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January 2008
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CONTENTS

ON THE COVER

Saga never expected its facility in Asheville, NC, to become a showcase. But when the need for a modern station arose, that's just what the company received. Read the full story on page 24. Cover design by Michael J. Knust.

Features

Columns

Departments

Wireless Broadband Internet Remotes

"The first time out with the Tieline was a brilliantly simple experience for everyone involved. For lack of a better phrase, the codec just worked."

- **Christian Vang**
  Chief Engineer
  Clear Channel St. Louis

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- **Grady Jeffreys,**
  Technical Manager,
  Mackay Communications

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- **Mike Rabey**
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  Entercom Indianapolis

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CONTENTS ONLINE

Currents Online

Selected headlines from the past month.

FCC Releases 2007 EAS Handbooks

The new handbooks include newly developed guidance for satellite digital audio radio, direct broadcast satellite and wireline video service providers. In addition, the existing handbooks have been updated for analog and digital television and radio stations, as well as cable systems.

V-Soft's Microwave Pro Now Shipping

The company is taking orders and shipping the software application.

Huttenburg Joins Broadcast Electronics as VP

Debra Huttenburg joins as the vice president of business development and marketing. She was was recently vice president and general manager of the radio business unit for Harris.

Osgood to Receive NAB Distinguished Service Award

The award will be presented during the All Industry Opening Keynote on April 14 at NAB2008. Osgood has hosted Sunday Morning since 1994.

FCC Adopts Localism Proposals

The FCC's Report on Broadcast Localism and Notice of Proposed Rulemaking sets forth proposals to increase local programming content and diversity in communities based on more than 83,000 written comments and the testimony of 500 panelists.

Ice Storm Brings Down Illinois Tower

An early December winter storm brought the WJCH tower in Joliet, IL, down to 200ft. The station is currently planning to rebuild the tower.

Arbitron to Delay PPM Rollout in Nine Cities

The delay ranges from 3 to 9 months depending on the market.

Site Features

New Products Extra!

We launched a new e-mail newsletter in November called the New Products Extra! This twice-monthly newsletter is packed with new product announcements, updates and more. Subscribe today and stay informed.

Engineer's Notebook

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One-Stops Help You Find Information

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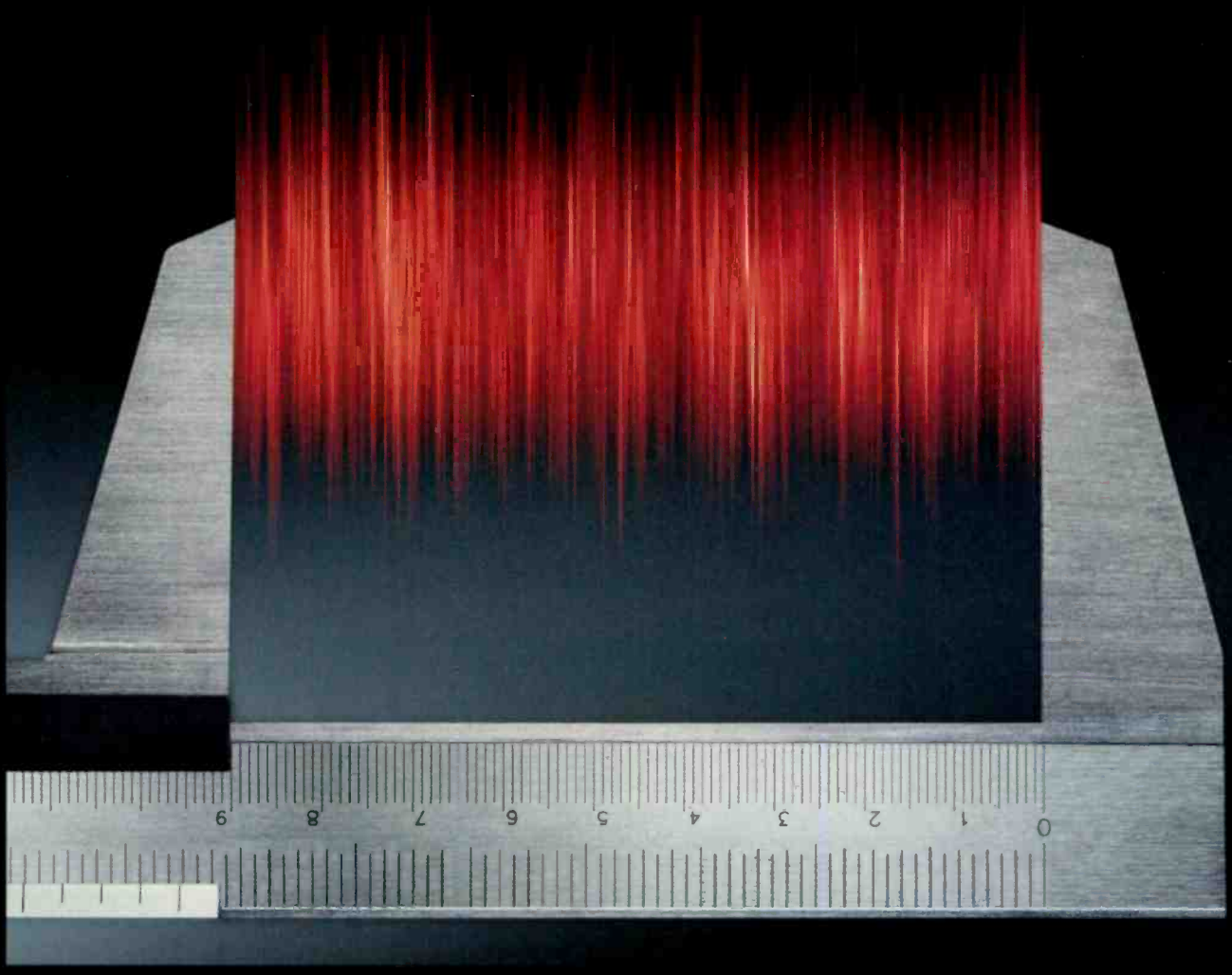

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Problems and solutions

In the eyes of broadcasters, December was a busy month for the FCC. Broadcasting is just one small part of the FCC's concerns, so when several significant rulings are made at once, broadcasters naturally take notice. Two recent actions deal with broadcast ownership while another deals with programming localism. Now that the FCC has acted, there are more questions raised than answers provided.

On the localism issue, the notice of proposed rulemaking is based on information from the FCC's Report on Broadcast Localism. This report calls on 83,000 written comments and the testimony of more than 500 panelists during the FCC's localism hearings that were held around the U.S. I am impressed with the amount of material collected by the FCC, and it would appear that there is a significant problem with the amount of local interest content being broadcast on stations. However, there are many more voices that have said nothing on the matter because I believe they don't really care.

Broadcasters are – according to the FCC – temporary trustees of the public's airwaves and are obligated to operate their stations to serve the public interest, including their airing of programming responsive to the needs and issues of their station communities of license. Can stations provide more programming to fit this perceived need? In almost all cases the answer is yes. The reality is that this type of programming will not likely appeal to the mass audience. There's a reason most of the public affairs programming is buried in the early morning Sunday hours. For more evidence, simply compare the ratings between the local zoning hearing on the cable community access channel to the ratings of nearly any reality show. What does the public really want?

Taking this one step further, TV stations are now required to provide more information on the local programming they provide. This is to help viewers better evaluate a TV station's effort to serve its community. I will not be surprised if this is also applied to radio very soon. Just what we need: more paperwork.

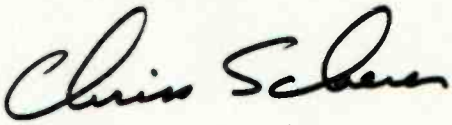
Once again, the FCC is trying to over-legislate the matter. Rules already exist that require broadcasters to serve the public interest. The FCC should enforce what is already in place.

The ownership issues are more complicated. One item deals with lifting the absolute restriction of a single entity owning a broadcast license and a newspaper in the same market. The rule change allows cross-ownership to occur in the largest markets, citing that larger markets have more broadcast and newspaper choices and therefore more natural diversity.

Because there are only so many broadcast licenses available, it's impossible to grant a license to any interest that wants one (although the FCC seems to have an answer for that as well). But anyone can own a newspaper. For that matter, anyone can operate a website or create an Internet audio or video stream. There are opportunities for diversity without restricting a media outlet from being a broadcaster and a publisher.

The ownership item that really confuses me deals with promoting diversity in broadcast ownership. The FCC wants to help new potential licensees obtain financing as well as identify available spectrum. Again, this is a noble goal, but the FCC created the problem itself, and this is a further step at applying a larger bandage to the problem. In one breath the FCC relaxes the ownership rules to allow a company to own hundreds of radio stations. Then it wonders why there is a lack of diversity in ownership. Gee, if we could only understand where the problem lies.

It will be interesting to see what the else the FCC can do for broadcasters during 2008. I expect there will be some changes at the FCC next year when a new president takes office, regardless of his or her party affiliation.



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Put Comrex On The Line.

COMREX

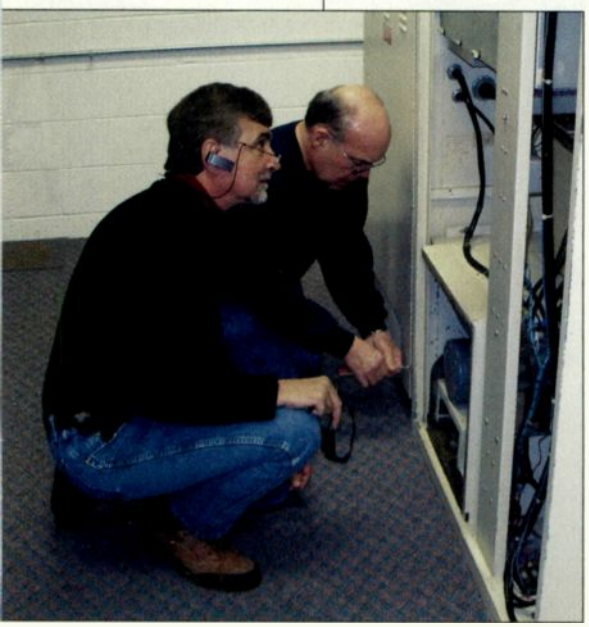
Don't become a statistic

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

Broadcast engineering history includes a number of accidental deaths. By its very nature, working with high voltages, heavy equipment and tall towers, is an invitation to trouble. Since the development of radio transmission, a number of well-known (as well as many relatively unknown) engineers have unfortunately lost their lives through even such lamentable accidents as raising a field strength-measuring antenna into a power line over a measuring truck in the dark.

It used to be said that you could distinguish radio engineers by the burns on their hands and forearms, generally produced by RF when working with transmitters and antenna systems. It seems to me that RF alone was not usually solely responsible for many fatalities in our field.

There are many lists extant of precautions to take before working with high voltage pieces of equipment. Lethal incidents may be more often caused by completely unexpected circumstances than from pure, careless accidents.



Always have a second person present when working around any high-voltage equipment.

Unusual incidents

More than 50 years ago I was director of engineering and general manager of CHCT-TV, Calgary, Canada. Canadian GE was supplying and installing the super turn-style antenna on our 600-foot tower about 20 miles west of Calgary. A fair number of people had gathered to watch and the RCMP was keeping the crowd at least 1,000 feet away from the base of the tower. Just before the antenna raising commenced, one of the riggers asked to ride on the antenna as it was hauled up, in case it fouled the tower or the guys. I said, "No, climb the tower in pace with the antenna."

The winch started and the antenna began to ascend. It rose slowly and smoothly until, when at about 400 feet, a very strange sound was heard. It was a keening, flute-like note, probably around 3 to 4kHz. The winch stopped.

Suddenly the antenna began to fall! I was concerned lest it foul the guy wires or the central mounting pipe struck the tower and brought it down, too. Very quickly the bottom of the pipe struck the footing and the ground. There was a strange puff of red smoke (the red beacon glass had disintegrated upon impact and I could not find a single piece of red lens at the base of the tower) as the pipe entered the ground for about 7' and gouged the side of the footing. The pipe was bent, two antenna sections were wrecked and one damaged. The rigger who wanted to ride the antenna came down the tower looking rather white and said to me, "Thank you."

The hoisting cable had failed due to a kink occurring the previous week when another station's antenna was being raised in Saskatchewan. Apparently no one had been concerned about this. The strange flute-like sound was that of the individual strands of the metal cable breaking at the kink. This was truly an accident waiting to happen.

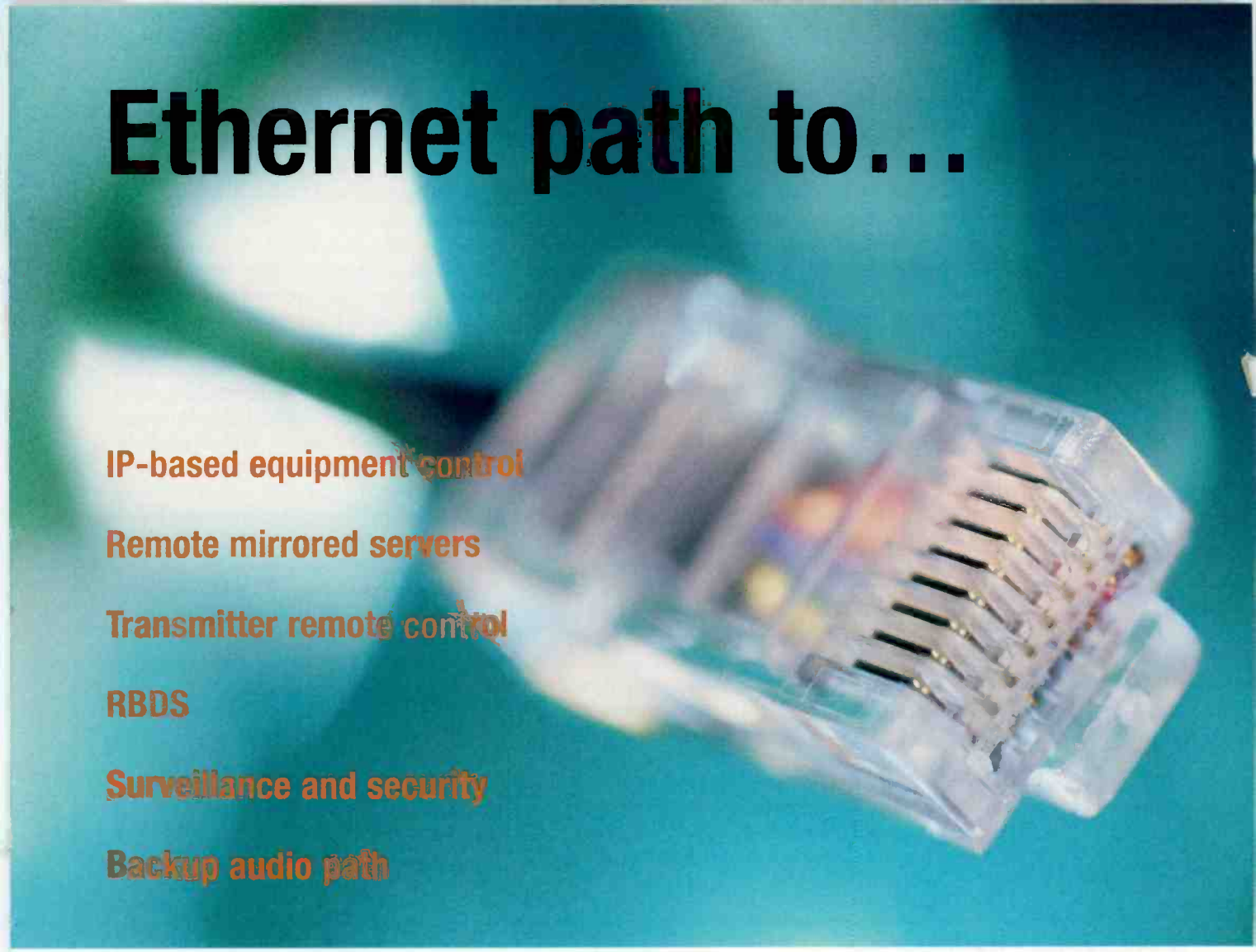
Another potentially fatal accident occurred when we were tuning the transmitter of KAVE -TV, Channel 6, Carlsbad, NM. We had finished installing the transmitter and all the tubes, including a set of mercury vapor rectifiers across the open lower front of the PA cabinet, and applied power. Everything seemed to be working and I was tuning the final.

Suddenly someone hit me on the back of my neck with a baseball bat and at the same time someone else hit me in the groin with another baseball bat. I sank to the floor. There was a smell of burnt clothing and my right knee was very sore. After a moment, I got up, killed the high-voltage circuit and replaced the bottom section of the front of the PA cabinet. This prevented other careless people's knees from contacting the top caps of the 9kV mercury rectifier tubes of the high-voltage supply. I was lucky to be alive. My right hand had been on the metal cabinet and my right knee came in contact with the top cap of a 9kV power supply – good conditions for electrocution.

This next incident was the kind of thing that could happen to anyone, but should not, if all safety rules are followed.

WKYC, 1100kHz 50kW Cleveland, OH, had been sold to WWWE, which was running the original 100kW Westinghouse transmitter minus one modulator and one power amplifier tube at 50kW while waiting for a new transmitter.

Ethernet path to...



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Always verify that no voltage is present before going in.

One morning the phone rang in my office and Charlie said, "John, we've got no audio". At that time we were operating WWWE with local manual transmitter control. I verified that audio was leaving the studio and Charlie, the transmitter engineer, confirmed it was reaching the transmitter. He opined that it was the modulation transformer. I told him I would be right out and to check connections and overall operation, but not to open the transmitter until I got there. I always insisted on two men when working on a transmitter.

About 10 minutes later, I arrived, assessed the situation and agreed that it probably was the modulation transformer. We switched off the transmitter and heard the usual clatter as safety-shorting connections, killed the transmitter high-voltage bus and went to the 25-square-foot high-voltage room. I was carrying the grounding stick and as we opened the door I heard another grounding safety drop into place.

We approached the modulation transformer, which was several feet high with a large four-microfarad capacitor mounted on it. Charlie pointed out the connections to the primary and said, "It looks as though there is corrosion, I bet that's the problem." He proceeded to reach out his hand toward it. I frantically hit the connector with the grounding stick and yelled, "Don't touch it!

There was a blinding flash and a deafening bang as the four-microfarad capacitor, hooked to the top of the modulation transformer, discharged 11kV through the grounding stick instead of Charlie. He turned white.

This near fatality showed the tremendous importance of following standard safety procedures, which include hanging a grounding stick on equipment where work is performed. Charlie went by the sounds of grounding contacts going into place when the transmitter was turned off, and he placed his confidence in the completeness of the high-voltage grounding procedures. He didn't remember that when some components and circuits fail, other capacitors and circuits could be left energized because of incomplete grounding.

The best way to become an old experienced engineer is to assume that every circuit is hot until it is grounded at both ends.

E-mail Battison at batcom@ohio.net.

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FCC Adopts Protections for LPFM

By Harry Martin

In a move designed to enhance the long-term viability of low-power FM stations and encourage new voices, the FCC has adopted and proposed additional rules, which will afford LPFM stations quasi-primary service status and provide other benefits. While these new rules will advance the FCC's stated goal of protecting LPFM, they also represent a significant departure from previous policies under which LPFM was a secondary service subject to displacement by full-power FM stations. The following changes were made or are proposed.

In the area of ownership, the transfer of LPFM station licenses will now be allowed, subject to certain restrictions. Under current policy, LPFM stations can be transferred if the seller does not make a profit, and if the buyer is a local entity and has no other media interests. It is expected that this policy will be put into the new rules. Moving in the opposite direction, the Commission is also reinstating the rules that require all LPFM licensees to be local and limit LPFM owners to a single station.

Dateline

February 1 is the deadline for submission of biennial ownership reports by radio stations in Arkansas, Louisiana, Mississippi, New York and New Jersey.

On February 1, radio stations with more than 10 full-time employees that are located in Arkansas, Louisiana and Mississippi must file their Broadcast EEO Mid-Term Reports (Form 397) with the FCC. These reports must now be submitted electronically.

Also on or before February 1, radio stations in the following states must place their annual EEO Reports in their pubic files: Arkansas, Kansas, Louisiana, Mississippi, Oklahoma, Nebraska, New Jersey and New York.

The FCC will no longer permit the practice of airing repetitious, automated programming and counting it as meeting the local origination requirement for LPFM operations. Further, in a move that might alleviate the problem of coming up with local programming, the Commission has also encouraged voluntary time-sharing agreements among LPFM applicants and stations.

Interference rules

Most significantly, the FCC has adopted new interference rules governing LPFM. For the first time, interference caused by subsequently authorized full-service stations will be subject to limitations. If a new or modified full-power FM station is built as authorized but receives interference from an existing LPFM station, the LPFM licensee will now only have limited responsibility to resolve the problem. In addition, the Commission has put in place a procedural framework for considering short-spacing waiver requests by LPFM stations and a going-forward displacement policy for LPFM. In some circumstances the FCC may even deny an encroaching full-service application to protect an incumbent LPFM.

Relatedly, the Commission imposed an application cap of 10 on still-pending FM translator applications filed during the 2003 window. Since FM translators use the same spectrum as LPFM stations, those translator applications are in the way of future LPFM stations. In an effort to clear some of that spectrum for LPFM use, the FCC will require applicants with more than 10 translator applications to pick their best 10. The rest will be dismissed.

In the rulemaking proposal adopted simultaneously with the rule changes described above, the Commission has tentatively concluded that full-service stations must provide both technical and financial assistance to any LPFM station that might receive interference by a new or modified full-power station. The Commission has also reached the initial conclusion that for LPFM it should use the contour-based protection methodology in place in the translator service. This will have the effect of expanding the opportunities for new LPFM stations.

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

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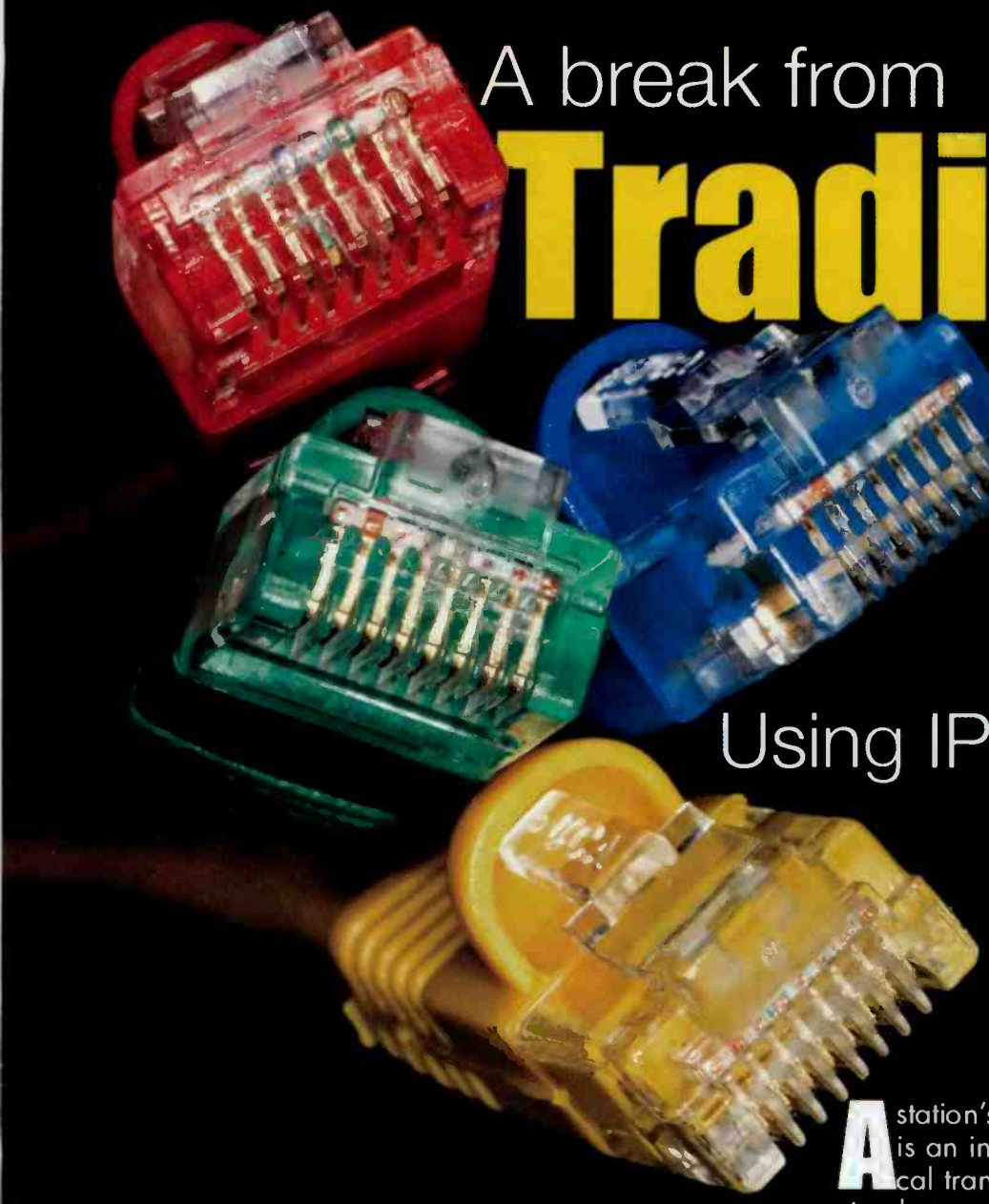

A break from Tradition

Using IP for an STL

By Doug Irwin, CPBE AMD

A station's studio to transmitter link (STL) is an integral part of its mission-critical transmission system – linking the site that generates the program material to the transmitter location itself. As such, the quality and reliability of STL equipment has always been of paramount importance. One critical aspect of an STL system has historically been lack of contention in its use; in other words, the facility wasn't shared in any way. If you had phone lines, they were yours and yours alone; if you used a radio frequency, it was licensed and coordinated among other users so the negative effects of interference were mitigated.

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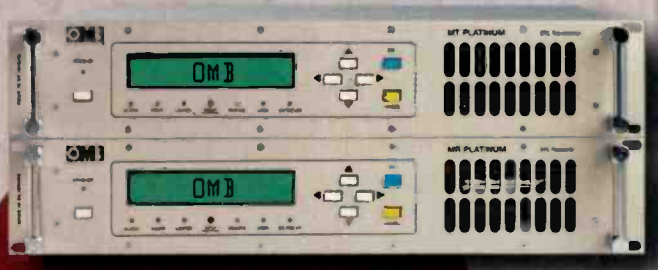

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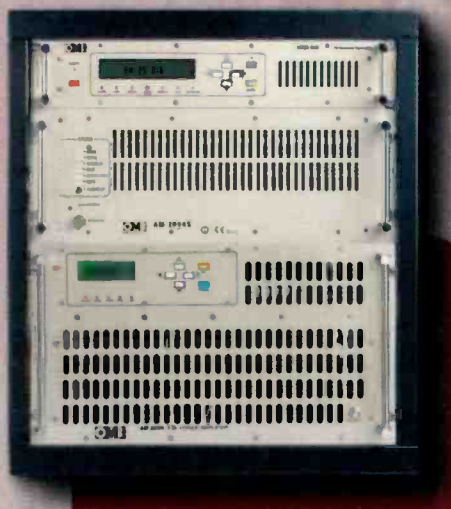
>1GHz is a high-performance Studio-to-Transmitter Unit. It is made up of the 5W MT transmitter externally synthesized in 10MHz sub-bands with a step of 100KHz, and the MR double conversion receiver, that is externally synthesized, too. The MT is microprocessor controlled, and includes LCD display for the visualization of the most relevant transmission parameters (frequency (6-digit), forward and reflected power, modulation level), balanced Mono, Stereo (MPX). The MR receiver has the same visualization system as the transmitter. It includes balanced Mono and Stereo (MPX) outputs. Furthermore, the MT/MR Platinum STL includes a jumper in order to get a proper operation with digital signals.



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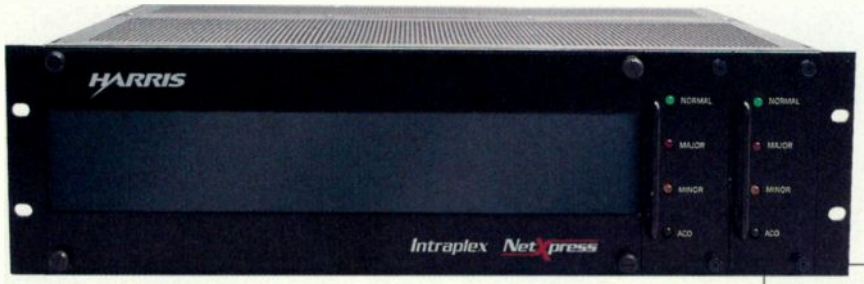
The cellular telephone system came in to wide use in the early to mid-1980s and many changes manifested themselves at mountain-top transmitter sites and other tower farms. Telcos began installing high-capacity data circuits via fiber optics, and the obvious result was the availability of more and more tributary data circuits, such as T-1s. The nature of the installations made them very reliable and the introduction of STL systems that used this new capability (notably Intraplex, Graham-Patten Systems and QEI) allowed more and more radio stations to take advantage. These STL links were still non-contentious in that the radio station had the private use of all the timeslots that were paid for. The STL systems were all based on time domain multiplexing (TDM).

APT Oslo



Harris Netxpress

In the mid- to late 1990s, usage of the Internet (which we all referred to as the World Wide Web in those days) began to take off. It became common to use the Internet to retrieve technical manuals and e-mail; so it wasn't very long before broadcast engineers began getting their networks extended to the transmitter site via WAN. Intraplex made it particularly easy to extend Ethernet from a studio to the transmitter site with the DS64NC card that could be used in its T-1 shelf.

From there it snowballed. Network access from the transmitter site to get on the Internet wasn't enough. Then the RBDS encoder was placed at the transmitter and accessed via Ethernet. Then more bandwidth was needed for the HD Radio system. Then the station added a webcam and a remote control with SNMP to send e-mail messages if something went wrong. Need I go on? We are bandwidth hungry.

Practical connections

If you go this far – adding a high bandwidth LAN or WAN connection to your remote transmitter site – the question of using some of it for yet another STL system soon arises. Likely it is a completely separate system from the main (non-contentious) STL system. How practical is it to use an IP-based STL system, one that contends with other users of the same bandwidth?

It is practical, but within the limits of the available connectivity. If you are using a contentious network then you can expect far less performance than you would from your own private network (that may still be built on top of a TDM network, of course).

And while the telcos are making use of IP technology to use their bandwidth more efficiently (or economically), I'm not suggesting that is the reason for using an IP-based STL. If you have a high-bandwidth WAN connection at the transmitter site anyway – with enough room (i.e., data bandwidth) left over – then this is something to seriously consider. Let's take a look at some of the products available to do just that.

A fairly new player in the STL field is APT. Its most sophisticated and capable product is known as Oslo. This 3RU product is comprised of a frame into which various modules are placed in order to achieve the functionality needed. The basic modules are power supply (redundant power supply module is available) and the MCU (or controller) module. The MCU communicates via Ethernet, and is controlled locally by way of GUI software installed on the user's computer. The far end is then communicated with via in-band management over the particular type of data connection, which can be via (non-contentious) TDM (either T-1 or E-1) or via IP with the appropriate interface module. Plug-in audio modules can be of the simplex or duplex variety; analog or AES flavor.

We are bandwidth hungry.

Enhanced Apt-x, MPEG layer 2, J.57, J.41 or linear audio (32- or 48kHz sample rate, 16-bit word) are the options for encoding the audio. Using the IP interface, an audio stream can be generated that corresponds to each of (up to) seven stereo audio pairs; likewise, up to seven stereo audio pairs can be received via streams and outputted on the appropriate modules. Duplicate streams can be sent to an additional 10 clients.

Harris/Intraplex is well-known in the STL field. A fairly new product is called Netxpress, which basically uses the same form-factor as the legacy T1/E1 shelf. This unit accepts the current line of Intraplex audio, video and data modules, and connects to the far end via IP. It has a total payload bandwidth of 8Mb/s and can accommodate up to 32 data streams (point-to-point unidirectional or bidirectional; or point-to-multipoint unidirectional multicast). It comes with a network management system that allows the user to control the packet size on a per-stream basis; a packet-jitter buffer that allows the user (also on a per-stream basis) to minimize the negative effects of issues such as packet delay, and the restoration of out-of-

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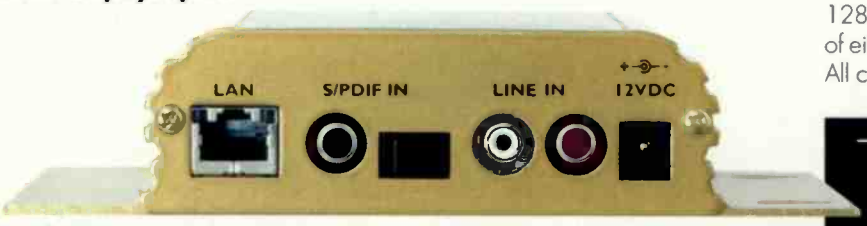
sequence packets; priority tagging, which can be used to give audio stream payload packets a higher-priority; and finally user-adjustable forward error correction (FEC) that is used to help the far end rebuild lost or dropped audio packets. Network statistics are available for current and cumulative packets sent, received, lost and delayed on a per-stream basis.

Musicam Suprima

Telos Zephyr Iport



Barix Instreamer

Musicam offers the Suprima-a 1RU, two-channel analog or AES interface audio codec (full-duplex). Communication with the far end is accomplished via ISDN or IP. Compression algorithms supported include MPEG 1/2 (layers 2 and 3), AAC LC, AAC LD, Apt-x (standard and enhanced), uncompressed PCM, G.722 and G.711 (with echo cancellation). The two channels can operate completely independent of one another if the compression algorithm is G.711, G.722 or MPEG. The send and receive directions can use different algorithms. Auxiliary contact closures are available in all MPEG modes. IP protocols supported include TCP, UDP and real time audio streaming. The Suprima has a built-in Web server so a browser can control it remotely. I don't want to forget the front-panel headphone jack that can be used to monitor audio in either direction. That's always a handy feature.

Telos is making its presence known in this field and has recently introduced the Zephyr Iport. This 2RU device can send eight stereo audio feeds over IP networks. It uses the Livewire standard for networked audio over Ethernet and typically would be part of an Axia IP audio network. (If the unit isn't part of an Axia IP-audio network, use of the Iport will require the acquisition of an Axia AES or analog audio node.) Compression algorithms include AAC LD, AAC and MPEG 3 (layers 2 and 3). Full configuration, and remote control is done via the embedded Web browser.

Perhaps you want to ease in to the whole audio-over-IP technology; if so then the product line from Barix may be exactly what you are looking for. The Instreamer 100 is a small, stand-alone audio encoder that connects to the far end via IP. It makes use of the MPEG 3 compression algorithm (16 to 48kHz sample rate, up to 192kb/s variable bit-rate) with stereo audio, RCA inputs or coaxial or optical S/PDIF. Control is accomplished via embedded web browser or RS-232. The complementary decoder is the Exstreamer 100: This unit will decode MPEG 3 (up to 320kb/s fixed or variable bit-rate) or Windows Media encoder (up to 384kb/s). Audio outputs are delivered via RCA connectors; control is done via embedded Web browser or RS-232.

There are several other players to consider – some that you may have not previously thought of. The first is a company well known for making transmitters: Energy Onix. Its offering in this field is the Tele-link III. This is a single-rack unit codec built on top of a small industrial computer running Linux. Audio inputs and outputs are balanced analog; the network connection is handled through an RJ-45, connecting at 10 or 100Base T. The necessary data rate is 128kb/s for 48kHz sampling, with a 16-bit word, by way of either the MP3 or Ogg-Vorbis compression algorithms. All control is done by way of the front panel.

Resource Guide

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A break from **Tradition**

Energy-Onix Tele-link III

MDO UK Audio-TX STL-IP

> Having LAN and/or WAN connectivity at a transmitter site is becoming more and more common

MDO-UK also has a single rack unit solution for audio over IP. Its product is known as Audio-TX STL-IP. Audio inputs and outputs are done by way of balanced AES. The unit will accept wordclock. The codec can generate up to six streams, while receiving audio from one remote location (TCP/IP, UDP or UDP multicast). Audio can be sent in an uncompressed fashion (assuming bandwidth can accommodate it) or at reduced data rates making use of any one of the following compression algorithms: MPEG 2 layers 2 or 3, ADPCM, AAC, AAC-LD or AACPlus. FEC is built-in. The configuration and control are done via a Web browser.

Audio over IP for STL applications is not a new idea, by any means. Having LAN and/or WAN connectivity at a transmitter site, even one that is way out in the sticks, is becoming more and more common – and we've gotten to the point where we expect just about every electronic device to have some sort of network connection. Even though the world is going this way, I'm not ready to hand over my main STL to a contentious network just yet. Still, as time goes by, it's conceivable that type of network will provide the same level of reliability, all things considered, as the type of networks and links we use today. Now might be a good time for you to learn how it's done.

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

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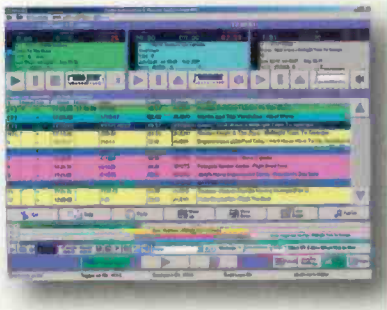
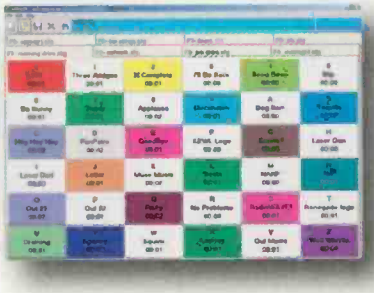
Radio Automation



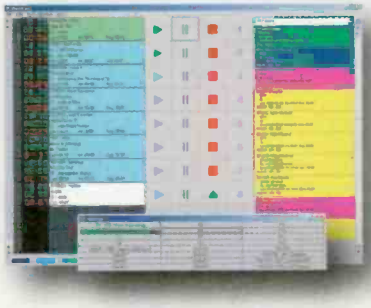
Simian - radio automation and digital play out system

Instant Audio



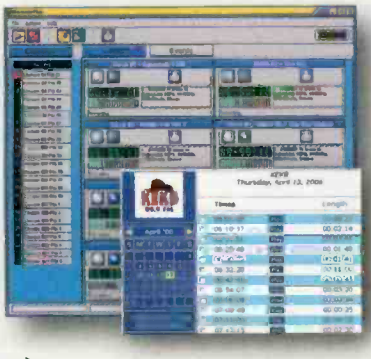
Stinger- instant acess to 288 'rapid fire' audio files

Digital Cart Player



WaveCart - the original on-screen cart machine

Audio Logging



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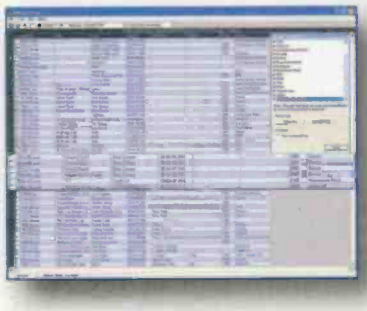

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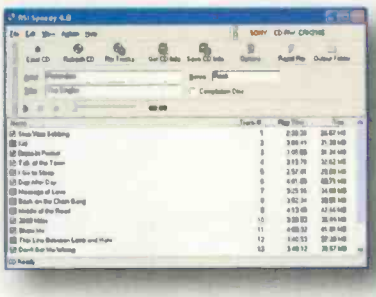

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BSI

The WOXL air studio

The production studio

The WISE air studio is a mirror of WOXL air.

A showcase wasn't necessarily in the plans, but that's what can happen when it's just

Built right

By Chriss Scherer, editor

In general, the planning steps behind any studio relocation project follow a common path. The basic elements of determining the need to relocate, establishing the facility requirements, finding a location and drafting the design plans are always the first steps, and these efforts can be tailored for specific circumstances. For the Saga Communications stations in Asheville, NC, the need to update the facility that had more than 30 years behind it set the steps in motion. While a modern facility was the goal, the Asheville project provided Saga with the opportunity to implement some new technologies and try some new approaches. In the end, a necessary rebuild provided a showcase for the station and the group owner.

Saga owns four stations in Asheville: WISE-AM (sports), WYSE-AM (sports), WTMT-FM (rock) and WOXL-FM (classic hits). The station group was built over the course of several years, and with each station acquisition, the existing studio site was expanded to accommodate.

The old studio was built to house one station: WISE-AM, the heritage AM radio station in the market. Located on the same property as the WISE three-tower array, the site was not in an ideal business location. In addition, being in the middle of an antenna array meant that RF was always a concern with the audio equipment. And while the equipment was kept mostly up-to-date, the building had plenty of wear. As Saga acquired stations, the plan to look for a new studio began. The details finally came together in early 2006 when a suitable studio site was found. The work began to design the facility and begin construction.

The news and dubbing studio

The new studio/office site was selected mainly because of its advantageous business location. On the west side of the metro, the facility is in a business area that is easy for listeners to find, which is important for prize pickup and helps strengthen the stations' ties with the community.

Expand and then build

The chosen building was previously a restaurant. Saga added to three sides of the building to increase the overall floor space from 4,280 square feet to 7,210 square feet. Once expanded, the interior build-out began. This is when one of the first challenges was met: The station lost its full-time engineer.

To keep the project on schedule, Saga looked to outside help. Greg Urbiel, director of engineering for Saga, contacted Larry Lamoray at Balsys Technology Group to take over the project. This was the first time Saga used an integrator for an installation.

When Balsys came in, the first project modification was made after the studs were in place but just before the drywall was ready to be installed. Lamoray first realized that the conduit entries for each studio's cables were not in an optimal location and some last-minute relocations avoided what could have been a significant problem.

While the studio space construction was underway, Balsys began building the custom furniture and assembling the studio wiring in its facility near Orlando. The wiring for the technical operations center (TOC) could not be integrated off-site because there were too many factors that would be determined on-site. One of those factors was the final layout of the TOC. With slightly less floor space than originally planned, providing sufficient rack space for the operation could have been a problem. The solution was to go vertical. Middle Atlantic GRK racks were used. Each rack provides 52 rack spaces and stands 8' tall.

This was going to be a digital facility, and with that in mind, Saga selected Axia for the audio network and Imediatouch for the automation system. With an IP audio system planned for the operation, Ethernet-ready cable was installed for each studio. Again, Saga used an outside service to handle the cabling. The phone system installers wired the office phones and office network, and also ran all the CAT6 cabling for the on-air operation. All the house wiring is CAT6. Each studio has 16 CAT6 drops, two coaxial cable drops, and a stranded #2 ground wire attached to copper bus bars at each end to create the star ground system.

In each studio, Krone blocks and IT-style Ethernet patch bays are used for interconnects. A studio's audio sources are punched down to one side of a Krone block. The Krone block has RJ-45 connectors

Built right

on the other side, and an Ethernet jumper runs from the Krone block to an Ethernet patch bay. The CAT6 drop into the studio is connected to the Ethernet patch bay.

While the Axia system can use distributed nodes to provide I/O as needed, the only nodes in the studios are for the microphones. Any other studio audio sources run analog or digital audio back to the TOC via the CAT6 cable. This was done to reduce some costs of installing additional Axia nodes. The Imediatouch computers and Axia engines all live in the TOC, where the signals remain as direct IP runs. The Imediatouch computers use the Axia IP audio driver to attach to the audio network.

New-found flexibility

Embracing a router-based audio system has provided significant flexibility for the stations. One main advantage is that any source is available to any station, and any studio can be used to feed any station. This provides one level of backup for all the stations. The Imediatouch system has built-in server redundancy in case of a failure, and if part of the Axia system were to fail, the problem could also be routed around. As a final backup plan, each station has a Broadcast Tools switcher to take a feed directly from the automation or any other desired source.

The flexible routing has also allowed Saga to expand the programming of one station. The two AMs run sports formats, and the old studio had insufficient resources to run WYSE on its own, so it simulcast WISE most of the

Equipment List

Adobe Audition
Alesis RA300
APC UPS
Audio Science ASI5042
Audion Labs Voxpro
Avocent LV830-AM
Axia Element and audio network
Balsys Technology Group project management, system design, systems integration
Balsys Wood Arts Furniture, maple wood ends for Axia surfaces
CBT CBT-2
Cisco WS Series
ESE ES185U, LX5112
Fostex 6301B, RM-2
Harris World Feed Panel
Heil PR-40
Henry Engineering Multiphones
Imediatouch
Krone punchblocks
Linksys hubs
Middle Atlantic GRK Series, RM-KB-LCD17
Minuteman UPS
O.C. White Pro Boom Elité
Omnimount monitor mounts
Sony MDR7506
Tannoy Reveal 6
Tascam CD01UPRO, CDRW2000, 112MKII
Telos 2101

time. With the new studios, there is adequate capability to route sources so that WYSE can often run unique programming. This was particularly useful during the local high school football season.

The new studio layout also takes advantage of the routing flexibility. The large talk studio can now easily be used for either station as it is needed.

Like many facilities now, there are times when an in-studio audio source or feed is needed. For this, Harris World Feed panels are placed in each studio. In addition, a custom Balsys panel housed in a weatherproof box was installed on the front patio to accommodate live broadcasts from the front of the building. Also, each studio has a pop-up data port for power and Internet connectivity.

The facility has a 110kVA natural gas generator to power the building if commercial power drops. To supplement that, several UPS battery systems are in place. The on-air operations are powered through a large UPS. In addition, each studio has its own smaller UPS. The various UPS systems provide 1 to 1.5 hours of backup power, which easily covers the generator transfer time, but it also provides some cushion in case there is a generator problem.

The facility's HVAC system is designed to prevent the typical problem that many studios suffer. Each studio has its own climate control. Air is fed into each studio, depending on the season, this air is conditioned (cooled) or filtered outside air. If heat is needed, the filtered air passes over heating strips in each studio's duct work so that each studio can maintain its own perfect temperature.

The voice tracking/second production studio looks into the WOXL air studio.

Meeting the challenges

Any project has its share of unexpected challenges, and this one is no different. The west side of the property looks into a bluff. To accommodate the

Built right

low look angle of the satellite dish, the dish is installed in the southeast corner of the lot. Mounting the dish on the ground and clearing the trees on the bluff would have probably provided minimal clearance, although the dish also faces into the parking lot. If any large vehicle passed in front of a ground-level dish, the satellite signal would be lost. The Balsys solution: raise the dish. It is mounted so the center of the 3.8m dish is 12' off the ground. The foundation – an inverterted T – is buried 8' into the ground. Raising the dish improved the clearance over the bluff.

The 8' racks in the TOC

The satellite dish was lifted into place with a crane. To complicate this part of the project, there are power lines running near the satellite dish mount. The crane had to lift the dish over the power lines to put it in place.

The facility installation was completed in April 2007, but it did not go on the air until some RF STL issues were resolved. The studio site does not have a clear line of site to any of the transmitter sites. Saga leased tower space on a mountain-top tower and relays the STL signals to the various transmitter sites from there. A small STL tower was erected at the studio to hold the necessary antennas. Obtaining the necessary zoning clearance for this studio tower was a challenge, but it was finally approved.

WYSE has a variation in its STL path. The WYSE audio is carried to the WOXL transmitter site via an STL where it is injected into the WOXL-FM subcarrier. A subcarrier receiver at the WYSE transmitter receives the audio for retransmission. This eliminated one STL path from the project.

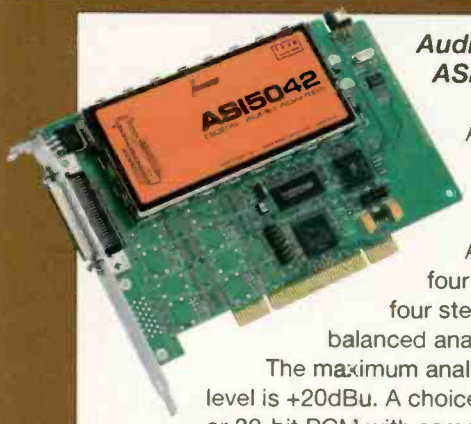
So now that the project is complete, the stations continue to learn the new capabilities of their facility. Chief Engineer Gary Robinson notes that routing changes once considered an obstacle are now simple matters, and the overall installation has gleaned praise from visiting radio engineers. While the goal from the onset was to build a top-notch facility, the directive was to build it right and build it well to provide modern, flexible facilities. By doing this, the result is a showcase that the station staff and owners are proud of.

More online

Additional photos and a floor plan of the facility are posted at *www.RadioMagOnline.com.*

FACILITY FOCUS

The technology behind Saga Communications



AudioScience ASI5042

Saga uses the ASI5042 in its Vox Pro and Audition audio editing systems. The ASI5042 provides four stereo inputs and four stereo outputs with balanced analog connections. The maximum analog input and output level is +20dBu. A choice of 8-, 16-, 24-, or 32-bit PCM with sampling rates from 32kHz to 192kHz is available for both recording and playback. All compression is handled by an on-board floating point DSP, allowing the host computer to focus on other tasks. Up to four cards can be used in a single system. In addition, the SSX multi-channel mode allows the recording and playback of PCM streams up to eight channels. Drivers for Windows 2000, XP and Linux are available.

www.audioscience.com
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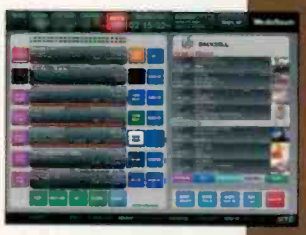
OMT Technologies iMediaTouch



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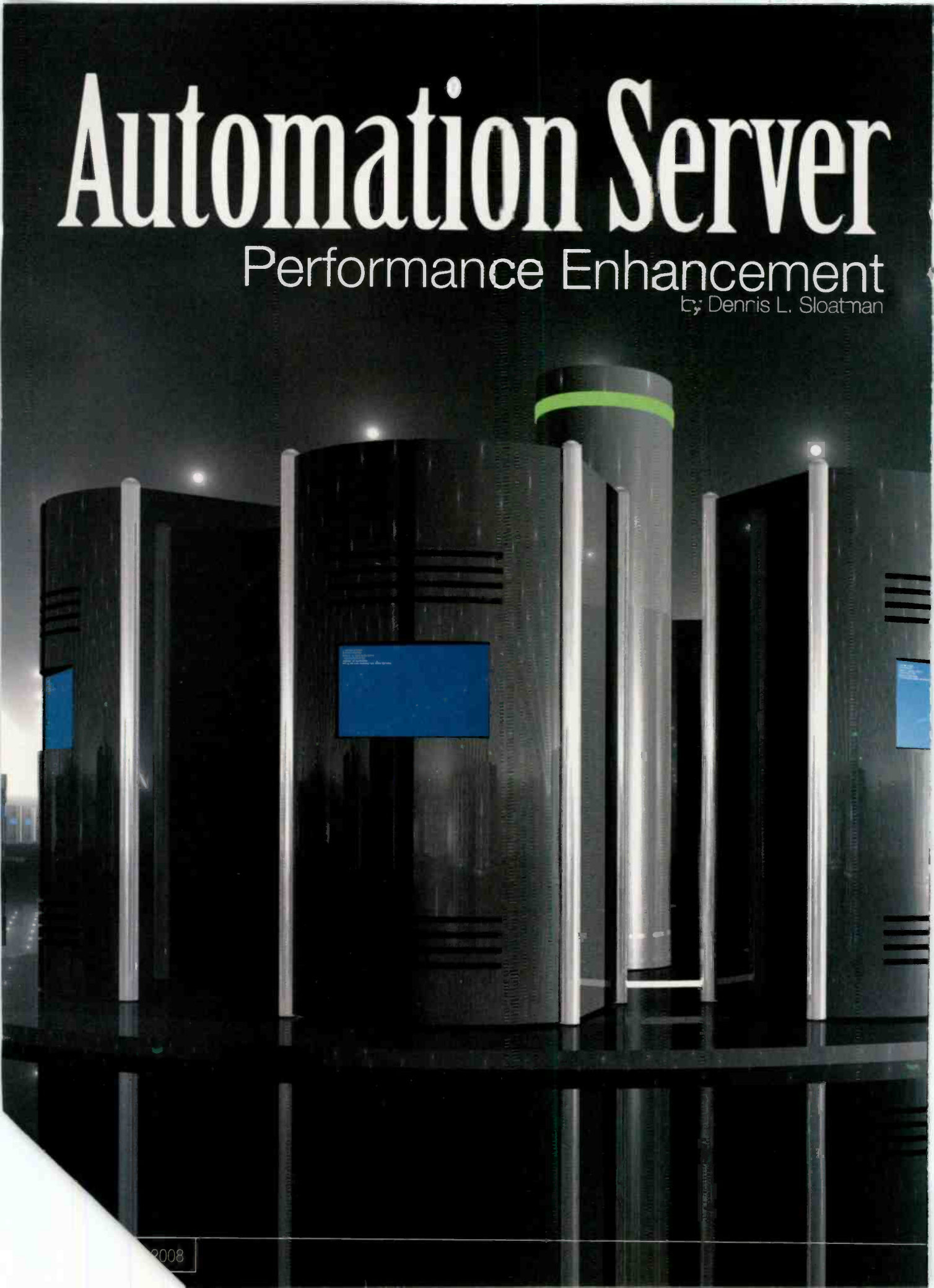
Automation Server

Performance Enhancement

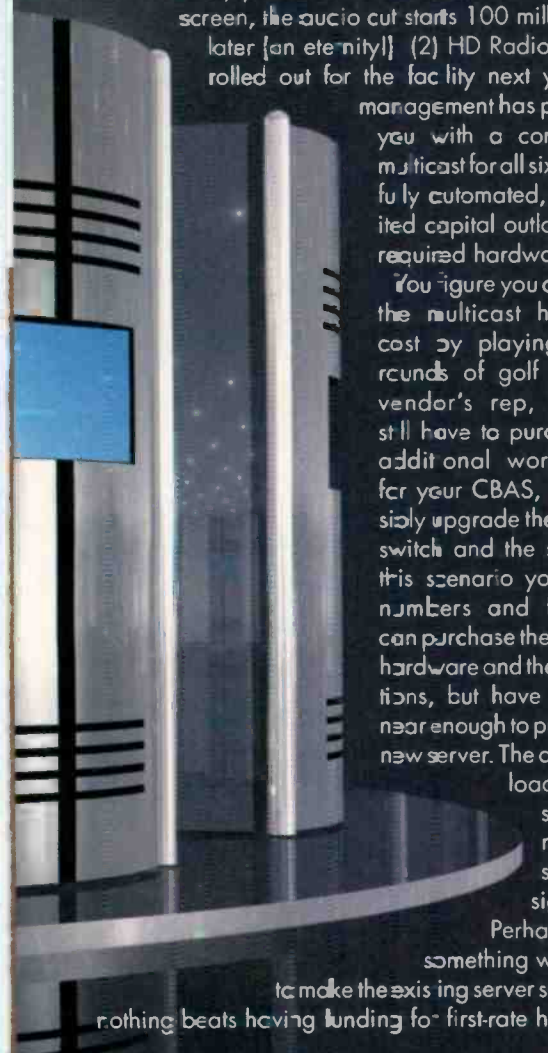
by Dennis L. Sloatman



I believe it's fair to say that most radio broadcast stations in the United States are using computer-based audio systems (CBAS). Further, I believe these systems, if not used for complete automation of a broadcast facility, are used for audio sourcing in some mixture of live-assist or partial automation. This being the case, the keys to the revenue-producing potential of a facility are performance, reliability and ease of operation of the CBAS. Here are some ways to improve performance and reliability of the CBAS in your facility. Ease of operation I'll leave to the vendors.

Problems, proposals and projects

Let's explore some possible scenarios: (1) Your system consists of a server, several workstations and network switches. It used to run OK, but lately the jocks are complaining of sluggishness while recording voice tracks, or when they press a start button on the studio touch screen, the audio cut starts 100 milliseconds later (an eternity!). (2) HD Radio is being rolled out for the facility next year and management has presented you with a conundrum: multicast for all six stations, fully automated, with limited capital outlay for the required hardware.



You figure you can lower the multicast hardware cost by playing a few rounds of golf with the vendor's rep, but you still have to purchase 12 additional workstations for your CBAS, and possibly upgrade the network switch and the server. In this scenario you crunch numbers and find you can purchase the multicast hardware and the workstations, but have nowhere near enough to purchase a new server. The additional load as a result of 12 new workstations is significant. Perhaps there is something we can do to make the existing server sufficient, but nothing beats having funding for first-rate hardware.

Baseline performance

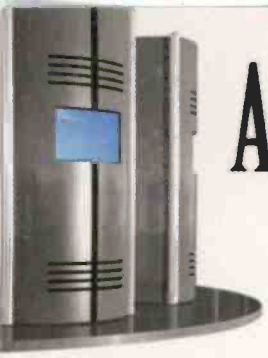
We often establish baseline performance for our transmitter systems through the use of manufacturer test data sheets, weekly logging of the parameters and the initial sweep of the antenna system by the station's consultant. Of course when an AM directional antenna system is installed we perform field proofs to establish conductivity and system RMS. We also (hopefully) log all branch impedances, currents, inductor tap positions and have a record of transmission line lengths. These things serve us by establishing a reference, or baseline for future problem isolation and performance verification. We should do this for automation, database and file servers, and networks as well. Fortunately, many tools exist to assist you at little to no cost. Allocating the necessary time for this when the system is operating normally will be time well spent.

CBAS baseline performance tools

It is my belief that Microsoft Windows 2000/2003 is the prevailing operating system for CBAS servers and fortunately for us, Bill Gates provided us with literally hundreds of baseline tools. To use them, open Performance Monitor (aka. perfmon) and by default, the three most-used performance counters will appear: Average Disk Queue Length, Pages/Sec, and Percent Processor Time. There are numerous options that can be set with these and all other counters such as color, scale, sample rate, graph background, etc. Please bear in mind that using Performance Monitor has a drawback. In order to measure something, you disturb it. Performance Monitor (as seen in Fig. 1, next page) while providing insight into your server's performance, uses resources and in so doing slightly degrades performance. Naturally, the more counters you use and the more objects (hard disk, processor, pages) you choose to monitor, the more pronounced this degradation becomes.

Let's address the first scenario where the jocks are complaining of sluggish performance. You might suspect the cause to be network bottlenecks due to congestion, high server processor utilization, or poor disk input/output performance. Windows Performance Monitor and Windows Task Manager may help. Often, I believe you'll find that network utilization is fairly low (a few percent unless file transfers or data backups are underway), and in most modern servers, processor utilization also will be 10 percent or less (although occasional "spikes" of near 100 percent utilization may be normal and no real cause for concern). An Average Disk Queue Length (ADQL) of 40 or 50 could be worrisome, but that depends on several factors including the type of disk storage system the server uses for audio data: a RAID (Redundant Array of Inexpensive Disks) system, Network Attached Storage (NAS), or a single disk. Most often, computer-based audio systems use some form of RAID array, and we'll make that assumption here.

The ADQL number, which you'll note is dimensionless, represents the average number of data requests per unit time that are pending in the disk operation. The rule of thumb to use in the interpretation of this parameter is two times the number of spindles, or hard disks in the system. So, if the RAID array consists



Automation Server
Performance Enhancement

of 12 drives (data drives only), then an ADQL of 24 or less is probably OK for the system. For this example, let us suppose that your system does have 12 drives in the array, and you are seeing ADQLs around 40 to 50 consistently. The most salient point here is that without having established a baseline when things were running smoothly, you will not be absolutely certain if this is the issue or not.

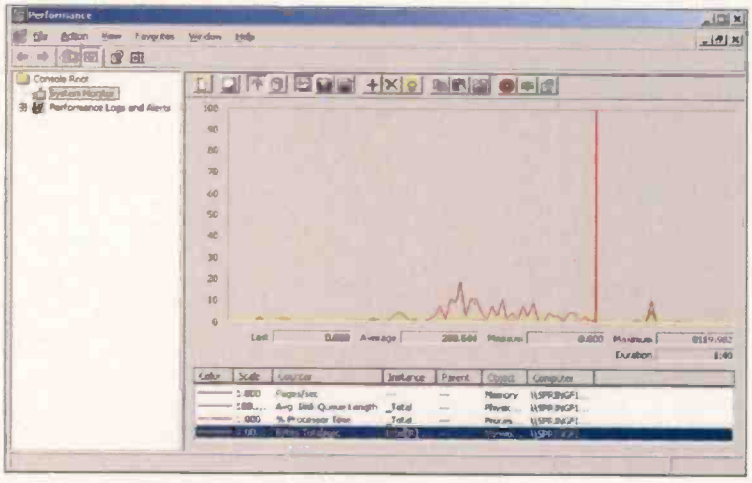


Figure 1. Windows Performance Monitor

Server performance enhancement: RAID systems

How do you go about fixing lackluster server performance and/or getting the most from what you have? Poor disk I/O performance can result from outdated or incorrect disk controller drivers, less than optimum setup of the RAID array, or a defective controller. For CBAS servers, we tend to use a RAID 1 (mirror) or a RAID 1 with duplexing (see Fig. 2) for the operating system. RAID 1 arrays consist of two drives in a mirror arrangement and a capacity of (n/2) X. For audio storage we most often use a RAID 5 array, which takes us to the intersection of performance, reliability and efficiency. A RAID 5 array consists of several hard drives (at least three) with a capacity of (n-1) X, where n equals the number of hard drives and X is the individual hard drive capacity. A RAID 5 usually has one or more drives declared to be a global hot spare or dedicated hot spare for failover.

Note that efficiency of surface real estate improves in a RAID 5 array as the number of drives in the array increases. To illustrate this point, consider a RAID 5 consisting of the minimum three drives. Let's suppose that our drives have a capacity of 73GB. Using the formula above, our RAID array would have a capacity of 73GB(3-1), which equals 146GB. Our efficiency of surface real estate is 67 percent. If we have an array of 14 73GB drives, two of which are used for global hot spares (leaving 12 for data), we have a capacity of 73GB (12-1), which equals 803GB. This

implies an efficiency of surface real estate for this arrangement of 803GB/876GB X 100 percent, which equals approximately 92 percent. This is one of the benefits of RAID 5 versus other RAID arrangements.

We want to make certain that our RAID arrays are up to standards in order to realize best performance. For a SCSI (Small Computer System Interface) system, you would want drives that spin at least at 7,200rpm/Ultra 320 interface, an Ultra 320 SCSI controller card with 128MB or more cache on-board. You really don't want to skimp here. The SCSI controller card may either be of the non-RAID or RAID type. If the card does not support RAID, then the RAID array will be set up under the operating system. A RAID type controller card will generally support a variety of RAID levels such as: RAID 0, 1, 5 and 10. Software RAID (set up under the operating system) and hardware RAID have advantages and disadvantages.

In most cases hardware RAID is the optimum choice. In this case, it is important to properly set up the array for best performance using the RAID controller's bios settings. Key settings are: RAID stripe size, write-back and read-ahead. RAID stripe size refers to the width of the data stripe in the array, and is not connected to the block size or the size of the allocation units formatted under NTFS (N.T. File System used with Windows).

I mention this because this does cause some confusion, as some administrators believe they should set the array stripe size to be the same as the block size. The optimum

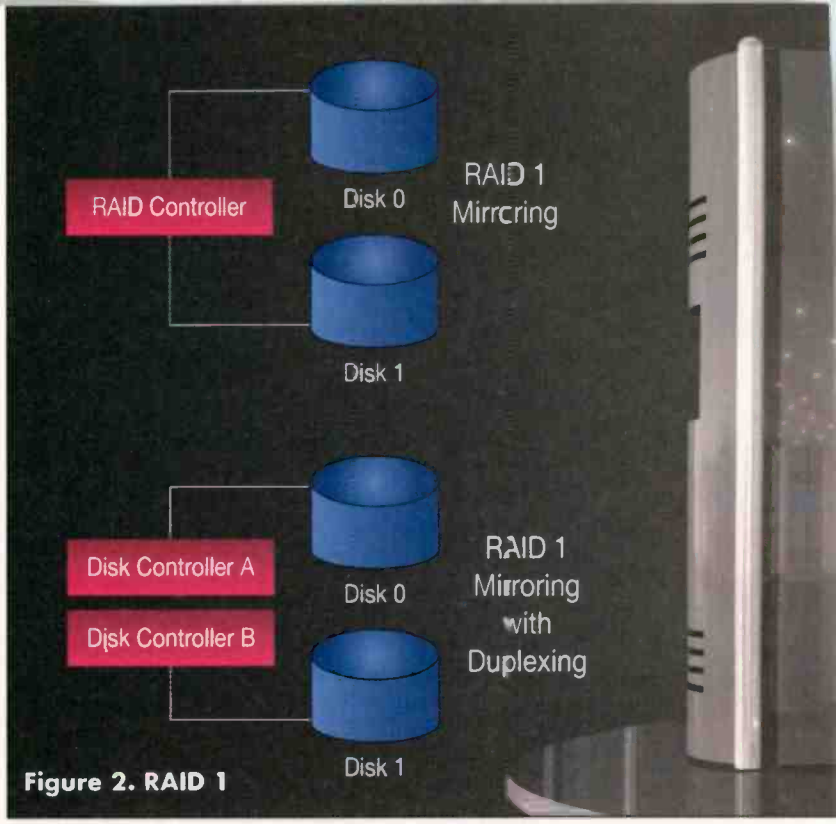


Figure 2. RAID 1

block size to set before formatting a drive with NTFS is often a setting recommended by your automation system vendor. For use with streaming music, the maximum setting with NTFS of 64KB is often used (but this may vary with the vendor). In any event, the array stripe size

Automation Server

Performance Enhancement

can affect performance of the array quite significantly. Some experts say the bigger the stripe size, the better. I have found 128KB stripe size to be the best for performance with heavily used file servers with multiple clients (as in CBAS operation). That said, go with your vendor's suggestions.

Write back will improve the RAID array's performance by writing data to cache first, then to the disks. This allows the CPU(s) to command a write of the data and then move on, allowing the RAID controller to process the write as hardware timing permits. It's very important to maintain the RAID system's battery when using this option in order to avoid data loss. With regard to the read-ahead setting, you'll find you have three choices: Read-ahead, adaptive read-ahead and no read-ahead.

Read-ahead works like this: A block is read from the disk, and then additional sequential blocks are read in the hope that these will most likely be required next. Adaptive read-ahead uses an algorithm that will use read-ahead until such time as the last two or so read operations were not sequential. For file servers used for audio streaming it's generally best to turn off read-ahead since file block reads are likely not to be sequential. This setting may be shown as normal on your RAID controller.

Server Performance Enhancement: Fine-tuning

Here are a few more quick tips to jazz up a file server: Note: The following actions require making changes to the Windows registry and should only be done by trained personnel.

Keep the executables (programs and dependencies) in RAM and from being swapped out to the page file by changing the registry key: HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Session Manager\Memory Management and change the key named Disable Paging Executive from 0 to 1.

Navigate to: HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Session Manager\Memory Management and modify/create a Reg_Dword named Clear Page File At Shutdown, and set the value to 1. This will delete the pagefile when the server is shutdown and create a new one upon startup. This will ensure no page file fragmentation. ■

Server performance enhancement: swap file

Windows makes use of a virtual memory technology called a swap file. When Windows has insufficient electronic memory to store data, program executables or data transfers, it can swap these data to and from a swap file on the designated hard disk. This of course slows system performance inasmuch as hard disks are much slower for reads and writes than system RAM. One very significant thing you can do to improve your server's performance is to move the swap file from the drive(s) used for the operating system to another drive. Often a machine constructed to be a server provides several slots for additional hard drives.

Consider installing a drive for use as a swap file surface and moving the swap file from the OS drive to the new drive. This can be done by selecting properties from My Computer, then Advanced tab, then Performance/Settings/Virtual Memory. Select change and then select the new drive. Then select custom size and set the initial and maximum size to 1.5 times the size of the system memory (so, for a system RAM of 2GB, set the saw file size to 3GB). After this procedure is completed, delete the existing pagefile on the OS drive. Setting the initial and maximum swap file size reduces the possibility of page file fragmentation, which would reduce performance. The page file does not need to be on a redundant drive and would also degrade performance. Format the partition used for the page file with 4KB blocks.

Server performance enhancement: memory (RAM)

More system RAM is better. As you increase the amount of RAM you reduce the amount of I/O operations to the page file. If you see many page faults in Performance Monitor, you need more RAM. If you're looking for a number, most experts would agree 2GB is a good starting point for a CBAS server. Note that server memory is most often of the Error Correcting Code (ECC) variety, which means it costs more than workstation RAM. Be certain to use memory of the type specified by the server's manufacturer and note if the memory sticks need to be installed in pairs or singles.

Conclusion

With careful application of the above information, you can get the most out of your server and perhaps delay having to purchase a new 8-core Blazemaster 3000 server for a while. By establishing a baseline for your server, you will be in a better position to evaluate performance and see the results of any changes or tweaks you make. If you'd like to know more, the Internet and your local bookstore are overflowing with information on Windows 2003 Server performance tweaks. Adaptec's website has some useful white papers on RAID arrays and good general information. I'd like to acknowledge Dave Dart and John Pike from Google/Maestro and Dave Turner of Enco for giving me some of their time and valuable input.

Sloatman is chief engineer for Cox Radio, Orlando, FL.

Tips, tricks, hints and more

By Doug Irwin, CPBE AMD

All about racks

So many times we talk about what goes into a rack, or how many racks are in a particular master control room. What about the racks themselves? What do we need on-hand to take care of them and use them effectively?

More often than not the rack itself is not a new piece of equipment. As such, the most common problem you might encounter deals with the mounting holes. How many times have you tried to turn a rack screw only to find that it won't budge? No matter how hard you try, it won't turn. Usually, this is an easy one. Apply some fine machine oil or WD-40 and give the tight screw a little shot of oil. Let it sit for a few minutes so that the oil can run into the threads.

One possible reason for the tight fit is that the threads are screwed up (yes, pun intended). Most racks use 10-32 screws, although there are variations, including 10-24 and metric sizes. Be sure that the screws you are using are the correct size. If you have racks with various thread taps, you'll need to keep the right screws in the right racks. One way to do this is to use obviously different screws: black for 10-32, silver for metric, for example.

If the threads are damaged, get a 10-32 (or the appropriate size) tap set. Run the tap through the threads to restore it. I have sometimes had to run the tap through new racks before. Sometimes the holes are partially filled with paint, or the tap that was used to cut the threads in the manufacturing process could have been dull. The threads on older racks can sometimes have rust in the threads.

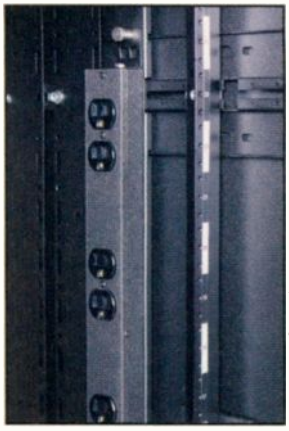
Efficient rack use

Rack drawers are often a very handy place to keep items that are specific to equipment in a rack, such as specially made audio cables, plain patch cables, small pieces of test equipment or even documentation. A 2RU or 3RU drawer is often very functional in a rack room or transmitter site.

Another useful space-saving and efficient option is a pull-out, flip-up keyboard/mouse/monitor combination. These put a keyboard and monitor in a convenient space without losing rack space for a tall monitor. Add a KVM switcher and one unit can serve multiple uses.

You have the power

Power distribution is sometimes a haphazard effort in racks. Very often, a rack will have a power feed from a single circuit breaker. This provides no power redundancy. I like to have two separate power strips, one fed from one breaker, and one fed from another. Plan ahead to plug equipment in to take advantage of the dual feed. Plug the main air chain into one source and the backup air chain into the other.



courtesy APW Mayville

If a UPS is installed in the rack, consider using a power strip that is fed by the output of the UPS. Only connect equipment that should be on the UPS to this strip to extend the runtime of the UPS. The main air chain can be fed by UPS power, while the backup chain can be fed by raw ac. If the UPS acts up, switch to the backup chain to keep the station going.

Use all the space

When I buy new racks, I prefer to get them as deep as practical. The area inside the back of the racks, on both sides, is referred to as the cheeks. With a deeper rack, there can be 10" to 12" of extra depth available behind the equipment. In some cases, I have cut a piece of plywood, usually 3/4", and installed it in either cheek. Paint the wood to match the rack. The wood inside is like having a backboard on the wall of the rack room, and it's a perfect surface to mount cable management systems and even small pieces of equipment.

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

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Enco Systems DAD

By Jeff Krinock

Southern California Public Radio operates both KPCC in Pasadena, CA, and KUOR in Redlands, CA. The two stations broadcast throughout Los Angeles County, northern Orange County and parts of San Bernardino County. Our main studios are located on the campus of Pasadena City College with auxiliary studios in downtown Los Angeles. We are an NPR affiliate that carries both live and time-shifted programs from Content Depot, as well as local talk- and magazine-type shows. We have been using DAD for digital audio storage and playback since 2004.

The automation software can be purchased and installed on any current Windows system, but we purchased the computers from ENCO. This allowed the system to come pre-configured, and Lance Harper, our chief engineer, installed it.

Since the initial installation we have added six additional workstations. Our current setup includes 18 separate machines. In Pasadena, 11 workstations are used for production, recording and on-air playback, one is used for recording live Content Depot feeds, one for Content Depot file ingestion, one to control HD-2 and KUOR, and one is a gateway between the DAD LAN and the KPCC LAN. We have three workstations at our auxiliary studios in downtown LA.

The Pasadena machines are on their own network while the downtown machines are on the company LAN. This configuration provides us with adequate security for our main network while allowing access to our remote machines.

Up to 99,999 unique cuts can be stored in the system. Each cut belongs to a user-defined group. In order to manage the library of cuts we decided to use a filing system where each five-digit cut number follows the GGSSN convention where GG is the group, SS is the show number, and N is the segment number. For example, cut number 12345 would be segment 5 of show number 34 (a Christmas special) in group 12 (Special Recordings).

Anything loaded into the system in Pasadena is immediately available in Pasadena. Retrieving audio files from the downtown studio system to playback in Pasadeana is a major challenge because the systems are on different LANs and must go through the WAN cloud. This is a big concern for us as the majority of our reporters file stories from downtown. We use an auxiliary program called Gateway, also by Enco. The gateway machine, located in Pasadena, is able to interact with both LANs. It checks for new cuts every five minutes during the day. Bandwidth is always a concern, but the gateway performs well. During heavy network traffic the gateway will sometimes fail, but we do not have the budget to have dedicated bandwidth to transfer audio.

Performance at a glance

Software-based digital audio storage, recording and playback system

Manual, live-assist or full automation

Multiple options for playback

Network or stand-alone system

Support contract available

KPCC on-air signal

We have a studio engineer on-site 24/7 to control our main on-air signal. Each studio engineer is given the freedom to use the system the best way he sees fit.

The playback machines are preferred for time-shifted network shows. The playback machine has a playlist that will sequentially play one audio file after another. The playlist can be generated from any workstation and loaded in the on-air machine as needed. The playlist can also be generated and changed on the fly. This allows studio engineers

Playback machine on DAD desktop

to set the playback for their entire shift, minimizing misfires and incorrect audio played on-air.

For our live, local call-in shows most choose to use the array or mini-array. Each mini-array has 24 buttons per page and 10 pages. Two mini-arrays are included as part of the basic software package. This allows for bumper music and other audio files to be played in any order.

We air *Morning Edition* and *All Things Considered* with local content inserted throughout the programs. The studio engineers use both the array and playback machines.

KPCC HD2 and KUOR audio

KPCC broadcasts an HD signal. This gives us two additional channels of content to program. We have one machine controlling two switchers. HD2 is programmed with world news in Spanish from the BBC Mundo. Our switcher machine has control of a Broadcast Tools ACS 8.2 Plus switcher and a Broadcast Tools 6x1B.

For the HD2 signal we have a playlist loaded into one of the playback decks. We use a combination of hard branch events, DCLs and IDs in playback deck one. A hard branch is fired in a playlist at a specific time. DCL is an acronym for DAD Command Language. In our case the playlist hard branch event fires at 59 minutes and 30 seconds each hour. The first event is a DCL that sends a signal to the ACS 8.2 that switches the input to playback deck one. A legal ID is then played, followed by another DCL that signals the switcher to select the BBC Mundo signal as the source.

We also need to get audio to KUOR, which carries the same content as KPCC. It was decided that each station needed its own unique legal ID. This was solved with DCLs. Each cut in DAD can be assigned a start and end DCL. This will fire whenever the associated cut plays. We assigned a start DCL to all of our IDs. The DCL sends a command over the DAD network to the Switcher machine, telling it to play the playlist in playback deck two. The playlist in this deck consists of a DCL to switch the 6x1B machine to deck two's output, followed by a rotated cut, finishing with a switch back to our main on-air signal. A rotated cut is a special cut that will play a different version each time it is called. We populated this cut with various legal IDs, but we could also create a rotated cut with different versions of a spot. For example, an automotive sponsor may wish to highlight a different car each time a spot is played. Instead of the traffic manager scheduling a different spot each time, the system automatically rotates the spot for us.

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The software package includes a few other ways to play audio, but we do not take advantage of these machines.

We have a support contract with Enco that provides 24/7 emergency technical support, next business day non-emergency tech support, and upgrades whenever a new version of the software is released. Like all companies, the quality of the support depends on the person that pulls the support ticket. Overall, the support provided has been very good.

Recording machine on DAD desktop

We do not upgrade our software with every version, but still upgrade two or three times a year. Program stability has not been an issue. The upgrades contain new features requested by various stations. For example, the start and end DCLs were not able to fire from an array and this was a problem for us. The next version of the software included this ability.

Overall, we are happy with the DAD system. In early 2009 we will move to an entirely new and larger facility, and we plan to use the DAD system there as well.

Krinock is master control specialist for Southern California Public Radio.

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

These reports are performed by the industry, for the industry. Manufacturer support is limited to providing loan equipment and to aiding the author if requested.

It is the responsibility of *Radio* magazine to publish the results of any device tested, positive or negative. No report should be considered an endorsement or disapproval by *Radio* magazine.

2007 PICK HIT

Burk Watchband

By Chris Verdi, CBNT

Nassau Broadcasting owns 14 stations in Vermont spread from the northern border town of Derby Line to the Southern Vermont Town of Bellows Falls. When I started with the company three years ago there was no off-the-shelf solution for monitoring all the stations from one location. When Burk introduced Watchband at NAB2007, I immediately ordered a unit to evaluate. Watchband more than exceeded my expectations: Not only can I now monitor all 14 stations from one location, but I can also monitor all the stations plus our competition from any location that has network access.

Watchband requires a computer to generate the Web interface and stream audio. I chose to buy a small HP P4 workstation running Windows XP Pro with a built-in sound card and 2GB of RAM. Out of the box, setup is simple and all the cables, serial cable, audio cable and whip antenna are included. I chose to connect all of my units to the house antenna for added coverage. Install the software, connect the cables, set some basic configuration, and Watchband is up and running.

Performance at a glance

Alarm reporting
Log and skim audio
Compare signal strength
E-mail alerting
Streaming audio
Playlist generation

Basic setup

The first setup question answered is where the Watchband radio is located. This allows the software to build a database of the stations you should expect to hear and their expected field intensity based on your location. Once finished with the basic setup questions the screen jumps to life with a large frequency display, field intensity meter and spectrum display. Navigating through the menu provides specific information about the station being monitored. The tuner button displays frequency, PS and PTY information, as well as scrolling RDS info. The owner button gives the licensee's name, call letters and frequency. The RDS tab shows all the standard RDS information if it's present. The FCC button displays information from the FCC database, including call sign, city of license, ERP distance and bearing from your location.

On the left side of the screen Watchband has a compass display that always shows the distance and bearing to the monitored station. The middle of the screen has basic tuning controls: scan, seek, AM, FM mono and FM stereo. There are six user-programmable presets buttons divided into five preset banks as well as preset scan. The bottom of the screen has the large spectrum display that gives a full view of the FM or AM band. Watchband can display the expected field intensity against a sweep of the spectrum to compare expected against real world. Watchband can also tune by clicking on each signal in the display.

As if the basic functions didn't make Watchband very useful there is a whole suite of reports that can be generated with Watchband.

The scheduler menu can program an endless number of jobs. I have the machine in White River Junction watch my AM change power levels and record this information. If it sees a problem, the system sends me an e-mail as a backup to the remote control. Watchband can record audio, log RDS information, log audio levels and field intensity. Plus, it can schedule this to happen every day, week, month or just once. These jobs can be scheduled for a specific station or a list of stations, or let it scan the dial and record data.

The reports button can create reports on the data collected with the scheduler. Depending on how the captured data is set up, playlists can be created from the RBDS info collected. Field intensity reports and audio phase, peak and average levels reports are all available. A report can be created to tell you everything you want to know about any station.

> Watchband is the perfect answer for out-of-market monitoring.

Recorded audio can be played back at a later date. This is perfect for letting the programming department record the morning show or letting the morning show hear the competition.

Multiple uses

I have installed three units and use them every week to listen to our stations, monitor for dead air and monitor our AMs when power level changes occur. The programming department uses it to listen to our stations, critique announcers and listen to the competition. Tony Gervasi, senior VP of engineering and technology for Nassau Broadcasting, was so impressed with the unit's performance in our Vermont region that we are now rolling the units out in our clusters from Maine through Maryland.

A single Watchband receiver allows the user to monitor multi-channels one at a time. However, if a second receiver is connected to the Watchband server it can monitor multiple signals at the same time.

Watchband is the perfect answer for out-of-market monitoring with some powerful tools to monitor and create custom reports giving you the information you need for compliance monitoring.

Burk

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Verdi is director of engineering/IT Vermont for Nassau Broadcasting.

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by Erin Shipps, associate editor

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CDR-882: This dual-drive CD recorder can be used in a REC-REC drive configuration. It supports extended recording time across two or more discs, simultaneous recording of two discs and high-speed duplication. The CDR882 features full 24-bit A/D and D/A converters and a high-quality quartz crystal-derived internal clock. The CDR882 uses noise-shaped dither onto CD to minimize quantization error noise, while audiophile-grade analog circuitry also plays a key role in ensuring superior sonic performance.

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EAS Listener: D.A.V.I.D. has added Emergency Alert System support to its program associated data functionality, giving stations the ability to display EAS alerts as text on RBDS and HD Radio-enabled radios as well as on their websites. The new EAS Listener connects to EAS receivers via RS-232 and monitors for incoming alerts. When an alert is issued, the EAS Listener formats the text and sends it to RBDS-enabled radios via Program Service Text or Radio Text. HD Radio-enabled receivers will also receive and display the text message. In addition, notifications of the EAS alert appear on all on-air workstations allowing hosts to read the announcement from a desktop computer. Station staff will be made immediately aware of the alert, giving them the earliest possible opportunity to determine if special coverage is warranted by the event. Also part of the module is an HTML export to allow stations to display the alerts on their websites and LED signs. It automates the logging of all of the EAS messages received as well.

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Analog audio signal generator
NTI

Minirator MR2: Minirator MR2 is a powerful audio generator, offering a full range of useful analog test signals for calibration, maintenance and repair of professional audio equipment. The rotary settings wheel combined with surrounding fast access function keys enables instant and intuitive operation without compromising fine adjustment capabilities. Instrument operation is further enhanced with a backlit LCD, illuminated mute button, safety hand strap, jack for external dc power supply and an USB interface for firmware updates.

503-684-7050
www.nti-audio.com
info@ntiam.com

Paperless studio software
Turnkey Media Systems

Center Stage Version 7: Version 7 of Center Stage Live, the core element of the Center Stage Suite of paperless studio software, now offers users the option to make changes in the exclusive Center Stage Enhanced-RDS, HD-PSD and Web displays from password-protected remote access points, as well as the main data entry sites. The Enhanced-RDS displays provide information beyond rudimentary station name and artist/title data from the playback units. The new release adds further off-site input opportunities to data streams for Enhanced-RDS (RBDS), HD Radio PSD, as well as the "now playing" and other Web content. Modifications are enacted easily by authorized station personnel who check-in off-site through the Internet. Copy and information changes, additions and deletions may be posted within moments, or on a timed-release basis.

866-359-7540
www.turnkeymediasystems.com
info@turnkeymediasystems.com

Power cord and ac adapter
Hosa Technology

PWC-408, PWA-486: The PWC-408 heavy-duty power cord and the PWA-486 right-angle NEMA ac adapter are designed to connect equipment directly to the power source without using a garish orange extension cord. The PWC-408 features 14AWG conductors protected by a black PVC jacket while the PWA-486 right-angle adapter facilitates connection in tight spaces. The PWC-408 is an 8-foot, 14AWG, 3-wire power cord featuring an IEC C13 receptacle to a NEMA 5-15P plug. The cord is also available in 1.5-, 3-, 15-, 25- and 50-foot lengths.

714-736-9270; www.hosatech.com; lee@hosatech.com

RBDS unit
Broadcast Electronics

RDS RT+: The RT+ Injector is based on RT+, a standard passed by the RDS Forum in June 2006 that builds on the internationally established Radio Text standard by adding category codes to existing text streams. The additional codes will create new opportunities for displaying traffic updates, weather readouts and more on RBDS radios.

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

Multichannel amplifier
Rane

MA4: The 100W-per-channel, four-channel MA 4 amplifier is housed in a 1RU chassis that weighs eight pounds. A universal-voltage switching power supply provides power factor, reducing peak currents to 1/4 compared to non power-factor-corrected supplies. Features range from constant load power to built-in automatic redundancy switching to advanced dynamics control. Advanced dynamics control algorithms adapt to changes in temperature, load impedance and sensitivity setting.

425-355-6000; www.rane.com; info@rane.com

Digital EAS encoder/decoder
Digital Alert Systems

DASDEC: The DASDEC is a software-based EAS endec. It meets current EAS needs and configurations, includes digital and is positioned to immediately address the pending CAP compliance issue. At inception in 2003, the DASDEC was defined as Linux software in a PC platform inline with today's IP-based, networked, browser operated technology. The DASDEC received FCC certification in 2004. The front panel has one button, the required readout, a speaker and no printer. The button is for testing and the browser directs printing to a network printer. Browser templates set up the desired configuration defining all EAS operations as well as emergency communications beyond EAS. One internal card contains three browser-defined receivers for EAS monitoring of AM, FM or NOAA, GPIO inputs and outputs and audio override switching.

520-896-0303; www.digitalalertsystems.com; info@digitalalertsystems.com

Miniature loudspeaker
Meyer Sound

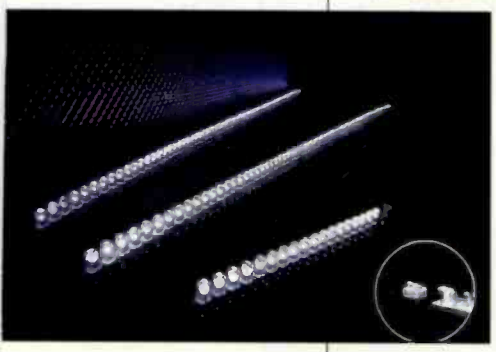
MM-4XP: The MM-4XP miniature loudspeaker is a self-powered version of the MM-4 miniature wide-range loudspeaker. With a face measuring just four inches square, this compact monitor is suited for locations where space is at a premium. The new MM-4XP has flexible mounting options, an operating frequency range of 120Hz to 18kHz, and peak output of 113dB SPL.

510-486-1166; www.meyersound.com

UPGRADES and UPDATES

Build 18 of ***V-Soft's*** FM Commander updates the contour overlap feature to get a reading of the greatest overlap or the least amount of clear space. Also, several builds ago, ***V-Soft*** changed the way the program displays commercial stations when the program is in the interference mode. (www.v-soft.com)...***Axia Audio*** has released version 2.4.8.12 of its IP audio driver for Windows. The new release increases the number of supported streams from 16 to 24 in the OEM version available from Axia software partners. Other features include new audio metering, clipping and silence detection functions, and enhanced real-time monitoring of audio stream statistics. (www.axiaaudio.com)...***RCS*** released version 2.7.4 of Nexgen Digital, which includes opto masking to enable the audio server to only respond to specific switch inputs. This customer-requested feature gives the engineer more control over what, when, and how each event is triggered. (www.rcscommunity.com) ■

LED light strips
Ledtronics



STP50XC: Series STP50XC super white inter-connectable 5mm LED light strips may be used along or connected to one another to configure lighting solutions for warning lights and rack lighting. Available in lengths of 6, 12 and 24", these light strips feature Ledtronics' 5mm dome LEDs in 7,000K and 3,000K colors. The STP506 is 6 inches in length and uses 1.08W. The STP512 is a 12" model that uses 2.52W. The STP 524 is a 24" model that uses 5.40W. Each module has a double-ended connector harness for easy daisy-chain assembly and a pre-applied strip of 3M double-sided foam tape for peel-and-stick placement. One inter-connector module and one power adapter cable are included with each light strip purchased.

800-579-4875; www.ledtronics.com

Audio processor
Orban

Optimod-FM 8500FM: Other than providing FM analog processing only, Optimod-FM 8500FM is identical to Orban's flagship 8500 and can be easily field-upgraded to full 8500 functionality. The 8500FM builds on the sound of Optimod-FM 8400 version 3 while adding features that make it particularly ideal for stations that may want to upgrade to HD Radio, Eureka 147, or netcast processing in the future. Under the hood, Orban redesigned all of the circuitry using the latest components and doubled the DSP power, so the DSP not only supports the new features but also provides comfortable headroom for future DSP improvements. The unit features five-band and two-band processing for analog FM transmission, stereo enhancement, equalization, AGC, multiband compression, low-IM peak limiting, stereo encoding, and composite limiting.

480-403-8300; www.orban.com
sales@orban.com

AC line switcher
DM Engineering

Solid State Relay Pack: This self-contained ac line switching device is designed to operate studio signs using a low dc input voltage to control the output. The input is not polarity sensitive, which simplifies installation. This device is designed to interface with the DM Engineering Slave Auxiliary Relay Pack and many other products. The unit features an input voltage range of 5-15Vdc at 17mA (maximum) with polarity guard. Input wires may be connected without regard to polarity and may be almost any length; fused output with capabilities up to 5A with NEMA standard U ground 3-pin outlet connector; 6' input ac cord with NEMA standard U ground 3-pin plug; Eurostyle removable two-station dc input connector; and zero-crossing technology to eliminate noise.

800-249-0487; www.dmengineering.com; info@dmengineering.com

Large diaphragm condenser mic
MXL Microphones

V88: A general-purpose recording instrument, the V88 is a large diaphragm, pressure-gradient, condenser microphone with fully balanced transformerless output. Internally wired with Mogami cable, the mic features a large 32mm capsule with a gold-sputtered diaphragm in a cardioid polar pattern. The capsule delivers a frequency response from 20Hz through 20kHz thanks to the microphone's Class A electronics. Featuring a nickel-plated finish and a low profile form factor of less than 6-inches in overall height, the mic ships with a protective aluminum flight case. A shockmount adapter is also included as part of the package.

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

Power meter
MGE UPS Systems

PM800: These power meters complement MGE's line of Power Management Modules with a selection of monitoring and communication features that can be tailored to individual needs. MGE's family of power meters simplify power monitoring of critical incoming power circuits as well as secondary feeders and branch circuits with multifunctional digital instrumentation and alarms. Providing users with an extensive data set that can facilitate optimized power quality and equipment utilization, this latest power meter reads over 50 metered values as well as minimum and maximum data via a menu-driven display.

800-523-0142; www.mgeups.com
info@mgeups.com

I/O boxes
Calrec Audio

AD5603, JB5607: These fixed-format boxes range from 2RU to 4RU in size and all have built-in PSU redundancy with single or optional dual IEC power connections. The AD5603 is a 2RU analog I/O unit and the JB5607 is a 3RU unbalanced AES I/O unit. The AD5603 consists of 24 mic/line inputs and eight line outputs with phantom power indication on mic inputs and a tri-color signal LED indicating whether audio is present, normal, or at clip for each input. The JB5607 consists of 32 AES inputs and 32 AES outputs on BNC connectors. The AES unit is also available as a 110Ω XLR-based 4RU variant.

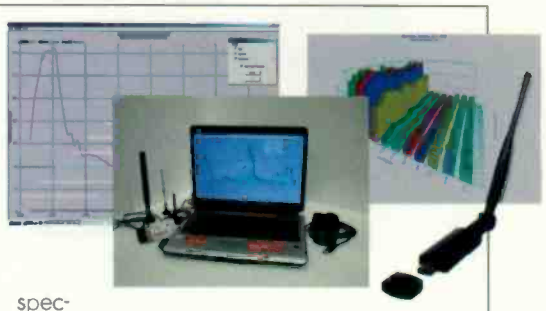
+44 1422 842 159; www.calrec.com; claireh@calrec.com

Uninterruptible power supply
Falcon Electric

FN Series: The FN Series double-conversion online uninterruptible power supplies expand the family's range up to 40kVA. Users have the choice of scaling from 3kVA to 24kVA or with this model, scale from 8kVA to 40kVA in the same compact footprint as the FN Series 6kVA unit. The parallel or N+1 redundant supplies are designed to meet the demands of IT infrastructures with a scalable platform and N+1 redundancy. The FN Series models achieve many technical milestones including a faster processor utilizing digital signal processing technology, improving performance, capability and reliability. An FN system can be configured using individual 8kVa and 10kVA models, providing up to 40kVA capacity or to 30kVA with N+1 redundancy. This approach eliminates the added expense of buying additional cabinets to house control, power and battery modules. In addition, the FN models can be programmed by the user for use as a 50Hz or 60Hz frequency converter.

800-842-6940; www.falconups.com; Info@FalconUPS.com

RF spectrum analyzer software
Kaltman Creations



Air Sleuth Pro: The Air Sleuth Pro allows the user to view Wi-fi channels 1 through 11 individually or simultaneously with peak, average and raw trace modes. There are 10 diagnostic modes including traces, spectrogram, channel time course, differential channels and pie charting. Air Sleuth Pro also includes a real-time calculation of the channel with the least interference. There is even a logging and playback recorder for extended monitoring. The Air Sleuth Pro is sold as a software-based application, which includes an antenna, user's guide and frequently asked questions document.

678-714-2000; www.kaltmancreationsllc.com
sales@kaltmancreationsllc.com

Ad-generating service
OMT Technologies

Web Shout: Web Shout Radio Software generates classified ads using a station's website to generate non-traditional ad income for a station using shout outs. Web Shout Radio gathers the advertiser's continuity through a custom Web Shout website, collects the payment and sales order, produces the spot, e-mails the finished MP3 spot to the station the next business day, and pays the stations its share of the ad revenue. Stations set the rate based on the amount of word content, have final scrutiny over the ad, set the schedule of the spot to play on your station, provide the link on the station's website, and promote the Web Shout Radio ad service to its listeners.

888-665-0501; www.omt.net; omt@omt.net

Handheld PA system
Behringer

Europort EPA40: This handheld PA system provides sound reinforcement wherever it is needed. The EPA40 features a variable gain mic input, line input for media and CD players, 40W amplifier and 5" loudspeaker. The rechargeable battery provides 12Vdc power for up to eight hours. Included is a rugged dynamic mic with coiled cable and on/off switch. A shoulder strap stows away inside the battery compartment when not in use. The unit is a complete public address system to provide coverage for up to 100 listeners in a package weighing less than under 6lbs.

425-672-0816
www.behringer.com
support@behringer.de

Remote site controllers
Asentria

Site Boss Series: This series of products detects and controls remote site factors such as non-networked, non-SNMP devices and environmental conditions, which otherwise remain outside the scope of the network management system, while providing sufficient security. The product line

consists of a series of low-end to high-end stand-alone monitoring hardware devices that can be deployed at the remote sites, providing a set of intelligent monitoring and control features to help detect and prevent potential operational issues at remote sites.

206-344-8800; www.asentria.com
info@asentria.com

A reel shock

I was shocked at your story on Otari. Shocked. Almost fell out of the chair. You mean to tell me that 20 years have gone by and I still have three of these things left in the rack? They seem like old friends to me. We started in 1976 with an Otari 5050, that we had to special order because I was the only kid on the block that had to have "capstan servoed direct drive", just like my big MCIs. So 20 years ago I purchased 15 MX-55s and used them for dubbers to release radio commercials to almost every market in the country. Today we do it via the Internet and it's much easier. Over the years I've sold the Otari's to mostly analog fans and guys who want to transfer tapes themselves rather than pay me. Now, every time I need more rack space to install a new server or RAID array, I remove one of them and set it in the tech room. Sooner or later, someone will buy it. But now I have only three left. I can sell only one. I always keep one for a spare. I also keep one-inch VTRs, Betacam/SP, 3/4", even MIIs and PCM-F1s to transfer from. It's actually a profit center for us. Twenty years, well time flies and nostalgia ain't what it used to be.

Pat Appleson
Hickory, NC

Loved the picture of the WBT cold war studio. With 50 years in the business I remember working with all the type of equipment in that room with the exception of the keyboard thingy with the blue screen sitting on top of the rack. Was that some Russian spy-monitoring device or was it left there by an alien from an advanced civilization?

Bill Draper, CE
Poughkeepsie, NY

GALLERY

Radio
THE RADIO TECHNOLOGY LEADER

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What was your favorite holiday gift?

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Contributor Profile

Meet the professionals who write for *Radio* magazine.
This month:
Field Report, page 40.

Jeff Krinock
Master Control Specialist
KPCC
Pasadena, CA

Starting as a student board operator 10 years ago, Krinock has co-produced and directed *Film Week with Larry Mantle* as well as various other live and taped shows. His current responsibilities include maintaining the digital audio automation system and facilitating the transfer of audio to the Web.

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ADVERTISER INDEX

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

by Erin Shipps, associate editor

Do you remember?

We found this Collins 12H console in the lobby of WFMS Indianapolis. It was used by WFMS in its earliest years in the 1950s, before stereo. This particular console was probably purchased used by the man who put WFMS on the air. It cost $645 new – about the price of a new car in 1950. In 1936, it was state of the art.

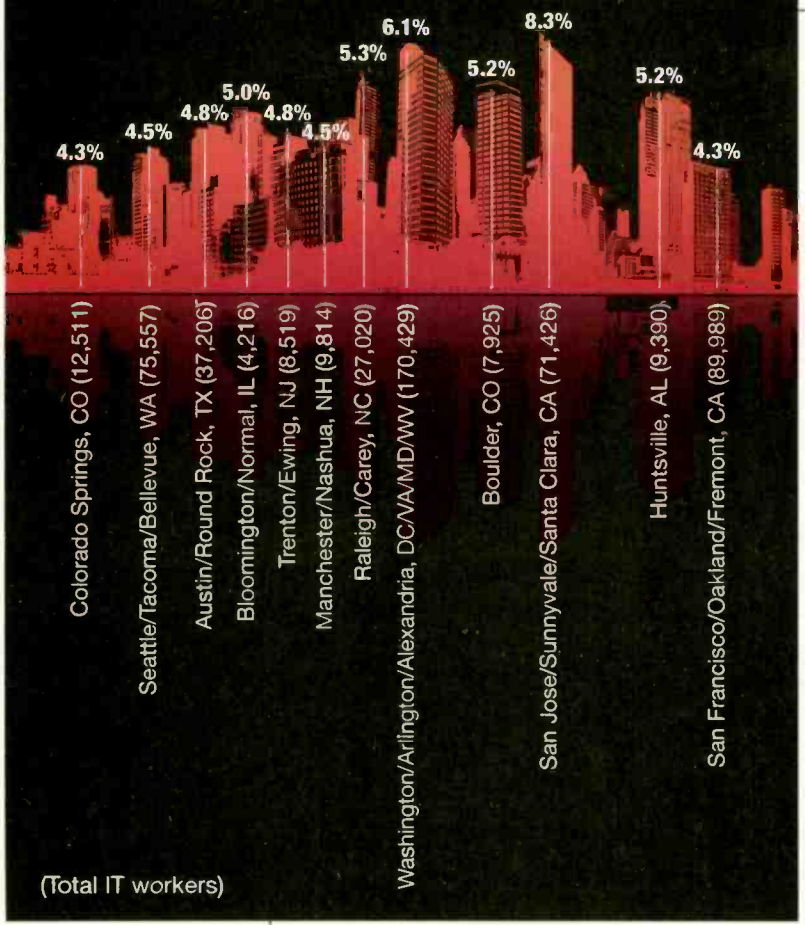
This six-position console provided control of four microphone inputs, transcription and six incoming lines. Originally equipped with a dB meter, a retrofit kit was offered for those wishing to replace the meter with the new VU meter standard that emerged in 1937. You can operate a Collins 12H console, the oldest operating broadcast console in the world, at the Camp Shohola Communications and Technology Center in Greely, PA.

Do you have any antique equipment still in use? Tell us about it at radio@RadioMagOnline.com.

Sample and Hold

America's Techiest Metro Areas

In today's world, radio engineers are increasingly being called to wear the hat of IT guru. With that in mind, here is a look at America's techiest cities.



Source: Census Bureau

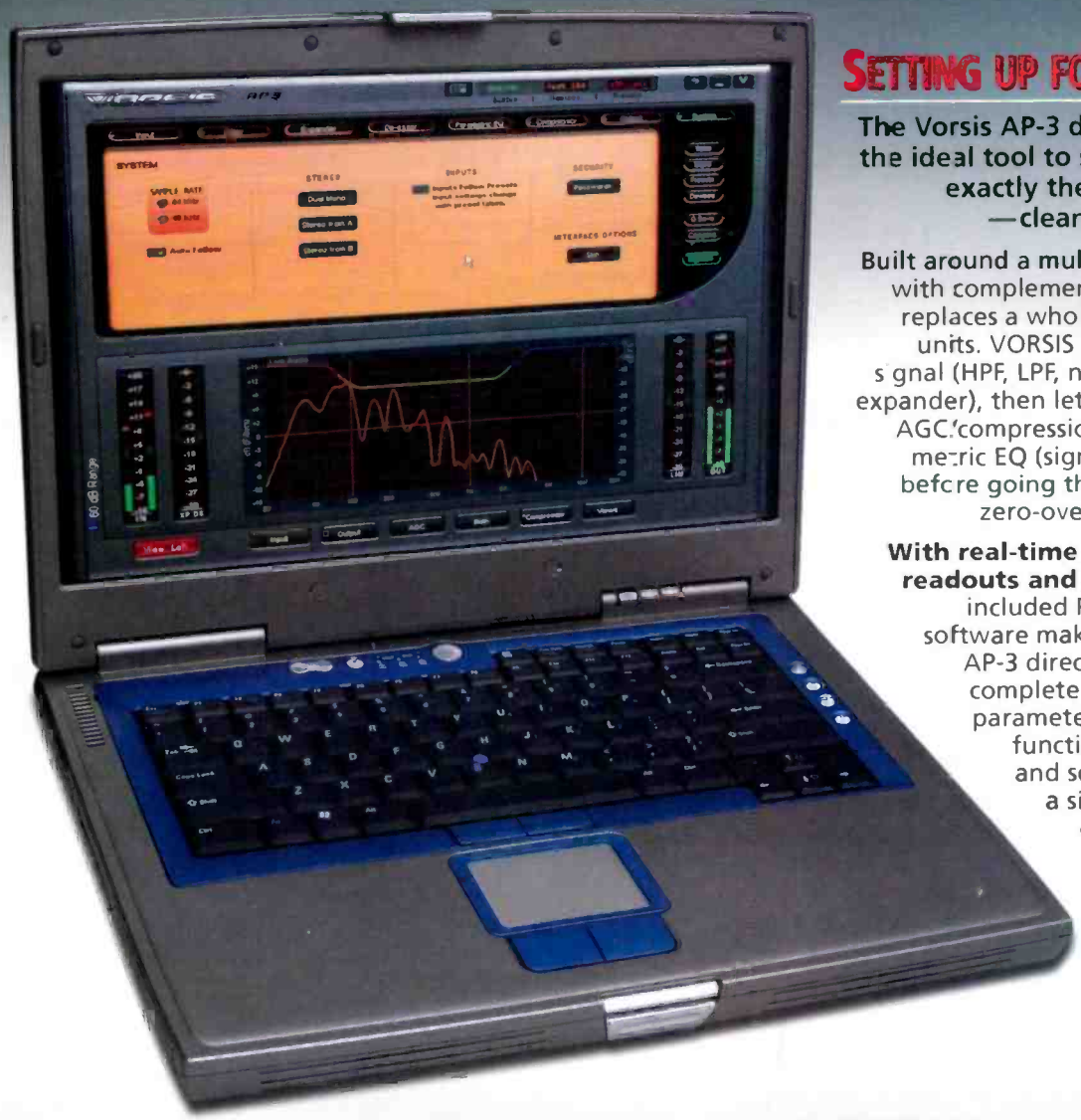
That was then

On Oct. 26, 2007, WFUV Public Radio from Fordham University, Bronx, NY, celebrated it's 60th anniversary on the air. The station sent us this photo of Pete Fornatale on the air in 1965 when he was a student at Fordham. Fornatale is a widely respected rock historian and veteran disc jockey who helped define progressive rock radio in the early 1970s. He is the author of several books including *Radio in the Television Age*, and in his career worked for WNEW and K-Rock. His syndicated show, *Mixed Bag*, now airs on WFUV.

This Little Unit

Can Do BIG Things!

Our new AP-3 is the perfect HD Processor.



SETTING UP FOR HD RADIO?

The Vorsis AP-3 digital processor is the ideal tool to shape your sound exactly the way you want it —cleanly and efficiently.

Built around a multi-band compressor with complementary AGC, the AP-3 replaces a whole *rack* of dedicated units. VORSIS pre-conditions your signal (HPF, LPF, notch filter, de-esser, expander), then let's you apply 3-band AGC compression *and* 4-band parametric EQ (signal chain reversible) before going through a final stage zero-overshoot peak limiter.

With real-time spectrum density readouts and full metering, our included PC graphic interface software makes operation of the AP-3 direct and easy, offering complete control of all audio parameters, presets, monitor functions, system settings and security—all through a single RJ-45 ethernet connection that lets you control one or many AP-3 units.

TAILOR THAT SOUND

VORSIS™

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Don't Just Bring Your HD Channel Along for the Ride

The VORSIS AP-1000 has a completely separate fine grained processor dedicated just to HD, so you can tweak your HD sound to deal with bit reduced audio while leaving your FM sound uncompromised.

Here's what professionals who've tried the AP-1000 have to say:

"By far the best processor I've ever used."

"It achieved greater loudness with a smoother sound right out of the box."

"Your GUI is so well designed I didn't even need to read the manual to get started."

"Love the box!!! The sound of the station is vastly improved...it's loud, wide and clear."

REDEFINING Digital Audio Processing

VORSIS®

www.vorsis.com / sales@vorsis.com