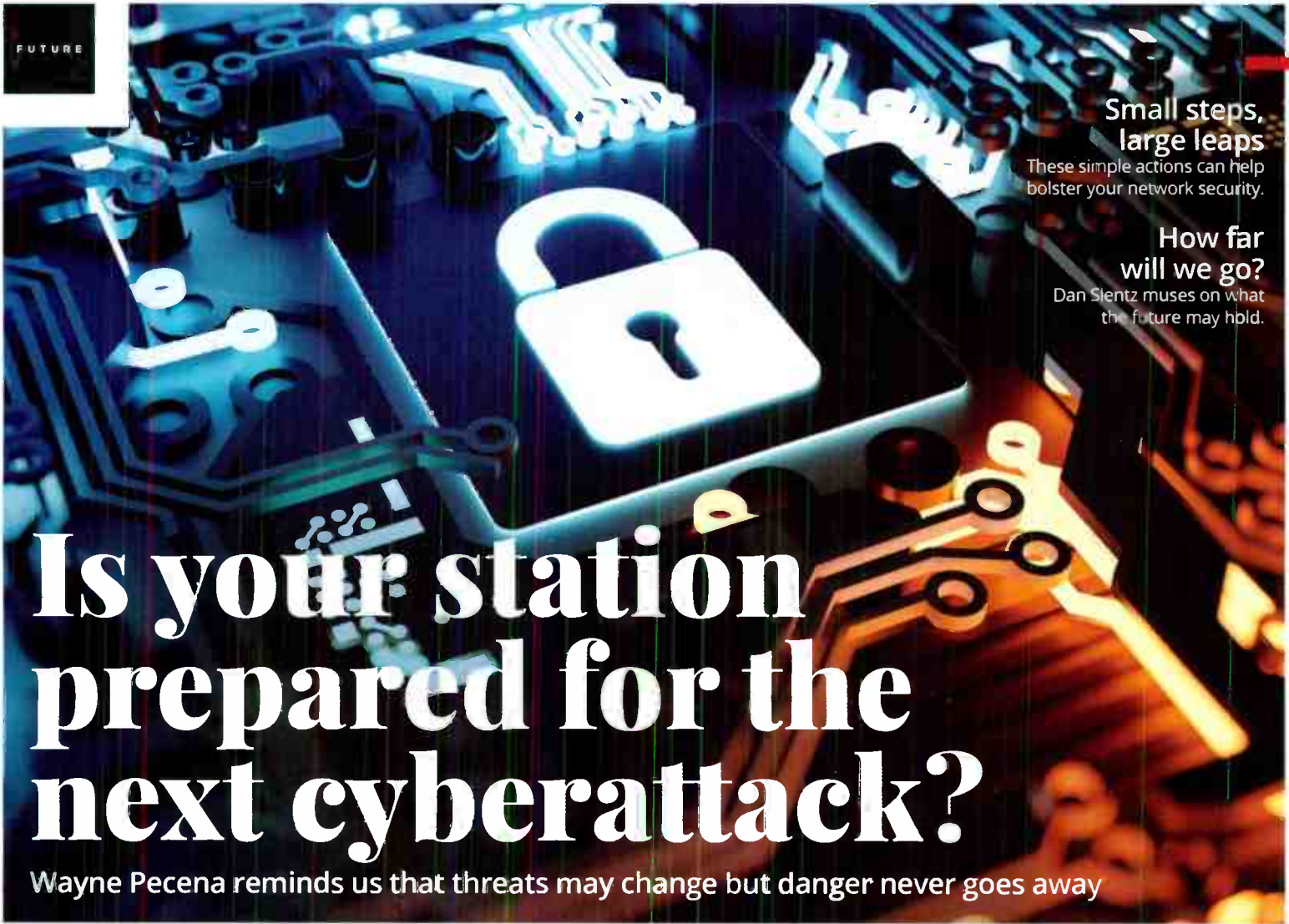


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CONTENT

Managing Director, Content & Editor in Chief Paul J. McLane,
paul.mclane@futurenet.com, 845-414-6105

Content Producer & SmartBrief Editor Elle Kehres,
elle.kehres@futurenet.com

Technical Advisors Thomas R. McGinley, Doug Irwin

Technical Editor, RW Engineering Extra W.C. "Cris" Alexander

Contributors: Susan Ashworth, David Bialik, John Bisset, Edwin Bulkent, James Careless, Ken Deutsch, Mark Durenberger, Charles Fitch, Donna Haiper, Alan Jurison, Paul Kaminski, John Kean, Gary Kline, Larry Langford, Mark Lapidus, Michael LeCair, Frank McCoy, Jim Peck, Mark Persons, Stephen M. Poole, James O'Neal, John Schneider, Dan Slentz, Dennis Sloatman, Randy Stire, Tom Vernon, Jennifer Waits, Steve Waiker, Chris Wygal

Production Manager Nicole Schilling

Managing Design Director Nicole Cobban

Senior Design Directors Lisa McIntosh and Will Shum

ADVERTISING SALES

Senior Business Director & Publisher, Radio World

John Casey, john.casey@futurenet.com, 845-678-3839

Publisher, Radio World International

Raffaella Calabrese, raffaella.calabrese@futurenet.com, +39-320-891-1938

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Senior Vice President, B2B Rick Stamberger

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Vice President, B2B Tech Group Carmel King

Vice President, Sales, B2B Tech Group Adam Goldstein

Head of Production US & UK Mark Constance

Head of Design Rodney Dive



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True cybersecurity is a PITA

Its inconvenience is a vulnerability in itself



Cris Alexander

CPBE, AMD, DRB

Tech Editor

I get pretty tired of playing defense all the time, and my guess is that you do, too. A good amount of my time and of our company resources are expended these days on cyberthreat protection. And about the time we get things figured out (or think we do), the next threat comes along and we find ourselves reacting to it, playing catchup to the bad guys.

In times past, I gave serious consideration to the possibility that the whole virus/antivirus thing was a

racket. Were the producers of antivirus software the very ones producing the threat in the first place, in essence creating and propagating the demand for their products? It seemed possible, even likely.

For many years, I have faithfully kept up the subscriptions to antivirus software, both personally and for my employer, and in all that time I have never been the victim of a computer virus. The antivirus software must be working, then, right?

From time to time I would get a notification that a particular file had been quarantined or a website blocked because of a virus signature or a reputational blacklisting, and there was some comfort in that. But still I wondered.

In recent years, however, we've found ourselves facing cyberthreats that have much more potential for disruption if not outright disaster than the viruses of years past. Some of these threats make those old viruses look like fraternity pranks by comparison.

Hackers!

The entertainment industry, movies and television in particular, have somewhat glamorized the "hacker."

I can think of many shows and movies in which a hacker pounds away at the keyboard to gain access (for only good and altruistic reasons of course) to someone's network or computer system. "I'm in!" they exclaim before they quickly gain access to the data or information that they are seeking.

THIS ISSUE

6 Is your station prepared for the next cyber-attack?

19 How much is too much?

21 Small steps mean large leaps in network security

A quick dictionary search for the word “hacker” turns up several definitions that are all similar, but their simplest expression is: “A person who uses computers to gain unauthorized access to data.”

I’m not sure what the etymology of the term “hacker” is, but to me it has a very real meaning. Looking at the logs on our firewalls, we see attempt after attempt to gain access, and the image I get is of someone outside our virtual walls with an axe, hacking away at our defenses and looking for a weak spot that they can exploit and breach.

We can tell that many of these attacks are by some sort of automated means, not by a human “hacker” trying port after port and password after password in an attempt to gain entry.

These “bots” (for want of a better term) are tireless, and their algorithms are designed to run all the possibilities within a certain range. Undoubtedly they are sometimes successful.

Home invasion

The greatest successes of cyber-intruders, however, are likely the result of their ability to trick unwary users to click a link or open an email attachment, thereby opening the door for them.

I have heard that in the non-cyber world, home invaders most often gain entry to a house when a resident opens the door for them. Clearly the same principle is at work in the cyber world, and it is very effective.

How do we combat that? Certainly by education and warning, but let’s face it, that only goes so far. And the “hackers” are getting more and more creative, sending very legitimate-looking emails that contain some kind of urgent message, something that produces a fear response — a message from the HR department or boss, for example. And the recipient has just got to know, so he or she opens the attachment, and ... the door is open.

Then there are those cyber-hostage-takers that manage to infect our systems with ransomware, encrypting our data and demanding a monetary payoff to remove the encryption and restore our access to the data, files and programs that we need to run our businesses.

Those miscreants have, unfortunately for us, met with some success.

So we find ourselves playing defense on a multi-front battlefield. They come at us with viruses. They come at us seeking access to our identities and bank accounts. And now they come at us to hold our data and systems hostage. They “hack” at our defenses with every tool at their

disposal, and we play “Whac-a-Mole” trying to keep them out. It is exhausting.

To add insult to injury, every effort we make to secure our systems and data comes at some expense. There is the ongoing monetary cost of those measures: firewalls and endpoint security applications. There is a slowing of our computer systems as those measures use processor, RAM, storage and network resources. And there is the inconvenience factor, which

is, in my view, the most costly and the most likely point of failure.

We are (rightly) cautioned time and again not to use simple passwords and not to use the same password repeatedly. Windows and other platforms now provide complex, long alphanumeric passwords for us in pop-ups as we are prompted to create a password, and that’s great — except that those difficult passwords are ... difficult. We have to record them somewhere, either by writing them down or entering them into a secure password keeper of some sort, and with all the upper-case/lower-case and what-is-that-character-anyway, the opportunities for error are plenty. Trust me on this.

And so, many folks say to heck with it and enter their old, tried-and-true dog’s name with an underscore and a number password and call it good.

The bottom line here is that real cyber-security that works causes inconvenience. It is, to use a popular acronym, a PITA. But it’s the world we live in, and we have to bite the bullet and live with the inconvenience — or else live dangerously and put ourselves and/or our employers and coworkers at significant risk.

In this issue of *RW Engineering Extra*, Tom Vernon takes us through an excellent white paper written by Wayne Pecena dealing with cybersecurity. We would all do well to listen to what Wayne has to say.

Stay safe out there. 



“ Many folks say to heck with it and enter their old tried-and-true dog’s name with an underscore and a number password and call it good. ”



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Writer



Tom
Vernon

The author is a longtime contributor who writes on a variety of topics including the history of radio technology.

Is your station prepared for the next cyberattack?

Pecena reminds us that threats may change but danger never goes away

Cybersecurity, unlike other projects around the station, is never finished. It requires ongoing diligence to be ready for threats that are constantly changing.

Wayne M. Pecena, CPBE, 8-VSB, ATSC3, AMD, DRB, CBNE, is associate director of educational broadcast services at Texas A&M University's KAMU FM/TV.

"Last year I would have said denial-of-service attacks were the greatest threat, but today it would be ransomware," he said. That was mid-2021. It can change, and change again.

Pecena is author of a paper submitted to the NAB Show Broadcast Engineering and IT Conference, titled "Can I Really Protect My Broadcast Plant from a Cybersecurity Attack?" It introduces the principles of cybersecurity, discusses how to protect the broadcast infrastructure and offers some action tasks.

This article summarizes that paper.

In the beginning

Over the past two decades, Pecena wrote, the broadcast plant has migrated from an analog point-to-point infrastructure to an IT-based system that offers greater flexibility, more features and lower cost. Along the

way, it turned into an Information Technology (IT) infrastructure, based upon the Internet Protocol (IP) for interconnection.

In many ways, it is like any other network, but the broadcast plant also contains servers that capture, process and playout content, as well as a cadre of host devices that provide the specialized services required in the broadcast workflow.

All those advantages come with a price. The same openness that makes it so flexible also enables hackers to easily get in and cause havoc. Those threats are numerous and widespread.

From a high-level view, they can be categorized into malware or network focused threats.

Malware threats focus upon the host operating system and applications they execute. Common industry sub-categories of malware include ransomware, viruses, worms and trojans, and spyware.

Network-focused threats target the network infrastructure components and exploit the IP protocol(s). They can include Address Resolution Protocol (ARP) spoofing, rogue service advertisements, Denial of Service (DoS) attacks, Distributed Denial of Service (DDoS) attacks and "Man in the Middle" attacks.

While the most dangerous threat is always a moving target, today it seems to be DDoS and ransomware. These

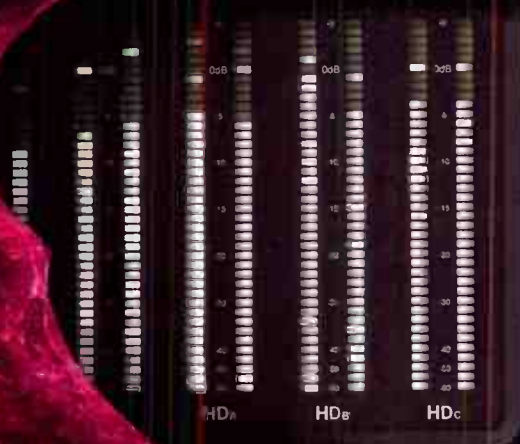
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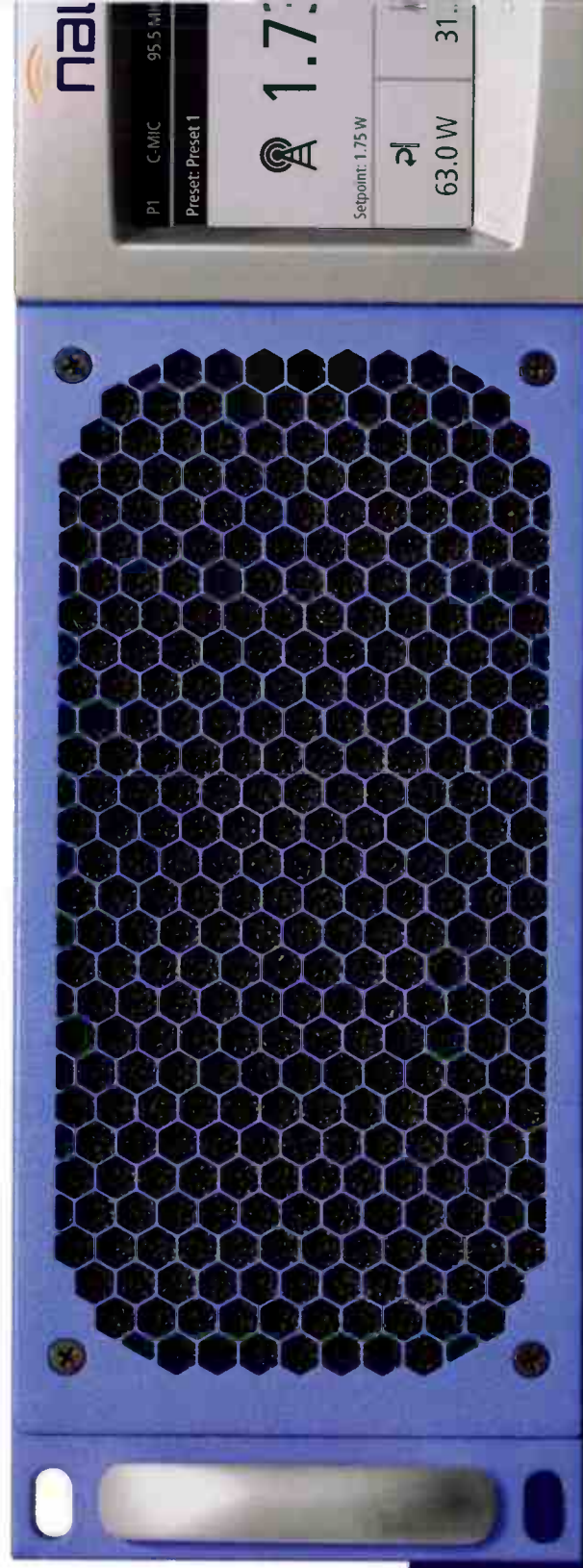
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many attacks can also come from several sources, including nation states, terrorist groups, organized crime, hackers, and disgruntled individuals.

The sheer number and diversity in the type of threat sources make it essential to have an action plan and follow it. In order to get there, one must first understand a few cybersecurity principals followed by a structured approach to implementing prevention measures.

Pecena noted that the question is sometimes asked, "Can you make a broadcast plant 100 percent bulletproof in terms of cybersecurity?"

He says absolutely — just remove all equipment that has an Ethernet connector and go back to analog gear.

Other than that drastic step, nothing is perfect, although a well-thought-out plan goes a long way towards mitigating the threat.

Principles of cybersecurity

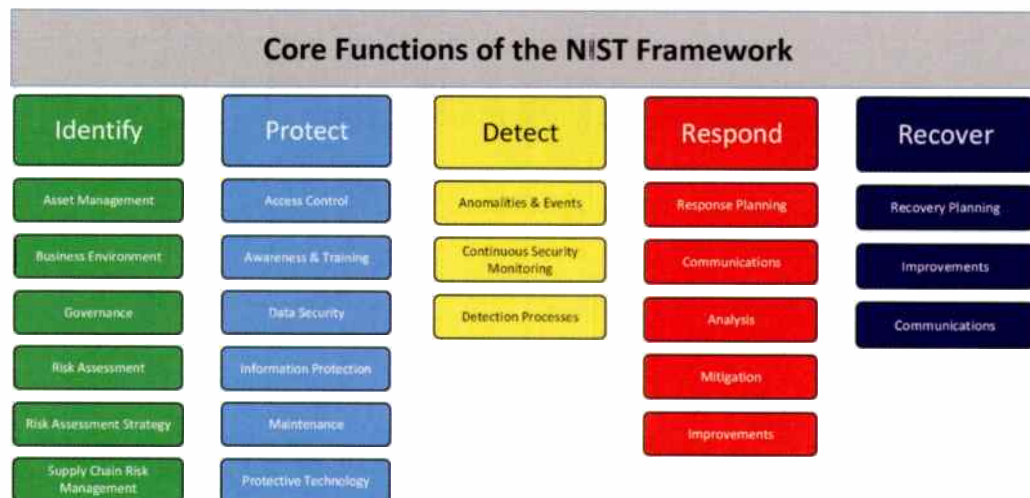
Fortunately for us, most of the groundwork for this topic has already been laid out by the National Institute of Standards and Technology (NIST). Their Cybersecurity Framework provides structured guidelines and steps to implement and maintain ongoing cybersecurity programs in any organization.

Five categories describe the high-level functional areas of a cybersecurity program, identify, protect, detect, respond and recovery. Additional granularity is provided by subcategories, each with its own set of reference documents.

The first function, identify, begins with a complete inventory of IT assets, including hardware, software, networks and data. From the inventory produced, the assets are in turn prioritized based on an organization's business needs. For broadcasters, any assets involved in the reliable delivery of program content should get top priority. Less priority is assigned to the lower impact threats. A numerical rating scale is often used to describe the overall cybersecurity health of an organization's IT systems. Areas found deficient can then be used to prioritize resources to remedy or bring into compliance in situations where regulatory requirements or organizational policy exists.

The second function, protect, utilizes the previously compiled IT asset inventory to create a policy or approach of what to protect and how to protect an asset. It is addressed in terms of physical asset protection as well as establishing access control for users and applications. The concept of least privilege required is utilized.

Thirdly, the detect function is focused upon IT asset monitoring, knowing what is normal and what is not, and



Above
The NIST Cybersecurity Framework provides structured guidelines and steps to implement and maintain ongoing cybersecurity programs in any organization.

sounding an alarm when an anomaly occurs. Necessary monitoring devices are identified in this step.

Fourth, the response function is a plan for when a breach occurs. This may be anything from a physical event such as a break in to a malware incident. A recovery plan should be developed in advance to ensure a return to normal as quickly as possible. This is a better alternative than developing a plan after an event occurs. The post-analysis aspect of any event occurrence is an important step in continuous improvement.

Finally, recover entails implementing the above-mentioned plan. Following the outlined steps should restore compromised assets and a return to normal operations.

A deeper dive into the protect function is available through the principal of Defense in Depth (DiD). Developed by the National Security Agency, its goal is creating multi-layered coordinated security mechanisms to provide redundant levels of protection.

Pecena says examples of DiD mechanisms found in IT infrastructures include physical access barriers, segmented (layered) network architecture, ethernet port security and packet filtering through an Access Control List (ACL).

To further clarify the access portion of the protect function, the Principle of Least Privilege (PoLP) is applied. Through the use of access controls, the system grants the minimal resources required for a user or an application to perform the desired system function. An example would be allowing on authorized users to access specific systems or an application to have file modification permissions.

The CIA triad is another classic model of IT security. It utilizes three objectives to be achieved within any IT system ranging from the network to the server storage systems to the applications. They are Confidentiality, Integrity and Availability.

Confidentiality entails preventing information from reaching undesired hands or unauthorized users. Access by users and applications is restricted or limited to a "need-to-access." Other implementation techniques include



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Integrity seeks to prevent data being changed as it moves through a network, is processed through an IT workflow or archived in a data storage system. Implementation mechanisms include file access controls, checksums and encryption. An important aspect of the Integrity objective is to have detection mechanism(s) to know if data has been if tampered with or altered.

Availability seeks to insure that IT resources are available to legitimate users or applications and not available to those who are not authorized. Implementation techniques include network infrastructure redundancy, server redundancy and attack detection systems.

Despite the CIA acronym, Pecena reminds us that this security model has nothing to do with the U.S. Central Intelligence Agency. To avoid confusion, the order is sometimes changed to AIC.

The CIA triad is also used as a roadmap for those seeking to do harm to IT systems and broadcast plant operations. In these instances, Confidentiality becomes a target to be breached to obtain valuable information through techniques such as social-engineering or spyware. Integrity may be compromised through Man in the Middle attacks, malware and data record manipulation. Availability becomes the primary objective of a ransomware infection or a Denial of Service (DoS/DDoS) attack.

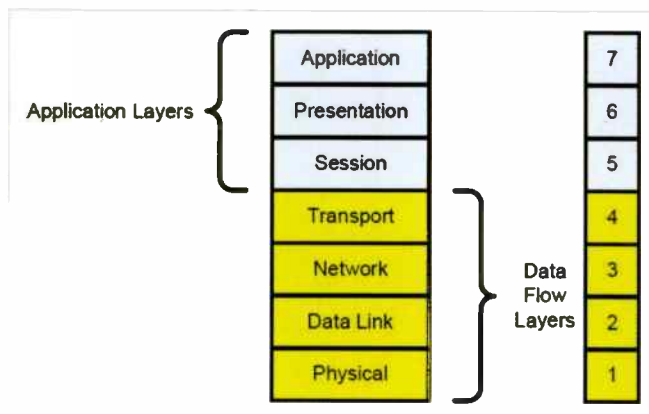
Protecting broadcast infrastructure

At a high level, the overview of an organization's IT infrastructure can be divided into three areas, each with unique cybersecurity needs. These are the network, hosts device and applications.

The Open Systems Interconnection (OSI) model developed in the early 1980s is the classic model that describes how host devices communicate with each other over a network. This model provides an excellent structure in which to implement cybersecurity precautions. The first four layers of the model are referred to as the data-flow layers and are associated with the network functions.

Layer 1 or the physical layer of the OSI model is associated with the physical type of network deployed. Options are Ethernet-based and include wired through twisted-pair copper cabling, fiber optic cabling, wireless or a combination of all three in many networks.

From a security standpoint, the physical layer can also be applied to physical security of the network infrastructure equipment. Implementation strategies can include locked wiring closets, equipment cabinets and rack cabinets,



Above
The Open Systems Interconnection (OSI) model is a classic representation of how host devices communicate with each other over a network

and/or a dedicated "IT" room with controlled access.

The physical layer can also be applied to the network architecture or design of the network. Traditional network design was based on a "flat" network approach where all host devices have the same access and are addressed to the same network or subnet.

The current network design approach recommends a layered or segmented approach to the network architecture. Advantages

of a segmented network design include performance enhancements and increased security. Cybersecurity advantages focus on the ability to minimize the attack surface and controlling access to hosts. In practice, the segmented network architecture approach groups hosts in functional layers based upon security priority.

The segmented network adheres to the cybersecurity principal of Defense in Depth, and is a fundamental recommendation in adopting the NIST Cybersecurity framework. If a breach should occur in the outermost network, another barrier is presented as well as limiting the reach of attack to those hosts only the compromised network.

In the case of a ransomware event, the spread of the malware is limited or contained to that individual network rather than the entire network within the organization. In practice the Virtual Local Area Network (VLAN) becomes the primary tool for implementing a segmented network architecture. The VLAN approach allows a single physical network to support multiple sub-networks or subnets. Each subnet is an isolated individual network with its own addressing assignments. At this point, there is no communications or interoperability between subnets.

If required, subnet interoperability will be added in a controlled manner by use of Layer 3 routing and Access Control List (ACL) techniques.

Upon first glance, the network illustrated would require numerous network devices to implement. In reality, this network could be built with two network devices. A firewall appliance handles the border protection, DMZ provisioning and VPN access. The remaining Ethernet switching and IP routing can be provided by a single "Layer 3 switch" with adequate port capacity. With 48-port switches being commonplace, small network needs can be met in a single device.

If additional capacity is needed, expansion can be accommodated by additional standalone Ethernet switches or use of a chassis-based switch platform with the appropriate quantity of switch port interface card(s) installed. It is important to note that a Layer 3 switch is a

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marketing term associated with a single network device that performs traditional Ethernet switching and IP routing on a port-by-port basis.

Going beyond the physical layer, Layer 2 or the data-link layer provides an opportunity for another layer of protection. With a VLAN-based segmented network implemented, the use of a managed Ethernet switch is implied. The managed Ethernet switch allows the custom configuration of VLANs, as well as providing several cybersecurity features.

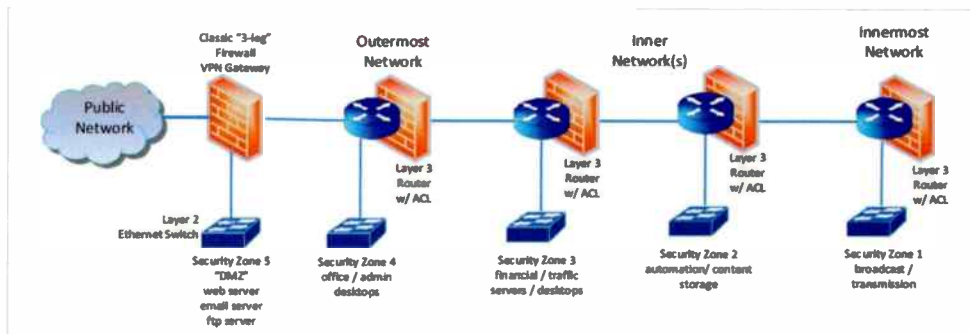
A fundamental cybersecurity feature is Ethernet switch port security. This provides the ability to limit or restrict what host device can be attached to a switch port. A fundamental role of the Ethernet switch is to learn a host device Media Access Control (MAC) address. The MAC address is the physical address of an Ethernet-based host device and is "burned-in" the device firmware. The learned MAC address is captured from an incoming frame and stored along with the switch port number in the switch internal MAC address table or Content Addressable Memory (CAM) table.

If a foreign device should be attached to a switch port, the switch automatically responds upon detection of a foreign MAC address. A typical switch response would be to shut down or disable the port involved, drop the received Ethernet frame and send a notification that a violation has occurred.

In essence, Ethernet port security provides another barrier if physical tampering occurs and a foreign device is connected to the network switch port. A best-practice approach allows a single host to be connected to a switch port by limiting to a single MAC address per switch port. This limiting step can also help to minimize the impact of a DoS attack by preventing the Ethernet switch CAM table overflow. A switch will re-boot if a CAM table overflow should occur.

The managed Ethernet switch can provide additional security features such as Dynamic Host Control Protocol (DHCP) snooping which can detect and prevent a rogue DHCP server from being attached to the network. This could occur during a Man in the Middle cybersecurity event or simply as an accident when improperly connecting a WAP to a switch. A practical example is the connection of the WAP WAN port to a network cable rather than the LAN port, thus adding the WAP DHCP or rogue functionality to the network. DHCP snooping essentially acts as a DHCP firewall.

After Layer 2, also known as the data-link layer, Layer 3 or the network layer brings another level of protection to the network infrastructure. The network layer is associated with virtual addressing (IP address), inter-network routing and packet filtering.



Above
Cybersecurity advantages of a segmented network include the ability to minimize the attack surface and controlling access to hosts.

Additional cybersecurity protection can be implemented through IP Security (IPsec) encryption. Interoperability between the segmented networks must be added when necessary. Layer 3 routing must be enabled to provide the desired inter-subnet communications. Routing is only added when required. If implemented, it is controlled via packet filtering through an Access Control List (ACL).

The ACL controls access to a subnet or network by performing basic packet filtering. It will permit or deny an IP packet from entering a Layer 3 device ingress interface or leaving an egress interface. The admit or deny decision is based upon a pre-defined rule that utilizes the IP layer 3 header information such as source IP address, destination IP address or protocol.

The IP address can be a single address, a logical block of IP addresses such as a subnet, as defined by the IP address subnet mask. With the additional information provided by Layer 4 or the transport layer, the decision can include port information. The transport port number is often associated with a specific service or application communication. Logical operator statements can be used in a ACL to allow logical combination of Layer 3 and 4 header information to reach the permit or deny decision. Creating the ACL can be complex and time-consuming. Once in place though, it is very effective, and acts as a stateless firewall.

In addition to an ACL, a conventional Layer 3 firewall can be implemented between internal subnets. An important difference between an ACL and a conventional firewall is the stateful operation of the firewall. The firewall will in general deny incoming packets from an outside network unless an internal network host originated the conversation with the outside host. The firewall remembers the conversation through an internal table dynamically created for each conversation created. In practice the firewall will incorporate both stateless permit or deny rules such as found in an ACL, and dynamic rules that are created based upon stateful conversations where allowed.

A practical example could be an automation system in a subnet requesting the daily programming log from a traffic system located in another subnet. The ACL would allow only the two hosts to communicate via the FTP.

IP by design is not secure. To secure a network, encryption or IP Security (IPsec) must be added. IPsec

is a Layer 3 encryption technique that provided secure communications between host devices. Encryption can be implemented at several levels of the OSI model, with Layer 3 or IPsec forming the foundation encryption.

It should be noted that Layer 2 encryption is possible and often utilized by the government and military applications. Layer 2 encryption is accomplished by dedicated proprietary hardware “green” boxes, and not typically found in the commercial market industries primarily due to cost.

Encryption should be used whenever a public network, such as the internet, is utilized for communication with another network, such as remote access via VPN. Encryption can also be used in internal networks such as a IP-based Studio-Transmitter-Link (STL) path. This is yet another method to prevent unauthorized access or disruption of information transported and/or a Man in the Middle attack to disrupt normal programming.

Encryption is also available at Layer 4 as Transport Layer Security (TLS) and at Layer 7 as application security such as Secure Sockets Layer. SSL is based upon creating an authenticated and encrypted communications link

operating systems. Both platforms have potential vulnerabilities but can be made secure. Linux systems may offer more flexibility due to the open-source design. Windows is more of a closed system with limited flexibility.

The growing popularity of Internet of Things (IoT) devices often create unique cybersecurity challenges. An IoT host device can be one of a variety of devices found in a modern broadcast facility. Common devices include security cameras, digital signage, thermostats, card access systems and even a light bulb. From a practical standpoint, these devices must be secured externally as they often lack basic security features due to limited or minimal operating system and cost.

Due to limited resources (processor and memory), it is impossible to change defaults configurations or add cybersecurity protections such as antivirus and malware. Common practice is to place essential devices on their own subnet and utilize external packet filtering via an ACL and/or firewall to secure and control access.

Application cybersecurity protection is focused on authentication and encryption of the interaction between

“ A fundamental cybersafety feature is Ethernet switch port security. This provides the ability to limit or restrict what host device can be attached to a switch port. ”

between hosts such as a user client exchange with an application server.

Protecting the host device is often complex due to the diversity and sheer number of potential devices in use. An IP host device can take on numerous forms and functions. Traditionally, a host has been a server or desktop computer. Today, the variety of possible devices is vast.

Regardless of the type, they share common characteristics and capabilities as defined by the Internet Engineering Task Force (IETF) Request for Comments (RFC)'s. IETF RFC 1122 provides the details of those capabilities.

IP hosts should be hardened to reduce or minimize the potential attack surface of the device. Necessary steps may include changing default device login information, removing any unused applications and services, deleting guest or legacy user accounts and maintaining a proactive up to date patch or update routine.

Most computer-based devices found in the broadcast plant will be derived from Microsoft Windows or Linux

user and application. Authentication ensures the proper user or application has the proper access, blocking all others. Application security can be cumbersome, especially where multiple applications are involved.

An authentication system is referred to as a “single sign on” system, and can be utilized to minimize the administrative tasks associated with application security. A benefit is allowing the user access without the need to manage multiple login information.

It is common for the system to provide federated identity techniques to secure application access and identification of the user or by another application. Two-factor authentication of users is often utilized as an added level of protection beyond simple login information exchange. In some cases, three-factor techniques can be applied to add a further protection barrier.

After much planning, time and labor, everything is in place, and your network is secure. Now what?

Some would sit back and see how it works, but a more proactive approach would be to test it yourself, as Pecena

Pecena's Top 15
Taking adequate cybersecurity precautions can be summarized in these 15 action steps:

Accept there is **no single** solution!

Implement **multiple protections** via Defense in Depth (DiD)

Change **default** logins

Use **strong** passwords (paraphrases)

Separate admin and user accounts on hosts (WIN)

Segment your network (VLAN) — reduce attack surface — create multi-layer security zones

Limit access (users and applications) — apply “least privilege”

Use **packet filtering** — control host access (ACL and/or firewall) deny by default

Disable unused services — close ports not required

Use **secure** access (SSH not telnet) and VPN for off-site access (2-factor authentication)

Monitor your network — know what is normal

Use **“intelligent”** host backup solutions — test backup restoration

Keep systems **patched**

Utilize **signature-based** deep-packet inspection antivirus/malware keep updated (often daily)

Don't overlook **social engineering** — engage and educate users — **phishing** is alive and effective

explains. "Anyone operating a broadcast network should do penetration testing on a routine basis. I view the pen test as the 'proof of performance' of a broadcast IT system."

Conclusions

The industry is well invested in the vast array of "IP-enabled" devices. However, it is well to question whether every host device needs to be on the network or have public network access. If so, then take the precautions

to minimize the attack surface and a potential cybersecurity event.

An important consideration not addressed in Pecena's paper is network monitoring. Best practices in network management is monitoring to ensure network operation in a proactive manner. Unusual network traffic patterns or unexplained increased in the use of resources can indicate that a cybersecurity incident is occurring. Knowing what is normal and alerting when it is not is an essential requirement of network and cybersecurity management.

All of the above is for nought if users are not educated in cybersecurity and social engineering. As cybersecurity techniques have improved, the use of phishing has increased. It only takes one careless user opening an e-mail attachment from an unknown source to bring your well-engineered system down. Training users in cybersecurity needs to be another ongoing process.

Finally, Pecena notes that the cyberattacks that we hear about are only the tip of the iceberg. "It makes headlines in the trade publications when a large broadcast group is attacked, but the mom-and-pop, middle-market and college broadcasters are also vulnerable. "These folks are regularly hit by cyberattacks which are financially devastating," says Pecena, "but these are the stories you never hear about."

“Encryption should be used whenever a public network, such as the internet, is utilized for communication with another network, such as remote access via VPN.”

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Dan Slentz

Chief video engineer for the Cleveland Orchestra, he has been working in and around radio and TV engineering since age 14.

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How much is too much?

Reader and longtime contributor Dan Slentz reflects on the state of technology

I was talking with a “lab-coat level” engineer on video projection systems and realized I’ve been completely unaware of the major differences between audio and video in technology development.

This was about two years ago at an NDA event at Universal Studios up in Orlando, in an actual movie studio — I didn’t know they actually have full filming ability there.

With current technology, we can exceed human hearing in terms of frequency response. We can emulate direction — surround, phase shifting, multiple speakers — and meet our ear’s ability (which we must remember is just the receptor, while the brain provides the real “hearing”).

When we consider that our “hearing technology” has but two “mics,” our ears, it’s positively amazing that we can process direction.

But with video technology, we have both color spectrum and frame rate (the equal of fidelity and multiple directions on hearing).

We gauge these with terms like Rec 709 and Rec 2020. To “Cliff Note” the whole thing, our eyes and brain can “see” far more than we can electronically produce!

Laser projectors can now hit almost Rec 2020, but as you look at the accompanying image on the opposite page, what you see is all the color space and what we can currently produce.

The audio equivalent would be the big color image being our “hearing” of about 15 Hz to about 19 kHz (depending on your own age and hearing). The “triangles,” being fidelity, would be represented by Rec 709, roughly 100 Hz to 9 kHz if this were the audio equivalent. Rec 2020 gets us much closer as a “70 Hz to 15 kHz” comparison.

In other words, electronically we just really can’t do what we can do with audio ... and that is to meet the ability of our eyes.

Now the brain aspect, related to frame rate, gets more interesting.

Charlie Chaplin and Edison films used very low frame rates (16 fps to 20 fps). This produced a jerky image, since our brains were capable of recognizing it was just a bunch of stills strung together. Yes, we saw motion, but unconvincingly so.

When sound came around, they couldn’t put any fidelity in optical sound tracks unless they gave more surface area (like a reel-to-reel running at 7.5 or 15 ips). So they moved the frame rate to 24 fps and added audio. The image smoothed out and audio was hi-fi. An fps of 24 was

“The future still has a LOT of technology that we can’t even imagine today.”

Eclectic Technology

"just enough" to convince the brain of fluid motion.

Video came in at 29.97, and today we commonly use 59.94 fps. The speed of the frames creates a far more convincing illusion for the brain.

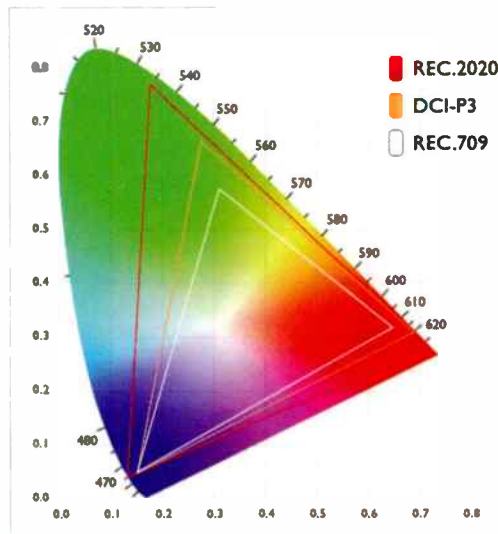
Now the cool part: I was invited to see a demo of 240 fps shot at Rec 2020 and projected. Holy cow!

It was a war scene from Afghanistan, a special demo movie made with this technology. As I looked at the image, I honestly had to keep reminding myself, "This is not real ... it's just an image." It was that true. No special glasses. No 3D. Just a frame rate 10 times the speed of film.

I asked the lab engineer, "Are we nearly to the same level with video as we are with audio?" and he said, "Not even close!"

He said there's a lot of work left to bring the visual reproduction to achieve the maximum ability of the eye (note that we CAN produce light and color that exceed the capability of our eyes; but uncontrolled we can cause severe damage, hence "laser technology").

I asked about the "brain portion" of all this. "Do scientists know how many frames our brain can decipher before



we have maxed the ability?" (Like audio producing waves lower than we can feel, and higher than we can hear.)

He said, "We currently estimate we could go as high as 900 fps, and that would be the limit." In other words, below that limit, if you threw in ONE single frame of black within 800 frames and rolled it (in one second) in front of a person, they would recognize "something" was there (unless they blinked). At 900 fps, that black frame would be invisible — the brain just couldn't pick it out from the other 899 frames.

So ... totally nerd talk, but I found all this fascinating. I'm just an average person with nerdy interests, but it tells me that the future still has a lot of technology that we can't even imagine today.

I recently heard a speaker who discussed Moore's Law and technology. He talked about Elon Musk, Bill Gates and Steve Jobs and said that today, the company or person who will be considered the technology leader in 20 years probably hasn't even come up with their idea or started their company — the Telsa of 2041 is completely unknown today. I thought that was an interesting statement. 🤖

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Small steps mean large leaps in network security

Taking care of the small things can greatly reduce your exposure to hacks

If you're in charge of creating some kind of security barrier between your local networks and the internet, the challenge is to decide where on the spectrum you're going to land with regard to the network traffic you are going to allow or deny.

For that barrier to have any work value, it almost certainly cannot be the cherubim with the fiery sword that guards the Garden of Eden. But you also don't want it to be the George Washington Bridge, either.

Take heart, there are billions of devices and users that are connected to the internet, and if you'll allow the punchline of the joke about the bear chasing two friends to paint a picture for you, "I just need to be faster than you."

I'm going to encourage you to stop, take a moment to put on some running shoes, and take some small steps that will put your network security at a different level than other easier targets.

No go, "Joe"

The first thing to change on any system that sees the internet is the use of a common user name and simple passwords.

Contrary to popular thought, hackers rarely focus on a single system. They have computer scripts that knock on thousands of network doors all at once with a list of the most common user names, passwords and combinations

thereof and attempt to gain access to computer system in the hopes that they'll hit a one and get access.

Do you have user accounts with names like "admin," "owner" or "joe"? What about password security? A recent report from Microsoft revealed that on some specialty honeypot servers that help them recognize trends, only 6% of brute-force attacks tried a password that was 10 characters, only 7% tried passwords with special characters in them.

This simple change alone will help you to avoid nearly 93% of username password attacks.

It is relatively simple to create secure passwords. Up-shift characters to the left or right so that the password *securenetwork* becomes *w3d743h35294i* (up-shifted to the left) or string a sentence together: *!lovejifpeanutbutter!*

Very secure, but still easy to remember.

Updates

Another simple suggestion is to make a point of running updates on your machines at least once a week. A

“ This simple change alone will help you to avoid nearly 93% of username password attacks. ”

number of exploits that run loose on the internet are weeks or months old. Although router firmware doesn't get updated as frequently, it still gets updated, and those bug fixes may be the difference between your system be safe or getting overrun by traffic.

The model for most software vendors in the modern era is that some bugs are show-stoppers and some can be fixed with an update. As long as no show-stoppers are present, it gets packaged and sent.

It is imperative that updates are run on a regular basis. While we're on that subject, make sure you're getting those updates from a legitimate source.

This is particularly true for hardware drivers. As long as a hardware manufacturer is supporting their hardware, updated drivers should be a part of their support page.

It is worthwhile to check semi-regularly to see whether updated BIOS patches, display, network, audio or other drivers have been created to fix their issues or nullify problems seen in the operating system they run on.

Get behind the wall

A third step to securing your network is the use of firewalls. This may be a firewall that is on your router or another machine that sits right behind the router that stands as a guardian between the internet and anything on your network.

Newer routers are robust and often contain a high level of security burned into their firmware. You can also reference an article about ClearOS that I wrote 10 years ago (!) for Radio World. At *radioworld.com*, type "ClearOS Is a Firewall Winner" in the search field.

We still use ClearOS in all of our markets and it has been invaluable for helping us to filter internet cruft from getting on our networks.

There are also companies that offer firewall services that you can purchase that redirect your internet traffic through their filters before it gets handed off to your network, what some call "sandboxing."

What about the firewall on your local machine? It actually may be time to turn on your operating system firewall, and if it is already on, take a close look at what services the firewall is letting through. In the name of network security, the days of blindly clicking the "allow" button so that you can get onto using a particular program need to become a chapter in history.

Ports


After the firewall step has been accomplished, the closely related next step is to make take a hard comparative look at what ports and services are open versus which ones really need to be open.

The idea is to limit the attack surface that your network is presenting to the internet by minimizing the number of service ports you have available.

Accomplishing that task is done in several ways. At one time, you may have needed that port forwarded to a device behind your firewall, do you still have that piece of hardware and is it being used? More commonly, is that employee still with us that needed the service, or do we still need access that way?

Are you using standard port numbers for those services (80/HTTP, 443/HTTPS, 22/SSH, 21/FTP ...)? So are the hackers that are trying to gain access to your network or devices.

Firewall port forwarding allows use of non-standard ports to be translated to those normal ports. For instance, forward the port 41022 on the outside to port 22 on your LAN. This is another fantastic way to cut down unwanted incursion into your networks significantly.

There is a myriad of other things that can be done regarding network security that also increase by several factors of difficulty. The simple steps outlined above can go a long way toward taking a giant leap forward in securing your network. They have worked well for us and have kept our network free from attacks that might have crippled them otherwise. 

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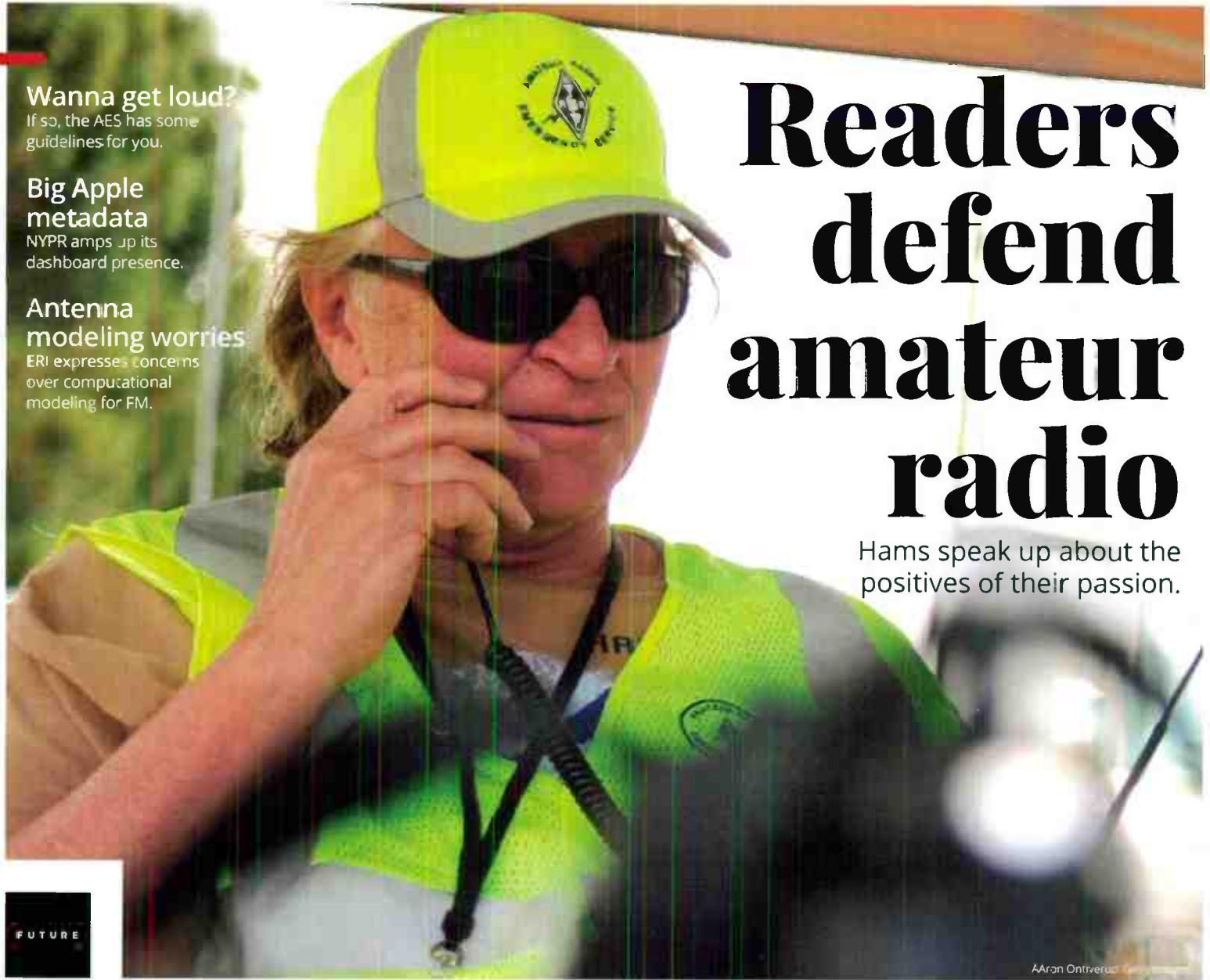
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CONTENT

Managing Director, Content & Editor in Chief Paul J. McLane
paul.mclane@futurenet.com, 845-414-6105

Content Producer & SmartBrief Editor Elle Kehres
elle.kehres@futurenet.com

Technical Advisors Thomas R. McGinley, Doug Irwin
Technical Editor, RW Engineering Extra W.C. "Cris" Alexander

Contributors: Susan Ashworth, David Bialik, John Bisset, Edwin Bukont, James Careless, Ken Deutsch, Mark Durenberger, Charles Fitch, Donna Halper, Alan Jurison, Paul Kaminski, John Kean, Gary Kline, Larry Langford, Mark Lapidus, Michael LeClair, Frank McCoy, Jim Peck, Mark Persons, Stephen M. Poole, James O'Neal, John Schneider, Dan Slentz, Dennis Sloatman, Randy Stine, Tom Vernon, Jennifer Waits, Steve Walker, Chris Wygal

Production Manager Nicole Schilling
Managing Design Director Nicole Cobban
Senior Design Directors Lisa McIntosh and Will Shum

ADVERTISING SALES

Senior Business Director & Publisher, Radio World
John Casey, john.casey@futurenet.com, 845-678-3839

Publisher, Radio World International
Raffaella Calabrese, raffaella.calabrese@futurenet.com, +39-320-891-1938

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Leave time alone

Don't mess with a system that works



Paul McLane
Editor in chief

Someone dear to me got excited when she learned that Congress was considering making Daylight Saving Time permanent.

Excited, that is, until I told her that in wintertime here in northern Virginia, she'd find herself arriving at work each morning in the dark — even though she gets to the office as late as 8:30 a.m. She didn't like that so much.

(Good thing she doesn't work in the

U.P. of Michigan.)

Why mess with a system that works? That's my take on it.

I find it interesting that some folks get so worked up about this issue. One end of the day or another, changing the system is going to inconvenience someone.

Or if we do decide to change it, why not stay on Standard Time rather than on DST? Isn't that more natural?

Well ... none of it is natural.

Me, I kinda like the semiannual changing of the clocks; I find it a rare common ritual in our lives (well, almost common, looking at you, Hawaii and Arizona). It's a ceremony that makes us all briefly aware that the structuring of our daily lives by the hours is really arbitrary. And even though DST itself only began in the United States in the early 20th century, changing clocks somehow makes me feel just the smallest bit closer to folks who lived centuries ago, their lives ruled by the cycles of agriculture and of the sun.

All of which is to let you know that in this issue, Randy Stine reports on the reaction to the DST proposal among AM broadcasters.

Also, I'm happy to welcome Elle Kehres to the Radio World team. She is the new editor of our daily Radio World SmartBrief e-newsletter and will also work as a content producer across our platforms.

Elle is a journalist who has experience in print, radio, TV and web, and a graduate of the University of North Carolina at Chapel Hill. She most recently was assistant news director and reporter for WCHL(AM/FM) in Chapel Hill. She is based in our parent company's brand new office in Atlanta's Bank of America tower. Reach her at elle.kehres@futurenet.com.



Elle Kehres

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On the cover

John Wells of Amateur Radio Emergency Service District 10 at the scene of a 2012 fire in Colorado. See page 29.

Photo By Aaron Ontiveroz/The Denver Post via Getty Images.



WEARABLES: Nielsen Audio recently updated clients about its Portable People Meter “wearables” initiative. It hopes that by adding several types of wearable measurement devices, panelists will find the experience better and Nielsen will get improved results. It told clients that its wearables have been vetted by rigorous lab tests, focus groups, dual “carry testing” and a former panelist test. It is evaluating its rollout plan.

SECURITY RISK: The Federal Communications Commission added three entities to its list of communications equipment and services deemed to be a threat to the nation’s security. They include a familiar brand of anti-virus and

cybersecurity products. The FCC expanded the list to include AO Kaspersky Lab, China Telecom (Americas) Corp. and China Mobile International USA Inc.

COMMENT SYSTEM: The FCC’s Electronic Comment Filing System is getting a makeover. The commission in early April announced that the ECFS has undergone an initial system upgrade, the first of several planned improvements. This update transitions ECFS to a cloud-based platform, which will make the system scalable and more agile, according to the commission. In addition, reCAPTCHA functionality was added.

UPTON RETIRES: Rep. Fred Upton of Michigan announced he would not run for reelection. Among his many roles since coming to the House of Representatives in 1987, he has been involved in broadcast regulation; he also was one of 10 Republicans who voted to impeach

President Donald Trump. NAB President/ CEO Curtis LeGeyt said, “As the leader of the Energy & Commerce Committee and Communications Subcommittee, his focus on bipartisan governance produced meaningful results to help television and radio broadcasters better compete, innovate and continue serving our tens of millions of viewers and listeners.”

DIGITAL RADIO: The Digital Radio Mondiale Consortium held its general assembly. Chairman Ruxandra Obreja described the consortium as “strong, very active and looking with confidence to the future.” About 80 people attended the open session portion of the virtual event. They heard presentations from India, South Africa, Pakistan, Brazil, Denmark and other countries, including discussion of trials of DRM FM in India. “The encouraging activity of the India automotive group and the progress of the innovative education project were also some of the meeting highlights.”

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Writer



Randy J. Stine

Radio World's lead news contributor profiled Xperi's Ashruf El-Dinary in our previous issue.

Extending Daylight Saving Time could hurt AM radio

Measure would sideline some broadcasters for part of morning drive time

The idea of making Daylight Saving Time a permanent fixture has been broadly discussed before but when the U.S. Senate adopted a bill to make it the law of the land recently, broadcast industry representatives quickly jumped up to protest.

The aptly named Sunshine Protection Act would extend Daylight Saving Time in the United States year-round but could have damaging programming and technical implications for many AM broadcasters. The outlook for the legislation in the U.S. House was unclear as of early April.

For 80 years most Americans have observed the tradition of resetting their clocks spring and fall. Reverting to Standard Time during winter months has benefitted AM broadcasters operating only during daylight hours and those with restricted nighttime

coverage. The time shift allows earlier sign-on and full-power operating times.

However, a change to extend DST would impact the critical AM morning drive time on those stations and potentially hurt revenue generated by morning shows. Those stations would benefit from later sign-off times in November, December, January and February, but not enough to offset getting short changed on morning drive, according to some AM owners (see sidebar, page 6).

The FCC declined comment on the legislation and would not speculate on how it could affect U.S. AM broadcasters. The commission has spent the past decade touting its AM revitalization measures to save the senior band.

The National Association of Broadcasters said it was working with the bill's authors and the leadership of the House Energy and Commerce Committee to minimize potential impact on broadcasters.

Unpredictability of nighttime AM

Thousands of AM stations, many of them Class D stations, are required by the FCC's rules to reduce their power, use a more restrictive coverage pattern, or cease operating at night to avoid interference to other AM stations. Local sunrise and sunset times therefore are critical to thousands of AM broadcasters in the United States.

There are 1,965 Class D AM stations in the United States. Of those, 1,011 operate daytime only, according to the FCC.

Industry observers say that in the lower 48 states, AM operators in major cities across the Pacific Northwest would be especially sensitive to a shift to permanent Daylight Saving Time, given their northerly locations.

For example, Portland, Ore., is farther north than Minneapolis.

Some Class D stations operate with presunrise authorization and postsunset authorization during some months with special authorization from the FCC, according to the commission. However, the rule is complicated, industry experts say, and because of a lack of suitable software, the commission has not granted new PSRA and PSSA authorizations for years.

A flip to permanent Daylight Saving Time would bring operating complications for AM broadcasters, said Ben Dawson, consulting engineer with Hatfield & Dawson, since the propagation mechanism for frequencies of

the AM band is different between daytime and nighttime.

"The groundwave propagation that provides service during daylight hours is quite consistent, but the nighttime propagation mechanism that produces skywave coverage and interference is not. And it varies seasonally and during the nighttime hours," Dawson said.

A change to full-time DST — essentially moving the entire country one time zone east — won't reduce daytime operation hours but would cause morning power change or sign-on times to be an hour later in the winter, Dawson said.

Final blow?

Ben Downs, vice president and general manager of Bryan Broadcasting, which operates four AM stations, said the harm from a switch to year-round DST would go beyond daytimers. He estimates that over 75% of AM radio stations would be affected.

"All but about 1,000 of the 4,500 or so licensed AM stations either sign on, increase power or go to a less restrictive directional pattern at sunrise," Downs said. "AM radio comes alive at sunrise."

The band is already "living in a sea of noise and interference from digital devices and their inexpensive power supplies," Downs said; he thinks permanent Daylight Saving Time would be the final blow for many small-market AM stations.

"As we all know, most small-market AM stations do not operate with large profit margins. The sun rising brings AM radio to life for most. In the winter, listeners would find these stations — their news, information, entertainment and advertisements — would not even exist," Downs said.

KTBB(AM) at 600 kHz and licensed to Tyler, Texas, is another of the stations that would be hurt by year-round DST. The station, 5,000 watts by day and 2,500 watts at night, would lose approximately 40% of its Nielsen-defined metro between local sunset and local sunrise, according to Paul Gleiser, its president and owner.

"For about a four-month period, 40% of the market would not be able to hear it until after 8 a.m., and possibly as late at 8:30 a.m. That would effectively end KTBB's viability," Gleiser said. "A station that can't be heard very well before 8 a.m. has very limited revenue prospects."

Gleiser says he is fortunate to be able to simulcast programming on an FM that he purchased in 2015, one that covers the full market. "For operators of AM stations without such an alternative, 12-month DST is potentially fatal."

And Gleiser said he wouldn't expect the FCC to step in with an across-the-board modification of operating hours to help AM broadcasters if Daylight Saving Time is in effect year around.

"If, for example, the FCC permitted power increases at 6 a.m. rather than waiting for local sunrise, the resulting interference would be a major problem. I would expect zero help from the FCC," he said.

"Very concerned"

Randy Miller, president of Miller Media Group, owns two daytime AM stations with no presunrise or postsunset authority. WHOW(AM) is licensed to Clinton, Ill., while (WTIM) is 500 watts and licensed to Assumption/Taylorville, Ill. They serve critical roles in the community, Miller said.

"I am very concerned about this. Our expanded local newscasts air in each market at 7:10 a.m., which means they won't be heard. When severe weather, i.e. snow and ice hits, parents and children will not be getting any of the school closings we'll be broadcasting in the morning during the winter."

His AMs are paired with several FM translators but he worries about older members of the community that rely on the AM signal to monitor programming.

"Finally, our local advertisers will miss an opportunity to reach their potential customers during the morning, due to the 8:15 a.m. sign-on," Miller said.

The Sunshine Protection Act, sponsored by Sen. Marco Rubio, R-Fla., would especially hurt stations in the northern

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half of the U.S., said Steve Moravec, president of Phoenix Media Group Inc.

"Senator Rubio represents a state with some of the southernmost real estate in the country. For the northern half of the United States, the measure would create yet another problem for AM owners to overcome," he said.

Moravec, a former AM radio station owner who now concentrates on consulting and brokerage activities, says restricting or changing daytime coverage or full-power hours makes a mockery of AM service to the listening public and threatens the AM band's long-term viability.

"It's hard to sell morning drive at a premium if the audience can't hear the radio station," Moravec said. "Just imagine a heavy spot load during the holiday season and you can't go to full facilities until perhaps 9 a.m."

There also would be the added burden of Canada and Mexico needing to concur with any U.S. action, he says.

Veteran news and talk radio consultant Holland Cooke said many of his AM clientele have already essentially evacuated the band for the safety of FM through the use of translators.

"The smart ones are already pretending to be FM by

“To think you can successfully operate an AM station being invisible during most of morning drive is ludicrous.”

rebranding themselves. Because AM is just so challenged, and this possible switch to year-round Daylight Saving Time will do none of them any good. To think you can successfully operate an AM station being invisible during most of morning drive is ludicrous," Cooke said.

Another AM radio advocate notes that translators generally are not available in larger markets, where the FM band is nearly full. There, AM operators cannot allocate an FM translator of any size due to spacing and interference requirements.

"A 250 watt translator is a rarity in large markets, with some translator operators operating with as little as one watt in order to conform to interference requirements. This leaves many AM stations in major markets without an FM simulcast as backup," he said.

Daylight Saving Time was implemented in 1916 in an effort to conserve fuel during World War I. Under the proposed law, the country would have until Nov. 20, 2023, to prepare for the change. 



Rotella Raises Concerns on the Hill

Broadcasters in New Jersey are pushing Congress to consider the impact on AM broadcasters if Daylight Saving Time becomes permanent.

One suggestion: Give all AM stations a common, earlier "power up" start time that would stay the same all year long.

Paul Rotella, president/CEO of the New Jersey Broadcasters Association, wrote to the chairman of the House Energy and Commerce Committee about this issue. The chairman is a fellow New Jerseyan, Rep. Frank Pallone.

Rotella was commenting on the bill, introduced by Sen. Marco Rubio and recently passed by the Senate, that would make DST permanent and do away with the twice-yearly "changing of the clocks."

"If this legislation is adopted, many, if not most, AM stations will lose an hour of morning drive with no or reduced power," Rotella told Pallone, "and no one seems to be addressing the issue.

"Simply put, AM 'day timers' and 'directionals' will not be able to power up in the dead of winter until approximately 8:15 in the morning, thereby losing most of the precious and important morning drive time segment of their broadcast."


He said the FCC should not force AMs to "power down," especially if they can show they are not interfering with other signals.

The NJBA also would like FCC Chairwoman Jessica Rosenworcel to consider a change to the rules to permit that all AM stations have a common, earlier "power up" start time year-round. "This would be similar to the current Pre Sunrise-Authority (PSA) reduced power granted many AM stations, but broader in scope." Rotella suggests it be set for no later than 7 a.m.

"A simple solution would be for the FCC to offer some form of Pre-Sunrise Authority to most, if not all, daytime or directional AM stations. At least this would allow operation and provide service at reduced power."

Rotella said that in the long term, this might even encourage new approaches to spectrum allocations.

He notes that New Jersey broadcaster Larry Tighe suggested using spectrum just below the current VHF TV band for DAB. "He claims the swath of bandwidth is little used and while not ideal for a number of technical reasons, it is still far better that the limitations placed on AM radio as we know it."

Rotella said using spectrum between 45 and 54 MHz and digital technology with 50 kHz slices — "roughly 150 kbs or more than enough for stereo AAC 3 digital compressed audio" — AM broadcasters could migrate, and "the existing AM band could be used for new higher-power full-time broadcasts that could overcome the ever-higher noise floor." 

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Writer



James Careless

Longtime Radio World contributor wrote recently about the BBC World Service's 90th anniversary.

Bottom

A sampling of podcast network sources available on PodMN.

Below

Jeremy Sinon

Hubbard attracts listeners with localized podcast apps

Media company is trying the concept in Minnesota and D.C.

There are approximately 2 million podcasts available to listeners online, according to the business/tech site Earthweb.com. With so many sources demanding listeners' attention, it can be difficult for locally focused content to attract ears even in their home markets.

Hubbard Radio created PodMN, a podcast app built to spotlight homegrown content in Minnesota, and PodcastDC, for Washington. They are free on Apple's App Store and Google Play.

"Our goal is to give listeners in our Minnesota and D.C. markets access to a full range of local podcasts from their areas; not just Hubbard's own podcasts, but ALL local podcasts covering sports, news, true crime and everything else that is being produced here," said Jeremy Sinon, Hubbard Radio's VP of digital strategy.

The UX

PodMN provides a surfable screen of linked icons under titles such as "Minnesota News," "Purple Daily" (the color of the Minnesota Vikings NFL football team), "Networks," "At the Movies" and so forth.

A click on "Categories" offers podcasts in the areas of comedy, news, sports, business, music, health & fitness, society & culture, history, arts, TV & film, fiction, true crime, science, education, government, leisure, kids & family, and technology.

In the True Crime category, the podcast "Midwest Madness" features two sisters talking "about true crime, cults, conspiracies and cryptids in the Midwest." (According to Merriam-Webster, a cryptid is an animal such as Sasquatch or the Loch Ness Monster that has been claimed to exist but never proven to exist.)

In designing the local apps, "our goal is to assist listeners in the discovery of smaller local podcasts," Sinon said. "When you open up the big podcast apps, you're going to see

the big national-type podcasts, whereas the local stuff can get buried and hidden. As a company that produces a lot of local podcasts, it's an important mission for us to make local content more visible."

"This is why PodMN and PodDC focus on local, not national, podcasts," he continued. "This means not only including our own podcasts, but everybody else's as long as it is local and relevant. We feel like 'all boats will rise' in this scenario, including our own."

How podcasts are selected

The available podcasts are not randomly selected, nor an aggregation of every local podcast in those markets. "They're all hand-curated," said Sinon. "In the very beginning we started finding local podcasts through simple web searches. Once we started making relationships in the podcast community and making our brand known on a wider scale, we now have podcasters submitting their shows to us to be added to the app."

The existence of PodMN and PodcastDC has caught producers' attention. "We're at the point where people who are launching new local podcasts are reaching out to us and asking, 'Hey, can you add this to your platform?' This is great, because it shows that podcasters appreciate the opportunity we are providing to connect them with local listeners."


As new content comes on board, Hubbard Radio highlights its arrival to PodMN and PodcastDC users.

Big surprise

Two years into provisioning PodMN and PodcastDC, Hubbard Radio has learned a lot about podcast selection, content aggregation and listener preferences. But a surprise has been just how many podcasts there were to choose from

"When we first launched this, we thought maybe there'd be 70 to 100 podcasts for us to offer in the app," said Sinon.

"Instead, to date we've curated at least a thousand local podcasts for the PodMN app alone, and the number continues to grow. Now they're not all big podcasts: A lot of them are smaller, so they aren't necessarily going to bring big audiences to the app. But they're all visible and we give them access to a more level playing field on our platform than they've ever had on Apple, Spotify or any of the other big guys."

Sinon says the company views these as beta tests. "We'll see how they evolve and what we have yet to learn, we'll then make decisions from there on what's next." 



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John Bisset

CPBE

With more than 50 years in broadcasting, the author is in his 32nd year writing Workbench. He handles western U.S. radio sales for the Telos Alliance and is a past recipient of the SBE's Educator of the Year Award.

Infrared pictures speed troubleshooting

Also, a handy way to obtain a list of Windows updates

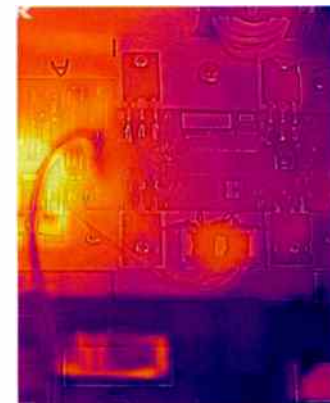
Jim Talbot handles engineering for WSYF(FM) "The Mountain 94.9" in Bangor, Maine. He has a FLIR ONE Pro add-on for his cellphone.

We've written about the benefits of this kind of tool before. Though the model he uses is expensive, it can make troubleshooting easy by identifying hot components quickly.

Jim had an audio board that contained multiples of the same op amp mounted on it. With the FLIR ONE Pro, he identified the bad chip quickly. Jim finds the tool just as helpful for troubleshooting hot spots on electrical panels and RF transmitter components.

Recently, Jim used his smartphone to troubleshoot several Nautel J1000 PA and modulator modules.

Despite seeing a difference in heat from the FETs, he could not feel any difference with his hand. Instead, it was the side-by-side comparison of the FLIR ONE Pro module pictures, shown in the images, that pointed to the trouble.



Be sure to check out the available versions of FLIR thermal cameras to find one that fits your needs and budget.

One feature of the "Pro" version is that you can see the components on the module you are measuring, not just the heat signature image. Where components are packed tightly on a board, this makes identification of the errant component easier.

Stingers that sting

We've received a few comments about Frank Hertel's use of the term "stinger strap" in his EZ Fix for a failed antenna.

Frank says he always heard the term "stinger" used to define the component that carries the RF signal from the central RF feed connection point to the radiating antenna element(s).



Fill Our Tip Jar

Workbench submissions are encouraged and qualify for SBE recertification credit. Email johnpbisset@gmail.com.

12



Above Right
The two orange and purple images allow comparison of bad and good PA modules. Bright FET spots indicate high temperature.

Right
The FLIR One Pro attached at bottom is a pro-grade thermal camera for smartphones.

“ The IR add-on for your phone can help you identify bad chips and troubleshoot electrical panels. ”

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Right
An emergency AM
antenna from The
Radio Source.

In AM, the stinger — strap, wire or copper tube — is the conductor that makes the connection between the antenna tuning unit (ATU) and the AM tower. Think of it as “stinging” the tower with RF energy.

In FM, some antennas use a “stinger strap” to connect the RF coax’s “feed point stub” to a connection point on the FM antenna elements. In FM, these “stinger straps” are critical in their length, and the position at which they connect to the FM antenna radiating elements. Their connection provides the best 50 Ohm match, at the desired frequency of operation.

If you happen to touch the exposed “stinger” (wire or strap) while it is radiating, you will immediately burn a hole in your fingertip, leaving you feeling like you’d been stung by a nasty bee.

RF burns hurt all the way to the bone, and you’ll be left with a white cauterized burned spot on the tip of your finger. There will be no bleeding, just intense pain.

Frank writes from personal experience. He takes the blame for getting burned but adds that he had “trusted” that someone else had turned off the transmitter before he touched the conductor. They had not.

Always use caution around live RF. At the worst it can kill you. At the least you may be reminded of the experience for weeks or months as the burn heals.

Take 555

Frank also shares a YouTube tutorial from the Element 14 online community, in which host Karen explains how the versatile and inexpensive 555 timer IC works. At YouTube, search “How 555 timers work.”

Frank adds that Walter Jung published a book, “The IC Timer Cookbook,” many years ago. It’s still a resource for tinkerers and experienced circuit designers. Search for copies through online used bookstores.

An AM resource

Bill Baker is with Information Station Specialists in Michigan. He has teamed up with Scope+Focus principal Len Watson to provide emergency AM radio components and rentals for temporary applications.

Their website <https://theradiosource.com/products/amready.htm> describes transmitters, antennas, support structures and ground planes. The photo here shows one of their emergency AM antennas. The site also lists a number of AM stations that have employed these solutions successfully. The company also maintains EventCast rental systems. These are small AM operations that include a transmitter, antenna and audio player to provide temporary broadcasts at events — “rental radio stations, ready



to roll.” The equipment gives the venue the ability to speak to arriving patrons using TIS rules. Learn more at <https://theradiosource.com/services/eventcast.htm>.

Testing with Ma Bell

I recently encountered some Windows update issues. Coincidentally, Workbench contributor Paul Sagi in Kuala Lumpur sent in the following note: “At a command prompt in Windows, type `systeminfo` followed by Enter. You’ll get a list of system information, including Windows updates. Those are file names beginning with KB.”

Paul also commented about our column back in March 2021 in which Marc Mann described a “Phone Phreaking Box” built with Radio Shack parts. For Paul the article brought back memories of Ma Bell calling his parents to complain about his “testing” of the phone system. Paul had discovered the phone numbers he could dial to obtain tones that he could use to test his own audio equipment. Very handy before he built his own signal generator! 📞

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**BLADE-4
COMPATIBLE**



Science-Photo Library - VICTOR HABBICK VISIONS/Getty Images

Streaming audio loudness guidelines explained

A new AES document recommends procedures suited to fixed and mobile listening

Internet audio streaming and on-demand playback have become ubiquitous, both in consumer media and professional audio applications. Today, it is a \$10 billion industry.

Despite this popularity, the effects of excessive loudness or inconsistent loudness between sources continue to detract from the listening experience. This topic was the subject of a presentation at a recent AES seminar by John Kean, former NPR senior technologist, moderated by David Bialik of David K. Bialik & Associates.

It discussed a new AES technical document on loudness guidelines, TD1008. Kean's presentation was followed by a panel discussion among several members of the Drafting Group.

What's LUFS?

To measure and control loudness, engineers speak in terms of LUFS, or Loudness Units relative to Full Scale, as defined by the ITU-R BS.1770-4 Loudness Meter standard.

LUFS relates loudness units to the maximum level that a system can handle, which is always expressed as a negative number, i.e., -18 LUFS. The less negative the number, the higher the average level. An increasing number of pro audio devices and software are equipped with LUFS metering.

Table 1 of the TD1008 recommendations (shown on page 20) covers all audio distributed by streams and podcasts as well as on-demand music services. These include audio content that is either mixed speech and music, or all music, interstitials (e.g., advertisements) and even automated voice announcements. Content where speech is measurable serves as the -18 LUFS anchor, against which music, sound effects, etc. are mixed.

As discussed below, the document recommends that music content be album-normalized, if practical, or track-normalized to no more than -16 LUFS.

To reach the desired loudness, audio content is normalized in a downward direction if the content loudness is above the target loudness, or upward if it



Read the Document

The entire TD1008 document may be read online and downloaded from the AES website (<https://tinyurl.com/rw-loudness>).

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Audio Standards

Table 1

Content		Distribution Loudness (LUFS)	Upper Tolerance (LU)	Loudness Measurement Method
Assorted ¹	Speech is measurable ²	-18	+1	Dialog Integrated Loudness ³
	Speech is not measurable See Section 5B	-18	+2 format-specific see Table 2	Integrated loudness
Music ⁴	Track-normalized ⁵	-16	+0.2	Integrated loudness
	Album-loudest track (e.g., on-demand music services, Section 5D)	-14 ⁶	+0.2	Integrated loudness
Interstitial ⁷		-18	+0.2	Integrated loudness
Virtual Assistant		-18	n/a ⁸	Integrated loudness of assistant's voice preceding volume control

“In managing content loudness, distributors need to sensitively balance the requirements of listening environments against the aesthetic quality of their content.”

Above
Table 1:
Recommendations
for loudness of
internet audio
streaming and
on-demand
distribution.

is below the target. The loudness of nearly all popular music is high, so only a downward gain is needed, requiring no further processing and effect on dynamics. There may be exceptions with upward normalization, such as content with a large peak-to-loudness ratio. Here, peak limiting may be best, or, if dynamic quality is affected, partial normalization may be necessary.

Music content is normalized for distribution in one of two ways. The first is “album normalization,” which preserves the relative loudness between songs on an album. This is

preferred because it respects the artist’s intent for the way their music should sound. This technique is well-suited to on-demand or continuous music services.

Album normalization first measures the integrated loudness of each track on an album. The loudest track is then set to a loudness of -14 LUFS. The same amount

of gain adjustment, up or down, is done to the remaining tracks of the album. The document notes that most popular music albums have loudness variation between songs of 2 to 3 LUFS.

Album normalization may be impractical in a radio-style production where songs are played out sequentially. In these cases, tracks are adjusted individually or “track normalized”: Each song or audio element is raised or lowered by different amounts to a similar loudness. However, this alters the artist’s intent by making some tracks sound louder or softer than they were intended.

Table 2 in TD1008 (facing page) provides simplified guidance on distribution loudness of track normalized content. News/talk and dramatic content is recommended at -18 LUFS, and popular music (track normalized) is recommended at -16 LUFS, which compensates for how the ITU Loudness Meter responds to voice and music. Mixed-format content and sports are targeted in the middle, at -17 LUFS. (These small differences require long-term measurement for accuracy.)

Distributors need to sensitively balance the requirements of listening environments against the aesthetic quality of their content. While fine arts programming may require reduced Integrated Loudness to help preserve the natural dynamics of a performance, popular music content requires no further processing, other than normalization

Meaningful metadata

Audio metadata that is embedded in the stream will play an increasing role in managing loudness. Development is in progress on the production, distribution and playback device fronts, but may require several more years for full adoption.

When metadata is used, the original content is distributed to the player non-destructively. Listeners receive the same content, but the players use that metadata to manage the loudness and dynamics of the audio according to the noise environment, capabilities of the playback device and listeners’ needs.

Most new mobile devices and HTML5-compatible browsers can use audio metadata. Over time, newer devices with these features will replace legacy devices.

Techniques for audio metadata have been fully established in video services. Within a few years, audio services and devices will adopt this technology and can converge with video standards. Until metadata content is widely available, TD1008 recommends loudness procedures that are well-suited to current fixed and mobile listening.

Why it matters

There are benefits to broadcasters in following the TD1008 guidelines. Listeners will no longer need to readjust the volume from source to source, a long-standing annoyance. The guidelines help to preserve the artistic intent of the content, which may encourage longer listening.



Audio Standards

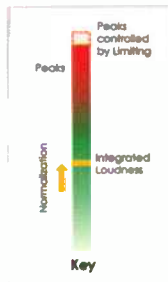
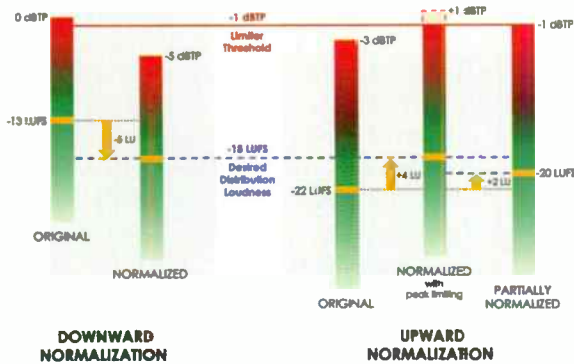


TABLE 2

Format	Distribution Integrated Loudness
News/Talk	-18 LUFS
Pop music	-16 LUFS
Mixed format	-17 LUFS
Sports	-17 LUFS
Drama	-18 LUFS

Far left
Processes for downward and upward loudness normalization.

Left
Table 2: Examples of applications for radio, podcasting etc.

One question that is being raised is whether -16 or -18 LUFS will be loud enough for listeners. The seminar participants agreed that the AES recommendations consider the many limitations in gain and acoustic output of consumer devices to ensure that most smart speakers, car audio systems and mobile devices will perform well.

Nearly all commercial music content requires no further processing (other than normalization) to meet these guidelines. In high-noise environments headphones are a much better option than trying to raise distribution loudness by excessive audio processing.

Complying with the guidelines is easier than it might first appear; -18 LUFS for speech-oriented programming and -16 LUFS for track-normalized music programming can be achieved with a simple audio processor. For best perceptual balance with mixed content, some radio-style audio processors of high quality are capable of handling the speech and music targets intrinsically (check with your manufacturer, or do your own listening tests).

The AES Technical Committee for Broadcast and Online Delivery is developing a website about audio loudness that will be open to the public. The website will educate and demonstrate loudness techniques for audio distribution and content creation. ²

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Writer
Paul
McLane
Editor in Chief

NYPR amps up its dashboard presence

Consistent and reliable visual information is part of its digital strategy

New York Public Radio is building its digital future and working to assure its relevance in connected cars. The multi-prong strategy includes integration of Rapid software from Xperi's All in Media division.

The software allows stations to automatically collect or manually create rich visual content and publish it on digital radio platforms, FM, online and mobile.

NYPR owns two major FM stations in New York. They are news, talk and information flagship station WNYC and classical station WQXR.

"We know how visible and competitive the dashboard is, with rich graphics and data from Apple CarPlay, Android Auto, Sirius XM, TuneIn Radio," Chief Technology Officer Steve Shultis said in late 2021.

"Human nature loves bling, it loves eye candy. So you've got to have a logo, you've got to have depth of metadata to grab the customer and hold them there, just to be able to compete."

The right Humperdinck

AIM and its founder Chris Gould have assisted NYPR to create public-facing metadata and visual displays,



integrated with its HD Radio systems and the public radio system MetaPub.

When the work is complete, listeners to the two FM stations who have HD Radios will see album art on the classical music station and other Artist Experience visuals on the news/talk station.

The Rapid software is a sophisticated cloud-based metadata distribution tool

that acts as middleware, collecting information from the station website, automation system or third-party provider. There are other middleware systems, but this one has access to an unusual resource

"DTS now owns TiVo and Rapid as well as Xperi," Shultis said. "So once you sign the deal with them, you have access to all that metadata from TiVo, an incredible array of Artist Experience, metadata and album art. For us that is especially desired on the classical side."

Historically, he said, it has been difficult to align album art with classical music content; WQXR experienced match rates as low as 30%. Those problems led the station to turn off its Artist Experience metadata until a better solution could be found.

"There are so many versions of Beethoven's Symphony Number 5. And there's a German classical composer called Engelbert Humperdinck — we knew things were wrong

Above
The WNYC logo on the instrumentation panel of a car with DTS AutoStage.

Right
Steve Shultis



More Info

This story appeared in the Radio World ebook "A Call to Action: Radio's Existential Battle for the Dash."

Metadata Management

when the audience was calling us saying, 'Oh, you've got the lounge singer Engelbert Humperdinck performing today.' That was embarrassing. And because we couldn't get the match rate we needed, we pulled the plug."

Shultis expects Rapid will solve such problems.

"It also can be your single source of truth for your metadata, assuring that you're using correct, consistent taxonomy across different areas of the radio station."

Rapid also is a scheduling tool.

"So if at 10 a.m. we air 'The Brian Lehrer Show' and at 12 p.m. we air the show 'All of It,' both of which are live shows, Rapid can hold those schedules and switch the metadata at the appropriate time. The producers can input specific metadata for their show as it's happening or do it prior. And then Rapid can push the metadata to the websites, the transmitter sites and wherever else it's going."

Rapid will also be embedded into an extensive new Digital Asset Management system that will serve the entire NYPR enterprise.

"Among many things, it will provide hierarchical storage management, a fancy term that just means if you haven't



Above
WNYC's logo on the carousel tuning screen in a car with DTS AutoStage.

touched a digital asset in 30 days or so, it will move it to lower-tier storage that might take a little longer to retrieve, although you will have compressed proxies available immediately" Shultis said.

This approach will eliminate silos that have developed within the company, with various departments managing assets and metadata differently. The new DAM will also help the organization better manage its massive historical audio archive reaching back 85 years.

"Rapid serves as the cohesive distribution arm of our metadata, so it will hook into this new digital asset management system."

In short, NYPR is moving from numerous back-end systems to fewer — with the focus on a main storage system and a main distribution system — partly in an effort to present a more consistent face to listeners.

Shultis cites the example of the program "RadioLab." One episode may have four or more versions: the broadcast show, with breaks for underwriting; a podcast with breaks for different underwriting; a "members only" podcast that has no underwriting; and a streamed version. All have slightly different metadata needs.

"When a listener tunes in to a NY Public Radio station, whether it's in the car or on a podcast, the logos will be the

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Metadata Management

same; and now the metadata will be standardized, with the 'NY Public Radio look and feel.'"

Shultis also is a firm believer in "segment-level" metadata.

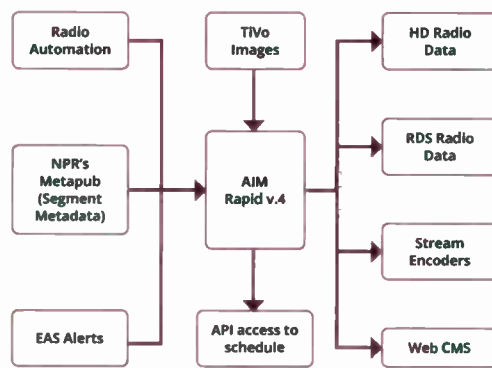
"More is better. When a person tunes into the middle of an interview, they say, 'Wow, this is a great interview, but who is it?' So instead of just presenting 'All Things Considered' the display will say something like 'All Things Considered, an interview with Paul McLane.' I would advise any engineer to go as deep as you can. The audience is hungry for that, and that's what our competition is doing."

Digital marketplace

New York Public Radio also supports DTS AutoStage as part of its digital strategy.

Shultis was drawn to it by its service-following feature, in which a receiver transitions from the OTA signal to the station stream if the vehicle leaves the coverage area.

"We're big on podcasting and streaming. We deliver over a petabyte of data per month of podcasts and streams of our programming. So when I heard about this idea through



Above
Conceptual inputs/
outputs for Rapid.
An iteration of this
is used for each
station.

the NAB and Xperi, I was all over it," he said.

"This is especially important for people in New York City, who may commute an hour and a half by car from the suburbs, which can easily lay outside the coverage area of a metropolitan station. Broadcasters have tried to do this all along with single-frequency networks — to be able to fail over to your next repeater site to keep the listener engaged."

Shultis looks forward to seeing more cars on the road with DTS AutoStage. He is enthused about how WNYC and WQXR metadata show up on its display in a Mercedes S Class, an implementation that includes a useful carousel tuning view and that also presents the station logo to the driver directly behind the steering wheel as well as the center column screen.

Overall, Shultis has been vocal to his station leadership about the importance of managing their visual product.

"I just bought a basic-model Subaru. It's got a beautiful, wide flatscreen with HD Radio in it. Older, analog radio cars are dying away, and the HD Radio marketplace in the New York City DMA now has over 50% penetration of cars, so this is what we're doing to compete in that marketplace." R



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NAB sees benefits of directional FM modeling

But antenna manufacturer ERI expresses “serious concerns”

The National Association of Broadcasters appreciates that the Federal Communications Commission wants to allow the use of computer modeling technology to verify performance of FM directional antennas. But NAB recommends that the commission keep in place a number of “guardrails” in the rules.

Meanwhile, antenna manufacturer Electronics Research Inc. says it still has serious concerns about the proposal and worries about possible inaccuracies in computer modeling.

FM radio is the only remaining broadcast service in the United States that requires physical measurements, thereby preventing manufacturers and broadcasters from relying on computer modeling to verify directional antenna problems.

Currently, applications proposing the use of directional FM antenna systems must include a tabulation of the antenna pattern through measurements performed on a test range of full scale or scaled model setup, commonly 4.1:1 or 4.5:1, according to the FCC.

The FCC adopted a Notice for Proposed Rulemaking in November based on a joint petition from antenna manufacturers Dielectric, Jampro Antennas, Radio Frequency Systems and Shively Labs and broadcaster Educational Media Foundation.

“We believe that giving license applicants the option of submitting computer models could provide meaningful relief to many FM broadcasters without jeopardizing technical standards or service to the public,” the commission wrote in its notice.

The proposal would relax the requirement for directional FM antennas operated by full-service and low-power FM stations in the United States. The FCC says there are about 900 directional FM stations licensed in the nation.

The most common reason to use a directional antenna by a commercial full-power FM is to allow it to “short-space” to another FM station while maintaining contour protection to that station.

The NAB in general supports the NPRM. It told the FCC that “computational simulation of FM directional antennas is already mature and produce computer modeling can produce comparable accuracy to physical measurements,” but still cautioned that

Writer
Randy J. Stine



Read more

You can view filed comments about this issue. At www.fcc.gov/ecfs/search/search-fillings, type “21-422” in the “Specify Proceeding” field.

“electronic modeling software is complex, can be subject to manipulation and limited by the accuracy and completeness of the input data.”

NAB continued: “Computer models can provide meaningful relief to FM broadcasters without substantially jeopardizing technical standards or service to the public. This approach should also lead to lower costs for antenna manufacturers and their broadcaster customers and allow for greater flexibility in transmitter site selection by FM broadcasters as tower space become increasingly precious.”

However, the association provided a list of requirements it would like to see maintained or newly, including a statement of the qualifications to the people responsible for the computer modeling and expansion of the rules to include specification of the mechanical and electrical properties of the antenna used in the model.

It also said the FCC should not require “in situ” measurements beyond ensuring the proper installation of the antenna and accept results from any appropriate electromagnetic modeling software. And because absolute accuracy is not achievable, the commission should not try to attain prediction accuracies that do not materially affect the interference environment.

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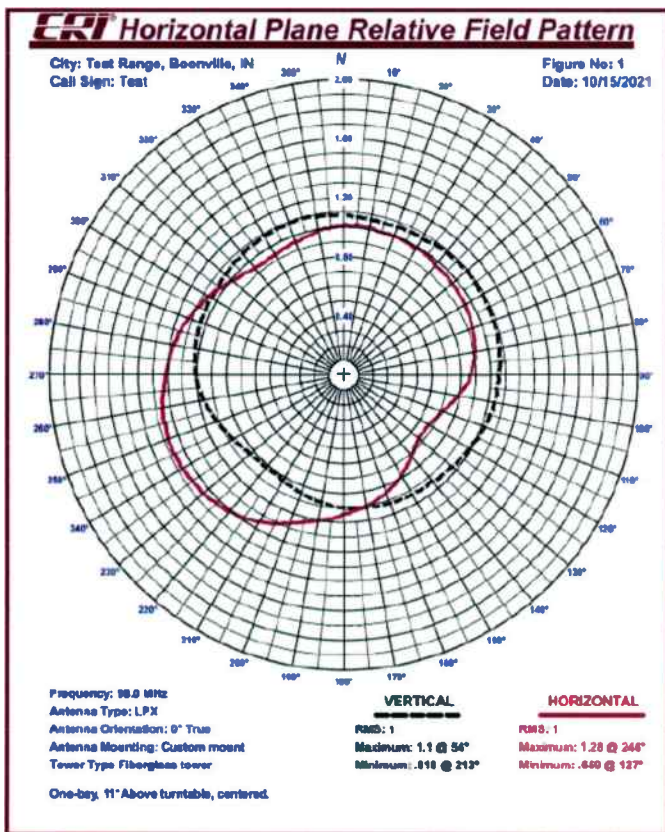
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Guardrail detail

NAB says errors associated with computational modeling are likely to increase with the depth of nulls in an antenna pattern.

The association asked the commission to retain a limitation that directional antennas proposing a maximum-to-minimum radiation in the horizontal (azimuth) plane of more than 15 decibels will not be accepted.

"Most commonly, the purpose of employing a directional antenna by a commercial full-power FM station is to allow that station to short-space to another FM station, while maintaining contour protection to that station. The commission's short-spacing rules provide a lower limit on the distance to which a station may locate with respect to other stations," according to its filing.

NAB believes that the present 15 dB maximum-to-minimum ratio is adequate to allow for alternative

transmitter sites within the spacing limits while minimizing the risk of interference.

The association also asks the FCC for a limit of 2 dB/10-degree rate of change in the azimuth plane.

"The pattern comparisons in the record demonstrate that the rate of change of the antenna pattern is critically dependent upon the accuracy of the data used in the model. Small errors in the physical dimensions used in the model can translate into larger errors in predicted antenna gain in a particular direction.

"Therefore, NAB recommends retaining the existing limitation that directional antennas that propose a radiation pattern in the azimuth plane which varies more than 2 decibels per 10 degrees of azimuth will not be accepted or authorized. This requirement helps ensure that modeled patterns will be realized in practice."

Above

An image from calibration tests on ERI's far-field full-scale FM antenna test range. ERI said the low level of range error shows that test ranges can be built in a manner that provides measured results as good or better than those from a simulation.

In addition, it asks for limits of 15 dB max/min in the azimuth plane and of 2 dB/10-degree rate of change in the azimuth plane (see sidebar).

To demonstrate the accuracy of computational modeling, Dielectric, one of the original petitioners, submitted to the FCC a set of 53 comparisons of predicted directional antenna patterns derived from computational modeling overlaid with drone measurements of actual television antenna patterns. They were taken from its recent TV repack projects.

Shively Labs reiterated its support of the proposal and said the FCC should adopt a period of discovery and study to determine the best methods and most acceptable way forward while maintaining or improving the accuracy of directional antenna pattern studies.

ERI's concerns

The majority of filed comments were supportive of the rule updates. But one antenna maker still had pause when considering the proposed changes.

Electronic Research Inc. said its experience has shown that computer models offer a good starting point. "Still, the final design of directional and nondirectional FM and television antennas should be completed and verified with measured azimuth patterns on either an antenna test range or in an anechoic chamber," ERI wrote.

It told worries that the proposed changes would allow computer studies to confirm compliance with no verification that the performance of the computer simulation is accurate and correct.

In addition, the company notes that the FM broadcast band has a history of changes and additions to the types of services authorized, the power levels at which they have been allowed to operate, and the criteria used to site new facilities through modifications to the table of FM allotments.

"The result has been an ever-increasing number of authorized facilities and a continuing impairment of fringe coverage," it said.

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WorldCast Has Fresh Take on APTmpX

WorldCast Systems announced new versions of its MPX/composite compression algorithm.

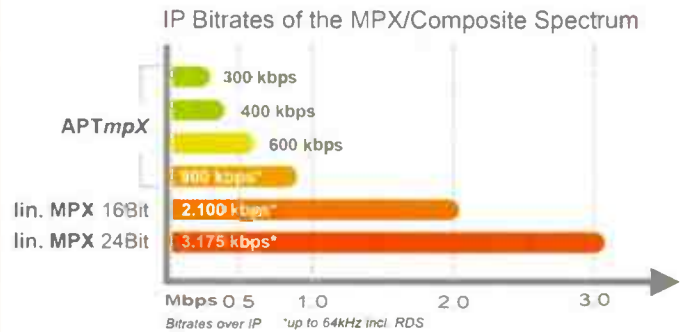
"APTmpX significantly lowers the hardware and distribution costs previously associated with standard FM network architecture," the company said in the announcement.

"Despite the advent of the internet and digital broadcasting standards, FM remains the world's most popular transmission format and a central technology in radio broadcasters' efforts to maximize their reach and audience. As a result, new technologies have had to be created to enable an FM-centric workflow to also work for internet delivery."

It said the initial version, launched in 2020, offered FM broadcasters access to high-quality signal compression for centralized FM MPX/Composite transmission.

"This provided a game-changing solution in the <900 kbps region," it continued. "However, the latest release of APTmpX takes this even further."

Three versions are available that offer levels of compression at 600, 400 or 300 kbps network bandwidth. "This dramatically widens the potential impact of the technology on the industry and means that the composite signal can now directly be transported with non-



destructive compression from 600 kbps down to 300 kbps, all at the highest sound quality," it stated.

Gregory Mercier, director of product marketing, was quoted saying the new versions will particularly benefit broadcasters in areas of poor bandwidth penetration.

Info: <http://worldcastsystems.com>

The ERI filing included details and testing to support its position that the changes would be detrimental to the public and the FM broadcast service, with its history of station growth and increasing congestion.

Comments from Hatfield & Dawson Consulting Engineers, which has extensive experience using electromagnetic modeling software, were supportive of the FCC proposal but asked for clarification of several sections of the NPRM.

"The text of the Notice of Proposed Rulemaking provides a clear description of the method of determining antenna pattern information by use of a test range or of an anechoic chamber," it wrote.

"Some confusion may, however, result from the lack of a careful distinction between such test range or anechoic chamber measurements and measurements made in the far-field from operating antennas. This confusion may arise from the comparisons in the NPRM with the field measurement versus moment method procedure for proof of performance of AM directional antennas."

The FCC in 2008 approved the use of the "method of moments" computer modeling technique to allow AM stations to conduct proofs of performance of directional AM antenna patterns without the use of actual field strength measurements.

Broadcast engineers familiar with computer modeling say the MoM approach has provided considerable savings in time and money for antenna manufacturers and AM broadcasters. 📻

Now You Can "Shop Kintronic"

Kintronic Labs opened an online store where engineers and other broadcasters can obtain specialized components.

The store can be accessed from the homepage of its website by clicking the Online Store tab on the main menu.

It launched with mica and vacuum capacitors, and is adding other products such as dehydrators, copper strap, RF contactors (shown), lighting chokes and other components.

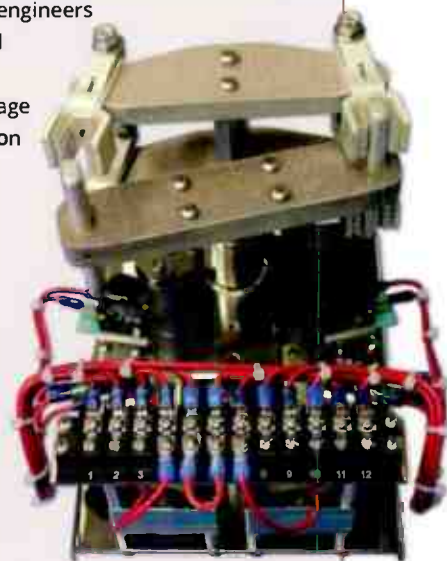
Shoppers will need to create an account to check out. The company accepts most major credit cards.

"We recommend that resellers continue to purchase from us using the standard purchase order process."

Online purchases are currently limited to the United States.

The company started after founder Louis King in 1949 resigned from RCA, where he was an AM high-power transmitter design engineer, to return to his birthplace of Bristol, Tenn., to pursue his love of RF antennas and components.

Info: <http://kintronic.com>



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When all else fails

I was disheartened to read Burt Fisher's disparaging comments on amateur radio in the March 16 Opinion section.

As an active member of the ham radio community and president of my local amateur radio club, I know that hams play an important role in serving their communities. In addition, most hams are dedicated to the craft and continuously seek to improve their knowledge, operating skills and ability to provide emergency communications.

As a prime example, I would point to amateur radio's response to Hurricane Maria, which hit Puerto Rico and destroyed its communication infrastructure.

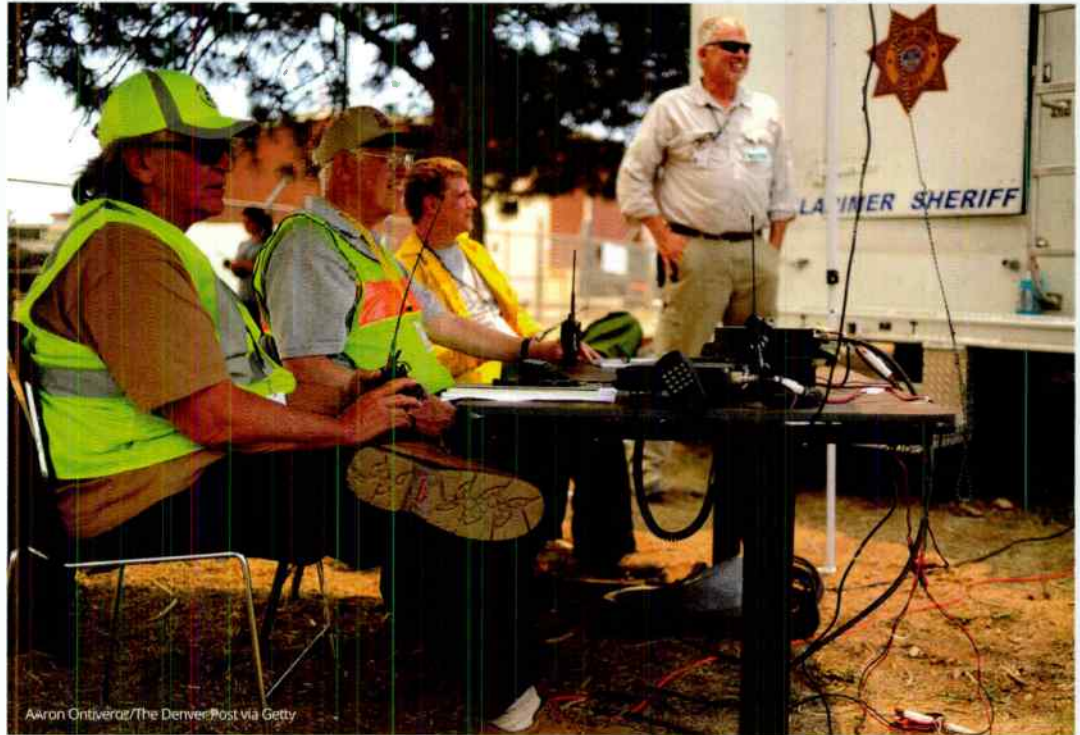
The American Radio Relay League — the organization that represents hams — asked for volunteers to travel to the island to help get emergency communications up and running. A total of 50 hams were sought, but hundreds volunteered. Within days, amateur radio operators had restored vital communication links, providing an invaluable service in assisting recovery efforts.

In the case of our own club, we have an agreement to provide emergency backup communications for our local sheriff's department in the event its own radio systems fail. We also provide communications support for numerous community events and first-hand information from the field to the National Weather Service during severe storms.

Fisher wrote that hams no longer advance the state of the art of communications. Perhaps he's not aware of the many new technologies that amateur radio embraces, including a host of groundbreaking digital modes that provide reliable communications during marginal conditions.

Regarding his concern that operators don't have generators and backup power sources for use during emergencies, I note that most ham transceivers run on 12 volts and are easily powered by car batteries, even solar arrays. As we like to say: "When all else fails, there's amateur radio."

Finally, his letter raised the issue of today's licensing of operators. As an FCC Volunteer Examiner myself, I can tell you that we "VEs" take our job very seriously and adhere to rigorous rules and regulations when administering licensing exams. While the entry level exam for the Technician license is relatively easy, it also has very limited privileges. It is designed to build interest in amateur radio, with the



Aaron Ontiveraz/The Denver Post via Getty

intent that these operators will seek to upgrade to General and Amateur Extra class licenses, both of which require substantial knowledge of electronics, RF radiation hazards, FCC regulations and more.

No doubt there are hams who fall short of the mark, but I have found the vast majority to be decent, caring people who seek to build upon amateur radio's great heritage.

Bryan Jackson
President

East Greenbush (N.Y.) Amateur Radio Association

Above
From left John Wells, Larry Olson, Christian Norris and Rob Strieby of the Amateur Radio Emergency Service District 10 man their station at the High Park fire incident command post hosted by the National Guard Army in Fort Collins, Colo., in 2012.

29

Necessary and welcome

Yes there are idiots who give the rest of the amateur community a bad name. Many amateurs are taking steps to take these stations off the air.

The FCC has issued monetary forfeitures, such as the \$25,000 fine to W6WBJ in 2016, but seem to be powerless to enforce collection of those fines and have these operators removed from the airwaves, as they did with others in the early 1970s.

Closing most of the monitoring stations such as the one outside of Livermore, Calif., certainly doesn't help enforcement ability.

As for wearing vests and interfering with emergency workers, that was a cheap shot hardly worthy of print. As president of the Amateur Radio Club of Alameda, Calif., I



How to submit

Radio World welcomes comment on all relevant topics. Email radioworld@futurenet.com with "Letter to the Editor" in the subject field.

can attest to the fact that not only do many of our members conduct emergency net operations nearly every evening of the week, they also work with local CERT teams, providing quality communication. Our assistance has been deemed necessary and welcome by officials in Oakland and Alameda.

Every June amateurs conduct a nationwide exercise known as Field Day, when we encourage amateurs to set up emergency communications under all manner of conditions. We use batteries, solar panels, generators and even hand-crank generators to keep the art of emergency prepared. We operate from mountain tops, schools, abandoned building and even emergency communication vans.

I am a (20-wpm) Amateur Extra class licensee. It was amateur radio that largely kept me off the streets and out of trouble with the police in my high school days. As for radiosport contesting, I contend that properly conducted, radiosport competitions constitute emergency preparedness training and have even written numerous WQ6X Contest Blogs to that effect

There is a new breed of radio amateur youth who are not only taking contest activities to the next level, they are developing new technologies to make things operate more of effectively.

For over 100 years, many things we take for granted in the broadcast industry were spearheaded by the amateur radio community, eventually co-opted by commercial interests.

As for the foxes guarding the henhouse, Volunteer Examiners administer the examinations only because the FCC abdicated its responsibility to do so. To the best of my knowledge, testing done by VECs is just as stringent as the FCC-administrated testing ever was.

Ron Fitch, WQ6X

President

Amateur Radio Club of Alameda

Fertile ground

I read with disdain the inflammatory letter about amateur radio. It contained falsehoods begging to be corrected.

Just because the rest of the amateur radio service is not snapping to and following Burt Fisher's edicts does not entitle him to distort the truth.

First, he should produce the name and callsign of the "five-year-old" who passed any of the amateur radio exams.

Second, he needs to look up the word "frequently." Profanity is likely more common on broadcast radio than on the amateur bands. In fairness, both are plagued by pirates.

The vast majority of amateur radio associations work closely with their local emergency management agencies, state and federal, and are welcomed as important elements of any emergency response.

If you were to ask FCC commissioners about their "successful" programs, the volunteer examination program for amateur radio continues to be one of their best.

I'm surprised that Radio World gave voice to such an extreme position.

I do agree, however, that is unfortunate that the FCC discontinued the First Class Radio Telephone operators permit.

Dolph Santorine, ADOLF

A cherished springboard

I'm chief engineer for a cluster of 24 commercial broadcast radio stations in northeast Pennsylvania and reaching into New York state.

I was licensed in amateur radio in 1974 as a Novice when I was barely out of my teens. I went on to achieve the General and the Amateur Extra Class license. I built my first 75-meter band receiver in 1974 from scratch, following a design in the ARRL Handbook. I etched the circuit board and stuffed it with hand-wound toroid coils and other components.

I made my first Morse Code contact with that receiver, worked an amateur station in Winnipeg, Manitoba. From that humble beginning I went on to build other pieces of ham gear.

Amateur radio was a springboard to a lifelong career in telecommunications. I went on to achieve the Second Class Radio Telephone License and then on to the First Class Radio Telephone License. Eventually I earned NARTE certification as an EMC Engineer and ran a NVLAP-accredited and FCC-Listed EMC Test Laboratory. When that laboratory closed nearly 20 years ago I started working in broadcast engineering.

Certainly amateur radio has met one of its stated purposes: to encourage the growth of wireless experimentation and self-training. It is unfortunate that the author of the letter seems to be ignorant of the vast amount of educational material published by the Amateur Radio Relay League and the encouragement it provides in experimentation with and use of spectrum-sparing modes of communication. These used by amateur radio operators around the world.

We recently advertised an employment opportunity for an assistant to the chief engineer. The only qualified applicant, whom we ultimately hired, is a licensed amateur radio operator.

Love for the practice and art of radio should be encouraged in every way possible, including amateur radio, for the health of the broadcasting industry.

Craig R. Seelig, WA3ZCR



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