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THE INTELLIGENT NETWORK

AES67. Hear, There and Everywhere.

5 things you need to know about this audio standard.

AES67

I N S I D E

AES67 is everywhere. It's in every major audio network, including our WheatNet-IP, which means that you'll be able to transport audio between all these systems and other devices and peripheral gear that are connected to them. This IP audio transport standard was ratified in 2013 by the AES X-192 task force, of which Wheatstone was a member.

But, AES67 is by no means a complete interoperability standard. It doesn't provide for discovery and control, both of which are needed for any kind of interfunctionality to take place. These standards are in the works, but in the meantime, turning devices on and off, controlling peripheral gear from the console, signaling when a source is ready for air play, and controlling the playout system with a fader - these are all functions of WheatNet-IP and similar audio networks. In the case of WheatNet-IP, for example, a single Ethernet cable carries the real-time audio stream as well as network and device control messages and other metadata. AES67 covers the audio streams only.

With all this in mind, here are straightforward answers to the more common questions our engineers receive on AES67.

For the entire story... INN27.wheatstone.com

New Studio?

Heaven Forbid You Forget the Elevator.

It's easy to lose track of the many details of a new studio project. Let us take a moment to remember Edificio Intempo, the 47-floor skyscraper built in Spain that was said to be missing one important detail. Elevators.

The good thing about being in the audio network and console business is that we get to tour more than our share of broadcast studios from around the world. Our Director of Sales Jay Tyler has been in no less than 3,000 broadcast studios in his 20+ years at Wheatstone, and he has seen it all.

Here are a few things Jay, along with Studio Technology's Vince Fiola, who builds broadcast studio furniture, has noticed lately.

For the entire story... INN27.wheatstone.com



Network Edge: Engineers Vote BEST of SHOW at IBC!

At IBC, judges are comprised of engineers and industry experts who spend a great deal of time poring over every considered product before they choose a winner. So, it's great news when they select your gear! This year, we are proud to have won *the NewBay Media Best of Show Award from Radio World International* for our *Network EDGE*, which lets you use IP wireless radios to establish STLs (and more)!



For the entire story... INN27.wheatstone.com



Pictured left to right: Wheatstone's Kelly Parker, Raffaella Calabrese (Publisher, Radio World International), Marguerite Clark (Editor in Chief, Radio World International) and Wheatstone's Jay Tyler



AM Redux

Beyond FM translators

AM gets a bad rap. Fortunately, recent changes to FCC regulations are helping some AM operators turn things around with the use of FM translators.

We're firm believers in translators to extend coverage, which explains why we've just come out with the FM-25 audio processor for this purpose (we also make a step-up version, the FM-55). But we're also firm believers in AM radio and began to wonder why so little in the way of new technology is available to adequately process the AM signal. So for our engineers Jeff Keith, Steve Dove and Mike Erickson, it was back to the drawing board - and Mike's large collection of AM radios....

For the entire story... INN27.wheatstone.com



Dan Slentz Sayz 'Thanks'

LPFM advocate predicts new 100W will rank in ratings.

We received an email from Dan Slentz, an engineering consultant who has become a tireless advocate and industry friend to LPFM. He recently flipped the on-air switch to new WDPE low-power, non-commercial, educational FM radio station licensed to Dover - New Philadelphia, Ohio. He's got stuff to say about the AIR-4 console and other gear he's installed at the station.

For the entire story.. INN27.wheatstone.com



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OK, this spread is an advertising space paid for by Wheatstone. But hopefully you'll find it informative, entertaining and compelling.

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The third generation top-of-the-hour tone generator, built by WGN engineering.



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On the cover: WGN edit suite E2 is shown, complete with Kurt Cobain poster. *Photo credit: Nick Gerber*

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FIND THE MIC AND WIN!

Tell us where you think the mic icon is placed on this issue's cover and you could win a Hosa CBT-500 cable tester. Send your entry to radio@RadioMagOnline.com by **November 5**. Be sure to include your guess, name, job title, company name, mailing address and phone number. No purchase necessary. For complete rules, go to RadioMagOnline.com.



Power Tools for AES

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AESDA

The AESDA provides extremely high quality AES Digital to Analog conversion while providing diagnostic analysis of the incoming digital signal to help in troubleshooting signal faults.

- 110 Ohm balanced and 75 Ohm unbalanced inputs.
- Dual function level meters display either digital input signal level or analog output level.
- Dual function LEDs display digital input information or signal condition/fault type.
- Separate balanced XLR and 3.5mm headphone outputs, each output has its own volume control.

AESAD

The AESAD is a portable battery powered device for converting mic or line level analog audio into an AES/EBU digital audio stream.

- The AESAD has two high quality transformer based mic preamps and outputs a single, variable level, AES/EBU digital signal. Phantom power is available to power condenser microphones.
- The output sample rate is selectable by the user and a word clock input is provided for synchronization with other AES/EBU equipment.
- Metering is provided to monitor both the analog input and digital output signal levels.
- The AESAD has a headphone output with level control.
- Operates from 4 AA batteries or the supplied wall power supply.

AES QBOX

Generate into or monitor from your AES digital sound system with this handy tool. Also doubles as a quality A/D and D/A converter and impedance transformer.

Receive Section

- Receives 32k, 44.1k, 48k, 88.2k, 96k, 176.4k, and 192kHz.
- Identifies Pro/Consumer mode, sample rate and faults.
- Converts AES digital to analog and outputs the analog via built in speaker or Line Out / Headphone jack.

Transmit Section

- Transmits 48k, 96k and 192kHz.
- Generate AES digital from analog Line In jack, built in dual tone generator or built in condenser microphone.



INTRODUCING AES-SP1x2

The Whirlwind AES Splitter 1x2 is a passive unit that delivers two identical AES/EBU signals from a single stream, maintaining excellent data integrity, and exceptionally high amounts of isolation between outputs.



What Can We Learn From This? And Can We Apply It?



This month, we present the long-awaited Salary Survey results for 2015. We added more than a few questions this time — sure, we wanted to know about salaries, but we also were curious if you got a raise or not.

We asked about staff sizes, too. It's not just about salary — there are other important aspects of the job, and I believe we covered them well. Readers are "seeing the finish line," as the saying goes. Two-thirds of the respondents were 55 years old, or older. What does that portend for the broadcast companies and the "younger" engineers out there? That's a question we'll be addressing in future editions of Radio.

There's also some talk ("on the Internet") that we're headed for more of a "gig" economy as time goes on. That probably wouldn't have a very detrimental effect on the radio engineering community; many survey respondents are already doing work "other than for your full-time employer."

One of my goals as technical editor is to get information out to you that will, at least in some small fashion, make your life easier. It can be very helpful to know more about what your contemporaries are doing, how much they make, what their benefits are and so on.

Our Facility Showcase this month covers one of the most well known stations in the U.S.: WGN Radio. They've built some nice new studios — we have pictures for you, of course — and a little history, as well. One of its best attributes is continuity in engineering; they're on the third generation of a unique device now, all built by the local staff.

Fardau Van Neerden is back this month, on the topic of streaming media. Just how can radio really compete with the big streamers? Fardau tells how — and yes, there is a way. This is a continuation of his first article, which appeared in our August issue.

We're presenting an article about RDS, RDS2 (the new standard, coming soon) and metadata — how to collect it, how to distribute it — and perhaps best of all, the evolution in its use. I hope your FM stations have some sort of RDS data being displayed on radios, at the very least — if not, there's no time like the present to get started, and this article is aimed at you.

Chris Cottingham is a new author for us, contributing his first article this month. Chris is an every-day radio engineer who just happened to grow up as an IT guy, so he has a great perspective on what the average radio engineer deals with and needs to know every day. He also teaches, and he knows how to explain things to beginners — which you may be, although, admittedly, none of this is brain surgery.

Your regulars are also back this month: Lee Petro, on a recent change in contesting rules; Tech Tips discusses means by which you can pick up some good test equipment on a budget; and the Wandering Engineer muses on the future of VHF Channels 5 and 6 (isn't it about time we use them for something?).

Once again, thanks for picking up Radio magazine!



Doug Irwin, CPBE AMD DRB | Technical Editor

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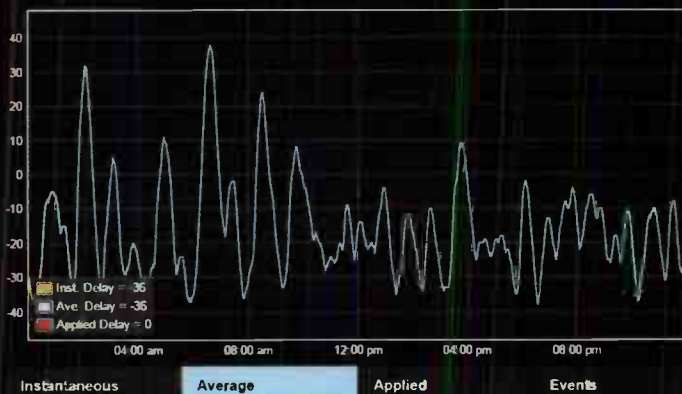


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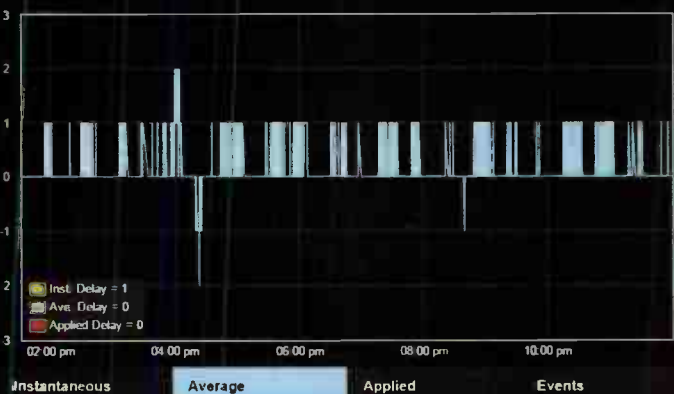
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Detail View



Typical FM/HD1 drift over a 24 hour period.

Detail View



Corrected FM/HD1 audio within ± 2 samples over 24 hour period.

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— Paul Shulins, Greater Media Boston.

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by Lee Petro

Contest Rules, Revised

The days of speed-talking contest rule disclosures may soon go the way of rotary dials.

The FCC adopted rules to avoid disclosing contest rules over the air, and to instead move to online disclosure of broadcasters' contest rules. The changes come nearly four years after a petition for rulemaking was filed by Entercom Communications.

The broadcast contest rule requires the station to "fully and accurately disclose the material terms of the contest" and to "conduct the contest substantially as announced or advertised." The rule requires that these disclosures occur periodically and not be false, misleading or deceptive. Enforcement of this rule has been rigorous at times, with several broadcasters being fined each year.

While the substantive requirement that material terms of broadcast contests be disclosed has not changed, the rule changes will permit the disclosures to be posted online. The following is a summary of the major points.

Publicly Accessible Website: First, if a broadcaster chooses to post contest rules online, the FCC will require broadcasters to place the complete rules on a website that is designed to be available at all times, without separate subscription or other registration requirements. The website can be owned by the station, the station's licensee, or if neither have their own website, any other website that is available to the public.

Broadcast Identification of Website Address: Next, the FCC will require broadcasters

to disclose the website address of the location of the contest rules on a periodic basis. The FCC declined to adopt specific language for how to refer to the website, instead permitting the licensee to use language that a typical consumer would understand and be able to use to find the website. For example, the broadcaster would be able to say, "For contest rules go to kxyz.com and then click on the contest tab," rather than specifically giving the complete Web address.

The FCC decided not to adopt requirements that the notices regarding the location of the online contest disclosure be broadcast on a more frequent basis. Instead, the FCC will continue to require that the disclosure be made on a periodic basis, and leave the specific timing to the broadcaster's discretion.

Internet Link to Contest Terms: To enable consumers to readily locate and review contest rules, the FCC adopted rules to require licensees to create a link or tab on their website home page that will take the consumer directly to the disclosure statement.

Duration of Online Disclosure Obligation: In the past, it was unclear how long broadcasters were required to air contest rules after the first notice of the contest. To ensure that consumers will have access to the contest rules, the new rules require broadcasters to keep their contest rules available for thirty days after the contest has concluded. Moreover, to eliminate confusion, broadcasters should update the website to label contest rules that have expired.

Changes to Material Contest Terms: As noted previously, the basic requirement for contest rules is that they are not false, misleading or

deceptive, and that requirement will not change under the new rules. However, changes to contest rules and procedures under the prior regime were more easily provided to the public because the new terms simply would be read over the air.

Under the new rules, changes to the rules or procedures of a contest will require the broadcaster to announce on-air that the rules of the contest have changed, and to direct listeners to the new contest rules available at the website. The notice of a change in the contest rules will need to be broadcast within 24 hours of a change in the material terms of a contest, and the FCC suggests that broadcasters specifically note when the contest rules were updated.

Consistency of Contest Terms: Finally, the FCC reminded broadcasters that the information provided to consumers over the air must conform in all material respects to the information provided in the online version of the contest rules. Thus, the FCC will focus on whether the disclosures are substantially the same when conducting enforcement actions.

The new rules should serve to eliminate the current awkward announcements that are not easy to follow and were often misunderstood if a consumer was driving or otherwise distracted. The licensee reaping the benefit of the modified rule should be very careful in implementing the new procedures though, and take steps to ensure that all information being provided to the public is consistent, and is not false, misleading or deceptive. **Q**

*Petro is of counsel at Drinker Biddle & Reath LLP.
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DATELINE

Dec. 2, 2015 – All commercial broadcast stations must file Biennial Ownership Reports (FCC Form 323) with data current as of Oct. 1, 2015.

Dec. 2, 2015 – Noncommercial broadcast stations in Alabama, Connecticut, Georgia, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont must file Biennial Ownership Reports (FCC Form 323-E).

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2015 Salary Survey

by Doug Irwin, CPBE DRB AMD

The 2015 Salary Survey was changed considerably from years past, and has presented us with more data to analyze. Likely, the most important part of the results is salary level, and this time, we decided to break all the results into market groups — specifically, markets 101 and below; markets 100 through 75; markets 74 through 50; markets 49 through 25; markets 24 through 11; and finally, the top 10.

Aside from salary, we also looked at other aspects of an engineer's work life, including staffing levels; whether or not those who responded got raises; and other benefits, such as vacation and vehicles.

SALARY LEVELS ARE A GREAT CONCERN

At the end of our 2015 survey, we provided a place for you to add comments, and although the topics covered were many, salary again came up frequently. That begs the question: What can be done by the engineer in the field to increase his or her salary?

It's a given that becoming the head of the department is a way to make more money at a particular station, at a particular market level. Many of you don't necessarily want to be the boss, however; so what else is there to do?

Market Grouping	Median Salary (all job functions)
Market 101 and below	between \$55,000 and \$59,999
Markets 100 through 75	between \$60,000 and \$64,999
Markets 74 through 50	between \$60,000 and \$64,999
Markets 49 through 24	between \$70,000 and \$74,999
Markets 24 through 11	between \$70,000 and \$74,999
Top 10 Markets	between \$90,000 and \$99,000

We would suggest that a reasonable way to get more money for the job you do is to move up in market level, and results of the survey support that claim.

Since these figures represent the median salaries, we want to make note of three other results:

- 21.7 percent of the respondents (for all job categories) in markets 24 through 11 category indicated that they make between \$100,00 and \$125,000 per year
- 22.7 percent of the respondents (for all job categories) in the top 10 markets indicated that they make between \$100,000 and \$125,000 per year
- 20.5 percent of respondents (for all job

categories) in the top 10 markets indicated they make over \$125,000 per year

As much as many of us lament the diminishing impact and importance of the radio-engineering field, the fact is that there are more than 15,000 radio stations in the United States, and they all need technical support on some level. The results show, as expected, that as you go up in market level, your salary follows.

HOW MANY ARE GETTING RAISES?

Many of us in the field are concerned that many years have gone by between raises. This is another question we put to you, and again, we'll look at the results on a per-market-group basis.

The likelihood that you got a raise last year seems to depend quite a bit on the market group in which you work.

Market Grouping	Received Raise	Did Not Receive Raise
Markets 101 and below	43.55%	56.45%
Markets 100 through 75	56.25%	43.75%
Markets 74 through 50	43.75%	56.25%
Markets 49 through 25	50.00%	50.00%
Markets 24 through 11	54.55%	45.45%
Top 10	59.09%	40.91%

STAFF RATIO

We've asserted that one way to get more money working in broadcast engineering is to move up in market level. However, one could easily ask: "Doesn't working in a larger market mean that I'll have to work just that much harder? Won't I have to take care of more stations?"

With that in mind, we put another question to those taking the survey on what we termed the staff ratio, determined by taking the total number of staff (including engineering and IT) and dividing it by the number of stations for which your department is responsible. For example, if you have 10 stations, and 5 total staff, your result will be 5/10 = 1/2, which is less than (<) 1.

What the chart below shows is that as you go up in market size, staffs get larger. That's not to say you won't have to work harder as you go up in market level; but our results indicate that the total number of people you have in a department will tend to correlate with the number of stations in

Market Grouping	Staff Ratio			
	less than 1	1	more than 1	N/A to respondent*
Markets 101 and below	66.13%	12.90%	16.13%	4.84%
Markets 100 through 75	68.75%	12.50%	12.50%	6.25%
Markets 74 through 50	62.50%	18.75%	18.75%	0%
Markets 49 through 25	45.95%	13.51%	40.54%	0%
Markets 24 through 11	50.00%	13.64%	36.36%	0%
Top 10	31.82%	20.45%	25%	22.73%

*The respondent works at the corporate level and has no station portfolio

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Contractor Rates Per Hour					
Market Grouping	Normal Rate	Emergency Rate	Market Grouping	Normal Rate	Emergency Rate
Markets 101 and below	high = 120	high = 180	Markets 49 to 25	high = 100	high = 125
	low = 10	low = 25		low = 20	low = 30
	average = 51.65	average = 84		average = 58.59	average = 73.50
Markets 100 to 75	high = 100	high = 150	Markets 24 to 11	high = 125	high = 175
	low = 35	low = 85		low = 28	low = 50
	average = 56.80	average = 117.50		average = 73.66	average = 103
Markets 74 to 50	high = 75	high = 100	Top 10 Markets	high = 200	high = 250
	low = 11	low = 60		low = 35	low = 60
	average = 45.86	average = 77.50		average = 97.55	average = 121.50

your portfolio. It's also not too much of an extrapolation to say that as your staff gets bigger, the amount of work you do simply managing them will increase as well.

CONTRACTOR RATES

If you took the survey, you probably

noticed a section for contractors. We were interested in knowing if rates tend to go up with market size (for the most part, they do), and we were interested in seeing how "emergency or otherwise unplanned hours" were charged to clients.

As one would expect, those rates also tend

to rise with market size.

Many of you moonlight or take on other side projects in addition to your regular employment. Looking across all markets, 49 percent of you work as employees only; 11.2 percent of you are strictly contractors; 39.8 percent of you are regularly employed but do "outside" work as well.

Another aspect of working as a contractor that is of concern is the percentage of you that maintain contracts with clients. Looking at all market levels, 14.5 percent have contracts with all of your clients; 18.3 percent of you have contracts with some of your clients; and 67.2 percent (over two-thirds) don't have contracts.

HOW ABOUT THE RESPONDENTS THEMSELVES?

We'll end our analysis with some information that you provided about yourselves.

It's been shown in previous Salary Survey results that certifications generally lead to higher salaries. What certifications, then, are currently held by respondents?

Are you certified with any of the following organizations?

Most of the category "other" were FCC radio-telephone license holders. Yes — in retrospect, that should have been included in the options. Interestingly, though, only about 11 percent of respondents noted that category — about one-quarter of those who responded as SBE-certified.

It's been said that the industry is graying at a rapid pace. Our results seem to confirm that.

What is your age?

That's perhaps the most important result

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that should be on the minds of station managers and corporate engineering managers.

We also asked respondents the number of years they've been in the radio engineering field. It's a variant of our last question, of

course. The shortest career was 1 year to date; the longest, 61 years (several responses at that length). The median was 31; the average 30.5.

There you have it. We hope that the information gathered from the many respondents is

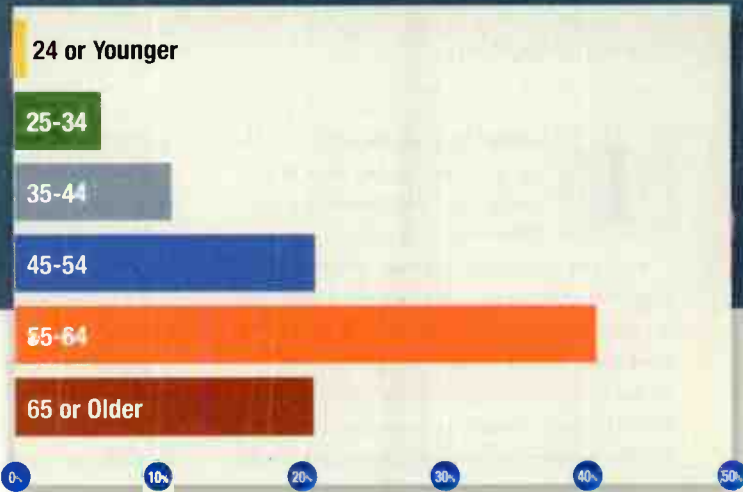
interesting and of use to you. To those of you that responded: Thank you.

Please look out for our next salary survey, which will be posted online in July of next year. 0

Are you certified with any of the following organizations?



What is your age?



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Compete With the Big Streamers

by Fardau van Neerden

In order to compete with streaming services, it is key to offer a similar user-experience but to differentiate on content.

I hate to use the catchphrase “content is king” but let’s be fair — it is. I enjoy listening to music but would also like to hear the latest news and weather reports and get updates on the traffic situation, and that’s why I don’t like to listen to streaming music services like Spotify. I prefer my local radio station with the

morning crew on my commute to work.

For listeners, one of the big, perhaps unconscious, benefits of traditional radio is that someone else did the thinking for me. I don’t need to put together my own playlist. If you run a good radio station, you know what your listeners want and how and when they want it. If you can keep this consistent, you probably have a well running station with a consistent set of listeners. Sure, you can listen to pre-defined playlists on streaming services, but somehow

they are never as good as a thought-out radio format. Use insider knowledge of your listeners to your advantage.

I have told companies in our industry that someone needs to offer a turnkey solution (with all the features I’m about to bring up) to facilitate online streaming for radio stations.

It is extremely difficult to keep up with the pace of online content distribution, especially if you are a local radio station. It’s a whole different world, and to develop your own platform would be a huge undertaking, one that is probably not cost-effective.

There are companies that do offer encoder software to get you started with streaming, and let me make one thing clear: I’m not talking about the Shoutcast/Icecast offerings. I’m referring to adaptive streaming. But this doesn’t get you far, because you need to ingest your stream somewhere. And there are, as far as I know, no truly ready-to-use platforms out there.

WHAT YOU NEED — AND WANT

To get started, you’ll need to get your own so-called ingest origin server. This origin server will repackage your stream in different adaptive streaming formats for reach across different platforms.

To serve huge numbers of listeners, you will also need a content delivery network, which will be associated with your origin server in a transparent manner. (For a deep dive on this technology, please read my product review on the Z/IPstream in the May 2015 issue.)

As a radio station, you probably want a one-stop-shop. You want to sign up online with a company offering an end-to-end streaming solution. They will give you the encoding software to get your audio signal in a multi-bitrate stream to this origin server. They will host and maintain the origin server and package your stream, and if necessary, add content protection (DRM).

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You'll also need a player on your website and perhaps apps for iOS, Android and/or Windows devices, and I know that this is a huge undertaking. It would be great if the same company had already developed something that would just require you to customize a generic app with your logos and to submit it to the app stores for you.

MONETIZATION

"Forecast data from BIA/Kelsey projects that by 2018 nearly 25 percent of terrestrial radio station's annual advertising revenue will be generated from online listening," according to <http://tinyurl.com/pbaru9h>. "And that is a conservative projection."

It is key to have ad integration. Specifically what I mean by that is ad insertion on a unicast basis — not just "pop-up" ads in the player. The theoretical company offering this all-encompassing streaming service would need to have deals with ad networks and the ability to dynamically integrate these ads with the app and player.

This approach would ultimately enable several things:

1. Stations will have the ability to stream their content online while offering a better listener experience.
2. Stations will be able to monetize their online content.
3. Stations will not need to develop or maintain technology that is outside their realm of expertise.
4. The technology offers the ability to grow with your success without investment up-front.
5. The technology used is standardized and open.
6. Future integration with mobile and in-car entertainment is covered.
7. Streams or specific parts of content with DRM can be protected.

Now, if I were an entrepreneur, I would be taking notes because, at this moment, there is no turnkey one-stop shop offering the whole set of features mentioned here. The technology is available, but you would need to glue it all together yourself. I'm sure it won't take long for someone to come up with a service like this. They might team up with different partners; I know of a few companies already collaborating, which is good for the industry.

I realize that to some this might all be overwhelming. I have a hard time keeping up with the latest and greatest this market has to offer.

But don't forget: Radio is still the same. In the end, the content you produce with your

radio station is the big pull for listeners. That's what sets your station apart from the generic streaming services.

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Don't Let Your Budget Hold You Back

by Doug Irwin, CPBE AMD DRB

At the first large company I worked for in radio (during the 7-7-7 days), our corporate engineer was oft quoted as saying “all you need is a 3-pound soldering iron and a Simpson 260!”

While that may have been true during his heyday (may he RIP), it's not even close to what you need today.

In our May and June issues of the magazine, I wrote about getting the basics set up for your shop.

This month, we'll take a look at additional test equipment, with an eye on budget.

HAS THIS HAPPENED TO YOU?

You walk into a new station and find that either a) the previous engineer was a contractor, and of course, used



The Pico Oscilloscope module uses your laptop for power and display, drastically reducing expense, while saving space and weight, as well.

all his own test equipment, or b) the previous engineer didn't have any of the test equipment he really needed to do the job right.

Don't walk down that same path. Even with tight budgets, there are ways to get the test equipment you need.

The oscilloscope. For the most part, it's an analog holdover; however, there are still plenty of reasons to have one.

An example: You might need to look at logic levels and see how stable they are. Is that 5V “send” from an automation machine rock-solid or noisy? That's difficult to tell with a DMM. Is there AC ripple on a power supply line inside of an audio amp, meaning it's time for a cap change? Use an oscilloscope to check.

Another example: You might be tracking down peak clipping in your audio. (Many times this is referred to as “overload” in equipment manuals; or those ignorant of the true meaning will often hear peak clipping and refer to it as “over-modulation.” What they really mean is gross distortion caused by peak clipping.) An oscilloscope is a great tool for looking at analog audio (in real time) to see peak clipping, or in conjunction with test signals, to gain insight into distortion caused by some problematic amplifier.

A great source for oscilloscopes is eBay; a good choice would be a Tektronix 2215.

Perhaps that isn't an option you want to pursue, though; if not, consider one of the following options.

Pico makes a line of mixed-signal oscilloscope/signal generator combos that use a laptop/computer for their display, via USB. (<http://tinyurl.com/o8bhkkl>). The fact that it has a built-in signal generator is a bonus as far as I'm concerned; clearly you can use it as stimulus



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The Signal Hound will give spectrum analysis capability to many engineering shops that were previously unable to afford it.

for stand-alone devices or entire systems.

Another option — and I'm sure there are quite a few — would be diligent (<http://tinyurl.com/p5mvso2>).

(A note here from your editor: put down the print edition, get on your computer, and look at the online version of this same article. You can click on the links directly then.)

Spectrum analyzer. This is considered a luxury around most shops, unfortunately. That's really too bad because there is so much you can do with one.

Say for example, one day your analog microwave STL gets "noisy" and of course that affects your on-air product. Is it a weak signal? Co-channel interference? You need a spectrum analyzer to figure that one out.

Take it to the far end, put it in place of your STL receiver, and see what you get.

Another common example: You need to take measurements to ensure compliance with 73.317(b) — look it up — to answer a question about your station's occupied bandwidth.

Again there are probably quite a few options, but one to definitely look at is this:

(<http://tinyurl.com/pbj8phw>). Now I cannot say that this analyzer has a "max-hold" feature, which you would need for 73.317(b), but even if this particular one doesn't, the idea remains valid. This analyzer uses a USB connector on your laptop or PC for power and as a means to get data to the computer for display purposes.

OFF TO THE TRANSMITTER SITE

Because both units mentioned so far are companions to a laptop, you can haul them around with you.

One device I saw recently (at KIRO in Seattle) was the AMM-SD1 from Radio Engineering Associates (<http://radioassociates.com>). Just like the other devices previously mentioned, it's a USB-connected, microprocessor-based hardware interface. It also has an RF demodulator that gets connected to the transmitter (or transmission line, unless the Off-Air pickup unit is used). The Modulation Monitor Software is installed and runs on the display computer, displaying the percentage of modulation and modulation envelope in a series of user-selectable windows.

"Don't let your budget stand in the way of getting things done" was the mantra of another former employer.

It's as true today as it was 20 years ago; the difference is that none of this test equipment existed back then, and having access to each type will make your job easier. **0**

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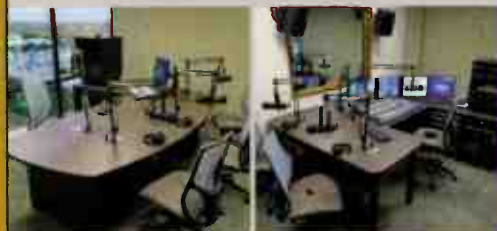
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WGN Radio Is a Chicago Hall of Famer

WGN Radio

by Jason Ornellas

Since 1922, WGN (then known as WDAP) has been broadcasting in Chicago, initially on 833 kHz, and since 1927, on 720 kHz on the AM dial.

WGN Radio is part of Tribune Broadcasting and is the company's sole remaining radio station. Its history is long and storied, but one thing has been the same since 1924 — the famous call letters that stand for "World's Greatest Newspaper." This moniker was on the front page of the Chicago Tribune for decades, but last year, Tribune Media (parent of Tribune Broadcasting) split from Tribune publishing, and WGN is no longer co-owned with the newspaper. Centrally located in the Tribune tower in downtown Chicago, WGN has a "walk of fame" marker along Michigan Avenue with a number of its legends enshrined in the walk.

WGN is in a unique position because they are

a top-rated stand-alone radio station in a major market. They are co-owned with over 40 television stations in 33 cities including New York, Los Angeles, Chicago, Houston, Dallas and Washington, D.C. WGN has been in its current facility since July 1, 2012 and completed a move from the ground floor to the seventh floor to give WGN a state-of-the-art facility, while maintaining continuity for programming with multiple sources and precise timing.

NEVER MISSED A TONE

Every facility has an interesting story behind it, and WGN is no exception. WGN takes time very seriously. Many years ago, WGN engineering constructed a top-of-the-hour time generator to give a very specific tone at the top of the hour. This tone consists of three frequencies mixed together and has been a hallmark of WGN Radio ever since.

Generally, WGN runs a 10-second delay, so the



Bill Murdoch
of WGN Engineering



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tone generator makes tones twice an hour, first at :59:50, so the talent can hear the tone in their headphones and monitoring, and then a second tone is generated at :00:00 for the air chain. Even while running multiple time tones for monitoring and on-air during the move from the first-floor facility to the seventh floor, WGN never missed a single tone.

The programming, news and operations departments, as well as the engineers Bill Murdoch, Jim Holland, Jim Carollo and Bill Maylone, all took part in the design phase for the project and decided on a WheatNet-IP infrastructure for the future of WGN Radio. The new facility took time to design because WGN's workflow required 10 studios with five newsroom workstations.

When it all came together, WGN rebuilt three on-air studios with integral producer and operator booths; two production studios; two editing rooms; a business studio; a sports studio; a traffic studio; and a newsroom with five workstations.

WGN Engineering decided on the Wheatstone E-6 consoles throughout the majority of the facility. The E-6 control surface is part of the WheatNet-IP Intelligent Network. For a station like WGN that requires a high degree of functionality, the console's four stereo mix buses, four mix-minus buses, four AUX buses, eight-character fader displays, "bus-minus" on all faders with talkback, fit the requirements well. WheatNet SideBoards are used in the newsroom for four workstations, and in business, sports, traffic and in the producer rooms. A Wheatstone A-6000 analog console in the showcase studio rounds out the facility's console family.

ALL THE SOURCES

WGN shares several resources with co-owned WGN(TV), from the ENG trucks to satellite downlinks.

Additionally, the station broadcasts some

shows during which the talent is on TV and radio at the same time. With the Wheatnet-IP, the station can do all manner of mix-minus setups easily.

Forty-eight blades make up the WGN Wheatnet-IP system; most of the Blades are

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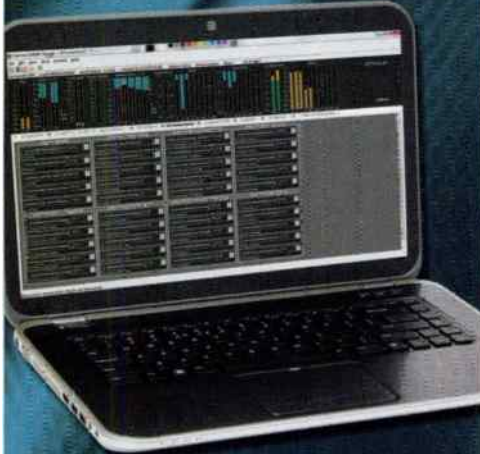


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FACILITYSHOWCASE

found in the rack room, with the remainder of the system found on the first and seventh floors, and in the TV station, located 5.5 miles away. The WGN system includes nine Console Mix-Engine Blades, 26 Analog Blades and two AES/Analog Combo Blades. It supports 284 stereo inputs and outputs.

COMPLEX REQUIREMENTS

Besides the WheatNet-IP system, WGN has a sophisticated multi-camera video feed that shows the main studio in three different HD camera angles. In addition, other cameras are used to develop a combined image of the news, traffic, sports and business studios.

and screened hold). It was a bit of a challenge to migrate the legacy choke-network calling system to the SIP trunks, but the switch was worth it. Lines come in on a T1, DSL and finally, POTS. This gives WGN the best quality available and the flexibility to grab and move lines if necessary and redundancy, if part of the system should fail.

WGN also originates "Kap and Haugh," a sports cable-TV show for Comcast Sportsnet Chicago, for three hours per day, with five Panasonic PTZ cameras and a TriCaster 8000 switcher.

Talent at WGN sometimes likes to move between studios (and floors). One day, the



WGN rack room, featuring incoming/outgoing ISDN units, Comrex Access and WheatNet Blades.

WGN's video system puts seven cameras on the air simultaneously. The screen is divided into four quadrants with three cameras showing the on-air studio, and a smaller box on the lower right with the News, Traffic, Sports, and Business studios. The video system uses Panasonic PTZ cameras, an Evertz front-end, a BlackMagic router and a Livestream streamer. The video stream can be viewed at www.wgnradio.com; click the "watch" button.

Because talk is a staple for WGN, a Telos VX system is an integral part of the system, with a number of features that enable the system to work as required for WGN. A couple of tweaks were needed for the system, and Telos stepped right up. The call screening software was changed to have different colors for different call states (ringing, on hold, on-air,

showcase studio on the first floor is the desired location; on another, the seventh floor studios are more suited.

The station is also the flagship for the Chicago Blackhawks and Northwestern University teams. Upon occasion, a Blackhawks game will air on 720, while station staff feed NU games to another station.

All of this studio switching is easy now with the WheatNet system. It used to take racks of relays to do the following when studios are switched: Switch the on-air phone lines to the correct studio, put the production lines on the other studios, switch the four mix-minuses to the remotes, switch the feed to the Internet stream, switch the cameras on the in-house video system, and finally switch the studio that feeds the air-chain.



Midday Personality Wendy Snyder with Newsman Steve Bertram.

TIME FOR TOUCHSCREENS

Most recently, WGN just finished installing WideOrbit as its automation system. This system replaced an AudioVault that served WGN for many years. A big advantage of WideOrbit is the integration between traffic and the audio automation system because WGN also uses the

WideOrbit traffic system.

The installation went very well, and the entire library was moved from the old system to the new with few glitches. The WideOrbit Automation system has touch screens, and the talent was able to operate the system with minimal training. Now, WGN can run spots on one

console channel, hotkeys on another channel and preview through an external speaker.

The architecture of WideOrbit Automation lets WGN run updates to the server while the machine on the air happily bounces to "Island Mode" without a glitch. This temporary state of isolation from the network is possible because the audio to be played resides on the computer associated with the on-air studio.

As a flagship for the Chicago Blackhawks, WGN ran into an issue with audio it sends to the United Center where the Blackhawks play. During games, some commercials need to be removed from the stadium feed (since it is used for the public address systems) and WideOrbit automation is able to accommodate that need. **0**

All studios were furnished with in-state manufacturer RAM Broadcast Systems, which is based out of Volo, Ill. Listen and watch WGN online at www.wgnradio.com.

Bill Murdoch contributed to this article.

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RDS and Metadata

by Doug Irwin, CPBE AMD DRB

While the use of RDS is now common among FM broadcasters in the U.S., not every station is taking advantage of the functionality that it provides.

A new RDS standard is on the horizon; RDS2 was just demonstrated at the 2015 meeting of the RDS forum. It's a good time to examine the current RDS standard some, along with RDS2.

There are many RDS encoder models available, and just as many ways to get metadata (such as "now playing" information) up to your transmitter site. We'll take a look at some of the products that are available.

RDS AS WE HAVE COME TO KNOW IT

The RDS system is the familiar way by which we have transmitted slow amounts of data over FM radio for the last 15 years or so.

Its primary characteristics are as follows:

- Data is sent by way of a 57 kHz subcarrier.



Inovonics 730

- The data rate is 1187.5 kbps, modulating the carrier by QPSK.
- The power associated with the 57 kHz carrier remains the same, even when modulated (Meaning: If you give the RDS subcarrier 5 percent injection, it maintains that level, even while it is modulated.)

For those of you who have never used subcarriers, I'll point out some particular FCC rules you must know:

- 73.1570(2)(i) The total peak modulation may be increased 0.5 percent for each 1.0 percent subcarrier injection modulation, and
- (ii) In no event may the modulation of the carrier exceed 110 percent (82.5 kHz peak deviation).
- In other words, you must give back a little of the modulation percentage of your main program audio when you add subcarriers, and RDS is no exception.

The most familiar payloads of the RDS system are the program identification (PI), which is a unique code that identifies the radio station (and also used in the RadioDNS system); the program service (PS), which is a simple eight-character static display typically displaying a station's name or call letters; radio text (RT), which is a 64-character line of text that can be static or dynamically associated with the program content (such as "now playing" information); Dynamic PS (DPS) which is the parsed, eight-characters-at-a-time dynamic display that some radios

have; and traffic message channel (TMC), which is data that can be used by automotive navigation systems.

RDS2

The RDS2 standard is coming, but it is still in development.

From the June 15 edition of the NAB Broadcast Blog (<http://tinyurl.com/pk75skx>), we can glean the following information:

- RDS2 will make use of up to three additional subcarriers (along with the original 57 kHz subcarrier) that will be centered at 66.5, 71.25, and 76 kHz.
- It is proposed that the new RDS2 subcarriers will be used exclusively to transmit Open Data Application information. Previously established as part of the legacy RDS format, ODAs are used to support a variety of data services, and are the principal way that new services utilize RDS.

The most important aspect of the proposed RDS2 standard is that it will support far more data transmission capability — on the order of 10 to 20 times more than the current standard. From NAB's Broadcast Blog: "With the completion of the successful prototype demonstration and the RDS Forum members in agreement that RDS2 should be incorporated into the Standard, it is now the task of the newly formed RDS Forum Working Group to develop the detailed specification for RDS2, and in addition

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to identify the obsolete sections of the existing Standards that can be eliminated.”

However, “there’s no such thing as a free lunch.” After the RDS2 standard becomes finalized, and equipment is made available, that 73.1570(2)(i) and (ii) are still going to



apply. Typically, RDS subcarriers are injected at a fairly low level — not enough to make a noticeable difference to the normal programming. If you add three other subcarriers — in order to transmit more data — you’ll be obligated to turn down the main channel modulation to the point that it might be noticeable. There will be a trade-off between the overall modulation level, and the effectiveness of the data transmission of RDS2. Those of us that transmitted data subcarriers in days past have already fought this battle.

HANDLING METADATA

Having the means to transmit “now playing” information, among other data, is fine — but you need some way of collecting it, and making sure it ends up in the correct place — like at your RDS encoder or streaming encoder(s). Many vendors are out there ready to provide everything necessary to make this happen.

Enco offers up PADapult, a system that allows the user to create and distribute “now playing” information along with message-casting content by sending real-time text data out to as many as 10 destinations, including RDS, your website and social media like Twitter. Because PADapult is a stand-alone application, you can use it with any automation system. Some of its other features include:

- Text data can be sent to whichever service you choose, automatically or on the fly.
- (Optional) PADLive!’s comment field allows free-form information to be sent for



Jumpgate3 RDS monitor

emergency or promotional messages

- When used with compatible automation systems, PADapult supports sending of iTunes tagging information for HD Radio
- When used with compatible Omnia or Vorsi audio processors, PADapult supports Content Adaptive Processing, allowing “on the fly” changes to processing based on audio group/types

Jump2go offers the Jumpgate data processor, which is a single device that accomplishes the following:

- Manages communications between automation systems and Jump2go’s Web-based distribution system (CORE)
- Affords station engineers the means by which they can browse at the bi-directional communications between Jumpgate’s CORE, either by PC or mobile device
- Provides both DPS and RT and RT+ for RDS
- “True iTunes tagging” (song identifications) broadcast via RDS
- Also sends data to streaming servers, social media destinations, and HD Radio PSD
- Can inject ad-insertion time-adjusted metadata into streaming media encoders
- Has message management system for creating day-parted messages for RDS
- Supports Artist Experience logos (for HD Radio) and TagStation-provided images

Arctic Palm is another important player in this space. Center Stage RDS is the link between the Radio Automation System, Satellite Services, and the data casting devices and services. Its basic features include:

- Transmission of messages to any combination of Digital Systems, website and Internet Streaming Services For RDS: PS, DPS, RT,

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and RT+ tagging are supported

- Transmission of messages based on metadata to TuneIn.com; or add the (optional) CSSocial module and automatically post messages to Twitter and Facebook accounts
- During non-automation periods, or prerecorded long play segments, the “now playing” information can also be added using the Center Stage Live’s (optional) CSLogIt. Messages can be generated “on the fly” or can come from a CSLogIt Playlist



Deva Smartgen Mini

- Based on user definable criteria, CSRDS will automatically switch between local automation, satellite services or playlist entries; promotional, information and commercial messages will be rotated into the display or added based on events in the automation system link
- Supports TagStation (NextRadio); Artist Experience (via HD Radio)
- Also supports Dynamic Label Slideshow, for DAB or DRM

A well known player in this field is **Broadcast Electronics**, and their product is The Radio Experience. In addition to pushing messages out to RDS and HD Radio, it has the following basic functions:

- TRE runs on a single, dedicated PC
- Interleave artist/title information with custom messages
- Link data to audio: provide concert info, advertiser info, and more
- Target different messages simultaneously to different destinations
- Publish to Twitter, Facebook and music communities on the Web
- Supports tagging
- Monitors datacasting logs in real time

BE has a link to a short video (<http://tinyurl.com/ofu7ybh>) on the setup and configuration of their RDS system. It's worth watching.

TagStation provides services based on your station's metadata. (It's essentially the “back office” of NextRadio functionality.) TagStation maintains a

- very well done set of tutorials (<http://tinyurl.com/ns9crw6>) as well.
- The TagStation service is reached via the Web and receives a notification every time you play a song, a spot or a promo from your automation system
- It then then finds (in a database) content related to the audio event and delivers the content in sync with your broadcast to mobile phones, car dashboards, and “any future connected devices”
- TagStation can also send the same content back

- to your playout system for delivery over HD
- TagStation enables you to enhance each audio event with an image, text and a number of interaction points
- The station can define its daily broadcast schedule and deliver an image, text and a number of interactions related to each on-air show

I'll wrap up this article by listing the most well known manufacturers of RDS encoding gear:

- **Inovonics:** models 703, 720 and 730
- **Deva Broadcast:** many models, including the SmartGen 3.1, the SmartGen Mini and the SmartGen micro
- **Jumpgate:** RDS generator
- **BW Broadcast:** the RDS2+ and the RDS3
- **Worldcast Systems:** FMB-80
- **Broadcast Electronics:** RDI-20


A large portion of our audience expects to receive additional information about music as they hear it over the radio; it's a consequence of the kind of functionality one gets when streaming music. In that virtual space, it's a must-have feature. This is



Audemat FMB50


one of several areas where radio needs to catch up with online and streaming services.

Use this article as a basic guideline for how to get started, if the topic is completely new to you. 0



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Firewalls Are Just Like Bouncers

by Chris Cottingham

In today's world, we are more connected than ever. With all of the remote access solutions available to us, we should be able to address and fix almost any station issue remotely within a few minutes.

The process of addressing issues has been greatly streamlined by the use of AoIP and other technologies. These new technologies afford us unprecedented ability to address most issues with a Web browser or a terminal interface. Because so much of our work now lies within computers, we can choose to work with our sites in-person or remotely, by way of laptops, tablets or smartphones. We need to leverage this connectivity to make our lives a little easier while providing excellent service for our stations.

In this article (and the next) we're going to discuss firewalls first, followed up by a detailed examination of various remote access solutions, so that you can learn to effectively make use this tool.

There is always a price to pay for this ease of communications and remote network access. The price is called risk. If you connect your LAN to the Internet — there is risk. If you open a door to allow remote access, there is even more

risk. Any network can be cracked with enough time and patience; there is no way to candy-coat this. If you enable remote access, someone can potentially break into your network.

Your job as the person implementing a remote access solution is to balance the amount of risk you are willing to take with the level of functionality that you need. If the solution is complex, it will have less risk, but utilizing it might be more challenging. If the solution is rather simple, then you might have more risk and more issues with unauthorized access.

As we cover various remote access solutions, you will have to assess where your comfort zone lies.

POINTS OF CONSIDERATION

Engineers need to consider some points before they dive into implementing a remote access solution. We all have budget constraints. A license for remote access software may cost thousands of dollars.

One must also consider the group of users that will potentially have remote access. Some stations only allow the engineering staff to access the station remotely; some stations will also allow program directors, production



Any network can be hacked with enough effort — but effective firewall configuration and maintenance make it much harder.

directors and traffic directors to access the system remotely. This will factor in to how complex the solution will be.

The final point I would like to address is that of maintenance. Someone will need to monitor and administer the remote access system. A remote access solution is not something you set and forget: Someone needs to make sure that passwords are rotated, logs are checked for suspicious access attempts, and that patches are applied. An engineer can implement the best remote access in the world, but it is worthless and a severe security risk if it is not maintained.

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When implementing a remote access solution, a limited discussion about firewalls and basic TCP/IP is in order. One of the most important concepts is the idea of inbound and outbound data traffic. Most firewall implementations do not block any outbound traffic, meaning that users on your LAN have access to whatever they want on the outside of the firewall, via the open Internet. When we implement a firewall, we are usually blocking inbound traffic.

Another concept to discuss is the use of port forwarding, or the opening a port on the firewall for inbound traffic. With any TCP/IP host there are 65,535 ports that can be utilized for services, but certain ports are defined and never change. These are called reserved ports and go from port 0 to port 1024. As an example, let's look at port 80: Everyone in the world has agreed that this port will be used for Web traffic. If you have implemented a firewall on your Web server you will need to open port 80 inbound so people using the Internet can "see" your website. Ports above 1024 are completely open and anyone can define or use them for their needs.

Some remote access solutions require a port to be opened on the firewall in order to operate properly.

Think of it this way: I want to access Bob's house. I need to know what door to knock on and Bob needs to answer that door. A firewall blocks everyone's ability to knock on the doors of Bob's house. Now, Bob wants people to be able to access his services so he sets up programs that will answer certain doors. After Bob sets up these services, he will need to tell the firewall that if someone wants to knock on these doors, let them. After that "configuration" is done, people can actually reach Bob's house and knock on certain doors, and they can access the services that Bob is offering.

OF PROTOCOLS AND PORTS

Let's talk about the difference between TCP and UDP and the significance of ports.

TCP/IP and UDP/IP are two flavors of network protocols we are interested in when we are talking about firewalls. These two protocols deliver your data in different ways: UDP is usually used for audio and video over the network

due to the time-sensitive nature of these types of data; TCP is used for everything else.

These two protocols work in conjunction with IP to get your data from source to destination. Four pieces of information are needed to get your data from one point to another: A valid source and destination IP address and a valid source and destination port number.

For simplicity's sake, you can think of TCP/IP and UDP/IP as the means by which mail gets delivered to your house. TCP/IP is like certified mail that requires a response to the sender for verification that the letter was received. UDP/IP is like a postcard; it gets sent, and we don't necessarily care about getting confirmation. We need a proper address in order to deliver mail. Usually a person will place a return address and a recipient address on a letter in order to mail it. The address of the destination building is like the IP address and the port is like the person we are sending the letter to. Without these two pieces of information, we cannot send data. When you are setting up the remote access solution of your choice you will need to know what your network IP address

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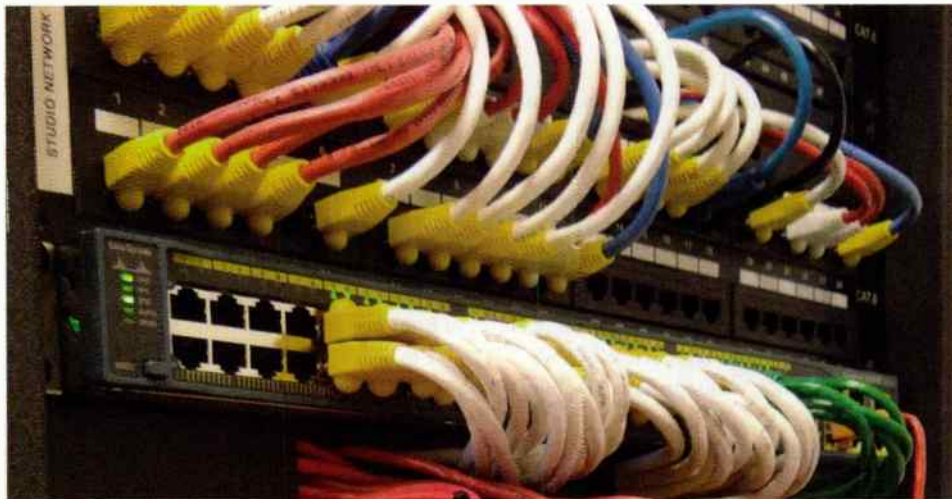
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The cable color/header color combinations correspond to basic functions of the network device on the far end.

is and what port you wish to use so you can properly configure your firewall.

NETWORKS

Another concept that needs to be addressed is the difference between the external network and internal network.

A firewall will usually have a different external address than its internal address. To the outside world, my computer accessing the Internet appears to be at this IP address: 208.61.234.54, which is the external (or "Internet-facing") address of the firewall. The firewall has an internal IP address of (for example) 192.168.1.1. My computer's assigned address is, say, 192.168.1.43. My computer and the internal address of the firewall are on the same network (the local area network), but my computer has no idea about the external address of the firewall.

As you can see, the external address of the firewall is completely different from my internal network number. How can this be? These addresses are completely different! Well, the firewall translates between my internal IP address and the external address. This is called Network Address Translation, and it allows me to hide my computer's true identity behind the firewall.

When you open a port on a firewall to allow remote access, you will need to know the external IP address so you can access your network from the Internet. The firewall will need to be told where to send the port forward on the internal network.

Let me give you an example. I have port 3389 open on my firewall. My firewall has an external

address of 208.61.234.54. I want to access my engineering network from my house over the Internet, so I open my remote access solution and place 206.61.243.54 as the address I wish to access. The remote access solution will either ask me for the port or it will default to 3389. Great! Now I have made it to the firewall. Now what? The firewall knows that port 3389 is open but to where? I need to tell the firewall that if someone knocks on port 3389 please send that knock or "data" to my internal IP address of 192.168.1.43. Furthermore, I need to have a service ready on my computer at 192.168.1.43 to answer the requests on port 3389 for the remote access to work.

This concept confuses some people. Keep in mind that the firewall protects you by hiding your true identity from the bad people on the Internet by blocking all attempts to connect to ports on your computer. The firewall needs to be specifically told about the "who" (IP address) and the "what" (port number) that will be allowed to be pass. The firewall is exactly like a 300-pound bouncer that sits at the door of your network; if your name is not on the list you are not getting into the building. Similarity, if your ports are not forwarded from the external network to the internal network properly, you are not remotely accessing anything.

Next time around, we'll talk about specific remote access solutions and their advantages and disadvantages. 

Cottingham is a Cisco, Microsoft, and CompTIA instructor with 25 years experience in IT and radio engineering. He's also the chief engineer of KFMK in Austin, Texas.



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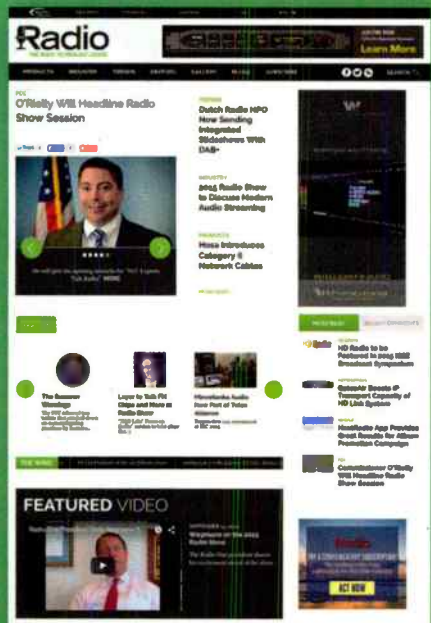
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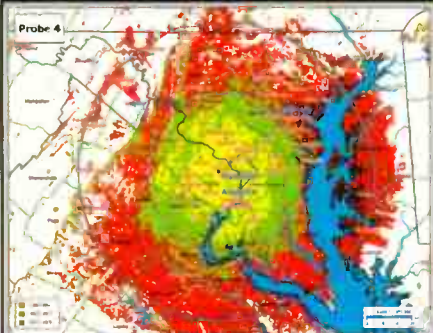
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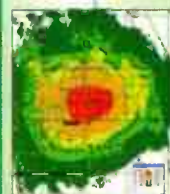


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The Myth of Channel 6

by the Wandering Engineer

Former VHF TV channels have no intrinsic value for "mobile" communications. The Wandering Engineer says we should let AM broadcasters have it, for cheap.

I am unaware of whether this is really true; for all I know it's just a twisted fantasy, some sort of urban radio legend. But it goes something like this: A major owner of failing AM stations is making a bid in the spectrum auction for Channel 6.

No one wants Channel 6, at least for wireless. As I understand it, that spectrum might be worth less than all of the property those AM stations use for their antennas arrays. The top end of Channel 6 has long been the land of the "Franken-FM," being receivable on most Electronically Tuned Radios, and the analog variety, if one twists the knob hard enough counter-clockwise.

The FCC is interested in selling spectrum, but before they can do so, they will have to move TV stations with appropriate incentives. No one knows what a good price for the about-to-be-available UHF spectrum really is; but every day that goes by, the carriers are building more and more tiny cells, slowly but surely reducing the demand for UHF wireless spectrum.

If the world becomes one giant set of high bandwidth micro-cells in the existing (already paid for) carrier-owned spectrum, the need for more bandwidth (at UHF in particular) is somewhat diminished.

It follows that as UHF spectrum loses value, low-band VHF drops as even more — perhaps

drastically. No one has any Channel 6 receivers that work, except for DTV-TV and maybe a few analog TVs, mostly found at antique stores. Everyone has receivers that almost work on Channel 6. It's not much of a jump to extend the FM band down, and that makes a lot more sense than the reasonably recent "extend the AM band up," movement did. Adding more services to an exhausted medium works about as well as bloodletting did.

I think it might make sense to let all those AM guys, who think that if they could just get out of the big-land, high-noise, poor-fidelity end of the radio spectrum and into something that sounded good and covered the audience, do what the wireless guys do — offer to buy spectrum. Sure, it's discount spectrum — but it doesn't look like anyone wants to give it away, even for the public interest and convenience.

And please note: If these guys decide to go digital from the get-go, they can build a radio service that has several times the capacity of the existing FM band... and it would work better, too.

Listen to people who want to look at running three HDs in an FM-sized channel, and forget that analog hybrid; listen to the folks who want to fill in that little gap between Channels 5 and 6; or better yet, listen to those folks who want to run ATSC and HD Radio on Channel 6.



Hans-Peter Scholz, Berkenfeld (Eckweh), Germany

Many batwings are still in place, just waiting to be re-energized.

It won't be the first time a broadcast service moved to new spectrum. Home TVRO did it — C band to Ku. But this would probably be the first time a whole broadcast service just packed up and moved.

Sometimes, towns get tired of floods and just move to higher ground. ☹

The Wandering Engineer is an industry stalwart who has been in broadcasting since the days of Marconi and Tesla. He gives his thoughts on the current state of broadcast engineering and the broadcast engineer.

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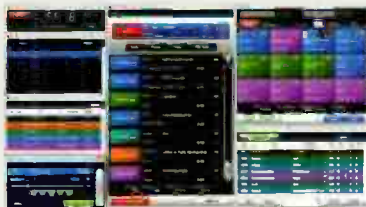
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Finding YOUR Sweet Spot with FM-55 is Easier Than Unwrapping a Candy Bar



We've engineered FM-55 to make it easy for you to craft your on-air sound to be clean, loud, and sweet - no matter what your format. FM-55 comes with presets created by our broadcast audio perfectionists to cover virtually every type of programming. Just dial it up and instantly your sound gets a sonic facelift - one your listeners will love.

Like giving candy to a, well, you get the picture...

Wanna tweak? We give you a toolbox that lets you get at every parameter in FM-55 to take control and sculpt the finest sound you can - YOUR signature sound.

Best part is, FM-55 is exceptionally cost effective/cost competitive - the fastest growing choice in under-\$3K FM processors! Give your listeners pure ear candy - contact us today and get FM-55 for your airchain now.

Nutrition Facts

Intelligent iAGC	Smart Stereo Enhancement	Bass Management System 3.0	Multipath Control	Wheatstone® baseband192	WheatNet-IP Compatible
Produces a consistent, spectrally-balanced sound regardless of density variations in incoming source material. Essential for different media formats.	Specialized automatic level and spectral management algorithms provide a wide but extremely stable 'on-air' stereo image.	Circumvents bass-related distortion. Increased depth, feel, and clarity of bass impact without affecting mid and high frequency content.	Mitigates market and terrain-specific multipath behavior, reducing the problem of multipath-triggered receiver-induced stereo blend.	A single AES/EBU cable between the processor and a current solid-state FM transmitter carries the digital baseband signal for exceptionally clean sound.	Control the FM-55 and stream its audio to and from anywhere in the WheatNet-IP audio network.

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