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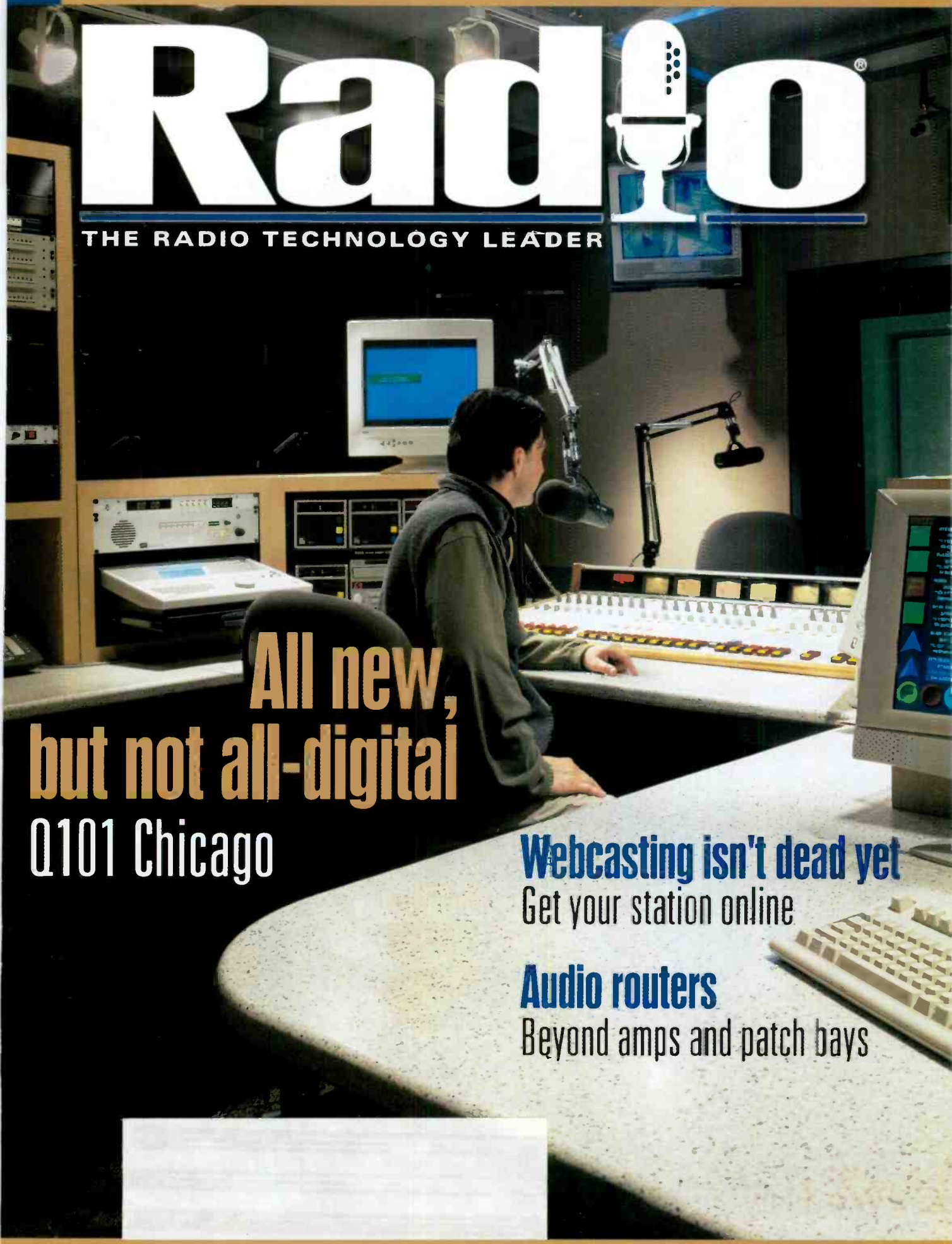

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Datacasting with IBOC - page 38

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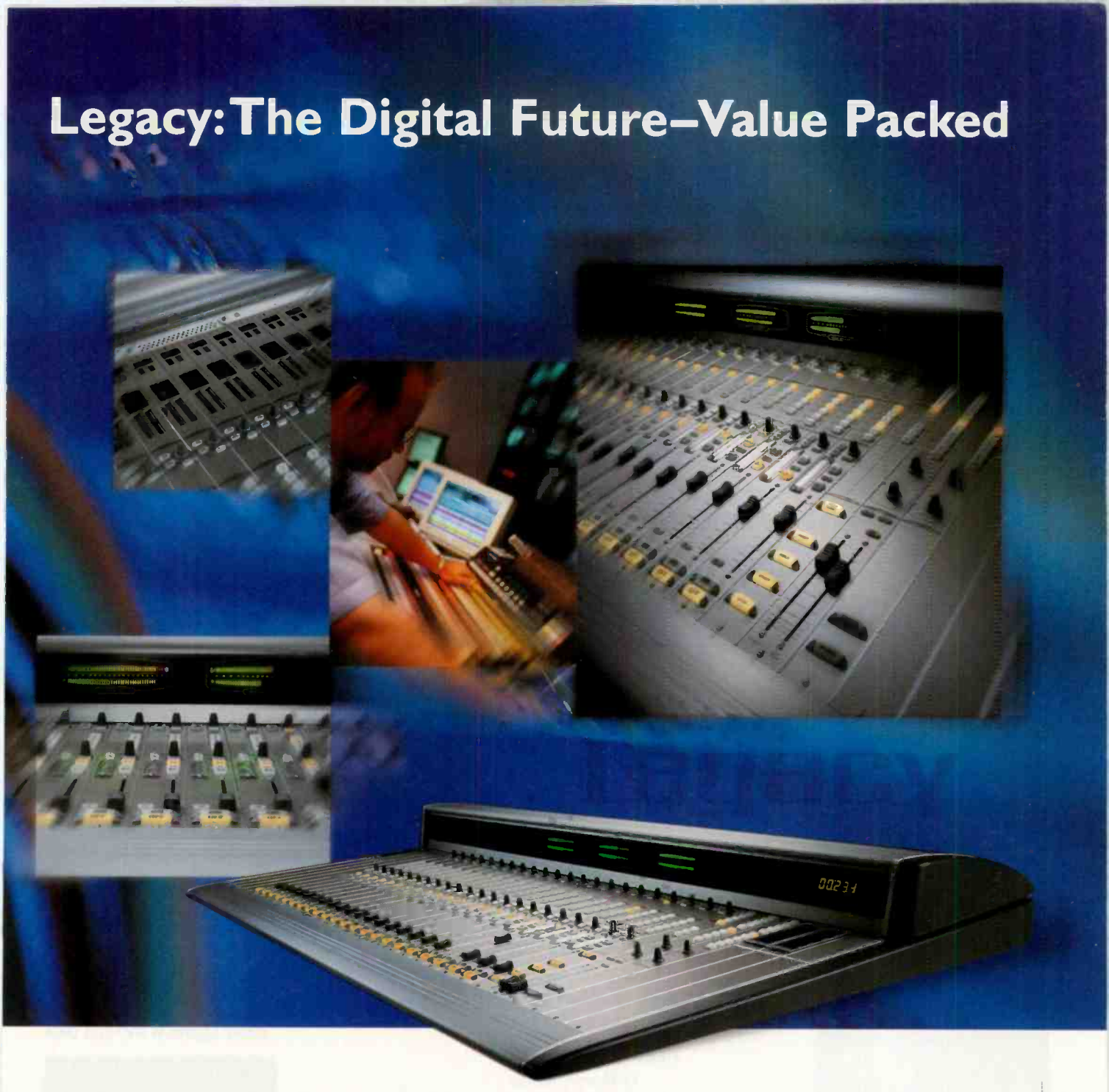

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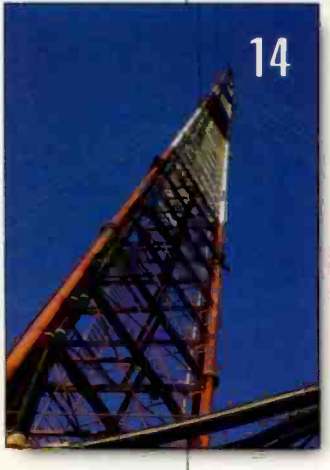

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ON THE COVER:
The main control room of WKQX-FM (Q101), Chicago, is also the home of the syndicated Mancow morning show. Photo © 2001, Anthony May, courtesy of Ratio Architects. Cover design by Michael J. Knust.

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Currents

FCC Amends EAS Rules, Includes Amber Info

The February Report and Order adds FIPS codes and extends the window to forward an RMT.

Streaming Will Cost You

Most broadcasters feel that the Copyright Office's fees will kill Internet Radio completely.

CEA Supports FM IBOC

The Consumer Electronics Association filed comments with the FCC endorsing the NRSC's conclusion on FM IBOC.

Denon and Marantz to Merge

D&M Holdings will become the new parent company, but the two product lines will remain independent.

PPM Trials add more stations

Six more stations begin encoding the Arbiton Portable People Meter signal to take part in the upcoming tests in Philadelphia.

NAB Protests XM Patent

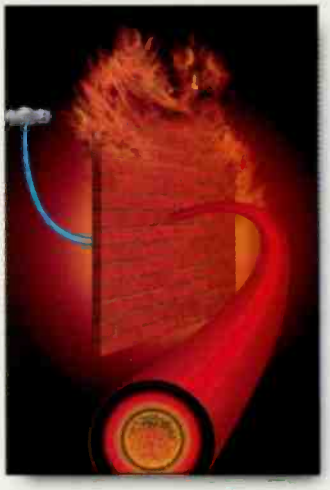
XM Satellite Radio patents a technology for insertion of information through the local repeaters. The move catches the NAB by surprise.

RDA Systems Completes HBC in LA

Twelve studios for five stations have been completed in Los Angeles.

Wireready to Offer Free Newsroom System

Software will be free to customers purchasing Salesready software.



Site Features

NAB2002 FASTtrack for Your PDA

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Look for the latest update information from EAS manufacturers following the February Report and Order.

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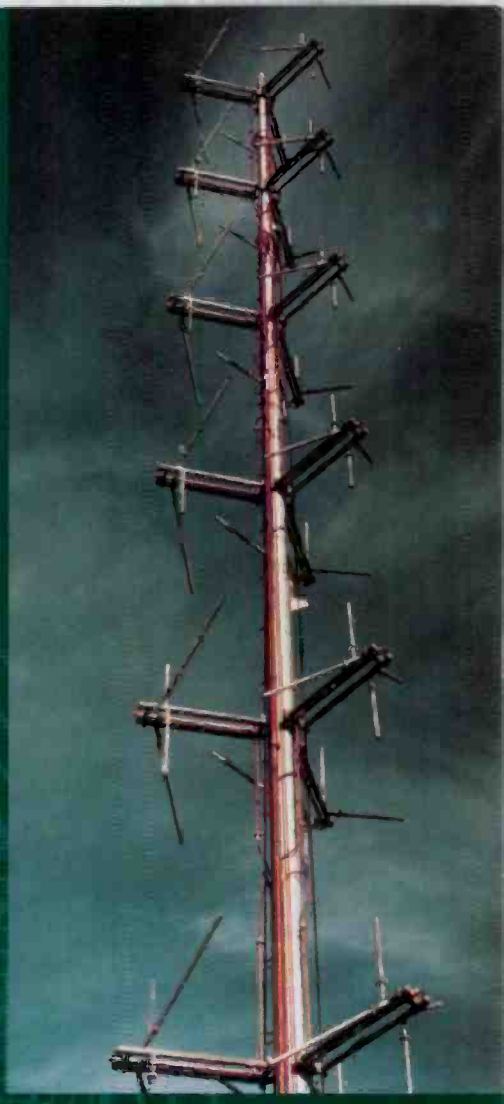

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Who will buy?

As IBOC gets closer to being a reality, radio stations are starting to see the light ahead. This light is not just the promise of an improved service, but also the realization that nothing in life is free.

Ibiquity, from the start, has been a technology developer with a goal of licensing its technology when it is used. Developing the technology to transmit digital radio is no small feat, and it has already taken 10 years to get us to where we are now. During this time, Ibiquity and it predecessors, USA Digital Radio and Lucent Digital Radio, were working on the entire system. It was not simply writing some code and passing it on for others to figure out the implementation and use. Ibiquity has been acting as a research and development arm for transmitter manufacturers and receiver manufacturers. In this capacity, there are costs to be covered. Ibiquity has decided that everyone involved will share these costs.

This is not appealing to any one segment. Broadcasters would rather have the transmitter and receiver manufacturers pay for it. As it is, transmitter manufacturers are paying a licensing fee, which will be passed through to the broadcaster anyway, so it doesn't really matter where the fee is assessed. Radio stations will pay no matter what. Ibiquity has kept the amount of manufacturer's fees under wraps. Some of the cost is for the development of the technology. There is also an ongoing cost for each unit manufactured.

In previous issues, *BE Radio* reported that stations can expect to pay for new hardware starting at about $30,000. For some stations, it will cost significantly more. In addition, licensing fees will added. The question is, "how much will it cost?"

The licensing fee is based on the current FCC regulatory fees. These FCC fees are based on the type of service (AM or FM) and the population that a stations serves. The fees range from $250 to $4,550. Ibiquity wants to charge you 15 times the FCC fee for a one-time licensing payment—a license payment range of $3,750 to $68,250.

If a lump sum payment is not possible, Ibiquity is also offering a 10-year payment plan, which is evaluated at 2.8 times the FCC regulatory fee every year for 10 years. This results in a payment of $700 to $12,740 every year for a grand total payment of $7,000 to $127,400. It is cheaper to pay it all at once. Because each station is signing a contract, there may be opportunities for other payment plans to be made.

Non-commercial FM stations, while exempt from FCC regulatory fees, are not exempt from the Ibiquity licensing fee. These stations will pay based on the minimum rate for FM stations of $250. This yields a licensing fee of $3,750 one time or an annual fee of $1,260 over 10 years.

The fees don't end there. Any station revenue from data services will also be subject to a royalty. Right now this stands at three percent of the revenue. This amount will be calculated quarterly by the station and continue in perpetuity. An option exists in the current contract to discuss this for the long term, so it may change in the future.

It has been expected that there would be costs involved in licensing the Ibiquity technology. This is not really a new concept. Now that the initial market roll-out efforts have begun, this point has moved into the spotlight and many broadcasters are not happy about it.

In the end, this is yet another financial obstacle for IBOC. I have heard the demonstrations and I am impressed with the audio quality it provides. Like you, I am not the average listener. Will a listener realize the improvements of the new system? Not initially and maybe not in the long term. Will stations voluntarily pay the costs to upgrade their systems and cover the royalties? Without an FCC mandate to implement the service—which I don't see happening—I don't think many stations will. The marketing engine must convince the listeners that this is what they need.

Chriss Scherer, editor
cscherer@primediabusiness.com

Chriss will moderate the session called *Why Buying Now Will Save You Later* on Monday April 8 at 10:30 a.m. at NAB2002. See the session guide at the show for the location.

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The challenge of systems integration

By Mark Krieger, CBT

Like so many other facets of the broadcast industry, the role of the contract engineer continues to evolve around technological advancement. One has only to look back 20 years or so to recall a time when computers of any type were likely to be found only in a radio station's sales or business departments. In those days, technical upgrades to the broadcast facility were likely to appear as a new piece of equipment that was simply plugged in to an outlet and wired into the audio chain using XLR audio connectors or barrier strips. Today's realities are different. Now the issue is not so much where to put the new box, but how to best integrate the new "solution." Instead of pondering simple questions like balanced or unbalanced audio and remote control requirements, engineers now face multiple issues when introducing new types of digital audio systems into the broadcast environment.

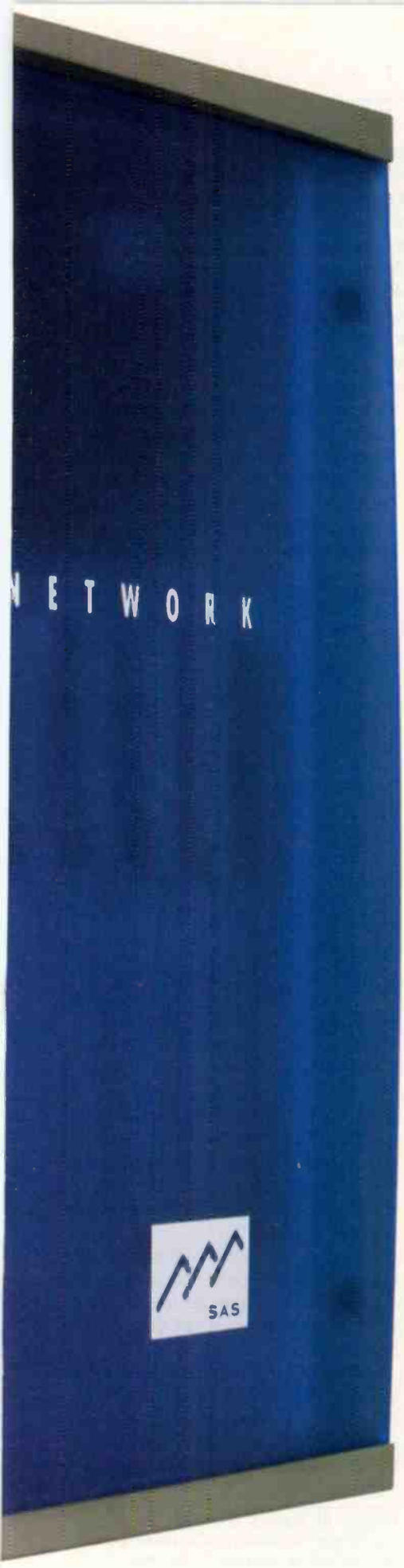
Integration at the hardware level is the first step.

There are three major areas of concern when it comes to integrating new hardware/software platforms into an existing facility. The first is connectivity at the hardware level. Most studio and production tools are available with both digital and analog I/O, but interfacing them is sometimes problematic. While AES and SPDIF digital inputs are more or less the standard interchange, consumer-oriented equipment with optical interfaces is also encountered. The picture gets even more complicated when considering sample rates. Existing AES equipment usually employs 48kHz, while CD players most commonly employ 44.1kHz. If you're connecting everything through a digital console with selectable input types and sample rates, great. Yet the equipment or the desired configuration often doesn't allow for this, and where dissimilar digital I/Os meet, interface and sample-rate converters are required. Because the cost of these black boxes adds up and sample-rate conversions are to be avoided whenever possible, you need to pay close attention from the start. Switching of inputs, outputs and studios may also require digital routers and a master reference (synch) clock.

Cross connectivity

Achieving connectivity at the network level can also be a challenge. For example, many popular PC- and Mac-based production packages can communicate at the network level, but careful attention must be paid to what network topologies are in use. Some older equipment was designed around thin Ethernet, while 10baseT and 100baseT later became popular, though economics frequently dictate that systems of these differing vintages must be adapted to communicate with one another. Likewise, many popular on-air digital delivery systems claim to be compatible with existing traffic and accounting systems - but beware: If more than one vendor is involved, getting this to work in practice is seldom as easy at it sounds. If your IT skills are not quite up to snuff, you may need some help sorting out cost-effective ways of tying various platforms together.

The final factors in this equation are the digital storage mediums and sound file topologies themselves. While CD burners have made direct audio archiving easy and inexpensive, it has to be done at 44.1kHz and in compliance with "orange book" standards. More often then not, however, it is necessary to store complex production projects, news actualities, and even music, as mass-stored data. As a result, the engineer has to deal with the complex issue of sound file interchangeability. Unfortunately, the PC world is still stuck with the nebulous WAV format, with its variable word length and sample rates. Further complications arise from the potpourri of compression algorithms currently in use, a factor that sometimes results in their haphazard overlap. So far, we've only mentioned the inside of the studio facility, but digital STL and transmission chains are also considerations, particularly in respect to sampling rate. Ditto for remote broadcasts and



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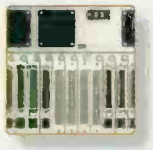

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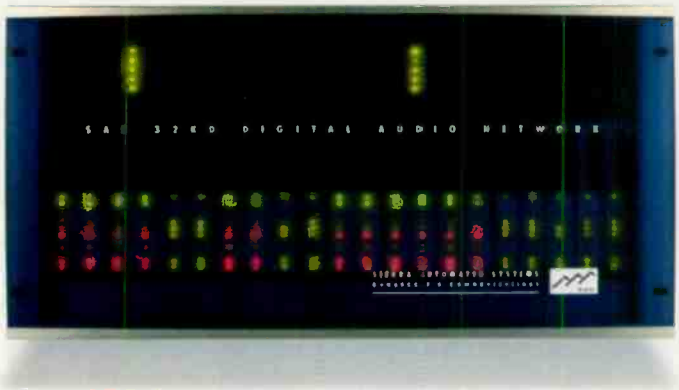

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feeds, including satellite and codecs, which all employ some form of digital compression. The situation is greatly exacerbated by the reliance on LANs, WANs, and the Internet by broadcasters, which sometimes results in digital sound files being copied (and converted) dozens of times.

Unfortunately, a lack of sophistication and awareness regarding the negative side effects of compression overlay and file/sample rate conversion is prevalent in the radio industry, and sometimes results in an inferior on-air product. Thus, it ultimately falls to the engineer to see that the quality, productivity and flexibility of any new system are optimally balanced.

This can be done in three phases. First, you must be proactive in understanding your client's needs and expectations before the selection and purchase of new hardware and software. Don't be afraid to speak up if you realize that another product or approach will better accomplish a specific task. This requires fully educating yourself about the systems in consideration as well as the mission of those expected to use them.

Second, take the time to thoroughly read and understand the nuances of the system or application before you install it. Because time is money and today's broadcast hardware and software are complex, this is an area where one may be tempted to cut corners. Often, the documentation supplied lacks the detail necessary to achieve the best results, and thus requires additional research on your part. Nonetheless, it's an essential step.

Differences in protocols, topologies and data formats all must be considered when mixing various systems.

Finally, put together a training plan that not only trains key personnel as users, but also increases their ability to make decisions that will enhance, not degrade, the final product.

The role of today's contract engineer has indeed changed. Even so, we can effectively deal with the challenges accompanying that evolution by embracing a comprehensive approach to system integration.

Krieger, BE Radio's consultant on contract engineering, is based in Cleveland and can be reached at mkrieger@drfast.net.

"The best choice"

Ron and Beth Fruit of WRCO wrote us a letter about BSI's digital automation

October 9, 2001

Dear BSI,

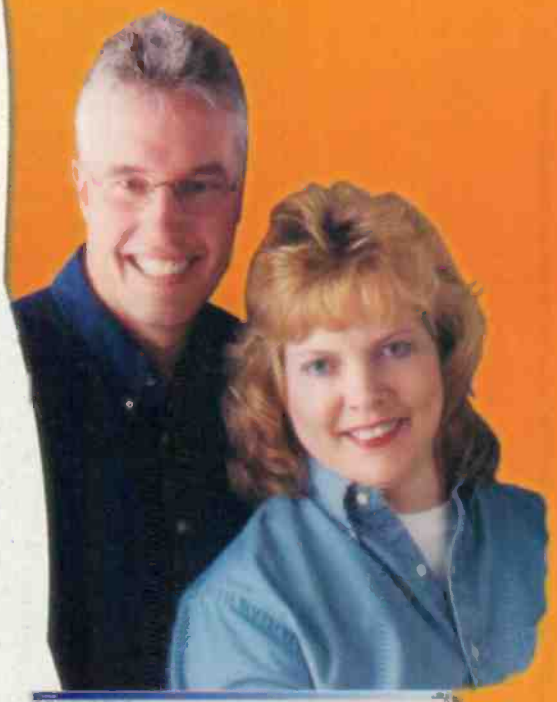
When WRCO Radio made the decision to go digital, our choice was BSI. I was really impressed and still am with your "try it before you buy it" philosophy. I became familiar with the software in the demonstration mode and was convinced it was the best choice for us before I ever wrote the check. After purchase, we were up and running in no time at all. I think it is clear that the BSI team has a strong grasp on what broadcasters want and need. I also appreciate the BSI philosophy that allows so much flexibility in hardware, although I have learned that following BSI recommendations is a very very good idea!

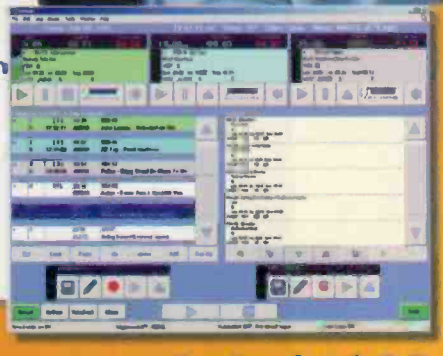
When we announced the change to digital at WRCO, several staff members were skeptical. Today, the comment often is, "how did we ever get along before?" or "I sure wish we would have done this even sooner."

We really appreciate the flexibility of BSI digital automation products. Our FM is live assist while the AM carries a satellite format. BSI products handle both tasks very well. When our farm network started offering mp3 downloads, we were able to route the material across our network and take full advantage of the opportunity in every studio, thanks to BSI. Similarly, as we have implemented change here at WRCO, BSI products have easily made the change with us. With BSI, I feel like I control the station and the software, not the other way around.

From the production studio to the control room, I can't imagine why we would ever want anything but BSI. It's reliable, user friendly software with the flexibility and power to make it a great investment.

Ron and Beth Fruit
WRCO AM & FM Radio
Richland Center, Wisconsin





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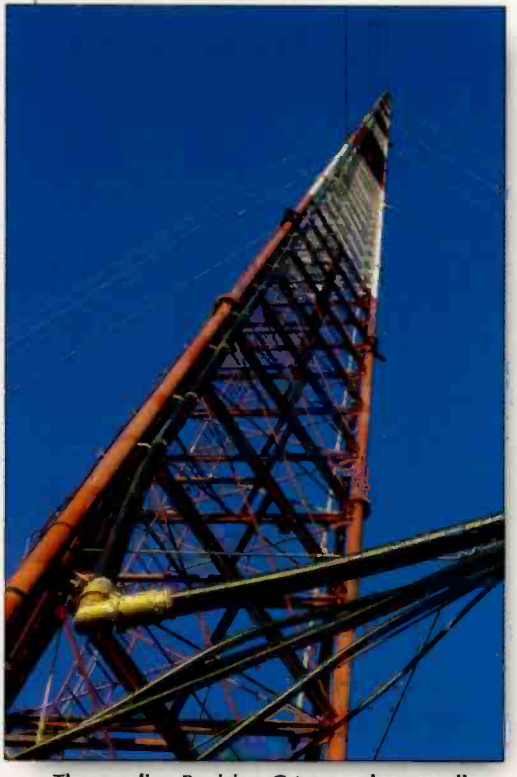
New tower standards

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

The onset of digital television has greatly boosted interest in broadcast towers. Existing towers that once were regarded by owners as necessary evils now receive favored treatment in their new guise as valuable vertical real estate. Most existing towers today probably have as many antennas and as much ancillary equipment hung on them as they can carry without collapsing. So the push is on for new tower construction, not only for digital television antennas but for all the new sources of communication inspired radiators that require stable sky hooks hundreds of feet in the air. This means that both AM and FM stations may be affected by the new tower standards when they are put into force.



The pending Revision G tower changes allow for some grandfathering of installations.

The broadcast tower industry has made fantastic strides since the beginning of radio. There have, of course, been a few spectacular tower collapses, generally caused by high winds and or ice, and occasionally by vandalism. I can't recall any whose failure was officially blamed on over loading; although most of us have seen towers that we would hate to be near in a high wind. In much the same manner as most critical engineering projects are safeguarded, broadcast tower construction has always conformed to specific engineering standards.

In the U.S., the joint TIA//EIA-222 standard oversees the design of broadcast and antenna supporting towers. Standards are not static and they are reviewed every five years to ensure that they keep pace with industry demands, safety requirements and new construction methods. Each successive revision carries a capital letter designator. Sometimes no changes are warranted and a revision may last for many years. An earlier revision, Revision C, was kept in use for nearly twenty years before being replaced by a new version. The current Revision F will remain in use until Revision G has been completed and approved by the various industry committees.

The engineering group that establishes the TIA/EIA standards has a two-part job. First they have to ensure that the approved design rules will satisfy the safety requirements of the new and often very sophisticated antenna systems that the new communications world requires. They also have to be familiar with the local and national building codes so that their new revisions are acceptable to these groups.

Revision G will accomplish a number of new things. In the past owners of tall towers have had difficulty in satisfying local authorities, not only about usually unfounded concerns of non-ionizing radiation, but fears of falling towers (plus general dislike of towers).

As presently proposed, the new standard will make several significant changes. Among others the safety requirement regarding climbing, working and the additional load of personnel working on a tower will be covered. The minimum safety requirements will be based on the use of qualified and experienced personnel.

In the field of safety the rather out-of-date design theories of Revision F are about 20 years old. The new Revision will take into account the latest steel design theory based on national building trends.

Tower loading

At the present time any "add on" structures such as FM, STL, cell or similar communication antennas are not considered as part of the original tower in their design, As a result we can expect to find structures smaller than the main FM antennas designed to the same structural limits as the tower itself.. This should help in lowering windage values and possibly in icing load conditions.

RF Engineering

Wind loading on towers is the major consideration when planning a new structure. Ice loading is of course a serious factor in tower design, but it is generally a *temporary* rather than permanent consideration. The effect and control of ice loading will of course also be addressed in Revision G.

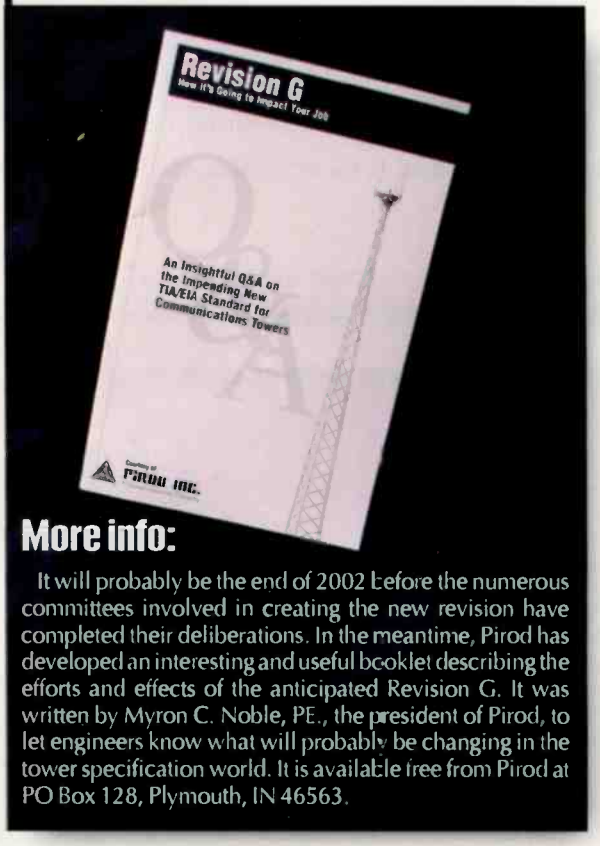
Wind loading is calculated based on wind speed. The government has changed the method of measuring and assessing the effect of wind on towers. At present, wind loading is calculated based on "the fastest-mile wind speed" encountered once in 50 years for the tower site. This means that the wind speed is determined by averaging the highest speed of one mile of wind driving the anemometer at the proposed site. Because the time required to obtain the top speed is variable and depends on wind velocity, high wind speeds require shorter recording time. This can result in incorrect or misleading wind loading figures.

Revision G is expected to base wind loading on the "three second gust wind speed." This will also use the once-in-50-years maximum value but it will be the maximum speed measured for a period of three seconds at the tower site. Basing tower design on the peak gust occurring over three seconds is designed to take the maximum instantaneous loading in account.

Put simply, the old formula allows for variations in the speed during that time. Most of the country's weather services use the new method of measurement of gusts in three second periods. The use of three second gusts provides a broader base for tower designers. A point to remember is that the new and old wind speeds cannot be compared directly because the Revision G wind speed of 100 mph for a three second gust is not the same as a 100 mph *fastest* wind gust speed. The latter value of 100 mph for three seconds would seem to have more effect on a tower than a single short gust of 100mph.

The broadcast engineer's *béte noire* is the ice that comes without warning and drags a tower down. It is most likely that ice will now be included as a part of the tower's mandatory load, and the ice area map will be included. The currently used Revision F only calls for icing to be considered if the tower is in an "ice region." It is felt that this is rather too arbitrary, and the new standard probably will nominate regions where icing has to be considered. Structural requirements will probably be based on ice data plus height of the tower, site elevation and the degree of exposure.

The question that many engineers will probably be asking is: "Will Revision G apply to my existing tower?" If no changes are to be made to the original load specification, and a professional engineer has certified that it was satisfactory, there will probably not a be any effect on an existing tower. But if new antennas, etc. are to be added to an existing tower that will change its loading beyond the original specification, then Revision G will no doubt apply.



More info:

It will probably be the end of 2002 before the numerous committees involved in creating the new revision have completed their deliberations. In the meantime, Pirod has developed an interesting and useful booklet describing the efforts and effects of the anticipated Revision G. It was written by Myron C. Noble, PE., the president of Pirod, to let engineers know what will probably be changing in the tower specification world. It is available free from Pirod at PO Box 128, Plymouth, IN 46563.

E-mail Battison at batcom@bright.net.

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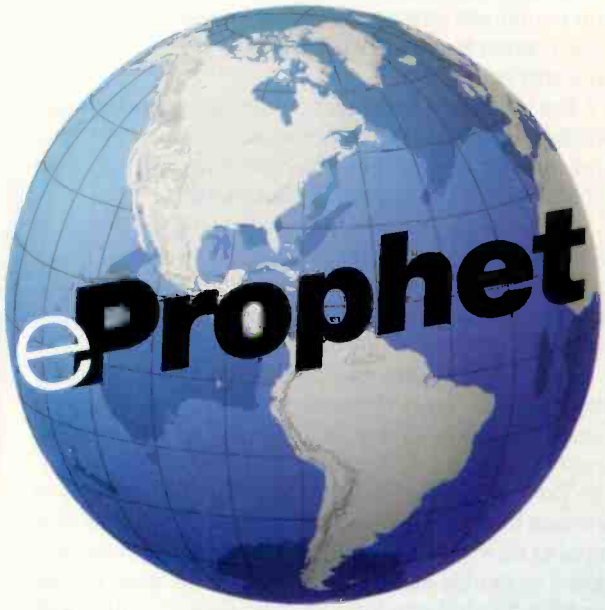

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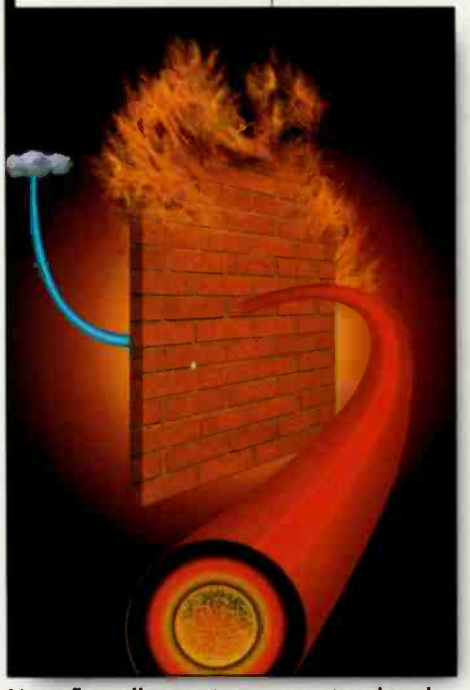
Firewalls and security

By Kevin McNamara, CNE

The Internet provides the best and most efficient means to communicate globally; however, attaching a single computer or group of networked computers to the Internet presents security risks ranging from simple access to personal/company files to total destruction of critical information stored on hard drives. We have read about hackers gaining access into government websites or viruses being spread through e-mails. Any individual, company or government is vulnerable to a security breach. Countermeasures are constantly under development, but hackers continue to find vulnerabilities in PC software and network hardware.



Use a firewall to protect your network and data from unwanted users.

Security issues

The definition of computer security is "the process of preventing and detecting unauthorized use of a computer workstation or server." As a general rule, security issues are most prevalent in computers attached to the Internet with dedicated, full-time connections, but can also become a problem with simple dial-in services.

A government-funded organization called the Computer Emergency Response Team Coordination Center (CERT/CC) tracks intruder activity. It has published *Overview of Attack Trends*, which documents six trends that intruders have used to gain access to PCs since 1988. According to the CERT report (available at www.cert.org), those trends include:

1. An increase in the use of software that permits automated attacks to computer software and hardware systems. The automated attacks involve four phases:

a. Tools that scan for potential victims are more efficient and are more widespread.

b. The same tools used to find potential victims can also identify vulnerabilities as part of the scanning activity.

c. Tools can self-initiate new attack cycles rather than requiring a person to start the process, such as "Code-Red" and "Nimda," which hit global saturation in less than 18 hours.

d. Using distributed attack tools, hackers can manage and coordinate attacks across multiple Internet systems, which permit the efficient launching of "denial of service" type attacks.

2. The tools used for attacks are becoming increasingly sophisticated. These tools are more difficult to detect using antivirus software or intrusion detection systems. These tools possess three important characteristics:

a. Techniques are available that make it difficult to determine the nature of the attack.

b. Instead of defined sequences, new tools can vary the pattern and behavior of the attack either randomly, predefined or controlled directly by the intruder.

c. Attack tools are now modular in nature, allowing portions of the tool to be easily replaced or upgraded in order to quickly evolve and stay ahead of detection technologies.

3. The time to find and exploit the vulnerabilities of software by attackers is decreasing. According to CERT, the number of newly discovered vulnerabilities reported continues to double each year. Software developers are addressing the problem through able patches to their software. It is critical that system administrators understand the vulnerabilities of the specific software used on their network, regularly download and install software updates, etc.

4. Some protocols designed to work with firewalls are designed specifically for the purpose of bypassing most firewall settings. Languages such as Java, JavaScript and ActiveX make it difficult to detect and protect systems from malicious software.

5. Through the use of distributed attack tools, it is possible for an attacker to launch a series of multiple attacks on a single victim.

6. The threat from infrastructure attacks is on the rise. These attacks include:

a. Distributed denial of service attacks where the intruder uses multiple systems to tie-up the victim's network, thus preventing use by legitimate users.

b. The use of *worms*, or specially written code that is intended to self-propagate, typically without user interaction. Viruses are similar to worms but require a user to take some type of action in order to propagate.

c. Attacks on the Internet Domain Name System (DNS). These potential threats may permit an attacker to gain control of a Web domain for the purposes of redirecting traffic to another site or modifying data on the site.

d. Routers form the basis for moving data across the

Internet. Attackers have been able to successfully identify poorly secured routers and use them as a means to generate attacks to other sites or for gathering information.

Another good source for security information can be found at the SANS Institute website, www.sans.org, that, in conjunction with the National Infrastructure Protection Center, has published a top 20 list of potential threats to computers.

Countermeasures are constantly under development, but hackers continue to find vulnerabilities...

Firewalls

In simple terms, firewalls are are designed to prevent unauthorized access by casual and malicious users on the public network (Internet) into a private network. The devices fall into three primary types: packet filter, stateful inspection and the application proxy.

The packet filter is the simplest of the three types. Most common, low-cost broadband routers, such as those for cable or DSL modems, generally posses the ability to filter packets based on the user's requirements.

An enhancement to the basic packet filter is called *stateful inspection*, which permits the evaluation of multipacket flow. An individual connection table is created for each packet stream and then comparisons can be performed across a series of packet streams based on policy established by the firewall administrator.

Firewalls based on application proxy are perhaps the most secure, making servers appear normal to users authenticated on the trusted network, while users outside the trusted network will only see the firewall. The specific IP addresses of networks located behind application proxy firewalls are hidden to the casual user.

The major flaw with firewalls is that they can only protect traffic moving through them. If a user on the private network connects to the Internet in an alternate way, such as a dial-up connection, then security can be compromised.

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

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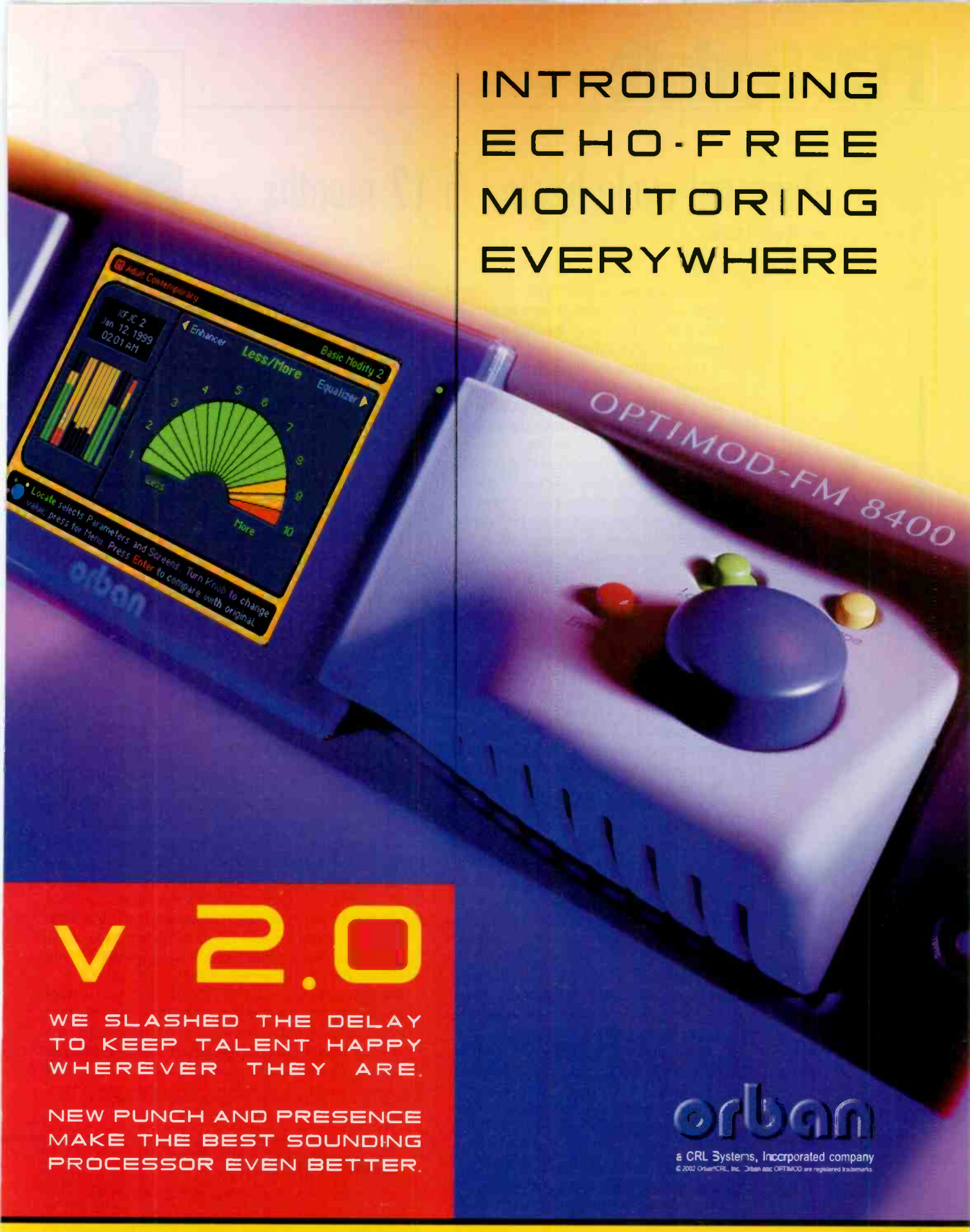

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Renewal cycle begins in 12 months

By Harry Martin

The next license renewal cycle will begin April 1, 2003, with preparations for license renewals for stations in the District of Columbia, Maryland, Virginia, and West Virginia. (The deadline for filing DC/MD/VA/WV renewal applications is actually June 1, but the pre-filing preparations, including the broadcast of pre-filing announcements, cranks up two months before.)

Now is the time to begin making preparations for the renewal process. While the Commission has streamlined license renewals over past years, these changes focus more attention on the regulations that are left. Further, while the yes/no questions about matters such as the public file and quarterly issues/programs lists appear routine, care must be taken that the answers given are correct.

Accordingly, at this time, station managers should check their stations' local public inspection files to make sure that they are complete and up-to-date. Ensure that basic documents such as licenses, ownership reports and information as to signal contours are in the public file. Be particularly aware of record-keeping requirements relating to political broadcasting.

Another related matter is the quarterly issues/programs lists that each radio station must prepare and place in the public inspection file each April 10, July 10, October 10 and January 10. Those reports should list at least five issues of importance in the community and provide a description of the programs aired by the station regarding those issues. The information in the report should include the title, time, date, duration and a brief description of each issue-responsive program.

The renewal application form will request information about compliance with these requirements. Stations not able to respond affirmatively will face further inquiries from the FCC.

Phone call equals fine

As a general rule, most broadcasters operate under the assumption that callers to the studio realize their call may be broadcast. However, that assumption may not always be valid, and a mistake can result in a fine as in the recent case of an FM station. A caller to the studio believed that she was calling the father of an acquaintance. The on-air personality thought the call was a prank and played along. The conversation was taped and rebroadcast. The caller complained to the FCC.

In response, the licensee claimed that its announcer told the caller twice that she had reached a radio station, but it is not clear exactly how or when in the conversation the announcer made that disclosure.

The FCC fined the station $4,000 for violating Section 73.1206 of the rules, which prohibits the recording and broadcast of telephone conversations without the caller's consent. The licensee argued that this situation fell within the exception, explicitly included in the rule, which permits such taping and broadcast when the caller may be presumed to have consented. According to the rule, such consent may be presumed when the caller originates the call and "it is obvious that [the call] is in connection with a program in which the station customarily broadcasts telephone conversations."

FM license revocation

The FCC is seeking to revoke four FM broadcast licenses and several associated translator licenses held by a broadcaster who refused to obey FCC orders.

The broadcaster operates translator stations that apparently do not qualify as "fill-in" facilities because they are outside the main stations' 1mV/m contours. The Commission refused to grant renewals for the translators unless the licensee sold them to an unrelated entity in order to bring them into compliance. The licensee did file for approval of such assignments, and approvals were granted, but the licensee did not consummate the transfers. The Commission then declared that, because the renewals had been conditioned on sale of the stations, and because the sale had not occurred, the licenses were deemed to have expired.

The FCC now has fined the broadcaster $140,000 for illegally operating the translators. Based on the licensee's continuing disregard for the rules, all four full-service and (even the remaining and legitimate) translator licenses were set for a revocation hearing.

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

Dateline:

Quarterly issues/programs lists must be placed in stations' public files on April 10 and again on July 10.

The deadline for filing comments on the FCC's newly-proposed EEO rules was extended to April 15.

Adding multimedia to your radio station Web page provides an immediate way for listeners to interact with your station and staff. Biographies, play lists, event schedules and listener feedback help develop a sense of community among your listeners.

Webcasting

a primer

By Stephanie Parrish Snyder

Online radio listenership has grown over 515 percent since January 2001, according to MeasureCast. Arbitron reports that 35 percent of all Americans 12 and older have used streaming media. Why? Webcasting lets loyal listeners continue to enjoy your content while traveling away from home. It allows you to reach your audience at times you may not have reached them before. Borders and transmitter coverage patterns no longer limit your audience size, so you can reach listeners the next city, next state, or next country over. Most importantly, it lets you continue to reach loyal listeners who are "trapped" in an otherwise impenetrable office building during the day.

Webcasting, or Internet broadcasting, is the process of transmitting your station's signal over the Internet. The technology used in webcasting is called *streaming*. Streaming multimedia allows listeners to hear your station live, just as if they were listening over the air. One more buzzword: *rich media* is an umbrella term referring to streaming combined with web-delivered text, graphics, animation and other content.

Far from being complex and difficult, the process of webcasting is similar to traditional broadcasting models. To demystify the webcast process, let's first review basic radio theory. In traditional radio broadcasting, the station signal is delivered to the transmitter. Next, the transmitter distributes the signal over the air. Finally, listeners tune a radio set to the appropriate frequency to listen to the station (Figure 1).

When a station's signal is webcast, only one step is added to the transmission process. First, the station signal is delivered to an encoder – a piece of equipment that converts the analog sound to a digital signal. Now, the steps are exactly the same as those you already know: the encoded signal is delivered to a server, a computer that acts as a transmitter, which then delivers the digital signal as a stream of packets over the Internet. Finally, listeners tune a computer to the appropriate location to listen to your signal, by typing in the address of your server on the Web, using media player software in place of a radio tuner. (Figure 2).

There is one critical difference between over-the-air terestrial radio and Internet radio: bandwidth. When you distribute a signal over the air, , the signal is one-to-many. In other words, the radio signal is hanging there in the air and any number of listeners (users) can passively receive it. In webcasting, the signal transmitted over the Internet is usually unicast, or one-to-one. This means that each listener (user) connects individually to the server providing the webcast.

When you set up your webcast, you choose the quality level and size of your stream's bandwidth. Internet broadcasts of audio programs are usually delivered at bandwidths for dial-up modems, such as 14kb/s, 28kb/s or 56kb/s.

Some stations offer additional streams that are suitable only for broadband users; these streams simply won't flow through a dial-up connection. Broadband bandwidth is considered to be 100kb/s and above.

The smaller the bandwidth number, the more compressed the signal will be. Higher bandwidth means the signal is less compressed and of higher quality. Normally, an unmodified 14kb/s audio signal sounds like a rural telephone connection, complete with static. A 28kb/s signal sounds similar to AM radio. At 56kb/s, an unmodified stream is similar to CD quality audio played from a basic stereo system. Audio processing can improve the clarity, depth and perceived audio quality, allowing some stations to be streamed at very low bandwidth.

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Webcasting

Fortunately for the new webcaster, most users cannot tell the difference between a 56kb/s streamed radio signal and one streamed at broadband speeds. In fact, depending on your content, most radio stations will find that a 28kb/s or 56kb/s stream will suit their webcast needs quite well.

The next concern in webcasting is choosing the size of your audience. The size of the Internet connection to your server and the bandwidth that you use to encode your signal directly determine the maximum number of simultaneous listeners that can access your webcast. For example: if you stream your signal at 28kb/s, then every user connecting to your server needs a continuous 28kb/s of network bandwidth through your Internet connection. So, if two users are connected at the same time, you'll need a minimum of a 56kb/s connection to the Internet (2 × 28 = 56). If ten users are connected simultaneously, you'll need a minimum connection of 280kb/s (10 × 28 = 280), and so on.

Webcasting can consume bandwidth at a voracious rate. Many stations choose to hire an Internet service provider (ISP) or specialist webcast service provider, called a Content Delivery Network (CDN) to handle their bandwidth needs.

But how do you put your station on the Net? Just as in traditional radio, there are several ways to manage and modify the webcast audio signal. There is also a staggering array of choices on hardware and services that can be used for Internet broadcasting. For the beginner, these choices can be broken down into three different categories: do-it-yourself, hardware solutions, and full-service providers.

Do-it-yourself

For stations in smaller markets or those on a tight budget, do-it-yourself (DIY) webcasting can be an inexpensive solution. In this model, you trade-off the quality of the signal and the number of listeners you can reach to gain the reduced cost.

To create your own DIY webcast, you will need a minimum of two computers, one sound card and an Internet connection. The computers can be somewhat older machines; PCs need to be at least a Pentium II running Microsoft Windows. Macintoshs need to be at least a G3 running MacOS X. The computers used for Internet broadcasting should not be used for running other applications, such as word processors, spreadsheets or browsing the Internet. No special hardware is needed, and an off-the-shelf consumer sound card can be used, placed into the machine that will be used as the *encoder*. Free encoding software can be downloaded from Real (www.realnetworks.com/products), Microsoft (www.microsoft.com/windows/windowsmedia) and Apple (www.quicktime.com).

The second PC (the one without the sound card) will be your *server*. Server software is also available from Real, Microsoft and Apple, however not all

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versions of the server software are free, so read the license agreements carefully. Real has a 12 month server license that supports up to 25 users at no charge. Microsoft's Windows Media server is included in Windows 2000 Server or can be downloaded for no cost for machines running Windows NT Server. Apple's QuickTime Streaming Server is a free service included with MacOS X Server.

The server needs to have a constant connection to the Internet. Many do-it-yourselfers find it is best to place the server at their local Internet Service Provider (ISP), so that they have the bandwidth to support dozens or hundreds of users. It is possible, though, to support a *few* users on a cable modem or ADSL line.

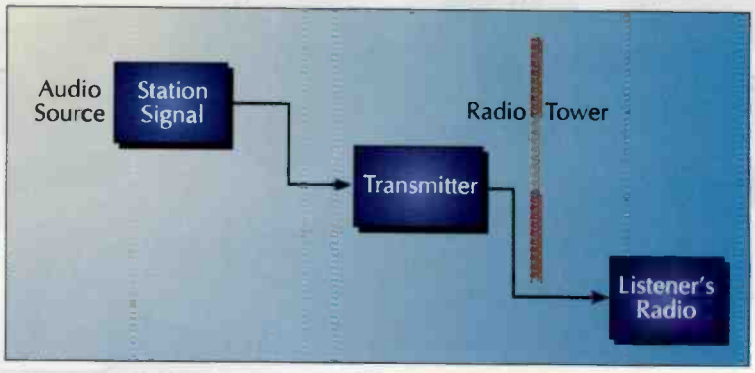

Figure 1. The basic transmission model for over-the-air broadcasts is similar to the transmission model for webcasts.

Hardware methods

When quality and control of the signal are more important factors than price, it's time to consider hardware solutions.

To simplify integration with existing broadcast equipment, manufacturers have developed sturdy, rack-mounted devices with professional-level analog and digital inputs. These devices generally handle at least one of the streaming formats and offer a choice of bandwidth and audio processing options. Some even have options to allow you to run special commercial insertions, so you can run targeted spots for your Internet listeners.

Most of these hardware solutions were created to handle the encoding step of the webcast, so these units still need to be connected to an external server or service provider to transmit your signal to the listener. After investing in high-end hardware, don't skimp on the server and Internet connection; it doesn't matter how good your source audio sounds if no one can hear it.

When choosing your encoding hardware, the key things to ask are what format and bandwidth does the unit support, how will the hardware integrate with your existing systems, and how will the unit connect to your server, ISP or CDN. Telos, for example, offers the Audioactive, an MP3-based encoder that can offer streams in both Real and Windows Media formats, as well as MP3 multicast for intranet networks. This sleek, 1RU unit starts at about $2,800.

Broadcast Electronics developed the WebVault, a combination hardware and software solution. WebVault streams in both Real and Windows Media formats and has proprietary audio processing systems through its e-stream card. The WebVault can integrate with an existing AudioVault system to filter ads for your stream.

Some hardware systems developed for video users may fit larger radio webcasters, or those who wish to include a studio camera image with their audio signal. Pinnacle's StreamFactory is a low profile, 1RU unit that streams in both Real and Windows Media formats and starts at about $9,995. Chyron, of television engineering fame, offers the Clari.Net, a 2RU system streaming in both Real and Windows Media.

If you expect to install a simple solution and leave it running for months on end, a hardware solution may be right for you. Everything comes in one integrated package with one manual and once source for technical support.

Service provider means

If you prefer a full-service streaming solution, or if you need to reach a larger Internet audience than your ISP can accommodate, CDNs are usually the answer. A Content Delivery Network is a special ISP that offers a wide range of webcasting services, including encoding, server hosting and bandwidth management. Stations managing their own encoding process tend to purchase only servers and bandwidth from a CDN. However, some stations choose to hand over the entire streaming and encoding process to the service providers.

Some CDNs offer a "turn-key" solution, where they handle all the details of your stream, from providing the equipment to setting it up and monitoring it for you. This is attractive, as it frees you to focus on what you do best: making good radio. One word of caution: be careful to verify a CDN's offer against their actual capability before signing a contract. The "Dot Com revolution" saw literally hundreds of closet-sized CDNs spring up, each claiming to "The World Leader!" in some small niche in the streaming industry.

Even if you are doing your own encoding by a hardware or a do-it-yourself method, it can still make sense to use a CDN for the delivery of your webcast streams. Mature CDNs have access to larger Internet connections and can help you reach a larger audience more cost effectively, than you could manage by installing or running your own Internet

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Service providers are fee-for-service solutions. While some will accept barter or trade to offset part of the cost, you should be prepared to pay a monthly service fee based on the size of your audience. Fees vary considerably, from a few hundred dollars a month to several thousand depending on the amount of bandwidth you require. Most CDNs also have setup fees and minimum-use contracts. If you are planning to have the CDN provide you with all the hardware and installation to start webcasting, these setup fees can run upwards of $3,000.

Choosing a CDN is like making any other large purchase. Look at the agreements carefully and make sure you understand all the options and add-ons available to you.

Because you are probably choosing a CDN to give you more listeners at less cost, the CDN's network is an important item to examine. To save money, some ISPs and CDNs will oversell their connections to the Internet backbone. They make the assumption that not all of their users will be online at once. Because streaming is a *continuous* service (meaning that once a stream starts, it needs the same amount of bandwidth continuously until the stream ends), make sure that your ISP or CDN can provide you enough *guaranteed* bandwidth at peak usage times to reach your regular audience.

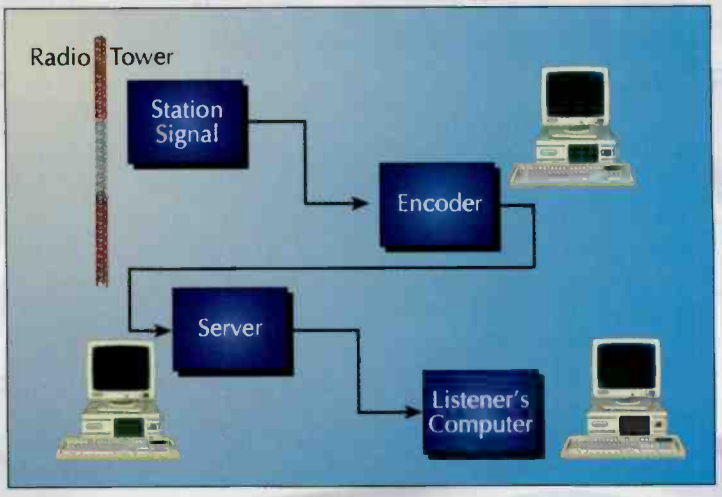
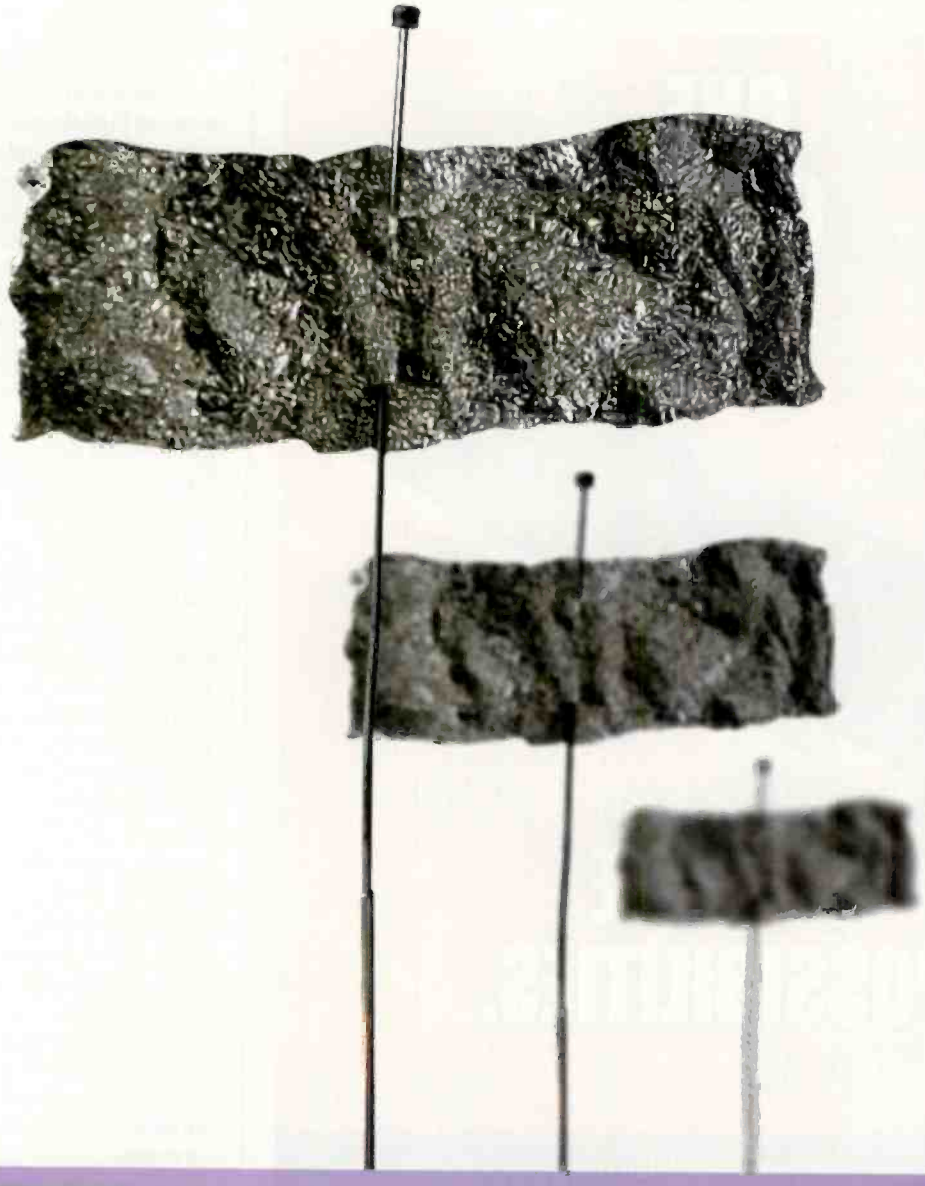


Figure 2. The Internet radio model has building blocks similar to the terrestrial radio model, but with a few additions.

Some CDNs manage and control every server on their network, while others distribute their servers among a variety of partners at different locations. A distributed network model can give you greater access to bandwidth, but the quality of service can be

...still running THIS???



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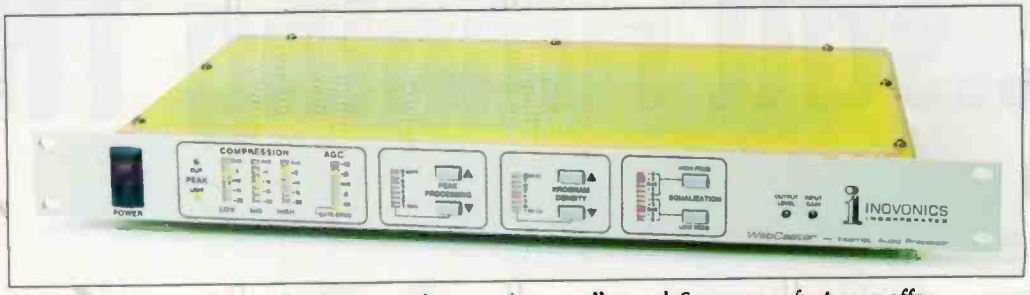

Processing an online audio stream can improve its overall sound. Some manufacturers offer processors designed for the online medium.

inconsistent in some areas of the network as high-demand servers get saturated. In a centralized network model, all of the servers are in one location, so the location of the central site might impact quality of service for remote listeners. Each model has its advantages and neither is truly superior over the other.

Regardless of the CDN's server model, make sure to ask how your signal will be acquired. Will the service provider be able to accept a pre-encoded stream from you, or do you have to use special equipment provided by the CDN? How does the encoded stream reach the servers? Delivering your stream over a public Internet connection can be inexpensive, but you may have buffering or degradation of your source signal. Conversely, a private digital line from your studios to the network costs a bit more, but can provide much more reliable distribution.

Redundancy and backup procedures are crucial when considering a CDN. For example, how does the provider handle power outages, downed telephone lines, and freak accidents? Some smaller service providers have limited response times and minimal monitoring, while larger CDNs maintain 24-hour operations and have a global support plan. Also, be sure to ask how quickly known problems will be repaired.

Statistic reporting is a service offered as an incentive from many CDNs. A variety of statistics on the listeners can be gathered from a radio stream. Data can be accumulated on time spent listening and number of users. Ask what other types of demographic or click through statistics the CDN can provide, if such data is important to you.

Each CDN has a different set of special features they can offer to differentiate themselves. These can include ad substitution, promotion, music titling, or interactive im-

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ages and slides. You may want to experiment to determine which special features work best for your station.

When discussing standard agreements, be sure to understand any exclusivity clauses that the CDNs require. A CDN is like any other business partner; make sure that you're not committing yourself to a relationship that you can't escape.

Many stations forget to consider the cost of success. Ask how your monthly fees are determined (that is, are the monthly charges set in advance or are they based on usage? Is it priced on monthly bandwidth usage, peak bandwidth usage or on a set number of users?). If your station is very popular and you go over your limit, what will happen to your users? Some providers will give your listeners an error message; others will just send you a bill for the extra usage. What will your plan provide?

Despite all the best-laid plans, things change quickly in the service provider market and many service providers have gone out of business in the past year.

Turnkey approaches remove the burden of webcasting from the station.

The "Dot Com crash" of 2001 eliminated many CDNs. As in all Internet businesses, consider your potential partner in terms of their leadership, business savvy and market resilience as well as the allure of their promises.

Some CDNs who specialize in radio station streaming are BNet Radio, Real Broadcast Network, StreamAudio, Broadcastport, Warp Radio and Yahoo! Radio.

What next?

Are you ready to start streaming? One last step to take before putting your stream live is to check your legal rights. Your station's legal counsel should be able to advise you on the details, but be aware that not all syndicated programs, commercial spots or music programs are allowed to be distributed over the Internet. In addition, the Copyright Arbitration Royalty Panel (CARP), in February delivered a report recommending rates and terms for transmission of webcast performances. While this is only a recommendation, it may have effects on webcasters legal obligations in the future.

Finally, weigh your staff's commitment to supporting both webcasting and Internet-based services. Once you begin offering a service, your customers begin to expect that the service will stay as fresh and reliable as you initially make it. Keeping your station on the Internet may require extra long-term commitments from computer and communications specialists, and may even evolve into a full-time requirement, so plan accordingly.

Snyder is an independent streaming media consultant based in Australia.

Web Links:

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Datacasting

By Joseph F. D'Angelo

As the conversion to IBOC nears, the benefits of enhanced audio quality for both AM and FM broadcasts are widely known. However, the ability for broadcasters to transmit a wide variety of data services along with their current audio programming promises to unlock entirely new opportunities for broadcasters.

IBOC system capabilities

Ibiquity's IBOC system has been designed to support the broadcast of data services in all modes of operation: FM hybrid and all-digital, and AM hybrid and all-digital. In the hybrid mode, broadcasters will continue to transmit an analog signal while adding the IBOC signal in the sidebands. Each mode will have different data throughput rates, but in each case a significant amount of data can be delivered representing a substantial upgrade to the existing subcarrier services.

Due to the nature of the FM band, FM broadcasters will have the greatest potential to leverage datacasting opportunities. The FM hybrid mode can deliver up to 150kb/s of throughput. Our current design has the maximum audio rate set at 96kb/s, which would result in 54kb/s being available for data services. This rate, while only a one-way transmission, far exceeds the throughput of other widely available wireless transmission systems at a fraction of the cost. In the all-digital mode, the capacity of the broadcast throughput roughly doubles to approximately 300kb/s, ample capacity to support five-channel surround sound and sophisticated data file transfers.

The AM band is significantly bandwidth limited in comparison, but it will be able to deliver meaningful data services. In the hybrid mode, the AM system will deliver 36kb/s throughput, delivering an *FM-like* stereo audio signal while supporting text-based message delivery. In the all-digital mode, the capacity of the AM system will increase to 60kb/s with the maximum audio rate set at 56kb/s.

Both AM and FM will be able to selectively utilize channels and carriers while at the same time dynamically controlling the audio data-compression rate. Trade-offs between audio and data throughput can be made in real-time as required or preset to support scheduled daypart requirements, ensuring high audio quality while maximizing the datacasting capabilities.

Radio data applications

Broadcasters will be able to provide basic programming information like station identifiers, artist and CD labels and song titles comparable to what satellite radio is currently delivering. This capability will provide the foundation for other message-based services that will enable broadcasters to generate revenue from their datastream with enhanced advertising and information services.

As IBOC receivers advance and manufacturers take advantage of enhanced displays, storage capacity and in-vehicle applications, the utility of an IBOC data broadcast significantly increases. Broadcasters will be able to brand programming for display on rear-seat entertainment units, stream 800 numbers and URLs of advertisers for easy retrieval from a receiver, deliver valuable information inexpensively to a telematics provider's customers and update integrated navigation systems with real-time traffic conditions and location-based advertising. Couple these receivers with a return channel and listeners would be able to complete transactions for concert tickets, CDs or additional advertising information.

While these scenarios may seem futuristic, many companies have already made significant steps towards enabling these services and applications, increasing the value of a broadcaster's data capacity and evolving into a significant revenue stream for stations.

IBOC's data capability will be able to provide enhanced radio services.

Open applications development platform

To ensure that broadcasters and receiver manufacturers are coordinated in the effort to make IBOC datacasting a reality, Ibiquity launched a formal process in October 2001 to develop an Open Applications Development Platform for IBOC. The goal of the IBOC Wireless Data Working Group is to rapidly develop and disseminate a protocol suite that facilitates application development and ensures interoperability between broadcast and receiver technology. Representatives from all major IBOC constituencies are participating in this process including station owners, receiver and broadcast equipment manufacturers, application developers and automakers. The development process is structured in three phases:

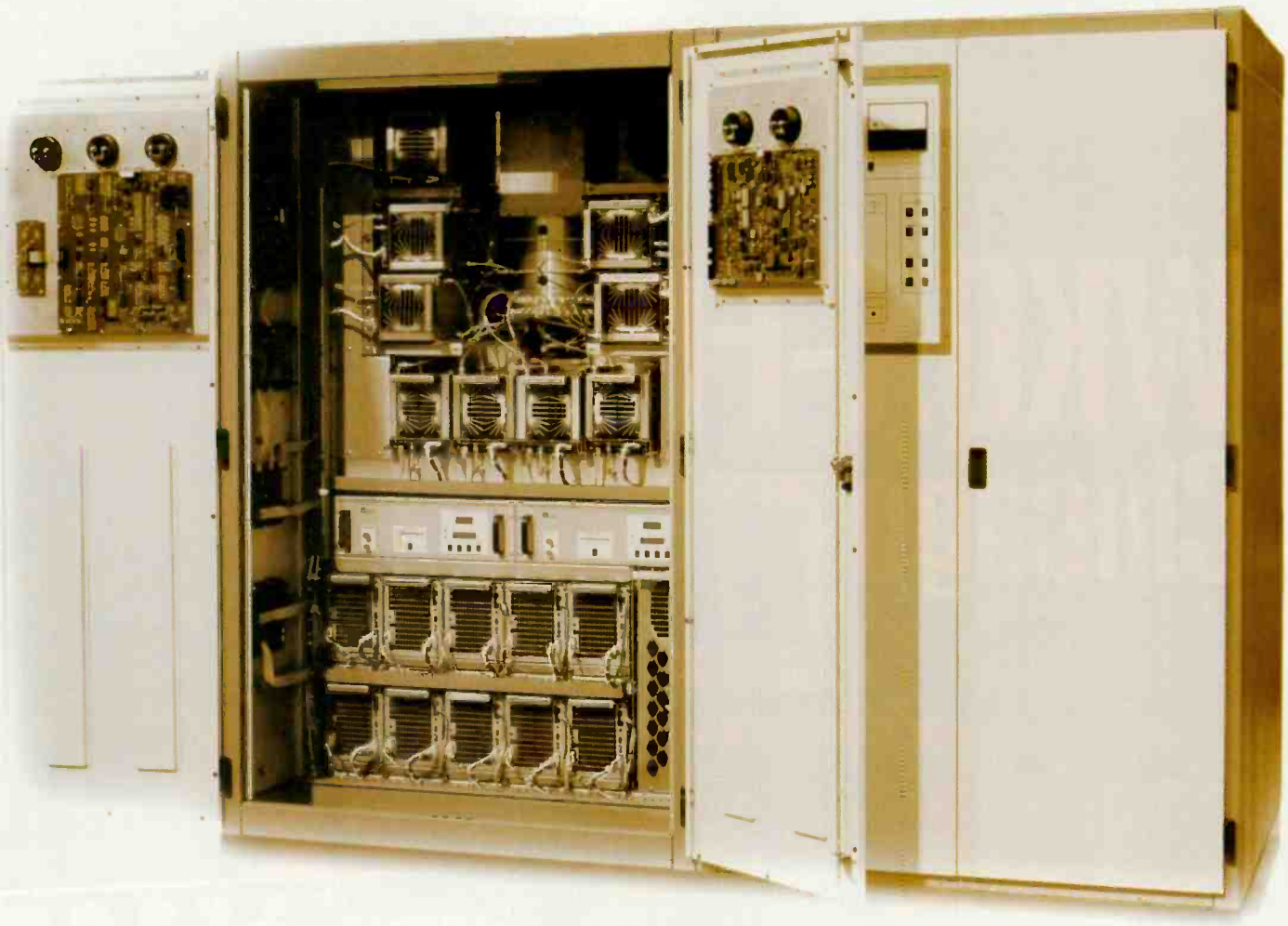
1.) *Use case development*. Identify core applications and functions;

2.) *Device Profile Definition*. Support the core applications and functions; and

3.) *Data Structures and Rules*. Interface to functions and applications.

The first two phases have been completed and the results will be presented on April 6, 2002. Phase 3 is scheduled to be completed in the summer of 2002. This will represent the baseline IBOC application development environment that will be enhanced over time to support new and emerging datacasting applications.

D'Angelo is director, PAC and wireless data business development, for Ibiquity Digital.



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WKQX-FM, Chicago

By Chriss Scherer, editor

It's a brand new facility with lots of new equipment, but it's not all-digital.

The Q101 control room, with room for eight guests, is also the home to the Mancow Morning Madhouse syndicated morning show.

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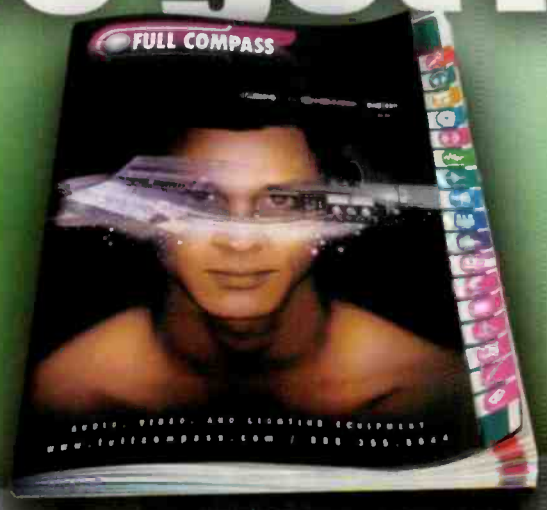

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WKQX-FM, Chicago

When WKQX, Chicago's Q101, looked at building a new facility, it didn't move very far. WKQX first moved into the Merchandise Mart more than 25 years ago and has been moving down ever since.

The station started on the 20th floor when it was owned by NBC. In 1979, the station was sold, and it moved into its own studio space on the 17th floor. It occupied the 9,000 square foot space until 2001, when a larger facility was required. The station moved to the 2nd floor.

The new studio complex occupies about 20,000 square feet. The space has more than doubled and allotted some of the new area to creating its syndicated morning show, Mancow's Morning Madhouse. Production of this morning show was one reason for the facility upgrade.

In addition to the space for the nationally syndicated show, some expansion space is available to allow Emmis to add another station to the facility. There is also some office space for Emmis Interactive.

The main production room handles most of the station's production needs.

Getting started

The six studios were completed in a three-month window. RAM Systems was the systems integrator on the project, and began the work by first running RAM 110Ω digital multipair cables between the studios and the rack room. For this project, RAM designed a digital cable with individual shields and an overall shield because of the potential RF interference. The cables were terminated on high-density, rack-mount QCP punch blocks.

While many facilities are making changes to be as completely digital as possible, Q101 decided to make a partial change. Many sources are digital, but mixing and routing is all analog. Digital-ready cable was installed throughout the facility, but all analog equipment and analog audio signals are used.

RAM furniture was used in all the studios. One design goal was to avoid cluttered workspaces. To achieve this, low-profile utility housings were used in the on-air studio, which was designed for stand-up operation. There are three production studios, one control room, one live performance studio, one news studio and the technical

WKQX-FM, Chicago

The imaging production studio is centered around the DAW, not the console.

operations center. Computer flooring was used to make installation easier and faster.

The main production studio serves the bulk of the station's production needs. It is set up in a traditional radio studio layout, with additional space for extra equipment that may be needed on occasion. The secondary production studio is primarily used for the station's imaging needs with promos and liners. This studio is centered around a DAW with a Mackie 24·8 mixer to the side.

The Lava Lamp Love Lounge is a live performance space that measures 24 feet by 21 feet. The morning show regularly has performers as guests, and this space allows them to perform live on the air. The morning show production studio serves as the control room for the Lounge.

There are two consoles in this control room. The Mackie 24·8 is used for live performances. The

The morning show production studio is also the control room for the live performance studio.

Lounge has junction-box input panels, which feed the Mackie mixer through a patch bay.

A Wheatstone A-6000 in this room serves as the backup on-air console and production console for the morning show.

In control

When you enter the control room, you will likely first notice the great number of guest microphones; there are eight of them. The morning show routinely uses this many mics each day, sometime doubling up on their use.

All terminations from the console and rack room are made in a rack in the studio. All processing and phone system equipment was installed in a locked rack. This rack is near one corner of the air studio. In some production rooms, this rack is built into the furniture.

The morning show also has a syndicated TV show. The cameras placed in the air studio were placed in such a way as to maintain the radio feel.

Looking into the control room are the telephone screener room and the news room, a small studio with some basic editing and news preparation functions.

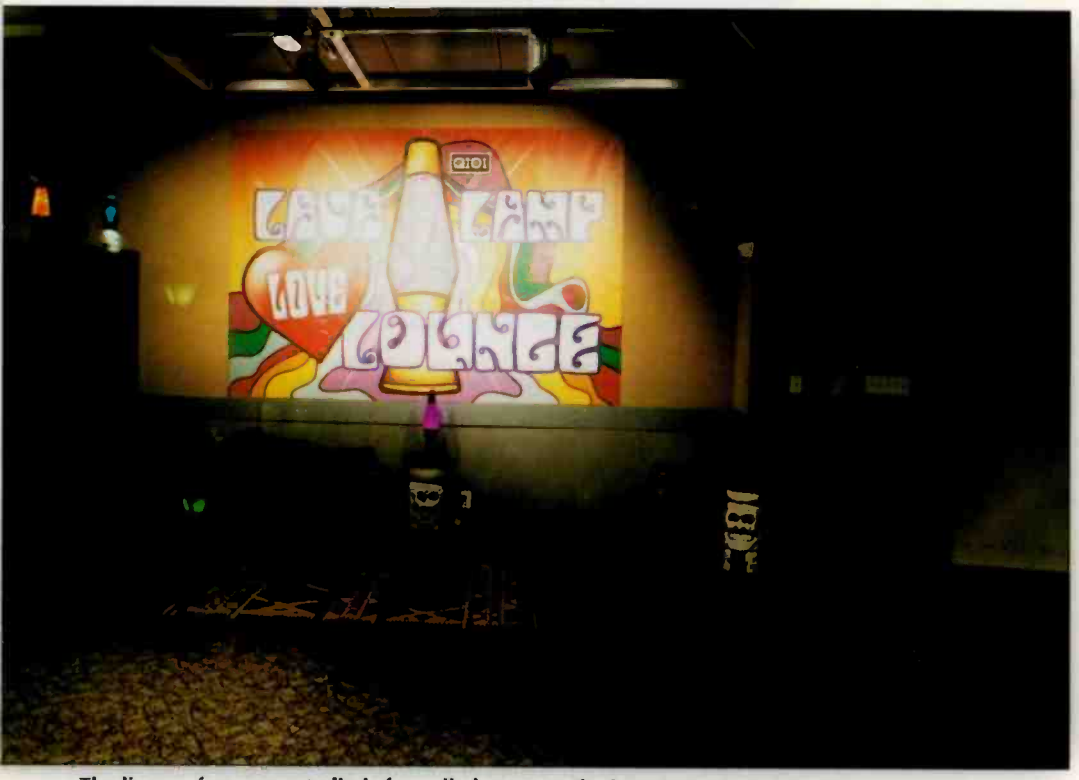
Scott Studios provided the audio storage and playback system. The station chose Scott because the system could be configured to the needs of the station and the Mancow Morning Madhouse show. In addition, Scott created special sets of Hot Keys with larger labels that can be read from a greater distance or without glasses for some of the operators.

In the photos you can see several cart machines have been installed in various studios. These typically see use only during or for the morning show. There are nearly 2,000 carts available for use on air. Like any method developed to handle a large number of audio files, converting this entire library to the hard storage and playback system would take some time, not to mention introduce a completely new way of filing and retrieval. Converting it all in one motion was not practical. It is slowly being converted.

With all the computer CPUs in the TOC, Cybex extenders were used to extend the monitor, keyboard and mouse controls. All the computers are industrial, rackmount versions with hot-swappable power supplies.

The SAS router handles most of the facility's audio routing needs. Each studio has a demarc point in the rack where

WKQX-FM, Chicago



The live performance studio is formally known as the Lava Lamp Love Lounge.

cables are terminated using QCP blocks.

The rack room houses the on-air operations equipment and the office computer network. Sensitive equipment is on a UPS, and a generator covers the technical centers, studios and computer networks.

There is a closed-circuit video system installed through the facility to smooth operations between studios. Each studio has a camera covering the studio. Each camera feeds a video modulator, which is then mixed into the in-house cable system. By changing the channel on any TV monitor, studio personnel can see what is happening in any other studio.

Photos: Large control room opening and lobby: ©2001 Anthony May. Courtesy of Ratio Architects. All other photos courtesy of RAM Broadcast Systems.

Equipment List

Wheatstone A-6000 consoles
Ward-Beck POD1
Telos Zephyr
Technics SLP-1200 turntable
Tascam 122MKIII cassette decks
Symetrix 528E mic processors
Shure SM-7A mics
Shure KSM32 mics
Scott Studios workstations
SAS64000 routing switcher
SAS32000 intercom/IFB system
RAM wire and cable
RAM studio furniture
RAM EM1930 Equipment racks
RAM ADA210A DAs
Panasonic SV4100 DATs
Mackie 24•8 mixer w/bridge
Mackie 24•4 mixer
JBL 4412 monitors
ITC Delta
ITC 99B
Gentner TS612-12 phone systems
Eventide BD500 profanity delays
ESE master clock system
Denon DN-961FA CD players
Denon DN951-FA CD players
DBX1066 compressor/limiters
Crown D75 power amps
Conex AS-110 audio switchers
Burk LX-1 switcher
360 Systems ShortCuts

Scott system details

Air studio
108GB Hot Swap RAID 5+1 array plus parity and hot swap drives
Two 15" LCD flat panel touch-screens for the host and co-host
Phone recorder with waveform editing
Audio preview to cue speaker
Ten cart walls for instant requests
30 sets of 30 hot keys for instant play remote broadcast control
Diagnostics package by modem or over Internet

Production studios

Scott TLC CD Ripper
Sound Forge
9GB hard drive

Image production studio

Wet Voice Tracker

Morning Show production

full backup air studio with 54GB drives

TOC

NT file server with 144GB storage on two drives

Program director's office

Scott TLC CD ripper

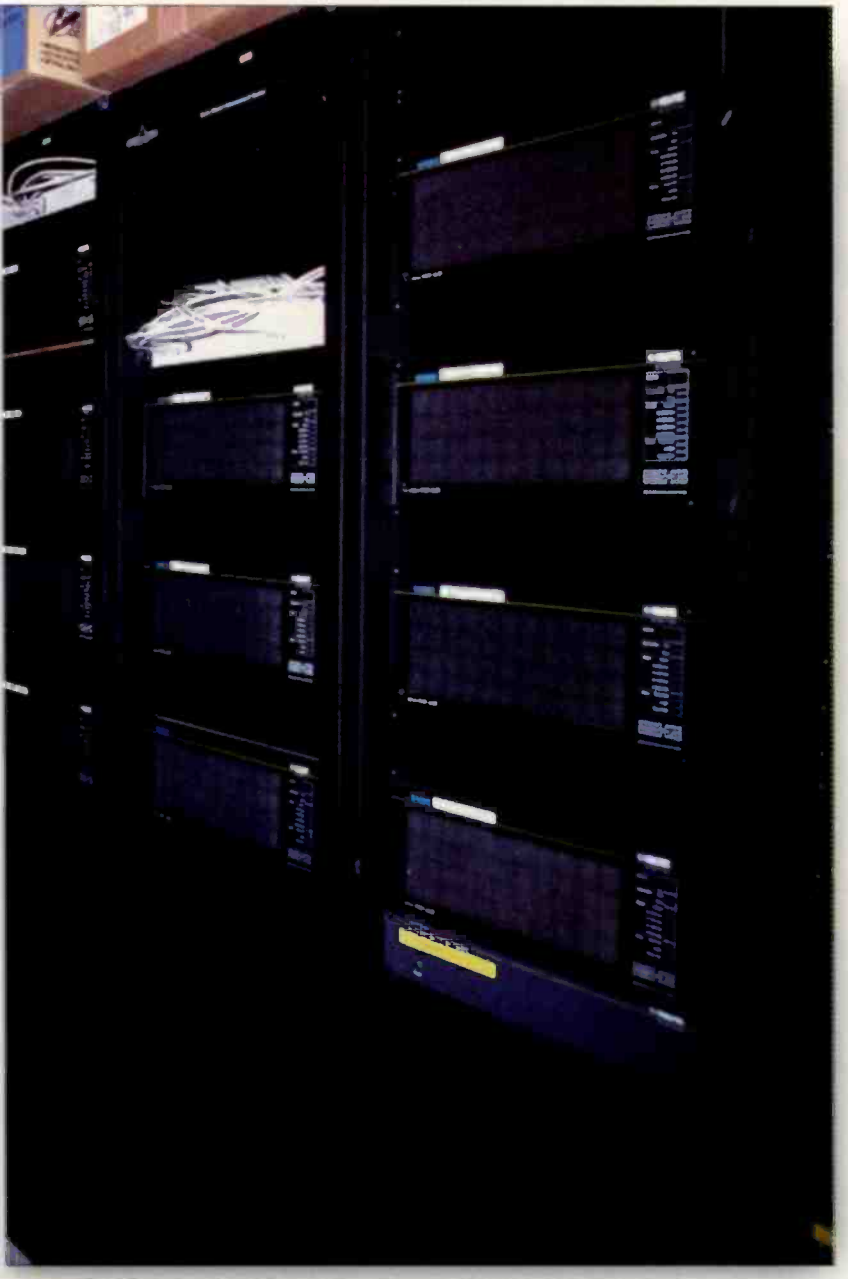
More photos online

See more photos of Q101, including details of the technical operations center, more views of the Lava Lamp Love Lounge, and additional perspectives of the studios in the Studio Spotlight at www.beradio.com.

All about ROUTERS

By Conrad Trautmann, CPBE

The term router has multiple definitions, referring to the interface between a LAN and the Internet, a tool used to smooth and round the edges of a surface, or a piece of equipment used to transport analog or digital audio from one place to another. We're interested in the last definition.

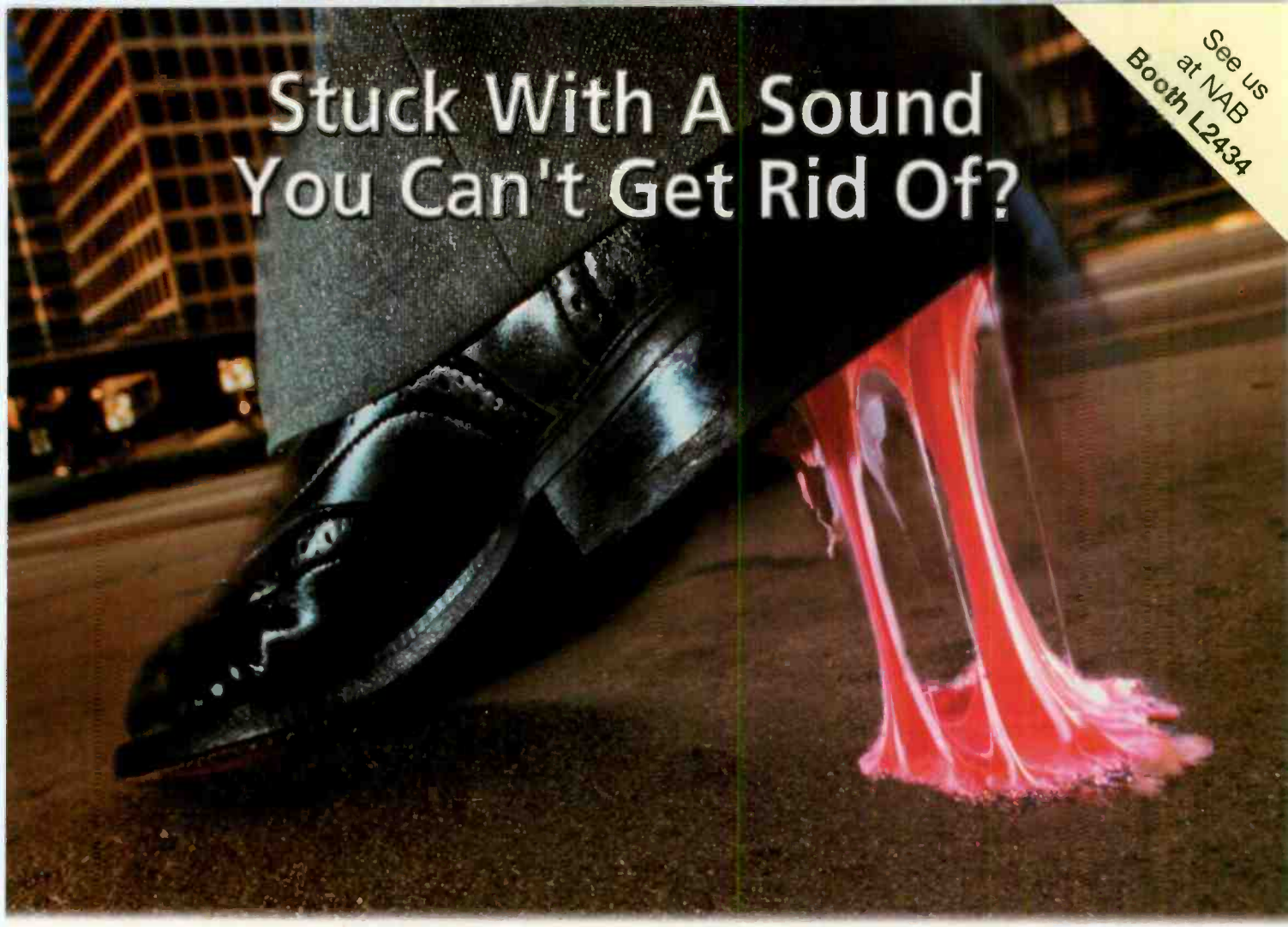


The Klotz Vadis audio routing frames at WCBS-AM, New York.

Beyond distribution amplifiers and patch bays and into the dynamic signal switching capability.

Surprisingly, there are many different companies manufacturing audio routers. Depending on your application, there are few different styles of routers to choose from in varying price ranges. There are three different categories of router design, though some of these do cross over into all of the categories. The first type is the facility router. The second is a stand-alone or small crosspoint switcher, usually smaller than a facility router and used in a studio. The third is what seems to be a trend in studio console design where the audio mainframe of a console can be linked to that of another, creating an audio routing system.

Let's first talk about what most people think of as a traditional router. A facility router or mainframe router is used to get an input or a source to some output or destination. Sierra Automated Systems (SAS) and Wheatstone are popular manufacturers of this variety. In a large radio facility, this type of router can be most helpful. The router is most often mounted in the rack room where sources can be wired to the inputs. Then, outputs are wired to individual studios where a remote control head is mounted, allowing an operator to select the source he wishes. In an air studio for instance, common sources on a router would most likely include anything that comes into the building as a remote: traffic, weather, a sporting arena or even other studios. A router can be a lifesaver in a busy facility when there are more inputs needed than a studio console can accommodate on its own. It can also save wiring labor each time a source changes, only requiring the single input to the router to be changed for it to be available anywhere an output of the router is wired. In a large facility like a radio network or multiple station facility with the number of sources and destinations exceeding what could easily be wired through patch bays and cross connects, a router is a necessity. It can help save space as well, especially in a large facility where space is limited.



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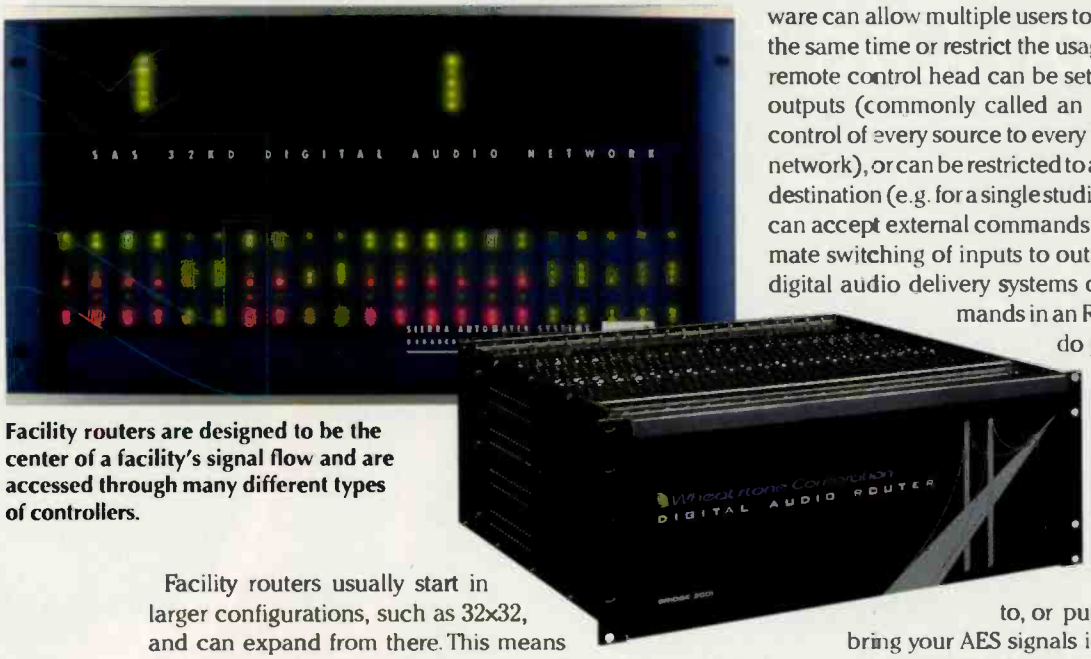
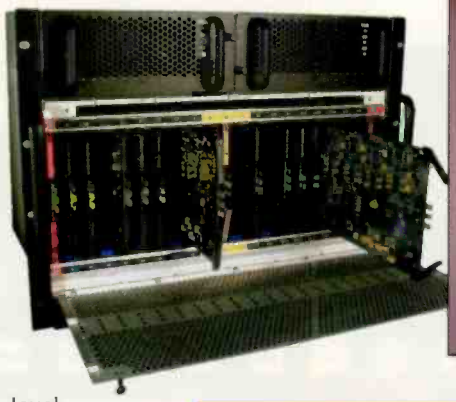
All about ROUTERS



Facility routers are designed to be the center of a facility's signal flow and are accessed through many different types of controllers.

Facility routers usually start in larger configurations, such as 32x32, and can expand from there. This means that the router has 32 source inputs and 32 destination outputs. Most routers of this size offer configuration software that is flexible, allowing you to join inputs and outputs for stereo operation. The software can allow multiple users to access the same sources at the same time or restrict the usage if you choose to. A single remote control head can be set to route any inputs to any outputs (commonly called an X/Y head), giving you full control of every source to every destination (e.g. for a radio network), or can be restricted to access all sources to a single destination (e.g. for a single studio). Serial ports on the router can accept external commands from other systems to automate switching of inputs to outputs. Most automation and digital audio delivery systems offer external control commands in an RS-232 or 422 serial format to do just that.

Most facility routers function in the digital domain. This also offers quite a bit of flexibility depending on the input and output cards you purchase. You can continue to use an analog source if you need to, or purchase digital I/O cards to bring your AES signals in direct. Time division multiplexing is used by most digital routing manufacturers to allow you to synchronize external devices to the router to keep signals in synch with each other, similar to the way television times their video signals. It helps prevent clicks and pops during a switch.



Integration of the router and a facility's consoles is a recent evolution of the technology. Shown here are two examples of audio engines from Computer Concepts and Logitek.

More features, more functions

One of the more recent developments in these routers is the ability to split an AES signal into discrete left and right signals in the router. An AES signal is usually a composite signal (left and right combined into a single AES stream), and in older-style digital routers was switched from place to place as a complete signal. Now, companies such as Lighthouse Digital Systems can split the digital composite signal within the router. This allows you to send the left portion of an AES signal to a different destination than the right if you so choose.

Because digital signals require more bandwidth than analog signals and require a timing reference, these signals are not all that different from a video signal. The benefit of this is that you'll find companies that traditionally market their equipment towards video routing and switching who also have products to route digital and analog audio. So when you're looking at possibly purchasing a new facility router, don't rule out looking at companies like Leitch, Philips and Chyron to provide the right solution for radio. Trilogy Corporation manufactures a facility router that also has intercom heads that integrate the intercom and sources together. In an example of another trend, Trilogy is testing its transmitting voice-over-IP, which uses a dedicated Internet connection to connect intercoms or router heads via a remote Internet connection.

Now that we've covered large facility routers, it leads us to the trend of hybrid audio consoles/router systems. Audio mixing console manufacturers are creating systems that provide a multiple solution product.

Ten years ago, it wasn't unusual to see console manufacturers providing a panel that fit into their consoles that interfaced directly to a facility router. Let's take that idea one step further and make the entire console interface with an external frame of its own that acts as a router. When you consider the function of an audio mixer, it

Stand-alone devices can switch a few sources at a time. Some of these units can be linked or controlled remotely.

is in effect a small, manual router. Allow those console frames to talk to other frames and you can build a system based on a station's individual needs. You have a facility router that interfaces directly to all consoles in the station. The console acts as the ultimate in router remote control. Wheatstone, Logitek and Klotz are companies that are building systems to do this. Telos Systems has designed a control surface that can be interfaced to an SAS facility router (and others, but we'll look at this in a moment) and in effect does the same thing.

With this concept, you can start off small, building maybe one studio at a time, and once you've outfitted a few studios with the same type of equipment, you can link them together, accessing any source to any destination. Linking can be done with CAT5 cable or fiber interconnects. All of this equipment is totally configurable to what you need.

Computer Concepts has moved even a step ahead of that, creating Epicenter. This is a facility router that can use an audio console as the router control surface or uses their software-based digital audio delivery system as the controller. Telos' new control surface will work with Epicenter, as will most of the Logitek models of consoles. Or it can be a combination of both. In addition, Epicenter can mix multiple audio formats and sample rates and mix multiple inputs to a single output. You can also add digital effects processing to the audio through Epicenter such as compression, limiting or delay.

Sized to fit the need

Finally, there are many companies that make small routers that can be used in a stand-alone environment such as a studio. They are sometimes called cross-point switchers. These can be 16×1, 16×2, 8×2, etc. These will most commonly be found in-studio and used to solve some problem, such as running out of inputs on an audio console. You might also use it in a studio that is automating a record in a digital audio delivery system. Most can be addressed using a serial connection. Broadcast Tools has a few different models that are designed for such applications. They can be handy in a studio with a digital audio workstation used for production to route different sources into the editor like a CD player or minidisk machine. Some other companies that make these types of routers include Symetrix, Yamaha, and Henry Engineering. In some cases, depending on the manufacturer, these smaller routers also have an interconnect feature that allows them to talk to others of the same brand, adding expansion capability.

Some of the things to look for when purchasing a router should include:

- Does it fit my application? Identify what you are trying to accomplish before doing anything else.
- Does it talk to other equipment (open architecture), or is it a closed system?
- How easy is it to program (user software), and how versatile is it (can it do everything I need it to)?
- What type of security does it have (to prevent users from accessing things they shouldn't, such as switching an on-air channel by accident or restricting access to certain inputs and outputs)?
- Does it offer the features you need, such as the type of remote control head or the ability to split an AES signal or digital signal processing?
- Can it be expanded? With just cards or are more frames needed? What's the maximum it can expand to?
- What type of redundancy does it offer? Multiple CPU control cards, dual power supplies, the ability to save the database to a file?
- Can it interface to an intercom system or provide IFB?
- Can it work over the Internet? (TCP/IP control or transmission)?

As you can see, there are many different types of routers to choose from. If you plan to start from the ground up or simply rebuild a single studio, there are some decisions to be made. The good news is that no matter what you decide to do, there is most likely a good solution out there for you.

Trautmann is senior vice president of engineering for Westwood One Radio Networks, New York.

Listener-customized webcasting

By Kevin Nosé

Internet-audio streaming is evolving disparately from the traditional radio broadcast model as computer-domain opportunities increase. Allowing the end user to interact with the content of an online experience is one such opportunity, and this interaction is definitely making its mark in webcasting.

Browsing websites has always been interactive to some degree. Following links from page to page requires user input. However, it isn't until the user can send more information that content-based interaction becomes possible. A good example of this would be with a search engine.

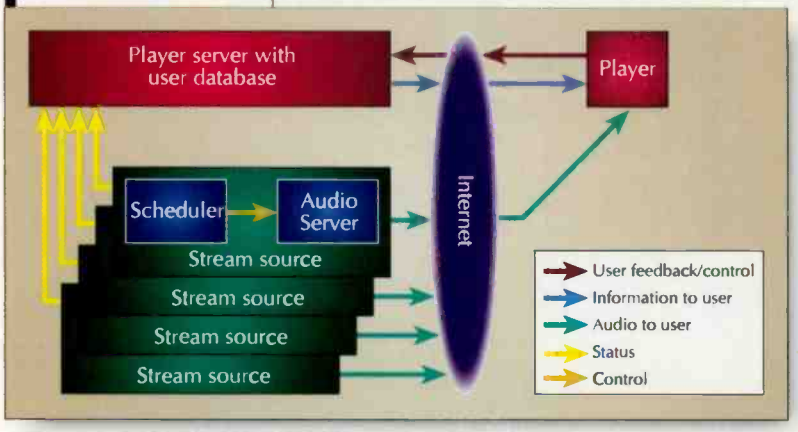


Figure 1. Customizable webcast among various streams.

Online services such as banking, shopping or gaming have even more interaction. These services require the ability to uniquely identify each remote user in a way that lasts between online sessions, unlike the generic search engine example. Preferences that influence how the service operates can now be set once and remembered indefinitely. From the user's perspective, the Internet experience becomes customized at the cost of anonymity.

Looking specifically at streaming audio services, Figure 1 shows one possible arrangement. The player application or Web browser becomes associated with a specific user at the start of a session with a unique user ID. From there, the player is automatically configured and connected to the appropriate audio server. The user listens to one of any number of preselected favorite streams, while the webcasting system uses the information and user feedback paths to provide additional non-audio content to, or acquire feedback from, the listener. It is important to note that the blocks of the webcasting system represent functionality, and that real-world implementations may use any number of computers or other dedicated hardware to create the full system. Spinner and Live365 use this approach.

The webcasting system in Figure 2 uses a slightly different arrangement. The listener has a feedback path that extends all the way back to the scheduler logic, which is able to generate and update a unique playlist for that listener. Again, it is important here that the webcasting system has a user database because each listener's profile must also include scheduler-related preferences in addition to operational preferences. Unlike Figure 1, the audio server here will be generating a unique webcast for each listener in an almost on-demand capacity. One company implementing this method is RCS.

In either system it is important to acquire the proper licensing permissions and pay the appropriate royalty fees to the copyright owners for any program material that is webcast. Currently, a statutory license exists under the Digital Millennium Copyright Act (DMCA) to cover webcasting systems, although it provides a number of constraints that a listener-customizable service could easily violate. The constraint of most interest here is that once the content of an audio stream becomes interactive (as in Figure 2) the DMCA license would no longer apply. It would be up to the webcasting service to acquire individual license agreements from each copyright holder (the record companies).

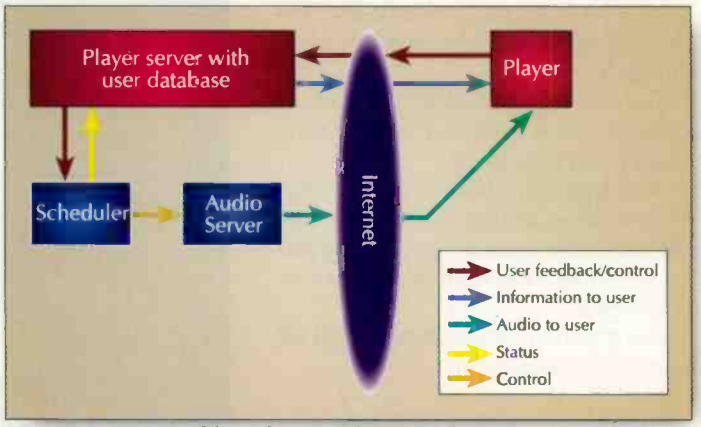


Figure 2. Customizable webcast within a single stream.

Nosé is president of NeoSonic Industries, Cleveland.

Superior Broadcast Products

FM Transmitters

All Power levels 20 watts to 30,000 watts
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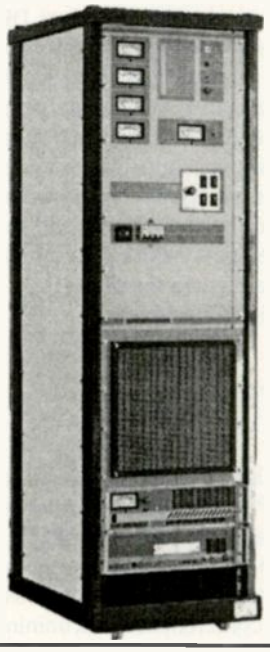

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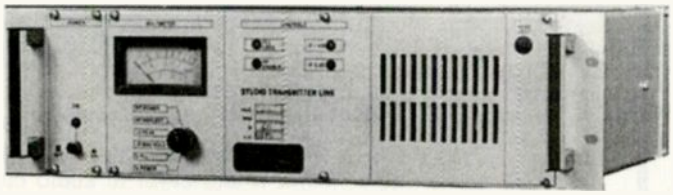

Both Transmitter and Receiver $3,500.00

Transmitter	Receiver
10 watt output	Active band pass filter
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Full Metering	Fast Delivery
Two SCA inputs	Two SCA outputs

One year limited warranty

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Power Levels from 500 to 20,000 watts per bay

One bay	500 watt input	495.00
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Ph. 800/279-3326 • Fax 800/644-5958 972/473-2577

New Products

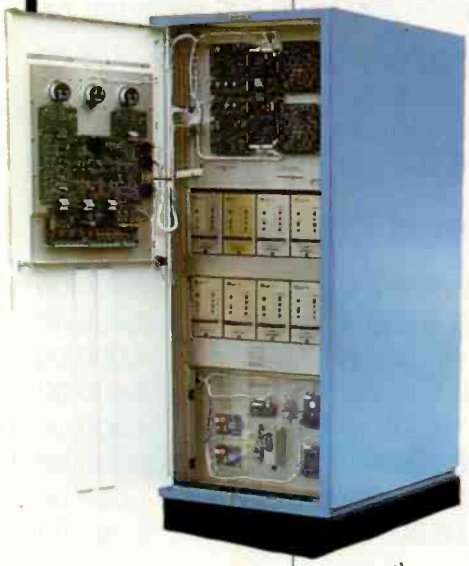
By Jim Saladin

ISDN codec
Telos Systems
Booth L 2251

Zephyr Xstream: ISDN transceiver includes MPEG AAC (Advanced Audio Coding), low-delay AAC-LD, Layer II and Layer III audio coding. An Ethernet port allows for streaming over IP and also networked remote control. Available in a rack-mount version, rack-mount version with mixer (MX), or portable version with mixer (MXP). V.35/x21, Ethernet-only or ISDN-only options are also available.

216-241-7225; fax 216-241-4103
www.telos-systems.com; info@telos-systems.com

IBOC/DRM transmitters
Nautel
Booth L 2323



ND1d to XL60d: A new generation of solid-state AM transmitters with power levels from 1kW to 60kW. Compatible with the Digital Radio Mondiale (DRM) and Ibiquity IBOC digital transmission systems. The interphase pulse duration modulator employs an ultra-linear extended-band filter. The phase and amplitude linearity of these transmitters provide high symbol-to-noise ratio when transmitting the digitally encoded signal. The ND1d/ND5d and XL12d/XL60d transmitters provide direct interface with the new NE IBOC Digital Exciter produced by Nautel under license from iBiquity Digital Corporation.

207-947-8200; fax 207-947-3693
www.nautel.com; info@nautel.com

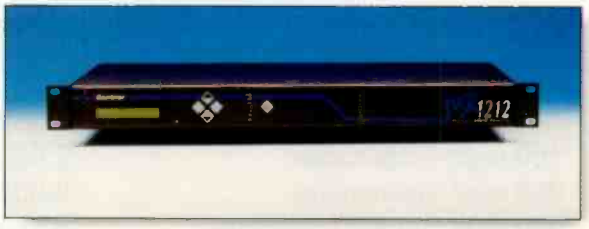
Database management
Netia Digital Audio
Booth L 1932

DBShare: A powerful automatic database access management device that centralizes all connections, meaning that however many workstations connect to the server, DBShare remains the only link between them and the database, lessening traffic with the server. The system secures data redundantly by feeding main and backup databases, automatically restored failed databases and is a statistical analysis tool, providing centralizes all connections, meaning that however many workstations connect to the server, DBShare remains the only link between them and the database. The role of this new device is to optimize connection and lessen much of the traffic with the server.

973-364-7511; fax 973-364-7522; www.netia.fr

Digital matrix mixer
Gentner/Clear One
Booth L 13760

PSR1212: A highly-advanced 12x12 digital matrix mixer with audio processing. The PSR1212 uses an internal macro language and 32 user-definable presets to adapt to a variety of sound reinforcement and room-combining applications in auditoriums, stadiums, theatres, gymnasiums, hotel/convention centers, conference rooms, training rooms and boardrooms. The PSR1212 facilitates local and remote PC setup and diagnostics, logic outputs, and gated



microphone operation. Microphone inputs can be individually customized to gate on and off as you wish, while automatic gain control keeps the overall sound level consistent. Input channels 1 through 8 can be configured as an automatic microphone mixer. The Expansion Bus network architecture allows up to eight PSR1212s and up to 96 inputs, 96 outputs, and 64 microphones to be controlled as if part of a single unit.

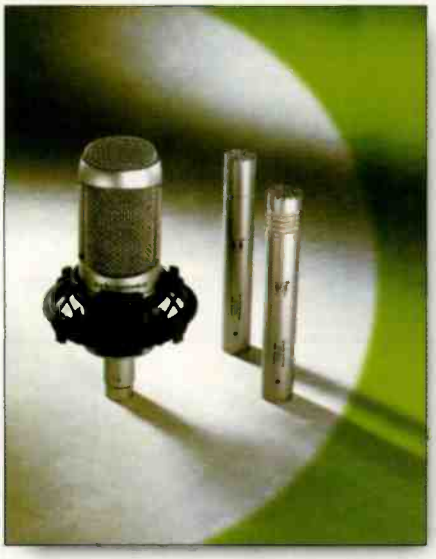
800-945-7730; fax 801-977-0087
www.gentner.com; bcastinfo@gentner.com

Audio processor
IDT Impact Development
Booth L 1963

Digital Link Driver: Audio leveler for any stereo feed. It has an AGC and a protection limiter. Accepts analog and digital signal from 32- to 96kHz and has the necessary algorithms to be totally compatible with a DVP.

+33 472 18 19 20; fax +33 472 18 19 21
www.idt-fr.com; mail@idt-fr.com

Microphones
Audio-Technica
Booth L 2115



30 Series: Three models comprise the 30 Series: the AT3035 large-diaphragm side-address cardioid condenser microphone, and the AT3031 cardioid and AT3032 omnidirectional small-diaphragm condenser microphones. The AT3035 has a fixed cardioid polar pattern and features a flat, extended frequency response (20Hz to 20kHz); SPL handling capability of 148dB (158dB with the 10dB pad); and an element yielding low self-noise (12dB SPL). The AT3035 requires 11-52V phantom power and has a switchable low-frequency roll-off (at 80Hz, 12dB/octave). The AT3031 cardioid condenser and AT3032 omni condenser microphones offer a frequency response of 30Hz to 20kHz; SPL handling capability as high as 148dB (158dB with the 10dB pad); 48V phantom power operation; and a switchable roll-off (at 80Hz, 12dB/octave).

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

Rules service
Rules Service Company
Booth L 1928

FCC Rules on CD-Rom: All the broadcast-relevant FCC rules are available in various packages are available. CD-Rom provides a searchable method of verifying station compliance in an easy-to-transport package.

301-424-9402; fax 301-762-7853
www.ruleserv.com; ruleone@starpower.net

Windows-based transmitter monitor

Burk Technology

Booth L 1923

AutoPilot 2: Using an intuitive Windows-based interface, AutoPilot 2 is enables stations to monitor and control multiple Burk ARC-16 transmitter remote control systems. The new version is a complete redesign of the original AutoPilot for Windows and boasts many usability and reliability improvements. AutoPilot 2 can monitor and control a virtually unlimited number of transmission sites from a single PC and create logs to record all activity. Each ARC-16-controlled site can be accessed by clicking on a tab on the main screen, providing a meter view for all 16 channels. ARC-16s are easily configured with AutoPilot 2's step-by-step setup wizard. Features powerful scripting technology for automation and unattended control. A wizard enables the simple creation of routine scripts. Scripts can also be customized or created from scratch using AutoPilot 2's Visual BASIC Script (VBScript) editing capability.

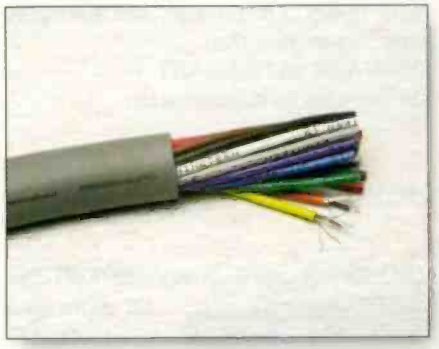
800-255-8090; fax 978-486-0081; www.burk.com; control@burk.com

Multichannel transceiver
Audio Processing Technology
Booth L 3243

E1/T1: Offers end users a cost-effective, low-delay, high audio-resolution alternative to existing technologies. The E1/T1 is based around APT's WorldNet codec range and its introduction supplies broadcasters with a feature-rich product that offers a 5ms delay end to end. The E1/T1 also features full duplex (bi-directional), analog and AES/EBU inputs and outputs, 32kHz, 44.1kHz, 48kHz sampling frequencies, 3.1 sample-rate converter, ISDN back up, alarm ports, RS-232 and remote control I/Os and 16-, 20- and 24-bit audio resolution. 44.1kHz, 48kHz sampling frequencies, 3.1 sample-rate converter, ISDN back up, alarm ports, RS-232 and remote control inputs and outputs and 16-, 20- and 24-bit audio resolution.

323-463-2963; fax 323-463-8878
www.aptx.com; aptmarketing@aptx.com

24-pair cable
Gepco International
Booth L 4929

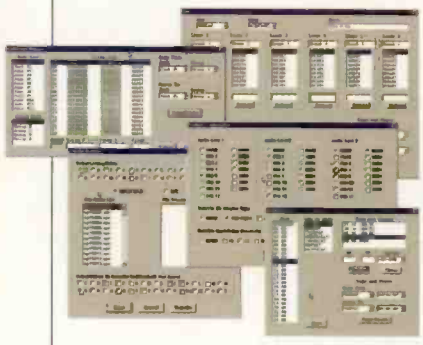


552624GFC: Features an exacting 110Ω impedance, low jitter and attenuation, ease of termination, and flexibility. Pair construction consists of two stranded 26-gage conductors, foam polypropylene insulation, 100 percent foil shield with drain wire, and a color coded and alphanumerically numbered PVC jacket. In addition, each pair also features a non-conductive polyethylene rod that maintains the impedance, lowers the capacitance, and provides structural integrity. The outer jacket is extruded from Gepco's extra-flexible GEP-FLEX compound, which remains extremely flexible in both high or low temperature environments and provides superior abrasion resistance and durability.

800-966-0069; fax 847-795-8770
www.gepco.com; gepco@gepco.com

New Products

System and file enhancements
Pristine Systems



Booth L 3255

RapidFire updates: Four upgrades to the RapidFire system. The Audio File Manager utility was designed for the Windows user to transfer and delete audio files from several workstations (on-air and production) at the same time with a few clicks of the mouse, eliminating the chore of single-file deletion. Rapid.ini wizard is a friendly user interface with easy-to-use menus that can be accessed with a mouse or keyboard. The wizard will assist the user to modify the many different settings for RapidFire. The user interface was created to help the user feel more comfortable in making changes and help reduce the possibility of errors. RapidFire AutoBreaks and Liners wizard will assist Windows users with customizing AutoBreaks and Liners formats for each hour of the day based on the station's format. Helps in scheduling end-of-hour and time-critical AutoBreaks for joining a satellite feed, playing back-to-back music, running a live show or any combination of the three Audio Drops Manager facilitates the process for the Windows users in creating and managing jock profiles for unique Audio Drop presets. Each DJ profile can store up to 90 audio drops for each of the 12 DJ profiles, for instant-play back from the RapidFire main screen.

310-831-2234; fax 310-831-6287
www.pristinesys.com; sales@pristinesys.com

Digital monitor
ATI
Booth L11435

DM200: Accepts loop-thru AES/EBU digital audio data via 110Ω XLR, 75Ω BNC and RCA connectors. A 24-bit, 96kHz D/A converter feeds stereo headphone drivers, balanced audio line outputs and a stereo LED meter. Input sample rates of 32, 44.1, 48, 82.2 and 96kHz are decoded and indicated with a front-panel display. A data VALID light indicates that there have been no data or transmission errors. Bright, stereo, two color LED meters are switchable to the D/A converter output and indicate headroom down from 0dBFS (the digital maximum output of the D/A) in ten 3dB steps. The meters also read the balanced line output level with 0dB midscale equal to +4dBm output. Display ballistics are PPM for optimum indication of audible peaks.

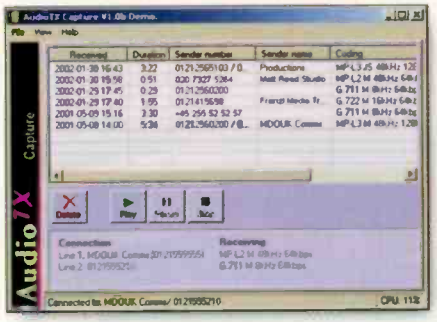
800-959-0307; fax 301-776-8117
www.atiguys.com; sam@atiguys.com

Remote pick-up
Energy-Onix
Booth L 3322

Roadcaster: Any of the assigned FCC frequencies for broadcasters in the 150-170MHz range as well as the 450-470MHz range can be selected from its front-panel display. The transmitter produces an output power of 45W and this system has less than one percent distortion over the frequency range of 30Hz to 7.5kHz. Available in both a portable and a rack version. As an option, the transmitter and receiver can be packaged together in one portable case to provide duplex operation.

888-324-6649; fax 518-758-1476
www.energy-onix.com
energy-onix@energy-onix.com

Unattended
ISDN codec recorder
Audio TX
Booth L 3205



AudioTX Capture: At present, when news reports, commercials or pre-produced audio are sent to a radio station over ISDN, someone has to be present in the studio and take the feed. With AudioTX Capture, the sender just dials the ISDN number of the Capture system with their current ISDN codec and it answers with a polite greeting before recording the audio digitally. The audio is then stored in an on-screen inbox or can even be instantly e-mailed to one or more people in the organization or copied to a location on the network. The software installs on a standard Windows PC and answers calls from virtually any ISDN codec directly and then records the audio received to disk. Audio can be recorded in MP2, MP3 or broadcast WAV formats suitable for import directly into most audio editors and playout systems. These files can also be played back in Capture or using Windows Media Player.

+44 121 248 0200; fax +44 121 256 5109
www.audiotx.com; sales@audiotx.com

Antenna system
Shively Labs
Booth L 3004

IAD-FM: Cost-effective antenna for low-power IBOC conversion aimed at Class A and similar power stations. Produces a digital IBOC signal using a separate antenna, but without requiring additional aperture. Does not require a 10dB coupler to inject signal onto the analog as is done with high-level combining. This means the 90 percent loss to the digital signal and the 10 percent loss to the analog signal is avoided. Requires no additional tower space as the unit allows the digital antenna to be mounted directly to the feedline of the existing full-wave spaced antenna. Will not affect the tuning of the existing analog antenna.

888 SHIVELY; fax 207-647-8273; www.shively.com; sales@shively.com

Portable CD recorder
Superscope/Marantz

CDR300: Designed for stand-alone portable recording, this professional CD recorder offers the functionality of a professional tape recorder, while recording directly to blank CD-R/RW media. Once finalized, recorded discs will play back in virtually any CD player. For live recording, an internal mic is included, or external mic attach to stereo XLR or mic/line inputs. A built-in speaker and headphone jack allows recordings to be monitored. High and low EQ and high- and bandpass filtering can be independently adjusted for each mic/line input in the preset menu. 48V phantom power is available for condenser microphones. The unit also provides manual or automatic level control, limiter, and digital level meters. Track titles can be added using CD-Text. RCA analog and digital S/PDIF I/O is provided on the rear panel. A four-pin DC power input enables the CDR300 to be used with external gel-cell battery packs.

630-820-4800; fax 630-820-8103; www.superscope-marantzpro.com

Multiple processor system

TC Electronic

Booth L 3343

DB-8: Keep production simple and fast using the stereo up-convert facility of DB-8. Disable up-conversion when transmitting, leaving only loudness control and limiting in the signal path. The 48-bit processing of DB-8 ensures pristine audio quality under all conditions. DB-8 features true loudness and ultiband processing, consistent level control across programs and maximum speech intelligibility. The unit offers 8x mono, 4x stereo and 5.1 combinations, and format conversion and flexible routing. The DB-8 allows intersample accurate limiting for maximum sound quality from compression codecs. In addition, DB-8 offers silent update delay adjustments in combination with other processing.

805-373-1828; fax 805-379-2648; www.tcelectronic.com; info@tcelectronic.com

Systems upgrades

Jutel

Booth L20515

RadioMan 4.4: New features to be shown include a Web publishing tool to make all material available online, wide character support for languages requiring wide character sets, a Remote-Controlled On-Air Workstation module set up on any standard RadioMan 4.4 Program Planning workstation. On-Air clocks can be followed without direct control to On-Air, and Newsroom Type Template Management to manage the program templates as well as the daily programs with the same tool, called Line-Up Toolbox. There also are new status indicators both for running orders and for audio items.

+358-8-551 4801; fax +358-8-551 4810

www.radioman.fi; sales@radioman.fi

New Products

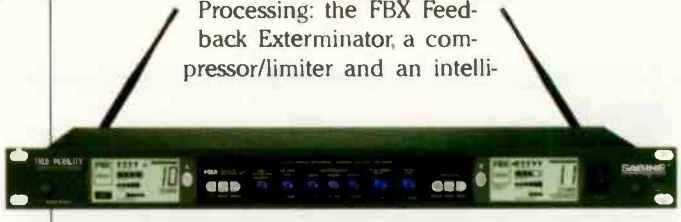
Internet radio product
Loudeye (formerly encoding.com)

Loudeye Radio: Combines custom programming, syndication and ad insertion into a single package. Provides e-tailers, portals and terrestrial radio stations with a custom-branded Internet radio application, delivered as a complete hosted service designed to extend a company's brand and create new sources of revenue. Loudeye Radio adapts proven elements from the terrestrial radio model and enhances them with Internet-only capabilities. Loudeye Radio also provides custom music programming and entertaining radio personalities; ad insertion and verification, an experienced radio sales team to sell ad inventory and generate incremental revenue; a customized, private-labeled radio player with a call-to-action button to fully extend brand and drive simultaneous point-of-purchase opportunities; and a syndication engine to broaden audience reach.

206-832-4000; fax 206-832-4001; www.loudeye.com; info@loudeye.com

Microphones
Sabine
Booth L 2903

SWM-5000 series: Available in one- and two-channel models, these mics include Sabine's built-in Targeted Input Processing: the FBX Feedback Exterminator, a compressor/limiter and an intelligent de-esser. Also included is Mic SuperModeling. A touch of the front panel dial brings up a choice of several well-known dynamic or condenser mic elements. In addition to the added processing, the SWM-5000 series allows users to save and recall up to 10 presets per channel on the receiver. All front panel information is saved in each preset, so custom settings can be retrieved for fast setups, or even on-the-fly changes during the program. Series 5000 systems are available with handheld, lavalier, or headset microphones.



800-626-7394; fax 904-418-2001; www.sabine.com; sabine@sabine.com

Broadcast monitors
Belar
Booth L 2723

AMMA-2: The most recent addition to Belar's line of Wizard broadcast monitors offers high performance, along with full PC-based remote indication and control. Special metering algorithms set at the front panel allow the AMMA-2 to monitor either conventional AM or controlled-carrier transmissions with unprecedented accuracy. The DSP-based monitor operates over both the medium and shortwave bands with harmonic and IM distortion residuals below 0.1 percent at all carrier frequencies, right up to 99 percent modulation.

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Contributor Pro-file

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

Stephanie Parrish Snyder
Streaming Media Consultant
Sydney, Australia

After 10 years in traditional radio, Stephanie Parrish Snyder made the move to webcasting in early 1997, joining the engineering team at AudioNet. As one of the original streaming media service providers in the world, AudioNet provided webcast services to hundreds of radio stations across the US. The company later became broadcast.com and was acquired by Yahoo! in 2000. As senior engineer with Yahoo! Broadcast, Snyder designed Yahoo's production studios, led countless live remote Web events, and has worked in all areas of online broadcasting.

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THE RADIO TECHNOLOGY LEADER

Written by radio professionals
Written for radio professionals

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Editor – Chriss Scherer, CSRE, *cscherer@primediabusiness.com*
Technical Editor, RF – John Battison, P.E., *batcom@bright.net*
Associate Editor – Cindy Holst, *cholst@primediabusiness.com*
Copy Editor – James Saladin
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VP, Audience Marketing Development – Christine Oldenbrook, *coldenbrook@primediabusiness.com*
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Shaping radio today and tomorrow

By Chriss Scherer, editor

Do you remember?

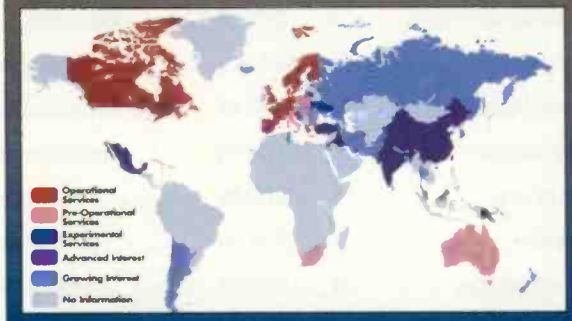
The Cetec Sparta 603 and 605B were on display at the NAB convention in 1977. Both models used a 3CX3000A7 tube in the final amplifier. The transmitters boasted features such as an automatic power control, vacuum-variable capacitors in the driver section, a solid-state, direct-FM 680 exciter with automatic frequency control, full metering of important parameters, tally light fault locators and an automatic recycle. The 603 and 605B were capable of 3kW and 5kW respectively.

In and ad from 1977, Cetec Sparta bragged that it was the only transmitter manufacturer to make both AM and FM solid-state transmitters.

Sample and Hold

A look at the technology shaping radio

DAB around the world



Source: The World DAB Forum, August 2001

That was then

This photo of the air studio for WTAQ-AM, LaGrange, IL, appeared on the cover of *Broadcast Engineering* in November 1969. At 1300, the WTAQ call letters indicated that the station served the "towns along the Q." The "Q" was the Chicago, Burlington and Quincy railroad.

The U-shaped layout was designed to handle both talk shows and "standard DJ programs" as the article details. The solid-state console (another bragging point for 1969) had four pots, with inputs set up for six microphones, five telephone lines, two turntables and a cart machine.

The walls were covered with ¼" thick, veneer plywood, perforated every ½". The space between the inner and out walls was filled with fiberglass insulation.

A single cart machine was mounted in the cabinet just behind the operator. A remote machine control box is to the right of the console and the telephone line selector is on the left. The two microphones are Electro-Voice 666 models.

Today, the station on 1300 is WRDZ.

Can you identify the console or the turntables? E-mail us at beradio@primediabusiness.com and tell us what you think they are.

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