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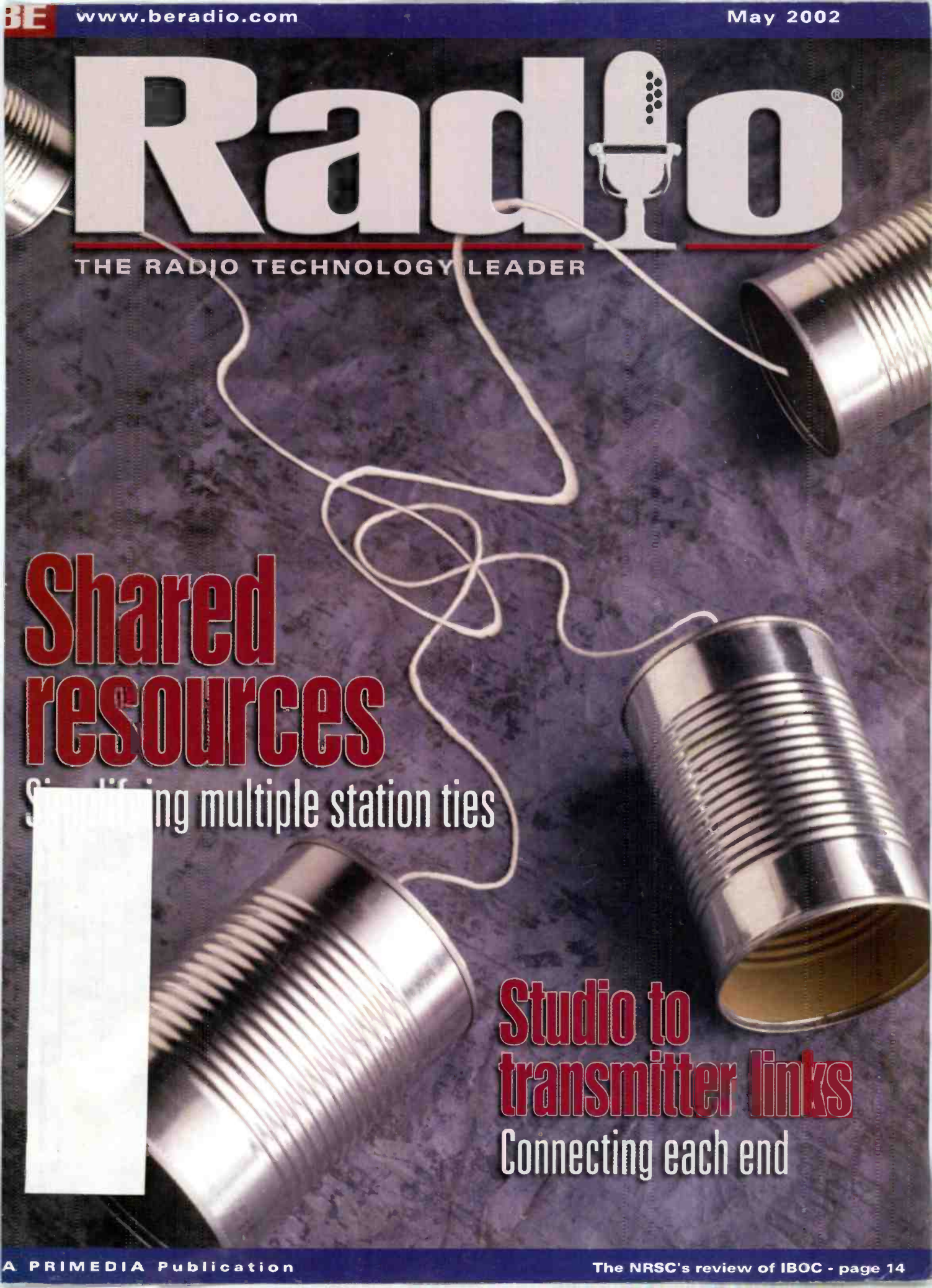

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The NRSC's review of IBOC - page 14

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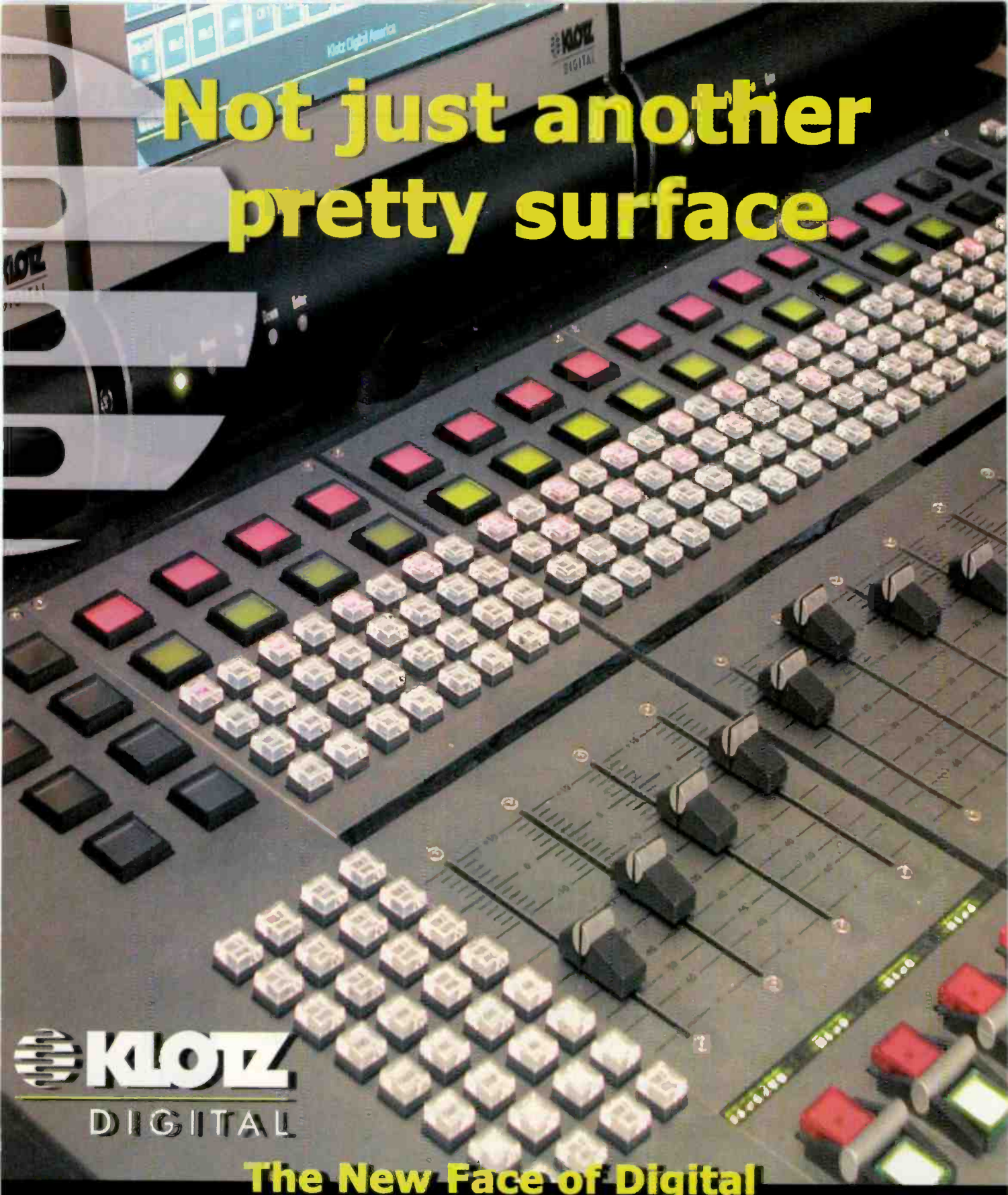
Departments

ON THE COVER:
Communication and planning are the keys to successfully integrating personnel and equipment in a station consolidation effort.
Cover design by Michael J. Knust.



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Currents Online

Digigram Establishes Latin American Subsidiary

Creation of a new subsidiary in Cuernavaca, Mexico allows Digigram to continue serving this region and increase its customer service role.

Dielectric Introduces New Warranty

Orders for new products will carry a five-year warranty, and complete systems will be covered by a 10-year warranty.

Arbitron Releases Initial Round of PPM Ratings

The Portable People Meter reports higher average quarter-hour audiences on a 24-hour day.

StratosAudio Works with Scott and Computer Concepts

AM and FM listener interactivity is possible for mobile phone users.

Sirius Inducted Into Hall of Fame

Space Foundation's Space Technology Hall of Fame honors Sirius.

SAS Sales Team Adds McConnell and Armstrong

Brian McConnell handles the western region, and Jim Armstrong takes on the eastern region.

Engineer Relief Fund Gains New Contributor

The Ennes Trust and SBE have approved the fund to receive the proceeds from the sale of a new book titled *Covering Catastrophe*.

RCS On Tour All Summer

The Selector XV Victory Tour 2002 provides an interactive forum for RCS users and RCS program designers.

Site Features

The NRSC AM IBOC Report

See what the NRSC reviewed and how it reached its decision concerning AM IBOC and its daytime-only use.

Trends in Technology: STLs

See the complete listing of STL equipment manufacturers in the Marketplace section online.

Reader Feedback

Readers share their thoughts on BE Radio's new look and perceptual audio encoders, and provide answers to the equipment in the Sign Off feature from April.

Engineer's Notebook

New information added: Descriptions and wiring diagrams for the Western Electric 111C and 119C repeat coils.

Advertiser Links

Web links to the advertisers in the May issue.

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Sorry I missed you

The NAB convention has come and gone. What was different about this year's show was typified by how many people I did *not* see. While I prepared for the convention, calling the group of reporters to cover the show, I was surprised at how many people said they would not be attending. This is the largest broadcasting convention (and a few non-broadcast-things convention), and it has shown the smallest attendance figures in several years.

As it is, registered attendance at the Spring extravaganza has been dropping, but this year's figure—which was never announced at the show—has been estimated at 95,000; a 16 percent drop from last year's 113,000. The NAB cites the events of Sept. 11 as being the main reason for the decline, and it was announced that the organization anticipated a reduced turnout. In the end, the NAB has stated that it is pleased with the figures. This is understandable. Why would the NAB admit that the convention is showing signs of decay?

Imagine if your station lost 16 percent of its listeners. Despite the economy or terrorist events, I think some serious fact-finding would follow.

In previous years, the registered convention attendance figures have been announced on Wednesday or Thursday during the show. Not so this year. As it is, I never saw a formal announcement of the attendance during the show. When I asked about attendance figures in the NAB pressroom, I was told that the NAB had not finished counting. I don't believe the number that is being reported anyway.

I have never liked the NAB's counting method of reporting *registered* attendance. This year I held three badges—as an exhibitor, member of the press and a full conference registrant. I may have also had a speaker registration for the session I moderated, but I never picked it up. I was counted three times this year. In previous years I have been counted as many as six times. Once you take out the duplicate badges and exhibitor badges, the actual number probably drops to 80,000.

In a down economy, budgets are cut and expenses trimmed. I hope that this was the case for the convention this year. The events of Sept. 11 have contributed to this, but they are not the sole cause. Stations that do not send key personnel to conventions deprive themselves of a way to develop their employees and deprive their employees of valuable opportunities to learn and interact with others. There is some play time in the evening, but it's all business during the day. I don't agree with everything the NAB does, but the experiences provided by the NAB convention are valuable.

What was the overall feeling about the convention? The general comment I heard from exhibitors is that there was a quality and not quantity attendance. Those present were not kicking tires; they were evaluating products and services for purchase.

The sessions provided good and timely information and covered a wide range of topics. The session I moderated, called *Why Buying Now Will Save You Later*, touched on issues of security and IBOC; two points indicative of what is currently happening in our industry.

The hot topic on the show floor was IBOC. Ibiquity made quite a splash with its announcements, coupled with the NRSC's decision on AM IBOC. While some of the headlines were misleading, stating that IBOC has been launched even without a final say from the FCC, the conversations were lively from supporters and opponents.

The AM IBOC demonstrations were less than stellar because they were showing a new installation with PAC encoding instead of ACC, which is what we have all heard so many times in the past. The new demos were not quite ready, but the show went on. If a technology is being officially launched, it should be complete, not half-baked.

Broadcast Electronics, Harris and Nautel showed IBOC exciters; Continental showed a variation with a Digital Radio Mondiale demo. In the end, IBOC was the star of the show.

The complete BE Radio wrap-up of NAB2002 is being assembled and will appear next month, including the results of the Pick Hit awards. Until then, I'll be resting my feet, sore from walking the show floor and resting my shoulders, sore from carrying the reams of new product information.

Chriss Scherer, editor
cscherer@primediabusiness.com

Send comments to: **E-mail:** *beradio@primediabusiness.com*
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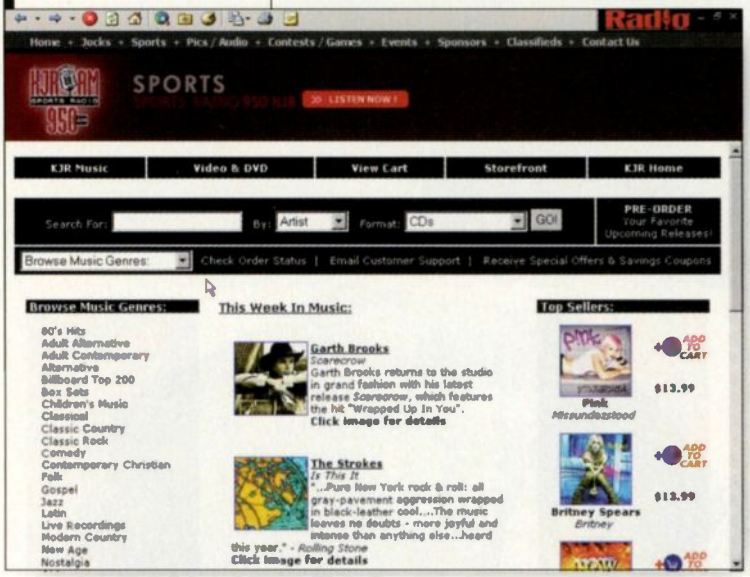
Revenue from the Web

By Stephanie P. Snyder

While creating a station website is a simple proposition, making a successful website, one that extends the station's goals and makes money, is a bit more challenging. Before considering the revenue solution that is right for a station, know the purpose of the website. Keith Swartz, senior consultant with Streaming Authority, warns, "if the goal is to increase listenership, and availability of programming and advertising, then [the Web] might be one marketing avenue to explore ... to make 'bunches of money' and buy a pro sports team, this might not be the easiest way to approach the goal." What would financial success look like for a particular station's website? A starting goal could be to create a self-funding website.



The website for KJR, Seattle offers online CD sales.

Developing a website that enhances the station's over-the-air presence and makes a small profit requires good planning, well-considered design and compelling content. Is the website an extension of the station's sales and marketing strategy, or is it part of the programming side of the business? Either strategy can be used successfully to drive revenue, but without a plan, the proposition will falter.

Website traffic is essential to generate revenue. Listeners need to be visiting and spending time on the site. It is not enough to simply throw up a Web page with the station's logo. Research the online market to deliver the content that the station's target audience demands. A site that engages the listener and keeps his attention can form a deep bond between the listener and the station. This will help drive recurring traffic, as the listeners will return on a regular basis.

Visit a website as if you knew nothing about the station or the town. Is the site attractive, well-designed and easy to navigate? Most users cite information and entertainment as the reasons for visiting websites. For example, the user might visit a radio Web page for weather, news, concert calendars and events around town. Does the station's Web presence deliver in these types of categories? Fresh and compelling content is crucial. The music reviews posted six months ago will get old and tired. Listeners will quickly abandon a website if they feel the content is inaccurate or stale.

Sales and marketing revenue

Once a site has traffic, the most common way to make money on the Web is through online advertising. These are graphical banners and click-through advertisements. Online ads can be value-add positions to existing over-the-air advertisers, or they can be sold to new advertisers that may have been unreachable before. Internet ads are generally less expensive than over-the-air spots, but a station can run more of them, more often, as advertisers are not limited by 30-second or 60-second time breaks. They can also be highly targeted.

Information gathering is a common way listeners use the Internet, so another way to integrate the station's over-the-air and online presence is to have a page on the website allowing listeners to find out more about companies that sponsor station programs. Sometimes a listener may hear an ad while in the car and have no way to write down the telephone number or address of the advertiser. Let the listener go to the website to look up the information when it's convenient. Some advertisers may offer a special discount or coupon that listeners can print out. For a small fee, this service can have great value to existing station ad clients.

If offering a streaming version of the station's signal on the Web, in-stream advertising can double the amount of airtime available for sale. Some streaming hardware and service providers will allow users to lay special Internet-only spots into a webcast. Imagine the potential for the sales manager who can now sell each spot twice.

Less obvious ways to drive revenue are selling station merchandise, such as hats and t-shirts, or sponsorship of interactive features.

A further way to use a website to drive sales revenue is to sell the station's database. The Web makes it possible to gather huge amounts of demographic data about listeners. This can be done by running online polls and questionnaires. Alter-

natively, by asking people to sign up for the website and become free members, the site can ask them a series of questions about their home and spending habits. Corporations can spend millions of dollars gathering this type of information through telephone and in-person surveys. For minimal cost, the station can gather and then use or sell this demographic data for clients and advertisers. Consult legal counsel to develop a privacy policy for the listener database.

The KDBN, Dallas, site offers station merchandise from the Bone Gear T-shirt shop.

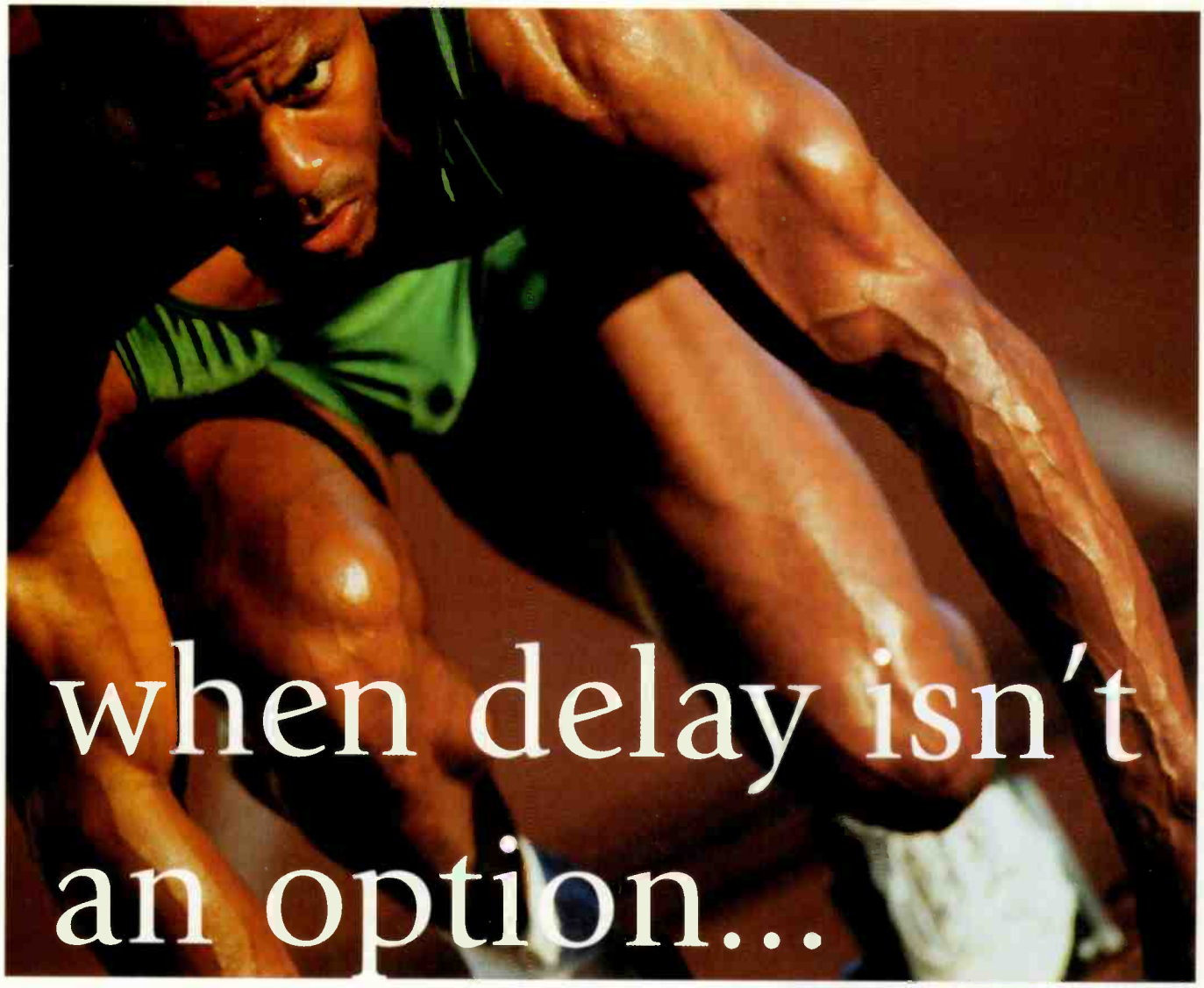
Programming-focused revenue

Adding to the content and value of the website while driving revenue for the station creates a winning proposition for everyone. Programming-based revenue models can do both. Arbitron reports that 40 percent of Americans have bought things online, and one in five people make it a habit. A music station can partner with companies to provide online sales of CDs, cassettes or concert tickets. News and talk stations regularly interview authors; consider a partnership with a bookseller. In such a partnership, the station does not actually sell the items, but rather provides a storefront with links for users to click through to buy from the partner company. In return, the partner pays the station a small fee for every referral, or in some cases every sale.

Another way to drive programming-based revenue is subscription services. For a small monthly or annual fee, there may be website extras such as members-only chat rooms or access to special events. Consider having users subscribe to listen to a collection of MP3 files or the streaming radio signal. Nine million online radio listeners would be willing to pay a fee for online music services, according to Arbitron and Edison Media.

A Web presence can be self-sustaining and profitable. Don't be limited by only thinking of the website as a place to put print ads for over-the-air advertisers; integrate existing station strategies into the online plan.

Snyder is an independent streaming media consultant based in Australia.



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Thoughts about IBOC

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

Many engineers anxiously awaited the release of the National Radio Systems Committee's AM IBOC Report, in hopes that the report would reveal good news about AM IBOC.

The engineering world has been working on the development and evaluation of IBOC transmission for some time. The NRSC began evaluation proceedings of general DAB systems in 1995. After the proponents merged into one, Ibiquity was left in the running for potential adoption. In the fall of 2001, the NRSC issued a report on Ibiquity's FM IBOC. This comprehensive report, runs 62 pages of engineering material plus 13 appendices. All of which covers the features and important areas of the FM application of the system with its blend-to-analog from digital-to-analog operation as signal levels change.

AM IBOC carried the most promise of service improvement, but the initial studies show that it may only be suitable for daytime service.

The application of FM IBOC has been studied by the NRSC and appears to be understood and accepted by radio engineers. AM IBOC has recently been studied by an NRSC working group as a prelude to its adoption for general broadcast use. Its was presented during the NAB convention in April.

Now, after the presentation of the AM IBOC report, the FCC must decide whether to propose a set of standards for the AM and FM IBOC services based on these reports or to require more testing. The NRSC report does not adopt the system as a standard by the FCC; it presents an overview of an investigation of both systems. The decision to prescribe a set of standards for IBOC must come from the FCC. It is hoped that the FCC will not cause IBOC to go the way of AM stereo.

Boom or bust?

IBOC could be a valuable addition to a broadcaster's armor, or it might end up as merely another avenue of expense that will have to be entered into without a waiting audience of suitably equipped receivers. The situation is similar to that faced by TV stations compelled to install expensive digital equipment without a digitally-equipped receiving audience, which has not yet embraced digital TV with open arms. On the other hand, if the NRSC report confirms what many engineers are hoping and expecting, new transmitting broadcast facilities could produce additional quality air time for AM and FM licensees to sell from the same site and revitalize our familiar and somewhat overloaded radio bands.

The FM Report covers eight areas of vital performance concern to the broadcaster and listener alike. If all of these concerns can be met as successfully by AM IBOC, and the receiver manufacturers rally to develop and produce the necessary receiving equipment, I feel that we can anticipate a brighter outlook for many AM stations.

The evaluated FM concerns were audio quality, service area, acquisition performance, durability, auxiliary data capacity, behavior as signal degrades, stereo separation and flexibility.

One of the features of the Ibiquity IBOC system as tested was noted as a seamless glide to FM from analog after tuning in an IBOC signal. The delay is about 4.5 seconds. This transmission delay may cause problems in off-air monitoring, and this will have to be tackled by individual stations as necessary. Stations are becoming accustomed to a system delay from the use of codecs, DSP-based audio processors and digital STLs.

The FM IBOC tests used a software radio whose performance is presumably not the same as a commercial auto radio receiver. For this reason, the NRSC tests did not comment on the audio performance obtained in the tests on a received signal that had blended to analog. It seems likely that the AM IBOC tests might also have to use a software radio unless some receiver manufacturer has developed a prototype auto receiver designed for AM IBOC.

The FM report paid strong attention to the use of SCA services on FM IBOC. About half of all the operating FM stations employ one or more SCAs for reading for the blind or similar services. In addition, RBDS and DARC systems use SCAs for data transmission. Appendix J of the NRSC Report provided detailed test results.

Regular broadcast station WPOC and experimental WD2XAB were used for the SCA tests, and the NRSC highlighted something that has probably been known by users of SCA receivers, but not previously been broadly discussed. The laboratory tests showed that there are significant differences in the performance of various makes of SCA receivers. These differences persisted despite the presence or absence of IBOC signals.

In the field tests, similar results were observed with and without IBOC. Some receivers took IBOC in stride and performed normally, while others completely failed.

Proper antenna orientation for analog SCA signals must be practiced by SCA-receiver users to obtain a good signal. This is to be expected in view of the complexity of SCA operation, which is dependent on the operating characteristics of the transmitter, adjacent channel signals and field strength.

Even if an IBOC standard is adopted, it will be some time before a significant receiver base exists.

AM IBOC

The NRSC report on AM IBOC recommends to the FCC that AM IBOC be approved for daytime use. The daytime service is comparable to FM, but at night, due to first- and second-adjacent channel interference problems, AM IBOC is not recommended. The proponent, Ibiquity, does not anticipate that sky-wave reception will be possible, and more AM IBOC tests will be needed to determine if it will eventually be usable at night as a local ground-wave service. In the 15kHz bandwidth are three 5kHz subcarriers, which are susceptible to first- and second-adjacent channel interference.

AM IBOC relies on ground wave propagation and works successfully to around the 2mV/m contour. It has been successfully received with field strengths as low as 0.6mV/m.

The daytime signal suffers from noise problems, interference and infringing AM signals. Stereo AM IBOC degrades gently as signal strength declines, from good FM stereo to FM mono and eventually to AM blend.

It appears that AM IBOC will produce quality audio within the 2mV/m contours in the daytime, but it is not recommended for night use. This seems a dubious advantage over regular AM broadcast transmission. Many stations suffer impaired night signals, and much hope was placed on the possibility of a superior night signal. Many stations will think twice about spending money to improve an already good day signal without improving the night signal. This AM IBOC report is based on conversations prior to the report's submission to the full committee and on information from the final recommendation. Pending further test data, we can only hope for better news for improved night operation.

E-mail Battison at batcom@bright.net.

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f Radio Colorado Network has some pretty to say about BSI's digital automation...

August 21, 2001

...me to write a letter to a manufacturer ... In the case of BSI, this note is long ...ary of this year, I installed BSI's digital ...to operate AM 1060 KLMO Denver/Longmont. The ...g using Windows 2000, "well it's rock solid". The multi-...ing is the best. We have numerous delayed programs, as well as live joins to 14 different satellite receivers every day.

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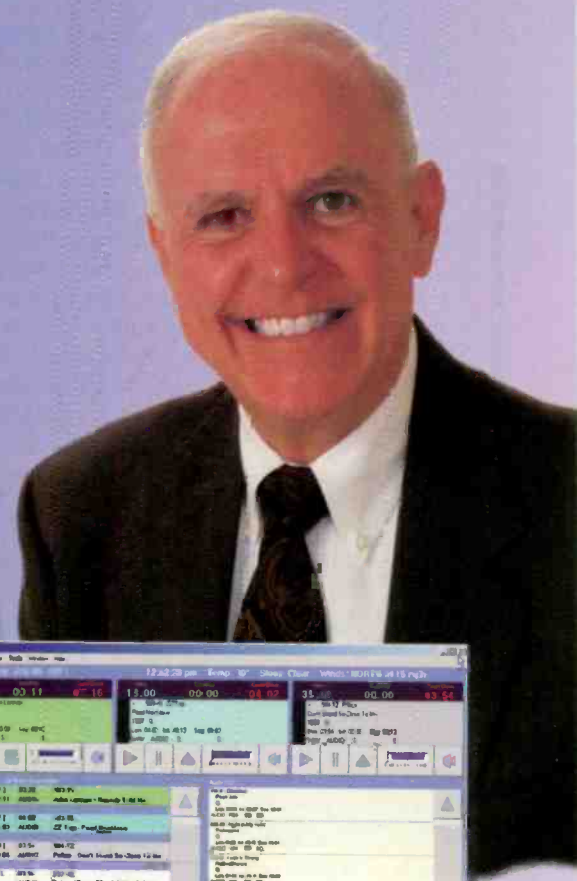

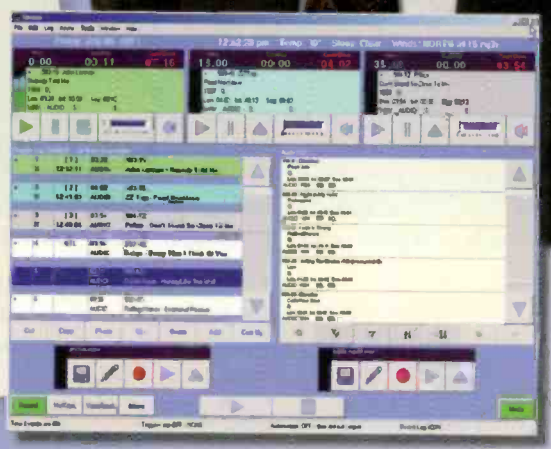

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Remote access: data cabling

By Kevin McNamara, CNE

Here are some interesting statistics based on a research report issued by the Cahners In-Stat group in 2001:

- More than half of the workforce in the U.S. performs their jobs remotely, either occasionally or on a full-time basis.
- By 2005, the number of remote workers will increase to 60 percent.
- There are about 3 million remote offices currently. That number is expected to grow to 5 million by 2005.
- ISPs currently deliver services to more than 21 million telecommuters. By 2005, 35 million remote workers will require Internet access to connect with employers.
- U.S. businesses currently spend about $160 billion on communications services, which is expected to rise to nearly $260 billion by 2006.

While most of the aforementioned Internet access is expected to continue through the use of dial-in connections, the availability of broadband high-speed services, such as DSL and cable, is growing at a rapid rate and currently serves about 20 percent of the total Internet subscribers in the U.S.

Wiring these remote offices can be a simple task using off-the-shelf products; however, when a business permits workers to perform duties at a remote location, particularly their homes, it assumes a certain level of liability for the physical facility that houses the equipment, workers and others using the equipment at the remote location.

Providing technical support to remc difficult than simply going down the hal a problem, sometimes requiring additio telephone and possibly visits to the locatic

Cabling options

In most cases, cabling a PC to a local LAN or network gateway will be done using standard cabling. I have dealt with many of the electrica mance issues related to Ethernet cabling in this c however, like all things electronic, performance inc and new emerging technologies begin to appear, so take a quick look at the current state of transport meth

Fundamentally, there are three transmission mediu that can be used for data transmission: electrical, optic and air. Each of these methods requires a specific component, which carries the signal from point A to point B.

	NEC	UL Rated	General Purpose		Riser		Plenum	
Application	Article	Voltage	NEC Type	Temp°C	NEC Type	Temp°C	NEC Type	Temp°C
Communications	800	300	CM & MP	60	CMR & MPR	60	CMP & MPP	60
Power Limited	725	150*	CL2	75	CL2R	75	CL2P	125
Fire Protective	760	300	FPL	75	FPLR	75	FPLP	125
Optical Fiber	770	None	OFN	None	OFNR	None	OFNP	None

*150V is the upper limit for Class 2 power limited circuit cable applications. Type CL2 cables do not have UL listed voltage ratings.
Note: Temperature ratings may differ on specific items as indicated on the pages where such items appear.
National Electrical Code (NEC) is a registered trademark of the National Fire Protection Association, Inc.

Table 1. Typical ratings and designations for low voltage cabling. Data courtesy of Berk-Tek.

Electrical

An electrical connection is the most familiar and popular transmission method. In the case of network cabling, we are usually referring to standard unshielded twisted pair (UTP) cable. Shielded twisted pair (STP) cable is similar to UTP, with the exception that the conductors are also surrounded by a braided shield. STP cable is used in areas where external sources of interference, such as high RF or electrical fields, might couple to the inner pairs and degrade performance.

Current versions of the Ethernet protocol over UTP supports data throughput of about 1Gb/s, and that is expected to increase to 10Gb/s in the next two years.

Optical

In the context of data communications, optical transmission medium generally refers to fiber optic cabling, where data is transmitted through thin strands of plastic or glass fiber material called the core, which is surrounded by a highly reflective material called the cladding. This assembly is covered with a protective outer jacket. The signals sent through fiber cabling originate from a laser light source, which operates at a specific wavelength.

An interesting fact is that fiber optic cabling has been around about twice as long as the standard UTP typically associated with the interconnection of devices on a LAN.

Air

Data transport through the air is possible using one of the many RF wireless options available for a variety of PC-to-LAN and LAN-to-LAN interconnections. The adoption of the 802.11x wireless Ethernet standard, along with the availability of spectrum specifically allocated for unlicensed RF applications, has created one of the fastest growing segments of the PC LAN market. The price point for consumer- and commercial-grade wireless devices is dropping to a point near that of similar wired equipment. Wireless LANs still lack the data throughput capabilities of their wired counterpart, typically limited to about 2Mb/s; however, emerging standards, improvements in technology and the allocation of new spectrum will ultimately make this the transport method of choice for most LAN designs. At least one manufacturer produces a line of point-to-point microwave radios that permits Ethernet throughput in excess of 100Mb/s.

A relatively new technology that uses high-powered, laser-based wireless radios is beginning widespread acceptance. These systems provide bandwidth nearly to that of fiber optic cabling and are limited only by the requirement that the radios have clear line-of-sight to each other.

Some cable-rating issues

In the U.S., the current National Electric Code (NEC) suggests that the installation of any permanent cable within commercial and residential buildings, including those that carry low voltage, have markings indicating the fire rating of the cable jacket. The NEC provides guidance in the installation of electrical systems based on its own testing, and it is generally the reference used by most electrical code officials.

There are various materials used in the manufacture of metallic and fiber-based cabling. In the case of a building fire, most of those materials were capable of supporting and carrying flames across several rooms or, in many cases, vertically through other floors.

The jackets of cables are manufactured with different materials based on the type of location (wall, inside conduit), orientation of run (vertical or horizontal) and where it will be installed. Table 1 describes some typical ratings and designations for low-voltage cabling.

Even flame-retardant cabling is capable of supporting a flame under the right conditions. To prevent those flames from moving into other rooms or floors, it is important, and required by code, to apply proper fire-stopping materials to walls and floors that have been penetrated by cables.

McNamara, BE Radio's consultant on computer technology, is president of Applied Wireless Inc., New Market, MD.

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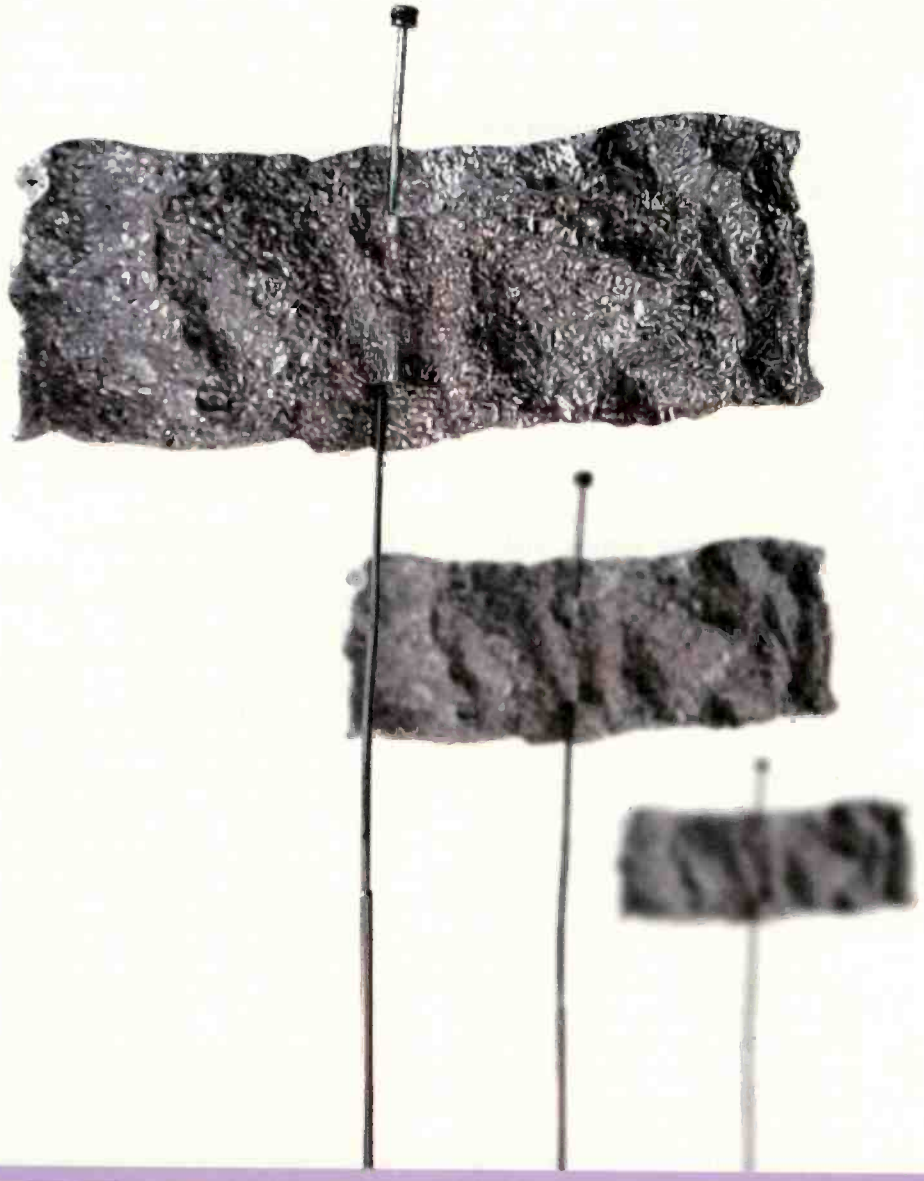

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EAS rules updated

By Harry Martin

The FCC has made several changes to its rules governing the nation's Emergency Alert System (EAS). Broadcast stations and cable systems are required to participate in EAS on a national basis. They must install EAS equipment that receives and transmits national alerts, and they must broadcast national alerts over their stations. They must also participate in tests of the EAS system. Stations and cable systems have the option of participating in EAS on a state or local basis, which involves broadcasting state or local alerts.

The FCC made the following changes to EAS at the request of the National Oceanic and Atmospheric Administration, the National Weather Service and the Society of Broadcast Engineers:

- New state and local event codes were added to further specify the nature of an alert. These include child abduction emergency, nuclear power plant warning, avalanche warning, earthquake warning, fire warning, hazardous materials warning, 911 telephone outage and volcano warning codes.
- From now on, new codes will adhere to a naming system in which the third letter of the code is one of four letters. This will allow consumer electronic products to check the third letter and generate a generic message corresponding to the level of the alert (i.e., warning, watch or emergency).
- New location codes have been added to cover adjacent offshore areas. Location codes specify the area of alert.
- EAS equipment manufacturers may now include a feature allowing stations to program their decoders to selectively display and log only those state and local messages that contain certain codes. This is more consistent with the voluntary nature of state and local EAS. All national EAS messages must continue to be displayed and logged.
- Existing EAS equipment need not be updated to receive and transmit new state and local event and location codes, or selectively display and log only certain state and local codes. However, all equipment manufactured after Aug. 1, 2003, must have these capabilities. In addition, stations that replace their EAS equipment after Feb. 1, 2004, must install equipment with these capabilities.
- Stations will now have 60 minutes after receipt to retransmit the required monthly test.
- In a national emergency, stations will be permitted to broadcast the President's voice message using a higher quality audio source than the EAS decoder audio. Stations may not delay the broadcast to substitute alternative audio.
- Satellite and repeater stations that rebroadcast 100 percent of the programming of their lead station will no longer be required to install EAS equipment. Lead stations are encouraged to monitor the EAS sources of their satellite stations where these are different from their own EAS sources.
- Low-power FM stations, which are currently required to install only a decoder, will be temporarily exempted from installing EAS equipment until decoder-only units become available for purchase.

EAS rule violations are a regular source of fines issued to broadcasters. Failure to have the proper equipment or to log required tests are the most common violations.

Enforcement actions

"If you're easily offended, please turn off your radio." This line during a Chicago morning show did not stop the assessment of a $21,000 fine against an FM broadcaster. Despite the warning, the FCC found that extensive discussions of sexual organs and activity merited fines. The station was fined for three morning shows in which on-air personalities discussed aphrodisiacs and graphically described sexual activities.

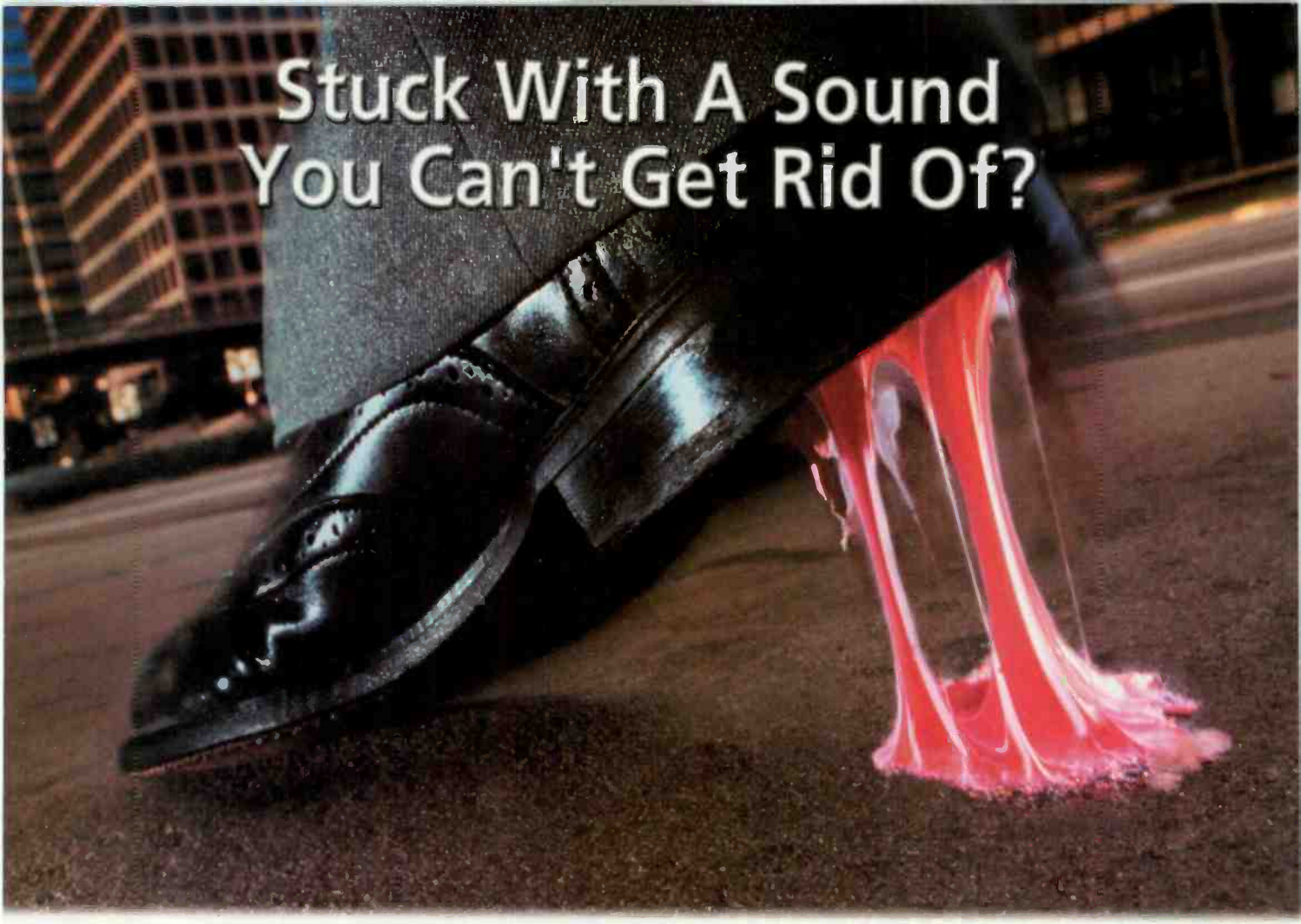
"We're not home, leave a message." Broadcasting an answering machine message, without the prior consent of the machine's owner, resulted in a $6,000 fine. The FCC's rules prohibit the broadcast of telephone conversations without the other party's prior consent. The FCC decided that the station that broadcast the answering machine message should have given the other party prior notice of intent to broadcast.

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

Dateline:

No biennial ownership reports are due in 2002. However, broadcasters who purchase a new station, or obtain an initial construction permit or license for a new facility, must still file a Form 323. These forms now may be filed electronically.

On July 10 all commercial and noncommercial stations must place in their public files their quarterly issues/programs lists for the period April 1 – June 30. Such lists must contain a brief narrative describing the issues covered and the programs that provided the coverage, with information concerning the time, date, duration and title of each program.



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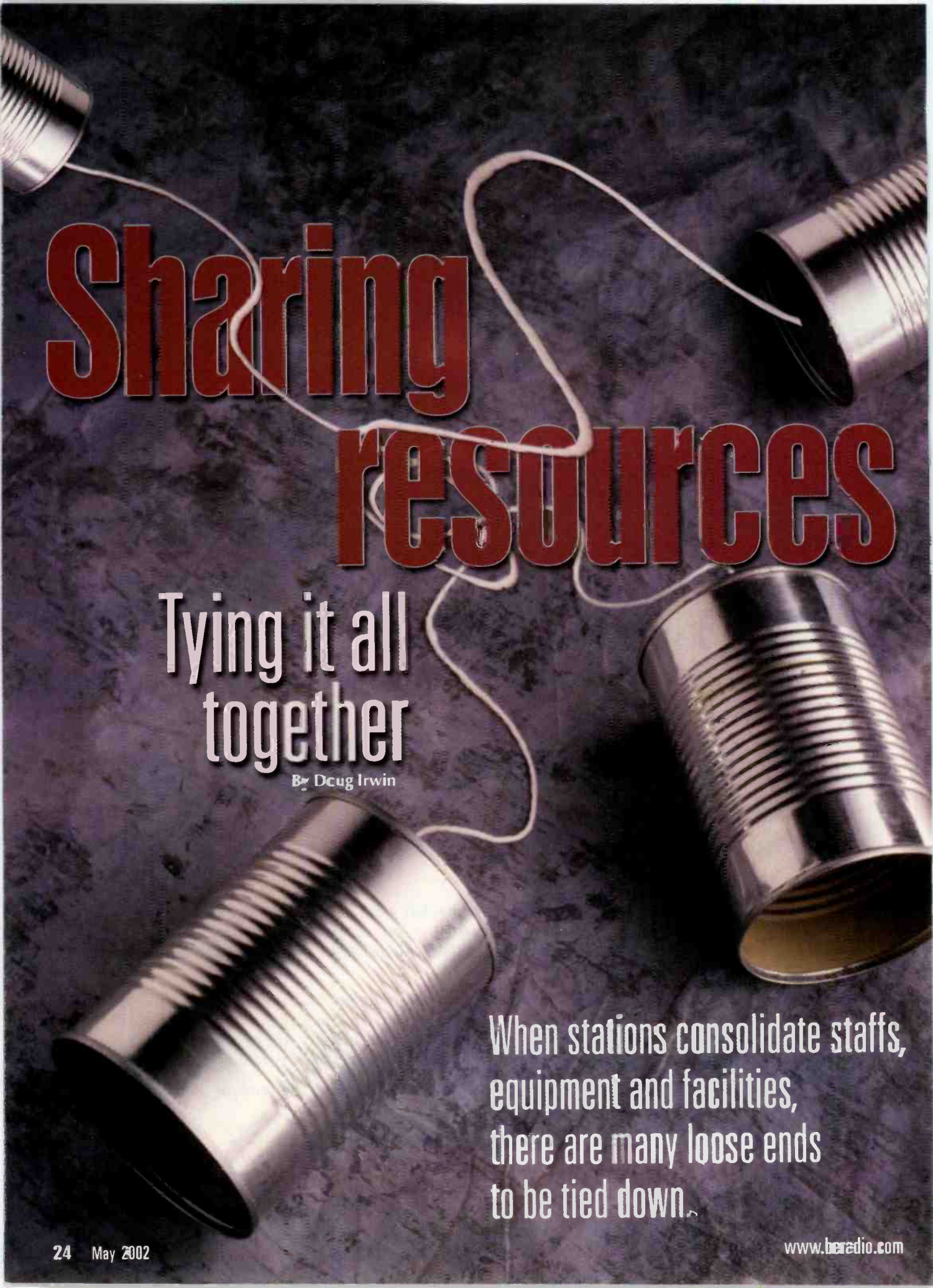


Sharing resources

Tying it all together

By Doug Irwin

When stations consolidate staffs, equipment and facilities, there are many loose ends to be tied down.

A broadcast engineer working in radio in the 21st century inevitably has a colleague that has been affected by an engineering department consolidation, has himself been affected by such or will be affected in the future. While the prospect may seem disturbing at first, it is important to consider the positive benefits of such an occurrence. There are many. Some benefit the company doing the consolidation (of course) and some benefit individuals.

Personnel issues

One of the results of a station's consolidation is the creation of redundancies within the staffs. The duplication in positions will be evident from upper management, to sales management, to programming management, engineering, traffic and even the receptionist. My experience is that the engineering department is never singled out. In fact, within the ever-changing technological framework of broadcasting, it isn't too difficult to keep many of the engineering staff positions by redefining responsibilities.

Start by determining each individual's strengths. In the old days, (before consolidation) a typical station engineer performed many duties. He maintained the transmitters and kept other parts of the RF system working. Studios quite often needed many hours of attention in keeping cart machines and reel machines operating correctly, and in many cases there were remotes to do. By the time paperwork is added in, the week is rounded out.

In the last ten years, cart machines and reel machines have, to a large degree, faded from view. Transmitters have become more reliable, and most importantly, computers have filled radio stations. While paperwork, unfortunately, never seems to go away, the focus of a typical engineer has changed.

Usually an engineer has a primary strength—something at which he excels. That person also has a good secondary strength, followed by many tertiary abilities. The engineer assigned the task of consolidating two or more engineering departments should consider each potential staff member and determine his strengths. It's likely that at least one potential staff member is sharp at transmission and knows the transmitters inside and out. Another may have less experience at transmission and a lot more interest and ability when it comes to IT/IS. Another may have a passion for studios and a great ability therein. The key to handling personnel is to assign the staff engineers to the duty at which they are best and like the most. That is not to say that there won't be duties that an engineer has to do that he isn't too fond of, but, to keep everyone happy, spread these tasks among the entire staff.

Whoever directs the department will have to make use of the individual staff member's secondary and tertiary skills as well. While it is important to let staff members excel at their specialties, it is undesirable to pigeonhole them in one discipline. In the ideal department, every member is as competent

Sharing resources

as any other at anything. In reality, there should be cross-training between staff members so that each person is well-rounded. This is better not only for the entire station, but for each person as well. Each engineer becomes more valuable as he picks up additional skills.

One of the most obvious benefits to a staff consolidation is that there can be bench strength where there was possibly none before. An engineer who rarely took time off because he had no backup will probably enjoy a new level of freedom as a byproduct of the consolidation. From the standpoint of safety, with more individuals available to work on problems across a number of stations, there should no longer be an instance where one person works on transmitter problems. Not only is it safer, but two heads are always better than one.

When consolidating multiple radio stations, plan an adequately sized engineering shop. In this facility, the chief engineer's office is next door.

Sharing of systems

Whether the stations in the consolidated group move in together or not, there are systems that can be shared among the group. The advantages are greater capability, flexibility and maybe some cost savings. Those aspects will be important to the head of the department.

One example is remote broadcasts. Invariably, one of the stations will be better equipped than the others. One station may have the best receive site at a mountaintop, with a full-time backhaul to the studio. Perhaps there are multiple mountaintops, and one can be eliminated, thus saving site rental. Perhaps with

different sites, more of the stations can reach different areas, thus giving the sales staff something (and somewhere) else to sell. Typically, the number of hours an RPU system gets used is quite small, and there is ample opportunity to share the resource among the stations. Perhaps one station has a van outfitted as a remote vehicle. Remove any station identifiers, and share the vehicle between all the stations. Promotions personnel will balk at this until they start working for multiple stations. Perhaps one of the stations has a great mobile PA system with wireless mics and a high-power sound system. Store it in an area that is accessible by all stations' staffs, so that it can be used at each of the stations.

Establish communications links between facilities. There are two stations in San Francisco that are located on opposite sides of the financial district. Call them station A and station B. Because of the geography of San Francisco, neither station can see its transmitter site from its location. However, station B's transmitter site can be seen from station A; and likewise station A's transmitter site can be seen from station B. The introduction of a duplex communications link, and the appropriate equipment at both ends, solved the problem and eliminated third-party site rentals. The system was built to allow backup STLs to be installed, as well as other audio functions, including bi-directional sharing of RPU, satellite and remote ISDN codec audio, and even a LAN extension. Station A and station B were then also able to share a high-speed Internet connection because it became economically viable.

If there are remote sites on a mountaintop, or other sites that are far from the studio location, at least one of the stations has a vehicle that can be used by the engineering staff. It might be that one of the long-suffering engineers who has been ruining his vehicle by driving it up a torturous mountain road can now benefit by using a shared vehicle.

Being able to take advantage of the economies of scale is one of the primary benefits of station consolidation.

Sharing of equipment and parts

One of the most interesting aspects of station consolidation is learning how much surplus equipment each station owns.

No doubt one of the consolidated stations has the appropriate type and amount of test equipment, while at least one of the others is short or has none at all. One of the stations I work for had a spectrum analyzer. Now all the stations have access to it. There were two distortion analyzers, which are now shared. There was a network analyzer, which is now available to all. Not only do the stations share equipment, but they also share the staff that knows how to use it.

After a consolidation of facilities, there will be spare equipment. Whereas before, if a CD player or DAT machine failed, there might be a big hole in the rack until it got fixed, now another can probably be dropped in; there is a ready spare. Among our stations we have spare exciters, which are frequency-agile, with the dip-switch settings for all five of our FM frequencies posted inside. A radio STL failure in the past may have caused us anxiety; now we have

Sharing resources

a system on the shelf ready to go for any of the stations. The list goes on and on.

In my group of five FMs and two AMs, we have six FM transmitters that all use the same solid-state IPA. When the stations were all separate, it would have made sense to have at least four spares (because some of the transmitters operated in pairs), but now we really only need one to share. The same can be said for tubes; we use two types among nine different transmitters, and we can now get by with as few as two spare tubes on the shelf.

Surplus equipment can be defined as stored equipment that has, at first glance, no real use. One of our FM stations had its functional two-bay antenna taken down and replaced because of a DTV-related move. This antenna sat on the ground for about four years before being re-tuned and used as an auxiliary antenna for another station in town. The fact that we stored it at one of our AMs saved us thousands of dollars later on.

When multiple radio stations move in to the same facility, there is bound to be surplus equipment, making storage space a more important part of a facility design.

During spring cleaning at one of our AM sites, we found four old 5A 24vdc power supplies sitting on a shelf covered in dust. At first I wanted to toss them. However, it occurred to me that they could be used in our consolidated engineering shop as test equipment. We ended up lashing all four together to make a 10A 48vdc supply. Surplus gear can also be used as trade fodder down the road.

Putting it all together

Whoever is charged with managing the newly (or soon to be) consolidated engineering staff, will face a moment of truth at which

point he will have to accept some of the hard facts and reasons behind consolidation. That point may be when the subject of budgeting arises.

There are no hard and fast rules of thumb regarding the *number* of engineers on a staff. Instead, consider function: what each staff member will do, and how much of that there is to do within the entire group of stations. If there are transmitter sites spread out over 100 miles, or if there are dozens and dozens of computer workstations spread out over multiple station locations, and likewise, if there are a dozen studios spread out over multiple locations, retaining all the current staff may be justifiable. At the very least, there should be a contingency plan so it will be possible to operate with a reduced staff. This requirement may be an absolute.

Whether all the pre-consolidation staff stays or not, look for other ways to reduce monthly operating expenses. Are there redundant remote sites that can be eliminated? What about redundant leased lines from the telephone company? How much of the parts budget can be reasonably cut, considering all the parts that are already available within the group of stations? Can outside repair budgets be cut if there is now a more capable staff?

Once the staff level is determined, there may be a period of adjustment during which time the culture of the engineering department will change. If one engineer that previously handled all the engineering disciplines for one station is now handling transmitters for the entire group, there may be several issues. This person may feel that the workload is now unreasonable because of multiple stations. The department head will need to convince him that the focus has changed; that instead of handling four disciplines for one station, he is now handling one discipline for four stations. Granted, this may actually be more work. It's the job of the engineering manager to make effective compromises.

It is also possible that staff at the engineer's old station will continue to call him for all the normal types of problems, because that's the way they've always done it. I would suggest making the changes in the department in an evolutionary fashion. Let the department get used to the new roles and let the remainder of the station staff adjust to it as well. Don't expect everything to fall in to place overnight.

The station management (and the station owners, too) expects that the economies of scale will justify and eventually vindicate their investments in other stations. With some imagination, study and planning, the engineering department manager can use economies of scale to build a department that will function well in the long run. Along the way, it may also be possible to build in new functionality for each of the stations using the same economies of scale.

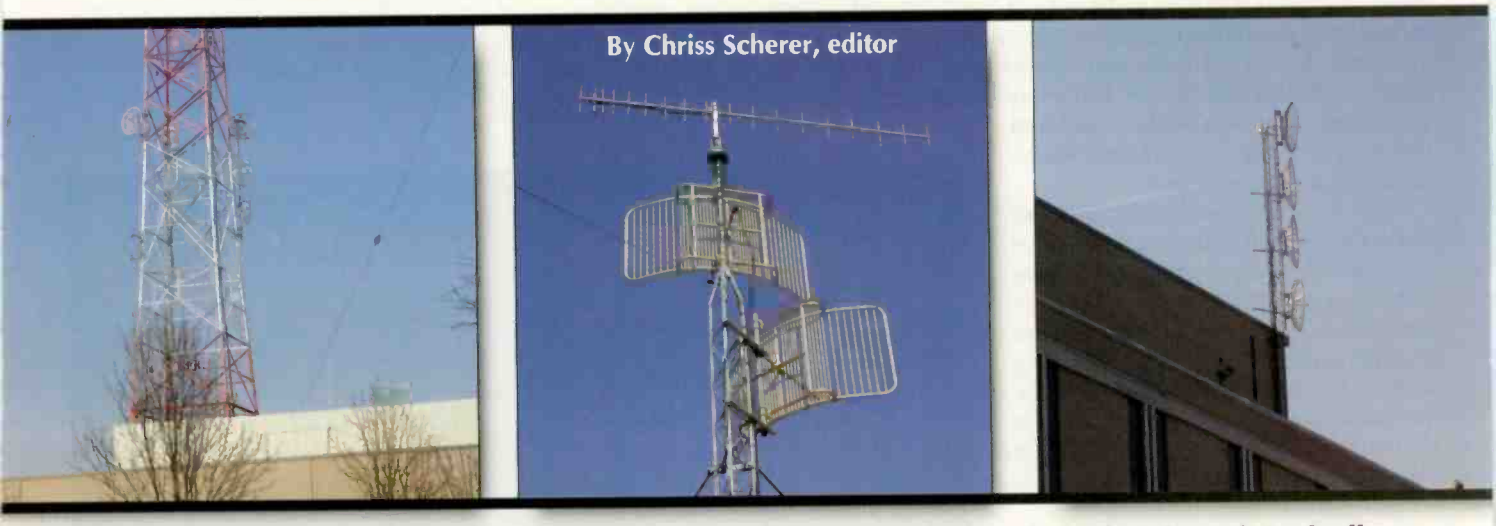
And finally, in the words of Horace, *Aequam memento rebus in arduis servare mentem*. (Remember to preserve a tranquil mind amid difficulties.)

Irwin is director of engineering for Clear Channel San Francisco.

***Editor's note**: For easier reading, the term "he" has been used frequently within this article instead of "he or she." The points presented apply to everyone, regardless of gender.*

Studio to transmitter links

By Chriss Scherer, editor



Fixed, point-to-point audio links are one part of the transmission chain that doesn't typically make it to the forefront of a facility discussion. This makes them no less critical than any other aspect, but with the current evolution in radio, their importance takes a step forward.

Studio-to-transmitter links, and to some degree inter-city relays are familiar elements of most radio stations. They allow stations the flexibility to build their studios in locations that may be miles from the transmitter, allowing certain creature comforts or marketing opportunities. To all but those who must maintain them, they are a silent and sometimes forgotten step in the transmission chain.

The term *studio-to-transmitter link* (STL) refers to the transmission path that carries the station's program audio. There are variations to this concept, including *inter-city relays* (ICR) and *transmitter-to-studio links* (TSL), which are closely related and have essentially the same function: to transport high-quality audio signals between two fixed points.

While TSL can refer to a data-return path used for a transmitter remote control, these links are better described as *telemetry return links* (TRL) and are limited in frequency response to less than full bandwidth.

With or without wires

The legacy form of an STL is a wired path. Traditionally supplied by the local telephone company, an analog wired circuit was once the most common form of STL. The most basic type of circuit is a *dry pair*. This is a straight-wire path between two points. There are no active or passive devices between the source and destination. This type of circuit is also sometimes called a burglar-alarm circuit because it is commonly used for signaling by monitoring companies. Because there are no transformers or equalizers, these lines can pass ac and dc voltages. Their frequency response can be unpredictable and will suffer at long distances.

It is possible to compensate for the line losses of a dry pair with external equipment. Transformers, line drivers and equalizer cards can be installed on each end of the circuit to provide a smoother frequency response. Some of this equipment can be found through surplus outlets. Newer versions of this transformer are available, as are quieter and more reliable amplifiers and equalizers. By equalizing a line personally, the ongoing cost of essentially renting the hardware from the telephone provider is saved.

Telephone companies can also supply equalized audio circuits. Such circuits were once the mainstay of radio audio circuits, but it can be difficult to order one of these lines today. These circuits are engineered by the telephone company to deliver an established connection at a specified frequency response. These lines were typically supplied with a frequency of as much as 8kHz for AM use or 15kHz for FM use. Depending on the distance, equalized circuits may have active components throughout the signal path to compensate for losses in the path.

Reliable performance of telephone-company supplied equalized lines can be problematic. The main drawback is that a station

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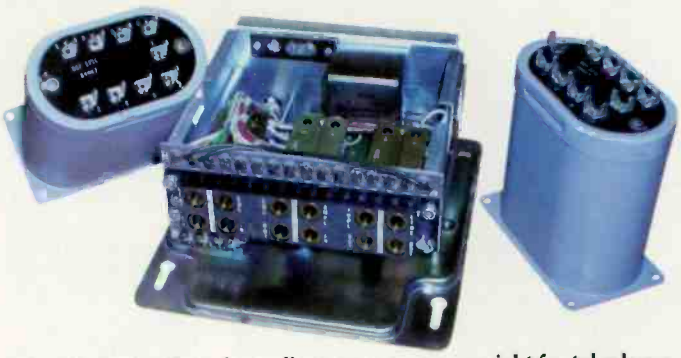
Studio to transmitter links

must rely on an outside party to provide the service. The established telephone network is far-reaching, but it is susceptible to problems from climate, human error and equipment failure.

As digital data circuits have increased in use and popularity, the telephone companies' analog services have become harder to order. In many cases, the local phone company may not have an installer who can even establish an equalized circuit. Most telephone companies are trying to get out of the analog circuit business as well. Because of this, the cost to install and maintain an analog circuit may be excessive. However, in some cases, these circuits may be the only option.



111C repeat coils and equalizers are a common sight for telephone company circuits.

Digital telephone circuits have increased in popularity and availability and in some cases decreased in price. Telephone companies have relied on digital circuits for their own backbone for some time, and they have made these services available to businesses and consumers.

Wired for digital

Dial-up digital circuits, including ISDN and Switched 56, were once expected to replace the analog dial-up services we still use everyday. While this has not happened, these services are readily available and cost efficient. ISDN service is routinely used for remote broadcasts and audio contribution. It can be used for an STL, but ISDN service is typically billed on a timed basis, so unless a flat rate can be contracted, it is not a good choice for permanent use. It is, however, ideal for backup and emergency use.

The high-capacity digital services from the telephone company have found widespread acceptance in radio. T-1 circuits, which are capable of passing 1.544Mb/s of data, are still subject to ongoing monthly costs, as are analog lines. The advantage is that the higher capacity can justify the cost. In addition, T-1 lines are bidirectional. The latest boom in telecommunications services has increased T-1 accessibility, and providers other than the local telephone company can offer service.

T-1 service is offered in North America. Outside North America a similar service, called E-1, is available. E-1 provides a 2.048Mb/s data pipe and uses a slightly different encoding scheme, but the basic principle and service is the same. Equipment designed for one of these circuits can usually function with the other without too much difficulty.

To use a T-1 circuit, some type of multiplexer must be installed on each end of the circuit. The multiplexers offer a variety of options for users to customize the type of signals that can be sent. Linear, PCM-encoded

stereo audio with a 44.1kHz sampling rate and 16-bit resolution will occupy 1.411Mb/s of bandwidth. If linear audio is sent to the transmitter site, there is just enough spare bandwidth for remote control telemetry, with a few bits to spare. Most manufacturers offer various encoding cards in addition to those for linear encoding. These encoding options include various forms of MPEG compression, Apt-x and even composite stereo.

Another advantage to T-1 circuits is that most telephone companies can install and maintain T-1 circuits more easily than equalized analog lines.

One additional link in the wired family doesn't even use wire. For our classification purposes, fiber-optic equipment can be considered here because it requires a physical connection. (Instead of wired and wireless, we could have said non-RF and RF.) Fiber-optic encoders provide the same advantage of a T-1 multiplexer system by providing a high-bandwidth, bidirectional pipe. An additional advantage to fiber-optic systems is that they are immune to electromagnetic and electrostatic problems. Lightning and electrical surges are impossible. Ground loops are eliminated.

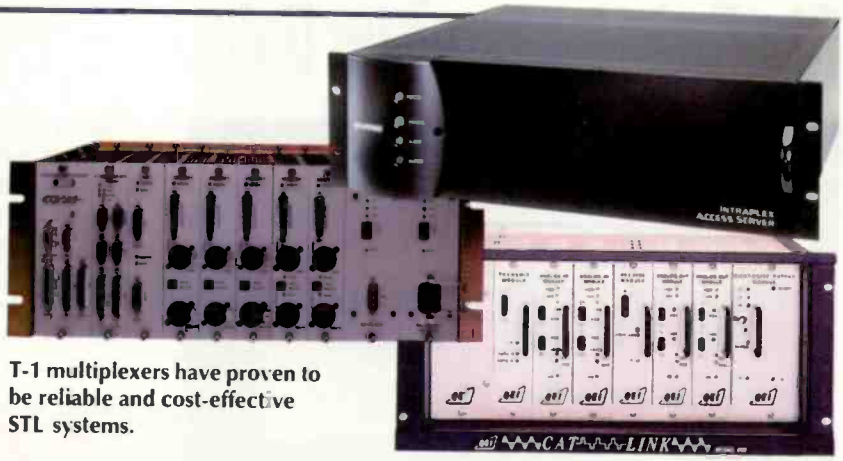
Unfortunately, end-to-end fiber connectivity is not available in most places. College campuses and business parks may have fiber capability, and a fiber-optic STL may be a possible solution. Another use would be for a long cable run, perhaps to a rooftop from a ground-floor studio.

Along this line, there are systems that use CAT5 cable as the wire medium. Again, distribution within a campus or other controlled space lends itself to these systems. CAT5 and fiber systems are ideal for covering spans between a studio and a tower or antenna farm installation. The send path can carry program audio, IFB audio and transmitter remote control. The return path can carry transmitter telemetry, RPU audio and satellite feeds.

The wired STLs mentioned so far all work with private connections. The connections may exist through a wider network, but the connection is still isolated in some way, and constant bandwidth or frequency response is guaranteed. There is one system that uses the Internet as its medium. The Energy-Onix Tele-Link uses a 126kb/s or greater Internet connection to provide a 22kHz audio path that can be received by as many as five online decoders.

Breaking the tie

The trend in STLs has come full circle for wired systems. The effort to eliminate the telephone company from the transmission path resulted in the introduction and



T-1 multiplexers have proven to be reliable and cost-effective STL systems.

Studio to transmitter links

Digital STLs such as these are a good first step in upgrading to an all-digital air chain.

Analog RF STL systems have not seen much change since they were first introduced. Like most technology, improvements in hardware and electronic design have made them more efficient, cost-effective and reliable.

The transition to digital has also been introduced to RF STLs. With this transition come the usual advantages of digital technology. The audio path can be less prone to noise and interference.

There are a variety of digital systems from which to choose. Digital paths can be linear or data-reduced with a popular coding algorithm. There are also digital codecs to transmit digital audio over a conventional composite STL system.

An efficient modulation technique, quadrature amplitude modulation (QAM), provides a way to encode audio into a limited carrier frequency. By adding a level of data reduction, as many as six channels of audio can be transmitted on a single carrier. With linear encoding, two or four audio channels can be sent.

Transmitting multiple channels in the space where one was previously sent has helped relieve some of the RF congestion, but with increased capability comes increased demand. Digital STLs offer additional noise rejection from adjacent carriers, so it may be possible to add a few extra channels into a congested area. Some stations use subsequent extensive use of wireless systems. STLs in the 950MHz spectrum are commonly used for mono, discrete-stereo and composite-stereo applications. This small chunk of RF real estate has become so crowded that some cities are unable to coordinate new users. This congestion, coupled with the increased cost efficiencies of wired systems, has pushed some telco-based systems back into popular use, but RF STLs are still practical when the spectrum is available.

Short distances can be covered with CAT5 and fiber-optic multiplexers.

the additional capacity for backup links to sister stations or as one-to-many links when the receive sites lie in a common path.

One caveat to digital STLs in the 950MHz band is that the FCC is currently not licensing digital modulation. Stations can apply for a waiver and STA to use a digital STL, but this STA must be renewed regularly until the rules are changed to allow digital modulation. Keep in mind that the emission designation for a digital STL is different from an analog STL. The FCC has a pending rulemaking that will likely change this, but that is still

Substitutions on the fly

Stations strive to have complete redundancy in on-air systems to minimize or even completely eliminate lost air time. The STL path deserves the same attention to system backup, making the transition automatic if possible.

Some digital exciters have the built-in capability to accept more than one source and automatically switch to a backup source when the primary one fails. If this is not available, a station can build its own switching device using squelch contacts from receivers, loss-of-data alarms from digital systems or silence sense alarms. Commercially produced products such as the SBS Guardian II are available to handle this automatic switching.

With the convenience and affordability of digital storage systems, an auxiliary audio source can be included in the STL backup chain. Minidiscs, CD players or devices such as the Digigram Hitplayer work well in this application.

An inexpensive, stand-alone automation computer system can be pressed into service. To reduce wear on the system, it could be configured to boot and await a play command when the last link is switched to air.

Studio to transmitter links

several weeks away.

Converting to a digital STL offers advantages, but it is best to coordinate its use. You may be licensed for the frequency, but the digital transmission occupies almost the entire RF mask, whereas the analog transmission is concentrated at the center of the carrier. A digital STL may interfere with analog STLs on adjacent channels.

While 950MHz has been the popular space for aural STLs, the FCC also permits aural STLs in the 18GHz band. Analog transmission on 18GHz is not practical

Studio to transmitter links

In areas of RF congestion, spread-spectrum links may offer a workable solution.

because of the excessive phase noise, so digital modulation is preferred—and allowed by the FCC. This band is not extensively used by radio broadcasters.

In addition, aural STLs can be used in the 23GHz business band by licensing their use for a private business. Both 18GHz and 23GHz STLs work well for distances up to five miles with few problems. Distances up to 10 miles can be covered with larger antennas. Longer distances push the limits of the spectrum, and the entire frequency band can be disrupted by heavy rain.

When RF congestion in an area is too great, spread-spectrum transmitters may offer a suitable alternative. Operating in ranges from 2GHz to 6GHz, these systems fall under FCC Part 15 rules and do not require a license. The transmitter power is limited to less than one watt, but high-gain, directional antennas can provide a useable distance of several miles.

There are a variety of choices for an STL that go beyond the traditional conceptions. As with any equipment decision, it pays to evaluate the available choices and choose the system that offers the greatest flexibility while still meeting the demands and restrictions of the installation.

Thanks to Dane Ericksen of Hammet and Edison for providing some of the information on RF systems.

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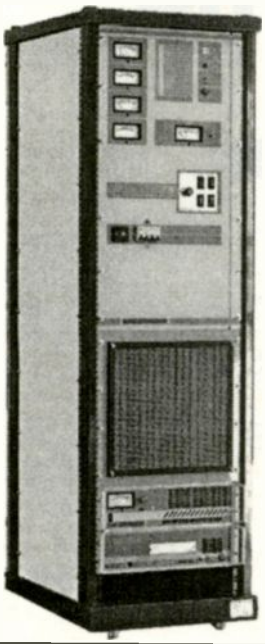

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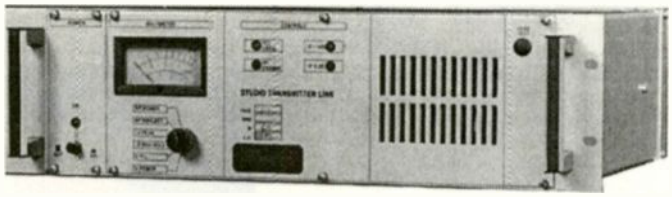

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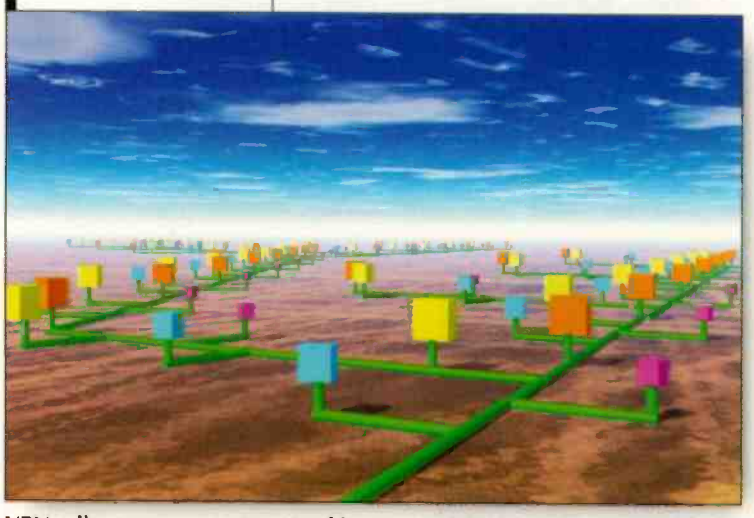
Using VPNs

By Kevin McNamara, CNE

In the past, providing access to a company's computer network for its employees and others that worked outside of the office was handled in one of three ways.

The first was by providing a simple dial-in access telephone number that allowed a certain level of access into the company network. Unless the remote employees were located in the local toll area, the company generally provided toll-free dial-in numbers.

The second way was by installing a dedicated leased data circuit into the remote location, which would permit a full-time connection into the network. While services such as Switched 56 and ISDN were offered in many areas, they were expensive and difficult to maintain. Likewise, more traditional leased data transport options such as T1 (or fractional T1) and Frame Relay can provide quick and reliable connections, but can also be expensive and are not widely available.



VPNs allow a company to extend its connectivity to remote users with the same reliability and security of those attached locally.

The third method is by creating internal company extranets or intranets that let authorized users access custom Web pages, reports and forms through the Internet. This method perhaps the easiest and most cost-effective to access; however, while it is possible to configure an extranet to permit direct access of files, they are generally used to serve information as a Web page.

While all of these methods worked well, and in many cases still do, they suffer from a number of drawbacks including speed, security, high recurring costs and time to deploy. The dependence of company e-mail is growing at a rapid rate. The number and size of each e-mail message is also increasing, placing importance on the speed and reliability of the connection for the remote user.

The underlying technology behind a Virtual Private Network (VPN) has been around for several years, but the wide-scale availability of low-cost, dedicated broadband Internet access such as cable and DSL has companies, large and small, rethinking their remote access strategy.

What is a VPN?

A VPN allows private connections between two machines using any shared or public Internet connection. VPNs permit a company to extend connectivity to remote users with the same reliability and security of those attached locally. The need for leased point-to-point links is eliminated because the VPN can function from any Internet connection.

VPNs are based on a concept called *tunneling*, a method of encapsulating data into encrypted packets that can travel over IP networks securely and be delivered to a specific address.

VPN protocols

VPNs are created using one of four possible protocols: Layer 2 Tunneling Protocol (L2TP), Layer 2 forwarding (L2F), Point-to-Point Tunneling Protocol (PPTP) and IP Security Protocol (IPSec). These protocols define methods to create a VPN over many connection types. The VPN was created prior to the availability of cable or DSL Internet access as a means to establish an on-demand private network between a network server and a dial-in remote user.

When dialing-in to any Internet point-of-presence (POP) using the basic 56kb/s (or slower) modem, the connection is probably made using the *Point-to-Point Protocol* (PPP). L2TP, L2F and PPTP are VPN protocols that were created primarily to work inside of PPP. These protocols support several authentication methods used in PPP including the Password Authentication Protocol (PAP) and Challenge Handshake Authentication Protocol (CHAP), a variation of which is used in Microsoft NT-based operating systems called MS-CHAP. Each of these protocols operates at layer 2 on the OSI layer, allowing them to handle a variety of protocols such as IP, IPX (Netware) and NetBEUI (Microsoft). The L2F protocol adds a two-step authentication process, one from the user and one from the ISP, as well as the ability to create more than a single connection. L2TP enhances and improves upon the security shortcomings of PPTP and L2F through the use of stronger encryption and its support of a multitude of transport methods in addition to PPP.

IPSec is currently the leading protocol used in corporate VPNs. The IPSec protocol was created exclusively for use over IP networks, to be used with the emerging IP standard called IPv6. IPSec also uses a host of features that ensure a high degree of security and data integrity.

VPN ROI

The costs associated with implementing a VPN must be justified against the current operational expenses incurred with the support of remote offices and users. A good place to start would be the Cisco VPN Savings Calculator (see sidebar), which provides a thumbnail view of the savings one might expect.

It is necessary to capture those expenses directly related to remote access including leased line costs, toll and monthly recurring charges used for any dial-in services, and the time required to support those users. The hardware requirements for implementing a VPN are minimal and can be handled by a single VPN-specific router. A good, properly configured hardware firewall device is also recommended. In addition, if the remote location is an office, the cost for the hardware, typically a VPN-enabled router, must be included. If the remote access is from individual users (clients), then a copy of VPN client software will be loaded on each machine. This software is typically provided free with the purchase of the VPN hardware. Finally, take into consideration those costs that might be reimbursable to an employee, such as the monthly fees for the cable or DSL service; this typically costs around $40.

With the advent of VPN-specific routers, creating a VPN for your company has been simplified. Installation of the hardware is similar to that of any other device on the LAN; however, configuring the router can be tricky. If you are not comfortable with setting up routers and firewalls, this task should be outsourced.

VPNs are a viable alternative to expensive leased lines and dial-access systems. Whether a network supports five or 500 remote users, VPNs offer a reliable and cost-effective solution. Consider also that VPNs permit system administrators the flexibility to manage remotely located computers and perform tasks such as remote diagnostics and software updates from a central location.

McNamara, BE Radio's consultant on computer technology, is president of Applied Wireless Inc., New Market, MD.

New Products

By Cindy Holst, associate editor

Studio furniture
Mager Systems

Sound Choice Furniture: This new series of stock studio furniture offers high quality materials throughout. Vented cabinets have curved corners and countertop edges are rounded. A standard color choice is available. Various riser heights are available for the rack turret. The cabinets are 19-ply, 1-inch thick plywood and do not use particleboard or melamine. The countertops are solid-surface Avonite. No cabinet assembly is required. All surfaces are fully sealed with no laminate to crack, chip or peel.

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Contributor Pro-file

Meet the professionals who write for BE Radio. This month: Sharing Resources, page 24.

Doug Irwin
Market Director of Engineering Services
Clear Channel
San Francisco, CA

Doug Irwin's involvement with radio began when he received his Novice Class license on his 14th birthday. By age 16 he obtained his Amateur Extra Class license and First Class Radio Telephone license. His first paying job was in radio in 1979, and he has worked full-time as a broadcast engineer since 1985. He joined KKSF in 1996, and later added KIOI and KYLD to his group. He became director of engineering services for the AMFM (now Clear Channel) San Francisco group in 2000.

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Shaping radio today and tomorrow

By Chriss Scherer, editor

That was then

The WABC, New York, main air studio 8A shown here was featured on the August 1979 cover of *Broadcast Engineering*. It was operated with the announcer and the engineer in the same room. The console is a Rupert Neve custom-designed console, built to meet the needs of the station at the time.

The custom consoles throughout the facility were designed with simplicity in mind. All unnecessary input switching was eliminated, with the first 10 faders dedicated to sources. The last two faders were switchable and were used to access other control rooms, the ABC Radio Network or remotes.

The upper right portion of the console features monitoring selectors for each set of headphones or speakers, with corresponding level controls. The centered UV meters are switchable to air, program or cue. The switches on the left control a relay air switcher that determines which control room is on the air. The center eight indicators show such things as bulletin, EBS alarm, carrier off and program outage. The overbridge has a clock, timer and end cue indicator, as well as telephone lamps and mic on lights. The controls on the announcer's side are similar to those on the engineer's side but arranged differently to allow announcer comfort.

Sample and Hold

A look at the technology shaping radio

Revenue rankings by stations owned

Overall revenue is important, but revenue per station shows business efficiency.

While BIA reports the data in overall revenue, we divided revenue by the number of stations owned and ranked the groups in the their respective order.

Source: BIA Financial Network Inc.

BE Radio rank	Group Owner/Operator	Revenue per station	# of Stations	# of Markets	BIAfn rank
1	Emmis Communications	12,328,571	21	7	8
2	Viacom International	11,431,976	183	41	2
3	Bonneville International Corp.	9,437,500	20	6	12
4	Greater Media	7,551,389	18	6	14
5	Jefferson-Pilot Communications	7,367,647	17	5	16
6	Susquehanna Radio Corp.	7,125,806	31	9	11
7	ABC Radio Inc.	6,925,862	58	29	5
8	Sandusky Radio	5,820,000	10	2	22
9	Spanish Broadcasting System	5,550,000	23	8	15
10	Cox Radio Inc.	5,283,951	81	18	3
11	Hispanic Broadcasting Corp.	4,574,545	55	15	10
12	Radio One Inc.	4,485,891	64	22	7
13	Entercom	3,923,798	104	19	4
14	Inner City Broadcasting Corp.	3,351,471	17	8	23
15	Beasley Broadcast Group	2,689,535	43	11	17
16	Clear Channel Communications	2,645,396	1,231	190	1
17	Journal Broadcast Group	1,922,917	36	8	19
18	Lotus Communications Corp.	1,912,500	24	7	25
19	Saga Communications Inc.	1,667,917	60	11	18
20	Salem Communications Corp.	1,638,253	83	36	13
21	Citadel Communications Corp.	1,528,585	205	41	6
22	Entravision Communications Co. LLC	1,206,604	53	23	20
23	Regent Communications Inc.	1,043,033	61	13	21
24	Cumulus Media Inc.	1,041,296	243	52	9
25	NextMedia Group	870,089	56	11	24

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boasts uncompromising **QUALITY** tailored to the **TIGHTEST BUDGETS**, with all the features a well-designed studio calls for.
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Wheatstone

DIGITAL AUDIO NETWORK ROUTER

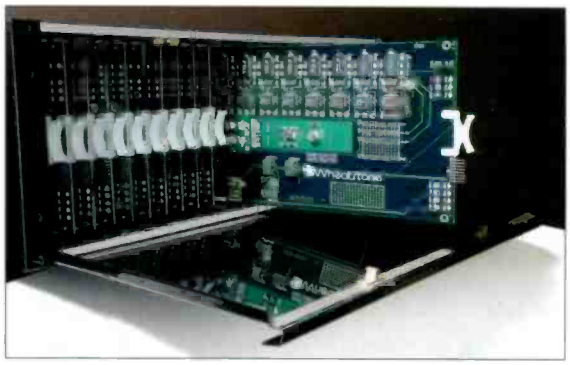
- *BI-DIRECTIONAL FIBEROPTIC OR CAT-5 INTERLOCATION CONNECTIVITY*
- *ALL DIGITAL DOMAIN AES SWITCHING*
- *ANALOG OR DIGITAL (AES SAMPLE RATE) INPUTS*
- *BOTH ANALOG AND AES DIGITAL OUTPUTS*
- *SERIAL CONTROL AND DISPLAY WITH WHEATSTONE CONSOLES*

THE 2001 MAKES AUDIO NETWORKING PRACTICAL. It's simple to install, easy to learn, and certain to reduce system costs. Compact enough for small applications, yet stackable for tremendous growth potential, it's design consists of 7"rackmount digital routing cages, each capable of handling 512 simultaneous audio channels on its backplane.

Units can be stacked to suit particular card complements (analog or digital input and output cards or optical network cards) but more significantly cages can be separated by great distances and network their audio through either bidirectional fiberoptic links or a single CAT-5 wire. **ONE INTERCONNECT DOES IT ALL:** 64 channels of simultaneous bidirectional digital audio, intercage communication, X-Y controller commands plus auxiliary RS-232 data streams. This single interconnect between your studio and central rackroom can save you tens if not hundreds of thousands of feet of wire in a typical installation.

The 2001's graphic based setup software is intuitive and easy to use, with all the authorization and security levels you could want. And of course we have a full complement of control panels and PC applications to choose from—all designed for straightforward operation and a rapid learning curve.

With 25 years of experience, Wheatstone has the infrastructure in place to help you build your OWN infrastructure. Contact us for answers.



MIXED SIGNAL SWITCHING is easily accomplished with a choice of AES digital or ANALOG 24-bit A>D input cards, and of course 24-bit digital or 24-bit D>A ANALOG output cards, all of which can be serviced from the front of the cage. All signals are routed entirely in the digital domain.

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