ADVANCING AOIP FOR BROADCAST

TAKING ADVANTAGE OF EMERGING STANDARDS SUCH AS **AES67** VIA **AUDIO OVER IP** TO GET THE MOST OUT OF YOUR BROADCAST FACILITY

Wheatstone

Planning For A New Studio

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

Heaven forbid you should forget the elevator.

The good thing about being in the audio network and console business is that we have a front-row seat to the important trends and technology driving most studio operations today.

Here are some of the things we've noticed during our recent travels around the globe designing and installing new studios.

Camera automation.
More and more on-air studios have a camera or two to run show video out to YouTube or other social media. Many of the larger studios have fulltime video editors onsite at the studio, while others are taking advantage of automation software to run those cameras. For example, camera automation systems are being integrated with WheatNet-IP audio networking to switch the camera to the host or guest position in the studio whenever a mic is turned on.

Downsized space.
Technology is getting smaller and smaller, and that goes for devices as well as studios. It's not unusual to see studio facilities scaled down, some by as much as half. Gone are the racks and racks of DAs and relays, thanks to IP audio routing and control.

Talent on the move.
Who knew that talent had legs? They're no longer confined to one studio, or even the studio facility. With WheatNet-IP, mix-minus, bus minuses, mic presets and even video follow talent and shows no matter where they are located on the audio network.

Signs of the times.
Signage in studios is one of the biggest trends going. We're seeing more and more clocks with metering on the wall, video feeds of talent shown in the lobby, and music playout schedules from the automation showing up on the studio wall or elsewhere in the studios. All this visualization is made possible because of the easy IP routing of media and data throughout the facility, thanks to the tight integration of WheatNet-IP audio networking and automation, metering and clocking systems.

Showcase looks.
With so many radio morning shows now syndicating with the local TV station, there's a lot more attention being paid to how the studio looks. There's way less clutter, more open space and less wiring everywhere. Broadcasters are recessing monitors, lowering mic booms and adding polish with better lighting.

Soundcards are out.
"That soundcard that fit your 10-year-old computer doesn't fit the newer computers," said Wheatstone Director of Sales Jay Tyler. Broadcasters are going with audio drivers instead, which can save a couple thousand dollars per studio.

More control.
The modern studio gives you far more control. One Ethernet cable is all it takes to bring up any source along with control commands in the WheatNet-IP audio network. Tyler noticed that there is a lot of interest in our IP networked TS-22 talent station because in one small talent station sitting, you can control mic on/off, talkback, muting, source selection and headphone amp all through an Ethernet cable.

Better workflow.
IP audio network integration with editing systems such as VoxPro makes it so much easier to do live telephone editing, on the fly, all on one cable – audio and control. Plus, WheatNet-IP integration with things like codecs means you don't need analog inputs and outputs.

Software flexibility.
Virtual console control and other software apps are making studios much more flexible. "With our new ScreenBuilder app, and a terminal, you can replace a whole intercom panel with a soft panel. You can build intercoms and talkbacks and mix minuses and on the fly mixes with a software application where you used to pay thousands of dollars in hardware," commented Tyler.

Energy efficiency.
According to Tyler, "You can plug in an electric space heater and it's going to use more juice than a big pile of Wheaty gear."

Network without limits, thanks to AES67.
The WheatNet-IP audio network is AES67 compatible. You can now transport audio between your WheatNet-IP networked facility and a remote production facility that has Dante® networking, for example.

AES67

HEAR… THERE AND EVERYWHERE

AES67 may be an IP audio standard, but it didn't take long for the various brand permutations to suck up all the oxygen in the room. These aren't standards per se. They are IP audio network systems, WheatNet-IP included, that incorporate AES67 as a subset among other functions and connectivity options. So while you will have to forgive us for proselytizing our respective brands, it's important to understand the significance of so many audio networks adopting and sharing this interoperability standard.

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

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

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

Why do we need AES67?

IP networking is easily one of the most ubiquitous technologies found in the world today. IP audio network manufacturers are able to take advantage of, and share in, many, many proven standards as a result. So, why do we need one more standard? Because the rules of IP packet distribution are not friendly to real-time audio. Synchronizing large amounts of data is the biggest problem. In the IP network, packets aren't necessarily routed based on which packets were created first. That works fine for a typical office network, but without some sort of deterministic routing for the heavy traffic loads of the audio network, packets can become jumbled and delayed. This can cause jitter and packet loss or dropout. Audio network makers have had to work around this problem with tools like buffering and QoS to assure continuous audio transport. No two manufacturers solve this problem the same way, which has made it difficult for them to exchange audio between them.

What does AES67 do?

Almost all audio networks use a standard IP protocol called RTP (Real-Time Protocol) to create the proper packet order. RTP provides identification in the packets about their creation time and order but, for all the reasons stated above, it has been up to the IP audio network manufacturer to extract this information and to recreate the audio data and timing. Each differs in the specific packet loading, timing and synchronization mechanisms within the protocol.

AES67 has come along to provide the common synchronization, clock identification, session description and other interoperability recommendations we can all share. AES67 adapted the PTPv2 (Precision Time Protocol - IEEE 1588-2008) standard as the master clock reference, so we can more easily transport audio between our various systems without jitter, delay and data dropout.

Check out this AES link for a full description: http://www.aes.org/standards/blog/2013/9/aes67-2013-audio-over-ip-130911

Does AES67 provide for discovery?

No. AES67 does not provide for a standard way to find and add devices to a network. Discovery is left up to each individual manufacturer, although most of the major players take a similar approach to finding and labeling components in the network. Most designate extra packets on the network to communicate discovery data and display it seamlessly to all users with signal names and other information easily created and recognizable to broadcasters.

Does AES67 provide for control?

No. AES67 is an audio transport standard only. Other standards are intended to address full interoperability of the control features of various audio networks.

We recognize that gaining access to hundreds of channels of audio on a network is useless if you can't route them, turn them on or off, fire their playback, or turn an ON AIR light on when needed. Currently, to accomplish this, IP audio network manufacturers use packets to communicate command and control. Each system is different, and sometimes an ancillary PC is used for this and sometimes the intelligence is built right into the network devices (as is the case for WheatNet-IP).

In a WheatNet-IP system, control is built into each I/O connection point and shared with other IP connection points across the network, allowing systemwide access to all available sources as well as any associated logic that goes along with each feed, such as control of mic ON/OFF, changing remote mic settings for IFB, audio processing, and other parameters.

Does AES67 pay it forward?

Yes. AES67 is extensible, meaning that you will be able to add to it as situations change. It is anticipated that any future standards are will add on to, not replace, AES67.

When IP Isn't Enough...

If you've already started transitioning your broadcast plant and workflows to IP, you've no doubt discovered one of life's little ironies. IP, it turns out, knows very little about the successful delivery of media.

IP can bring unbelievable adaptability and extendability to audio for live remote production. But you'll still need a way to bring audio into the network, prioritize it to reduce packet dropouts and other quality issues, plus manage, process and do all those things you normally do with audio.

In short, you'll need something that talks both IP and audio, and knows AES67. That's where WheatNet-IP audio I/O BLADEs come in.

For example, the M4IP-USB BLADE is used at remote venues and in studios as an interface between the network and up to four microphones. It's essentially a four-channel mic processor with four XLR inputs and an Ethernet output port, with parametric EQ, de-esser and compressors for each channel – all of which can be set and adjusted from a laptop. The M4IP-USB also has two 8-channel utility mixers that you can assign to be a very low latency IFB subsystem and/or premixer with remote control capability in a network of other BLADEs. It includes built-in silence detection on all outputs with auto switchover and auto fall back for enhanced operational reliability, and USB ports for feeding audio directly from computers and other devices. And most importantly, as an I/O BLADE, it can route audio streams to anywhere in the network.

The M4IP-USB can be used as a standalone BLADE, or it can be part of a network of BLADEs to form a WheatNet-IP audio network. It can also be interfaced to just about any analog or digital mixer that takes AES or analog audio, and as an AES67 compatible unit, it can be interfaced into any IP audio network that has AES67 (such as Dante®).

But what if you needed to bring in audio from a camera or other HD-SDI source? We have a BLADE for that, too. Our HD-SDI BLADE can feed audio from video production automation systems, routers, and other professional video equipment that use HD-SDI. It de-embeds multiple audio channels from HD-SDI streams so you can mix, process or simply route audio to your console for final broadcast. It is capable of de-embedding up to four HD-SDI streams, and up to eight audio channels per stream, and this BLADE also has all the standard built-in features like utility mixers and AES67 compatibility, so you can use it for IFB and interface it to all the same networks as our mic processor BLADE.

We also have a MADI BLADE for exchanging up to 64 bidirectional channels (AES10) of audio between our WheatNet-IP audio network and any MADI-compatible intercom system, TDM router, ProTools system or DAW. For TV folks, you can roll your production truck into a venue and plug the MADI BLADE into the house system for intercoms and mixing, and use its IP connectivity for backhauling to the main studio located elsewhere.

Wheatstone has 11 different flavors of BLADEs, any of which can be connected together into a WheatNet-IP audio network to provide resources and utilities for specific IP audio applications.

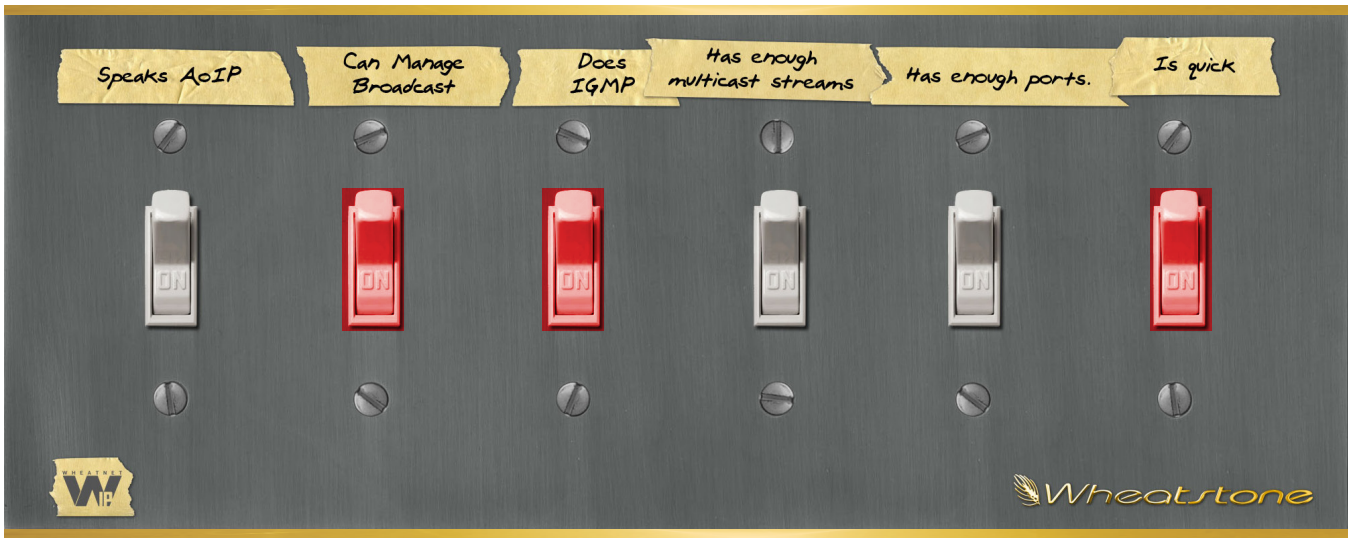
Highlighting Three Things You Need To Know About

Network Switches

You're about to embark on a social experiment.

You've selected the perfect control surfaces and the audio network is almost laid out for your new studios. Everyone and everything speaks broadcast and, so far, you haven't had to take up IT as a second language. But now you're about to drop a couple of network switches into the middle of it all and you're worried that things could erupt into a civil war between this newer IT world and the radio cavalry.

Relax. You'll be glad to know that our engineers have already done the testing and vetting for you. Here are three important characteristics they look for in a network switch.



Fully managed.
We use managed switches rather than unmanaged switches for WheatNet-IP audio networks because this type of switch allows us to configure the switch to operate most efficiently in IP audio networks. Management also allows us to control and monitor the switch during operation; for example, we can directly gauge switch bandwidth usage.

Robust IGMP (Multicast) Capability.
Switches with good, complete IGMP implementations allow a large number of multicast streams to pass unhindered through the network. They also allow us to keep track of streams in use, and prune those which are no longer needed.

Fast.
Switches in IP audio networks control a large amount of traffic. This requires fast, high-capacity switching fabric inside the switch, as well as gigabit connectivity. This combination results in near-zero latency, reliability, and a whole lot more.

Wheatstone engineers perform testing in order to develop a list of switches known to be suitable for the WheatNet-IP audio network. Your Wheatstone sales engineer can help you in selecting and obtaining these switches. We recommend that you install dedicated switches for your audio network; never share switches with the office LAN. You can always install separate NIC cards in workstations or servers – one for the enterprise LAN and another for the audio network – to provide access to both networks.

Countdown To The Big Game

Live remotes are what keep broadcasters up at night. But after nine years of extravagant remotes the week before the NFL's Big Game, Jim Hibbard of Pacific Mobile Recorders knows to expect the unexpected and is prepared like a Boy Scout! He's the audio engineer responsible for The Dan Patrick Show NFL remote every year. Any pops, clicks, or dropouts of any kind will be heard by some 1.2 million weekly sports fans tuning into The Dan Patrick Show during the week preceding the Big Game.

In just a few months, Jim Hibbard will be packing several hundred pounds of audio necessities onto pallets and heading out to the remote site for some pre-game fun with all the guests that arrive that week in anticipation of the Big Game itself. It's never too early to start planning.

Jim will no doubt be dealing with all the usual issues: arranging IFB between producer/talent/director in three geographic locations, getting phone calls and bumper music from the show's studio in Connecticut to the talent at the remote site, and handing off audio to the show's syndicator, Premiere Radio Networks, as well as to its television producer, the DirecTV Audience Network. The show is also seen on the NBC Sports Network.

The week will likely hold a few surprises as well, starting with the many guests. The weeklong remote for The Dan Patrick Show includes any number and variety of high-profile guests, from actors Adam Sandler, Ryan Reynolds, Kevin Bacon and Jerry Seinfeld, to athletes Joe Montana, Dan Marino, Steph Curry and Emmitt Smith, plus coaches, sports commentators, and the NFL superstars themselves.

One thing's for sure: all the audio will be running through the WheatNet-IP audio network, as it has for the past nine years.

WheatNet-IP switches audio to and from a fiber link using Tieline Genie and Merlin codec units, joining together operations and directors, producers, talent and content for the syndicated radio show as well as television production in separate locations.

The studios are geographically dispersed. Typically, the multi-camera shoot is switched in Los Angeles, which is some 3,000 miles from the home studio in Milford, Connecticut. But for the remote, cameras are switched in nearby production trucks that are rolled in for the occasion, and the video feed then is uplinked to Los Angeles and on to the rest of the world. Meanwhile, the main studio for the radio show is in Milford, with IP audio shuttled between the remote site and the Milford studio.

At the remote venue, the show is broadcast from a large set which serves as a makeshift studio complete with several WheatNet-IP TS-4 remote turrets and M4IP mic preamps and a fiber link to the backstage control area, at the center of which is an IP-networked 12 channel console, the Wheatstone E-1.

The studio setup for the 2018 game in Minneapolis remains to be seen. Each event provides unique challenges in terms of space and acoustics. One year, the remote was set in three large temporary buildings on an acre of land complete with a waterfall! Another year, the two-story set was built on the top of the parking lot at Pier 40 in lower Manhattan. That one included a half-size regulation basketball court on the second floor!

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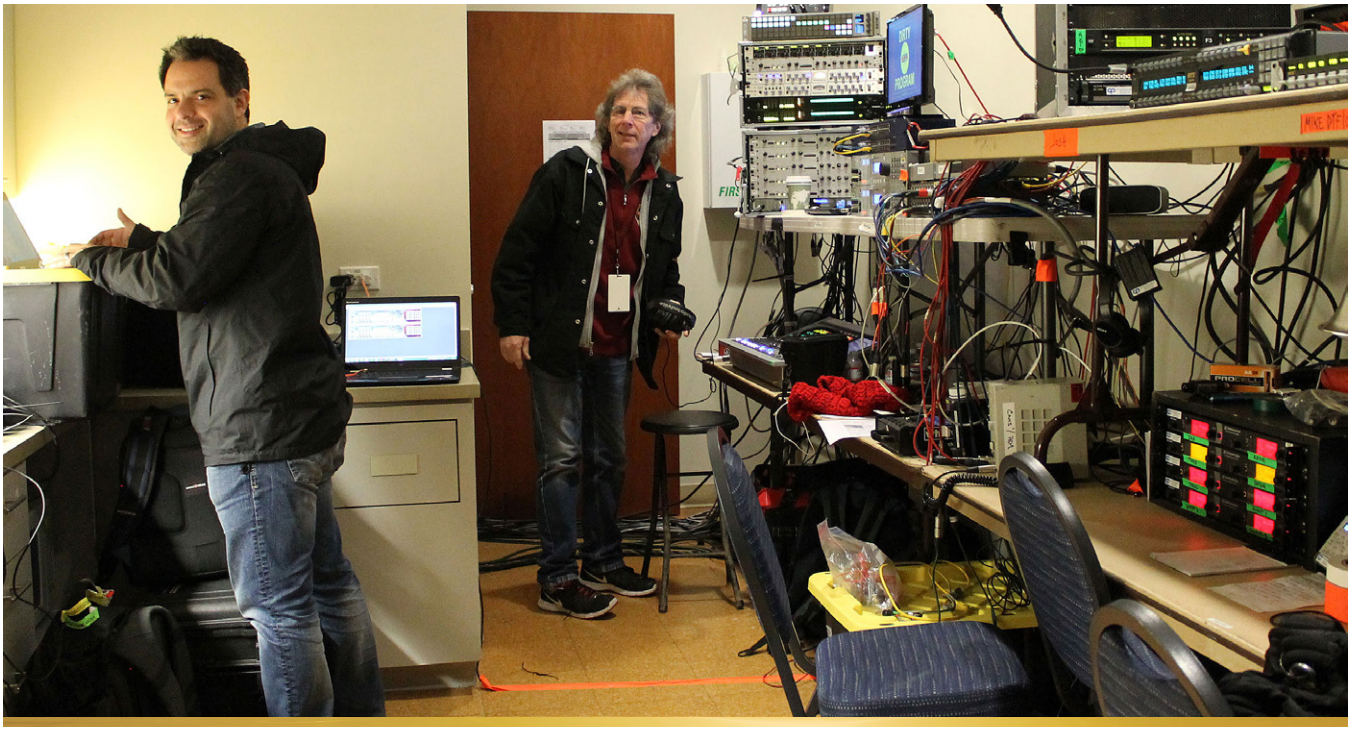


Hibbard also manages the remote audio for the Rich Eisen Radio Show during the week leading up to the Big Game.

Jim has his work cut out for him. But at least audio over IP across all studios and locations takes a few worries off his list. With all audio feeds and phone calls being fed by the home studio, there's no need to set up a separate number or additional phone lines at the remote site or to add equipment for audio feeds since all feeds come through the IP connection between the remote site and the Milford studio. IP audio networking via WheatNet-IP also serves as an intercom backbone for talkback IFB.

And those guests that pop in from time to time? Hibbard uses M4IP four channel mic processors for guests as well as Dan and the Danettes! The M4IP has all the dynamics processing needed to smooth out any voice, but also has an Ethernet port so all controls for those mics – including turning them on/off – run across the network and can therefore work from the TS-4 talent stations and remote console.

Hibbard says: "Using a Wheatstone console with audio over IP system gives us the flexibility and routing functions to easily provide everyone involved in the show the same comforts and quality of the home studio!"

The Dan Patrick Show is produced by DirecTV Audience Networks for television viewing and syndicated on more than 250 affiliate stations by Premiere Radio Networks.

Q: Why do I need an IP audio network specifically for broadcast?

A: IP networks weren't originally intended for real time audio/video delivery. IP networks distribute packets in a non-deterministic manner, which can lead to dropped packets or noticeable jitter as the traffic increases on the network. IP audio networks made for broadcast purposes such as WheatNet-IP use QoS technology to assure seamless audio transport and to mitigate synchronization and audio quality issues. In short, unlike the enterprise IP network, these systems talk both IP and audio.

In addition, because they're broadcast-specific, IP audio networks are designed to accept audio from microphones, production automation systems and other sources as well as control and manage audio devices across the network.

SNMP

Because Networks Don't Get Smaller.

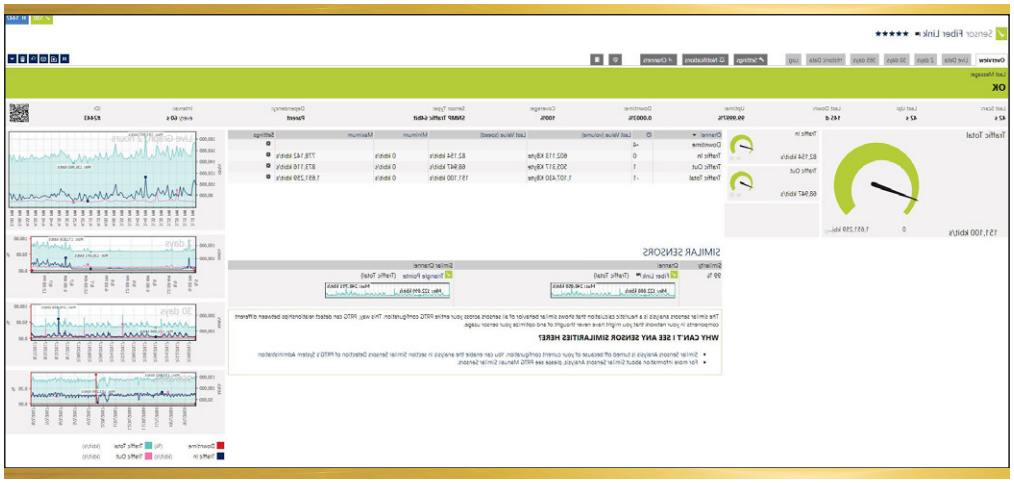
Networks never seem to get smaller. They expand and grow and get more complicated. If you plan to follow along, you will want to look into SNMP monitoring and management tools.

Just about anything that hangs off an IP network can be monitored using Simple Network Management Protocol (SNMP), which is used to monitor and manage data from servers, switches, hubs and IP audio networks like our WheatNet-IP.

SNMP monitoring can tell you if a particular port is dropping packets or if a device is heating up and about to fail. It can show you data packets coming in or going out, by the port or by the link, and from the mic processors on out to the transmitter.

Not all network devices, or even IP audio networks, have SNMP monitoring capability. They need to generate MIB, or Management Information Base, files. For example, the BLADE I/O access units that make up our WheatNet-IP network each have a unique MIB file with hundreds of data points, and each BLADE has a unique object address in the network for SNMP monitoring and alerting purposes.

This data can be useful for alerting you by email or text if silence is detected by a critical BLADE in the network, for example.



Our field engineers work regularly with SNMP, and can answer most of your questions about setting up an SNMP monitoring and alerting system for your WheatNet-IP network that will work for your purposes.

The MIB file tells about the operation of the BLADE or group of BLADEs, such as packet rates, changing bitrates or operating temperatures and overall health of the BLADE. (For security reasons, we've set some of these data points as read-only, while others are set as read-and-write and therefore can be manipulated and controlled.) Other MIB files for servers and switches contain relevant data pertinent to the operation of those units. MIB data can be organized by the device or grouped in tables for viewing, say, a particular stream of data running across the network.

Pictured above is a single example of the depth of data you can have access to with SNMP. This shows all the data associated with a single sensor monitoring traffic on a fiber link. This image is from a commercial tool called PRTG.

To view MIB files, you will need a MIB browser, which can tell you things like if the fan speed in a particular server is off and you need to replace it. But if you want to do more with SNMP, you'll need an SNMP management tool that lets you manipulate MIB data using basic SNMP commands such as GET, SET and TRAP. By sending a TRAP message, for example, the client device can alert the SNMP manager to conditions like a CPU that's overheating, if a router port is no longer responding or if a hard drive is approaching full status. If you don't already have an SNMP manager, there are several decent freeware suites like this one: http://www.dart.com/snmp-free-manager.aspx and several like this one by Paessler: https://www.paessler.com/info/snmpclient that you can download on a free trial.

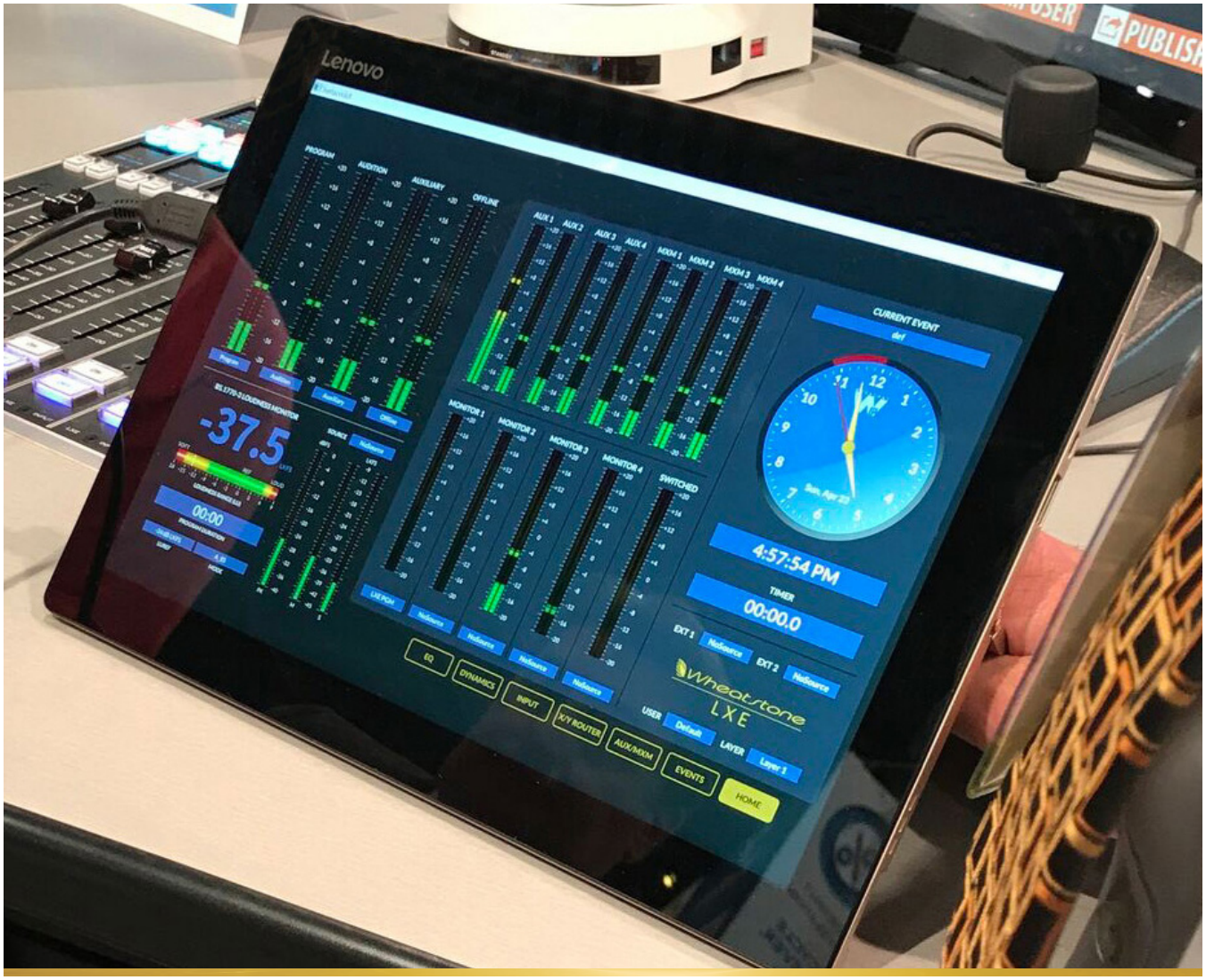
IP Onboard for Immersive, Personalized Audio

We've seen IP audio consoles get smaller, more adaptable, more capable, and, in truth, stranger looking. One console-like appliance that is recognizable to anyone familiar with WheatNet-IP audio networks is the SideBoard, a surface that contains faders and controls typical of a control surface but in a 4 RU rackmount chassis. Another interesting appliance is the TS-4 or TS-22 talent station, which is essentially a console all rolled into a small turret for putting mic controls, source selection, headphone volume and all the other necessary functions in front of talent.

We've just begun to scratch the surface of what IP audio networking can do.

We can now source, route, mix, and send to air from just about any surface imaginable, in some cases without touching a single physical fader.

We know of announcers broadcasting from a remote location using a touchscreen interface that is essentially a bank of faders, knobs and other software widgets on a flat screen monitor recessed into the furniture. Virtual surfaces like this are becoming more popular, thanks to the advent of apps such as Wheatstone's ScreenBuilder app that make it possible to create GUIs with the drag and drop of a widget on a screen, which can then be scripted for controlling devices and various elements in the IP audio network.



Not only can audio programming today function in a console-free environment, it can be more tightly routed and integrated with program automation systems, such as RCS Zetta, Enco, and BSI through IP.

In fact, much of what we've learned about software apps is directly transferable to hardware. IP audio consoles such as Wheatstone's configurable LXE are removing the limitations of a fixed surface by providing a completely reconfigurable architecture. Instead of mapping switches, buttons and knobs to a particular function that can never be changed, the LXE's surface controls are completely programmable – and continually re-programmable – through a GUI similar to ScreenBuilder. Any button anywhere on the surface can be programmed at any time for talkback, cue, start/stop or for toggling between functions, which can also be tied to different elements such as microphones.

In this new world of the expandable, adaptable and transformable broadcast console, there's also something else going on: a fresh, new way of interacting with audio. One of the more noticeable features of new consoles like the LXE are their intuitive GUIs, which make them not only the ultimate user interface between announcer and listener/viewer but also between announcer and audio as well. Being able to "pinch" the right amount of EQ or boost/cut frequencies using touch just scratch the surface of what these powerful platforms can do.

All of that is going to be more and more important as sound engineers add more channels to their workflows for immersive audio, as they add more control parameters to those audio mixes for the personalized sound experience, and as they continue to reach a wide audience with a myriad of playback requirements for cable, broadcast, web, even mobile.

DO MORE. A LOT MORE.

There's far more to Wheatstone's WheatNet-IP system than simple routing.

The phone comparison is a good analogy – in WheatNet-IP there's a world of audio modification tools and control options that allow you to create solutions unique to your applications with ease. All work with existing standards and are created to evolve with emerging and future standards as well. It's the evolution of standard routers.

- Routing Of Audio, Logic & Control
- Virtual Utility Mixing
- Silence Detection
- Salvo Creation & Storage
- Store & Recall 100s of Presets
- Macro Creation & Storage
- Mix-Minus Creation
- IFB Creation & Function
- Full Logic Control
- EQ & Dynamics Control
- HD/SDI De-Embdding
- Auto Mono Summing
- Routable Stereo Processing
- 5.1 Surround Processing
- Virtual Metering
- Universal Audio Format Support
- Programmable Delays
- Source & Destination Control
- WheatNet-IP API
- Live Access To All Sources
- Associated Connections
- Audio Clip Player
- Full System Backup On Every BLADE
- AES67