/3 (VBR) decoders for both MPEG and WAVE file capabilities, with off-the-shelf components. Drivers for both consumer and professional cards are available. Also features the ability to work in conjunction with Windows-based WAVE and MPEG editors and CD Rippers.

972-481-8700; fax 972-481-9499
www.onairusa.com; info@onairusa.com
Circle (270) on Free Info Card

GSC3000 software package
Gentner/Booth R1581

Lynx: This Windows-based software package improves the functionality of the GSC3000 by letting the user preschedule tasks such as logging and capturing stored data, printing reports and configuring user-defined jobs. Allows for user viewing of historical information from any networked GSC3000 unit. Available to current users in an easy upgrade path.

800-945-7730; fax 801-977-0087
www.gentner.com; bcastinfo@gentner.com
Circle (256) on Free Info Card

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- **Regional Sales Managers** will have demonstrated success in selling digital audio, live assist and automation systems, particularly in a group environment. Candidates will have demonstrated success in broadcast industry managing sales and or general business of radio station operations or experience selling digital audio products. We are looking for people who have a strong knowledge of computers, proven sales techniques, follow through for clients and possess an impeccable work ethic and customer service attitude.

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	Page Number	Reader Service Number	Advertiser Hotline
Antenna Concepts	64	150	530-621-2015
Antex Electronics	77	160	800-338-4231
Aphex Systems	33	126	818-767-2929
Armstrong Transmitters	87	167	315-673-1269
Arrakis Systems	17	114	970-224-2248
Audemat	14	112	+33557928933
Audioscience	89	170	302-324-5333
Avcom	86	166	804-794-2500
Broadcast Electronics	15	113	217-224-9600
Broadcast Electronics	51	138	217-224-9600
Broadcast Software Intl	22	118	888-BSI-USA1
Brdcst Supply Worldwide	59	146	800-426-8434
Broadcast Technology	88	168	719-336-3902
Broadcast Tools	92	177	360-428-6099
Broadcasters Gen Store	31	123	352-622-7700
Cartworks	46	133	601-853-9976
Circuit Research Labs	29	122	602-438-0888
Circuitwerkes	92	175	352-335-6555
Coaxial Dynamics, Inc.	86	165	800-COAXIAL
Comrex Corp.	7	106	800-237-1776
Comrex Corp.	41	130	800-237-1776
Comrex Corp	94	185	800-237-1776
Crown Broadcast	11	109	219-294-8000
D H Satellite	95	182	608-326-8406
Digigram	62	158	703-875-9100
Electronic Assoc.	88	169	915-595-3103
Energy-Onix	47	134	518-758-1690
ERI-Elec.Research Inc	93	180	812-925-6000
ESE	91	172	310-322-2136
Fairlight USA	43	131	
Gorman Redlich Mfg. Co.	94	184	740-593-3150
Hafler Pro	23	119	480-967-3565
Harris Corp./Enco	3	104	800-622-0022
Henry Engineering	85	163	626-355-3656
Hero Radio	19	116	972-447-9115
Industry Click	34	127	816-300-0323
Industry Click	55	188	816-300-0323
Industry Click	69	155	816-300-0323
Inovonics	68	154	800-733-0552
Intermax	56	143	314-345-1030
J K Audio	50	148	800-JKA-UDIO
JK Audio	95	183	800-JKA-UDIO
Kintronic Labs	18	115	423-878-3141
Klotz Digital	9	107	678-966-9900
Logitek	52	139	800-231-5870
Media Form	48	135	800-220-1215
Mediatouch	32	125	204-786-3994
Moseley Assoc.	53	140	805-968-9621
Mouser Electronics	93	178	817-483-6813
Musicam	25	120	732-739-5600
musicmusicmusic	39	128	416-537-2165
Nagra USA	58	145	615-726-5191
Nautel Electronics	57	144	902-823-2233
Neumann	73	157	860-434-5220
NPR Satellite Serv	13	110	202-414-2620
NSN Network Serv	76	159	303-925-1708
OMB America	71	156	305-477-0974
On Air Digital USA	85	164	972-481-8700
Prophet Systems	10	108	877-774-1010
QSC Audio Products	63	142	714-754-6175
Radio Design Labs	78	161	805-684-5415
Radio Soft	30	124	904-426-2521
Radio Systems	40	129	856-467-8000
RF Specialties	54	141	816-628-5959
SBS	27	121	
Scott Studios Corp.	67	153	800-726-8877
Shively Labs	91	173	207-647-3327
Sierra Automated Sys	49	136	818-840-6749
Silicon Valley Pwr Amp	28	189	408-986-9700
Sine Systems	50	147	615-228-3500
Smarts Broadcast	45	132	800-747-6278
Sonifex/Independent Audio	66	152	207-773-2424
Soundelux Microphones	99	102	323-464-9601
Spacewise	93	179	800-775-3660
Studio Pro 2000	74		
Studio Technology	92	176	800-676-0216
Superior Broadcast Prod	90	171	972-473-2577
Superscope Tech	65	151	630-820-4800
Svetlana Electron	78	162	650-233-0429
Telos Systems	21	117	216-241-7225
TieLine	75	149	765-747-6957
Transcom Corp.	91	174	800-441-8454
USA Digital Radio	35-38		410-872-1530
V-Soft Communications	95	181	319-266-8402
Wheatstone Corporation	2	101	252-638-7000
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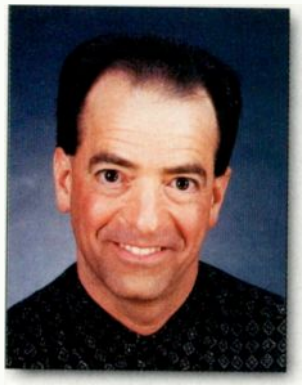
Life in the post-LPFM world

By Skip Pizzi, executive editor

The recent and ongoing proceedings on low-power FM broadcasting (LPFM) have prompted the airing of many divergent views on these pages and elsewhere. In sorting through this multifaceted discussion, I have been trying to get a mental picture of what life would (will?) be like in an LPFM-deployed world. It's not a pretty sight.

First, the ostensible goal of using new LPFM rules to balance the massive consolidation engendered by previous regulatory change is not likely to be achieved. LPFM will not result in a general triumph of the unserved or underserved. While there may be a few valuable new services established in small markets or rural communities, these will likely be the exception, not the rule. Far more likely is the proliferation of many new religious broadcast outlets and even less desirable developments (e.g., the personal aggrandizement of narcissistic individuals, or the airing of racist diatribes). This may all be part of the price paid for the gift of free speech, but it's ultimately unlikely to improve the cultural conversation or value of the FM band.



The key to understanding this comes from the support system. What is the revenue model for these new stations? There are very few available slots in highly populated areas, and all LPFM stations must be run noncommercially. Keeping these new services going over time is unlikely to be a very viable business, so the motivation will have to come either from personal vanity or religious zeal. We can hope there will be at least a few zealots of another sort, such as those who are truly committed to running a unique local broadcast service, but realistically speaking, this is far less likely, particularly over the long term.

Tarred by the same brush

Second, how probable is it that these shoestring operations will be competently operated? Yes, some reputable broadcast equipment outfitters are jumping into the turnkey LPFM business, but even the latest hardware will require some maintenance, and it's a safe bet that most LPFMs will not be using the most recent or reliable equipment. The result could be a flock of new, technically inferior services — hardly likely to be appreciated by an increasingly quality-savvy public. At worst, improperly run LPFMs could cause localized interference to other established services (a frequently cited anti-LPFM argument), but I'm more concerned about LPFM's aggregate potential to downgrade general audience perceptions of FM service, at a time when other new, higher-quality competitive services are emerging.

Keeping these new services going over time is unlikely to be a very viable business, so the motivation will have to come either from personal vanity or religious zeal.

Third, if there is still a chance that IBOC-FM DAB can work, LPFM doesn't make it any easier. As some have suggested, a better technical plan would have been to settle IBOC first, then work on LPFM. Politically, of course, the opposite priorities were more advantageous — and ultimately, LPFM is about politics. (Some analysts feel that FCC Chairman Kennard is making LPFM a signature political achievement as part of his maneuvering for a future judgeship appointment.)

Wrong place, wrong time

Finally, in an age of burgeoning Internet connectivity, including emerging mobile and broadband services, it makes far more sense for narrowcast interests to deliver their content online rather than on-air via such limited means as LPFM. By the time LPFMs become common, Internet audio delivery will have grown to a point at which its cumulative audience will likely never be matched by even the rosiest of cumulative LPFM listenership projections. Coverage and cost-per-listener will be far more advantageous to would-be broadcasters in the online environment, offering a much lower barrier to entry, better access to targeted audiences, and freedom from regulation when compared with any LPFM circumstance.

So, while many of us agree that LPFM isn't a beneficial development, its most damaging elements may turn out to be something other than the problems that are most commonly cited today. Meanwhile, while others may think LPFM seems like a good idea now, they might not continue to feel that way after seeing what happens a few years after its deployment. Be careful what you wish for.

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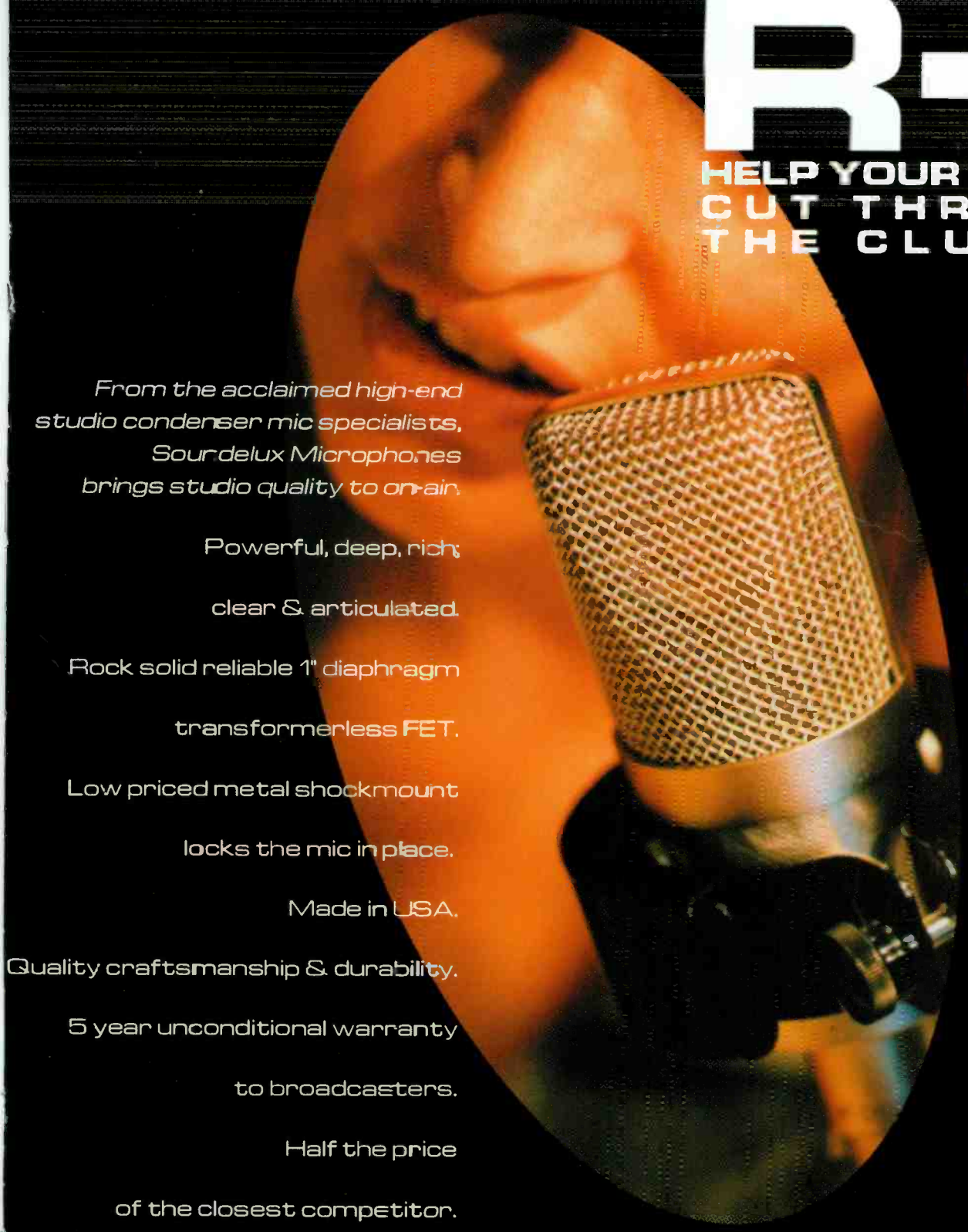

Heidi May,
95.7 KJR-FM
Seattle

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