# The Local E Oscillator

# The Newsletter of Crawford Broadcasting Company Corporate Engineering

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Last month, we were looking forward to January and hoping for some good weather in which to install a microwave link in Denver and three microwave links in Buffalo. Well, we got the good weather, and for that we're grateful. The several feet of snow even melted off at the Buffalo tower sites, making accessing the tower base areas much easier than it would have been otherwise. Denver still had snow on the ground, but it wasn't deep enough to give us much in the way of grief.

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Toward the end of the week of January 3, Amanda and I horsed the new three-foot radomed 5 GHz antenna, radio and lightning protection unit (LPU) up onto the roof of the studio high-rise, some 160 feet in the air. We took down the old Motorola Canopy radio and reflector, which had been up there and feeding KLDC at the Ruby Hill site since 2010. That left room for the new antenna and link equipment on the same mast, mounted on a framework on the side of the

took the PowerBeam antenna and radio down from the KLDC/KGNU tower.

On the ground, we mounted the new antenna, radio and LPU onto a galvanized mast and weatherproofed both ends of the RG-213 jumpers that connect the radio to the H and V ports of the antenna. The crew then winched the whole assembly up the tower and attached it to the tower leg using saddle brackets and all-thread in the same location that the Ubiquiti antenna had been. They connected

> the shielded, UV-rated CAT6 cable to the LPU and I fired up the PoE supply in the rack. The radio booted up, and within a few minutes we had a lock to the studio end of the link.

Next, the tower crew panned the antenna for maximum signal – the Cambium PTP 450i has a great alignment utility for this, showing a graphical signal vs. time display along with a horizontal line representing the best signal received. That made it easy to find the optimum

elevator penthouse, right above the Ubiquiti PowerBeam M500 that we have been using to connect KLDC since the move last September.

Then on January 10, the crew from Colorado Springs based Galvanized Endeavors arrived at the KLDC site. In preparation, we switched the input to the processor over to the backup internet feed, which uses a Barix Exstreamer 1000. That allowed us to shut down the Ubiquiti link and fire up the Cambium PTP 450i radio on the studio roof. The tower crew orientation. With the azimuth lined up, we did the same thing with the elevation and got quite a few dB more signal. We started out level and ended up tilted up quite a bit. At that point we locked it down and I sent the tower crew home. We had plenty of signal to put the Tieline codec back on the air.

Back on the studio roof, I used my iPhone to connect to the PTP 450i at the transmitter site over the transmitter network and then watched that alignment graph as I adjusted both azimuth and elevation. I had the azimuth pretty much nailed from





The darker gray radome is the new Cambium antenna on the studio roof. The white Ubiquiti antenna below it is for the link that was replaced. That antenna has since been removed. Extra credit for eagle-eyed readers that can spot the incongruity in this photo.

the outset (I eyeballed it to be the same as the PowerBeam right below it), but I had to adjust the elevation down quite a bit and picked up another 10 dB of signal. With that done, I cranked the power way back on both ends. We still have a -54 dBm RSSI on both ends, and the link has been absolutely solid ever since, far better than what we were getting with the Ubiquiti link.

I'll have to say that I am impressed with the quality of the Cambium PTP 450i. The radio itself is in a heavy-duty powder-coated cast aluminum housing. It comes in several versions, some of which can be mounted directly onto an antenna, panel or reflector. The model we bought requires an external dual-polarity antenna, and the radio takes the best of the two signals (H or V) all the time. The options for frequency band, frequencies within each band, channel bandwidth and other parameters are many, allowing the user to tailor the link to the exigent needs. In our case, we used a 10 MHz channel at 5.065 GHz, which provides us more throughput than we probably need.

With the microwave link issue resolved, I consider the KLDC relocation project officially done!

#### **Buffalo Update**

As noted above, we got some good weather windows in Buffalo in January, and we were able to get the antennas mounted on the WDCX-FM tower at Boston, NY. But it was not without issues. In fact, the whole 6/23 GHz microwave link project is at a standstill for the next few months. Last year, as I was working on the microwave system design, doing the PCN (coordination) work and filing the FCC applications, I chose the height of the incoming and outgoing 5 GHz link antennas on the Boston tower based on the center-of-radiation height above ground of the existing 946 MHz STL

As the tower crew prepared to install the 6 GHz antennas, they measured their way to that height and found that there were obstructions there that



# The upper base insulator at WDCZ tower 5 shattered, likely the result of frost heave.

would not permit installation of the 3-foot solid dish antennas. I had them continue up the tower, measuring their way to a clear spot that would work. That spot turned out to be some 36 feet higher than what we originally specified.

I had the crew go ahead and mount the 6 GHz antennas at that elevation, and I did a new RF interference study and started a new PCN. At present we're waiting on that to be completed, and then I will file the modification applications for all four paths that use these two antennas. If we were located anywhere else we could use the presumptive grant provision in Part 101 of the FCC rules and go ahead and fire up, but because we're in the Canadian border zone, we have to wait for the applications to go

through Canadian coordination and all that. We can't fire up until we get an actual grant of the applications, which, based on our last trip through the process, is expected to take about 4-1/2 months. So as I said, we're dead in the water until summer, at least for the microwave links.

We'll go ahead and get the 23 GHz link up and running (or at least ready to run) between the new studio rooftop in Amherst, NY and the State University of New York (SUNY) tower down the road. At some point this spring we'll also get everything installed on one of the towers at the WDCZ site for the final leg of the link. At least then we'll be ready to go when we get FCC approval.

We actually started the 6 GHz antenna installation work at the WDCZ site when we discovered that one of the base insulators on tower #5, where the link radio will be mounted, to be shattered. That leg of the tower is being held up with just a small remnant of the ceramic upper insulator. Naturally no one is going to climb that tower until it has been made safe.

It's going to take months to get a custom replacement insulator made, and in the meantime, we're having our friends at Magnum Towers fabricate a dummy insulator out of steel that we can slide in place of the damaged insulator. That will keep the tower safe while we wait on a replacement insulator, but it will ground the tower. We're going to have to pull the J-plug in the phasor for the transmission line feeding that tower and adjust the common point network to keep the transmitter happy. We'll have to reduce power to find a power level that will keep monitor points all within their licensed limits and run with that until the insulator is replaced. The Cumulus station that diplexes with WDCZ at the site will have to operate non-directional from one of the towers for the duration. They did that for over a year in the recent past while working to fix their phasing and coupling system.

So how does all this affect our timeline for completing the studio move? It may actually push it up by a month or so. We're going to have to go on an internet based STL path very shortly anyway so that the tower on the old studio roof can come down, and there's no way we're putting it back up.

With no need to wait on the microwave system installation to complete the move, we might as well go ahead and do it. We now have all the Cisco switches that we need (that's another story for another day), so assuming that we can get a solid, reliable, internet-based link from studio to AM and FM transmitter sites, we're good to go. I'm talking with our friends at InRush Broadcast Services about the schedule as we run our tests on the link.

The New York Minutes By Brian Cunningham, CBRE Chief Engineer, CBC – Western New York

Hello to all from Western New York! The month of January saw a blizzard of activity, and I am

not referring to the weather kind! On Tuesday the 10th, Transwave Communications began the new Part 101 microwave link installation for our new Amherst facilities, including WDCX-FM and WDCZ. From the moment the project started, so did the trouble. Cris had laid out the plans for the installation in great detail, but there was evidently some confusion that sent the project off the rails in short order.



The confusion started when Transwave read the Cambium LinkPlanner reports and took the

boilerplate bill of materials (BOM) contained within as gospel for this project.

We had provided Transwave the LinkPlanner reports in PDF form to give them all the details of each path – antenna, radio, path profile, link budget, etc. Although we had made it clear both in writing and verbally that we would be using separate DC power and fiber to connect the radios at all three

sites, the Transwave folks saw CAT6 cable listed in the BOM in the LinkPlanner reports. The

LinkPlanner software injects a BOM as a suggestion for ordering only, and by default it includes CAT6 cable and PoE, and the program does not give the user an option to change it. We provided Transwave with fiber-optic cabling and PVC jacketed UV/outdoor-rated 16-gauge power cable, and the plan was to run two fiber-optic cables (one for each radio) and one shared power cable that would be split off to feed both radios. Cris specified this in the initial project plans, but the Transwave folks latched onto the LinkPlanner report. It didn't help that almost three months passed between the initial conversations and email messages and the start of work. Clearly some of the details were forgotten.



#### Control room cabinets in the new studio leasehold.

Once we got that issue resolved, they began hoisting the dishes up the tower. After dealing with an issue that required moving the antennas up the tower some 36 feet, they got the antennas hung and pointed in the right general directions.

We had four or five days of inclement weather, so Transwave was unable to get back and complete the cable installation, so on Tuesday the 17th, they decided to install the dish on the WDCZ tower, which is the end location of the three-hop link. I arrived about a half hour before they did and shut down the WDCZ transmitter along with our tenant's transmitter and went out to the tower to get everything unlocked and provide power for their cable winch.

I opened up the ATU, which contained the power outlet, and looked down on the ground and saw a huge chunk of base insulator! I went around to the backside of the ATU and found that one of the tower insulators had busted, big enough to reach my hand inside! The tower crew arrived and I had to inform them that no-one was climbing today! In all probability, the base insulator cracked due to frost heave on the concrete base. The problem is, this tower was erected on site in 1941, for the mathematically challenged, that was 82 years ago! Finding a new replacement would be all but impossible, and locating a used one, just about as difficult. But we did find that Austin Insulator can custom manufacture an exact replacement. While we wait 12-16 weeks for that, Cris is having a steel "dummy insulator" manufactured to temporarily hold the tower up until the replacement insulator can be installed. When it rains, it pours, or in Buffalo's case, when it snows, it accumulates!

We recently had to ship our Omnia.11 audio processor back to Telos following a failure during the holidays. Telos determined that the power supply had failed and installed a new one. They shipped it back to Buffalo, and at midnight on Tuesday the 24th, I went out to reinstall the processor.



#### Production room cabinets.

Thinking it would be a 30-minute install, I shut us down, removed the Omnia.FM processor, and replaced it with the Omnia.11 After plugging in the power cord and all the other I/O cables, I went around to the front of the unit and saw... nothing! No input, output, no activity what-so-ever. Evidently, Telos decided to upgrade our software which blew out all of our settings, including the preset that took us months to put together.

I don't understand WHY companies do this without asking permission to do so before they do it. I could have easily saved the preset, installed the upgrade, then reinstalled our settings. It took me several hours to get the station sound presentable, but I will need to perform further tweaking until we achieve the sound we want.

Finally, some good news! Viola Cabinets finished the new studio cabinet installation at our

new Amherst location, and I couldn't be happier! They did a first-rate job, and I am extremely pleased with how everything turned out.

I have been designing broadcast cabinets for years for many other stations around New York and Pennsylvania using Hi-Tech Laminates out of Lewiston, NY. Unfortunately, Brian Francis retired right after I did the WLGZ studio remodel two years ago. Brian Francis has known Pat Viola for years and recommended him for our project. In fact, Brian even worked some with Viola Cabinets fabricators so they would provide us with exactly what we designed. We will most definitely have a facility to be proud of, and it will serve us well for many years to come.

That about wraps up another month here in the great northeast, and until we meet again here in the pages of *The Local Oscillator*, stay safe, and happy engineering!

## The Motown Update by Mike Kernen, CSRE Chief Engineer, CBC–Detroit

#### **New and Improved!**

No, sorry, it's not my *Local Oscillator* article here that's both "new and improved," but

rather Inovonics' FM modulation monitors! I just installed their new model 551 here in Detroit and what follows is a brief overview of the product and my user's perspective.

Readers of this monthly newsletter likely also get, *Radio World* or similar trades and have already seen ads for the two new modulation monitors named sequentially Models 551 and 552. The two mod monitors are functionally identical but have a few

differences. Most obviously is that the lower priced 552 is a 1RU package with a limited front panel display and its user interface is by way of a single knob rather than by touch screen. The 552 pares down the 551's rear panel's I/O. Missing are the complement of 10 StudioHub-compliant analog and AES3 jacks, one for each of your station's FM analog and HD1 signals, and three assignable HD signals beyond HD1. The 551 and 552 allow a user to assign the XLR jacks as desired to any analog or HD signal.

The remaining I/O is identical between the 551 and 552 and consists of two RF connections, one high-level port for a transmitter RF sample and a low-level port for a simple off-air antenna connection. Also on the rear panel of both units are GPOs for up to 10 assignable active open or active ground status condition outputs which are software assignable to any of 18 different statuses. Finally, there are two ethernet jacks, one for AOIP AES67 and the other for standard network access.

The front panel of the 551 is very simple and straightforward. It closely parallels the unit's network GUI so you'll feel at home with whichever



interface you're using at the time. The 551's touchscreen is very good with quick response and excellent resolution. Those familiar with other

Inovonics' products will feel right at home using the interface. It's well laid out, sensible, and has the same look. Smartly included are a comprehensive summary screen with ten cool 'mini graphs' and an audio streaming feature that lets you listen to anything its imbedded SDR (software defined radio) can receive. There are configurable alarms and alerts for nearly everything you can think of. Alarms and alerts can be delivered by way of SNMP, direct

wired open collector outputs, and/or email. Users can select thresholds for most alarms and even set their desired hysteresis.



#### The new Inovonics 551 (top) and 552 (bottom).

One of my favorite features of all new Inovonics gear is their inclusion of SNMP. SNMP makes it easy to add status, metering, and control of enabled gear to your site's remote-control system. For those of us who like to have everything under the sun monitored, it's a huge advantage over the limited method of wiring out GPIO. For one thing, it eliminates the expense of the modules needed to sense voltage levels and contact closures and those to issue commands. It also eliminates tedious wiring,

testing, and for me the huge frustration that results when I cannot get a remote-control system's meter to track with that on the connected device.

A downside of SNMP is that it has a learning curve and requires one to acquire a MIB database file from the devices manufacturer. A MIB (Management Information Base) is a file that defines all of a unit's available SNMP OIDs, which are the objects made available to monitor or control. OIDs are all unique addresses and are impossible to guess or to figure out. No MIB, no bueno. Inovonics lets you download the MIB directly from its user interface, meaning that any firmware updates necessitating and updated MIB will provide that same updated MIB directly via the GUI.

Another of my favorite features of the 551/552 is the set of Listener Experience tools. I was fortunate enough to be among those who tested HD Radio's "The Radio Experience" prior to its broad introduction. "The Radio Experience" delivers station logo artwork and program associated images via HD Radio data carriers. Until now, broadcasters had no professional monitoring or proofing tools. Acquiring a car or table radio that supported the technology was the only way to see if what we were putting out was correct and of adequate quality to put in front of our listeners. The Inovonics 551/552 not only displays the images and the program associated data, but it will alert you if logos stop transmitting, there are any issues with the images being transmitted, or if there is too long between image updates.

There's lots more to love here too. Adding to traditional FM and MPX modulation parameter monitoring, Inovonics has integrated a spectrum plot, history plot, and oscilloscope functions. Also included are continuous time and level alignment analysis for HD1 and FM analog correlation, RDS monitoring, support for multiple station rotation, plus DANTE and AES67 capable AOIP.

The Inovonics 551 and 552 are great looking, easy to use, and ultra-capable modulation monitors that can easily be upgraded as times and needs dictate. Their use of an SDR is also an indication that the units will deliver super long life and excellent performance regardless of what changes occur in the world of FM broadcasting.

News from the South by Todd Dixon, CBRE Chief Engineer, CBC–Alabama

#### My Cabin in the Woods

I've been looking for a site on which to build a cabin that I can visit on a regular basis that's close enough to home and close enough to work that

I could interchange staying at home or the cabin and still make it to work. I found the ideal location and it's about three and a half miles from our studios. Unfortunately, it's located in a Birmingham city park and has a 700-foot radio tower situated right in the middle of the prime living space. I guess I need to go ahead and say it – it's our Red Mountain tower site.

The truth is that since early December, I've spent weekends there, weekdays there, flown it with a drone several times – what a perfect spot – if it weren't for our main

antenna still not acting right and all my visits being work related.

The weather hasn't helped as the new area record for rainfall in the month of January was set around the 15th of last month. Drone pictures and



footage revealed a definite lightning strike on one of our top bay antenna arms and it correlates with a fairly nasty storm that came through on November 30

> which had heavy lightning and 50 mile per hour wind gusts. Ever since then, the 8-bay ERI SHPX antenna is giving us steady reflected power for about five minutes and then begins to creep up like a bullet or block is getting heated up. Our normal reflected power for our 27 kW TPO was around 45 watts. We're getting that now when we put 10 kW into the line and it begins to creep up from there.

We replaced a 40-foot section of our 3-1/8" Heliax antenna feed line which was found to have a

spot worn through the jacket and some of the outer copper by an older style clamp. The replacement, although necessary, did not fix our reflected power issue. Cris sent us the company's TDR and a sweep of the line revealed no anomalies between either end



# Only four bays left of the eight as we take the antenna down for IRAN.

of the line.

We've pulled in a different tower crew to begin what Stephen Poole calls an IRAN (Inspect and Repair as Needed) on our antenna. This is a new one for me – we've had a similar situation at our Cullman site with the ERI antenna there, but it was relatively easy to find compared to this situation. The entire antenna was redone with new O-rings and bullets in 2001, about a year before I started my illustrious career at Crawford Broadcasting Company. It's experience and I'll take it, but this hasn't been a 30 minute sit-com... it's been a documentary.

So as I write this, the crew is pulling the antenna apart and dropping it to the ground. So far, the lower four bays have been pretty clean, but as we're moving up, each successive bay block reveals a little more crud on the Teflon bullet spacer, so I suspect we'll see something spectacular shortly.

#### In the Meantime

As many of you have no doubt noticed, the \$45 dollar Raspberry Pi 4 2 GB models are nowhere

to be found, and if I'd only known I could have sold them for \$175 post chip shortage, I'd have taken out a short-term loan from the bank and bought a thousand of them...but I digress.

Fortunately, there are a handful of companies that are making similar spec boards with the same pin out as the venerable Raspberry Pi. As I have said many times, I love open source anything, but I also love the open source community's penchant for their naming schemes.

One board that has almost identical specs to the current Rapberry Pi is the Le Potato (https://libre.computer/products/aml-s905x-cc/). With the exception that it has 2 GB of memory instead of 1 GB and it is a whopping \$35. You sacrifice 1 Gb Ethernet for 100 Mb and all of the USB is the 2.0 type, but it is just \$35. The other board I've seen is the Orange Pi 5 (http://www.orangepi.org/html/hardWare/computerA ndMicrocontrollers/details/Orange-Pi-5.html). This one runs for about \$142 on Amazon and it has 8 cores, Gb Ethernet, and supports m2 SSD drives.

That last one is important. Amanda has been dealing with micro SD card failure on one of her Raspberry Pi instances and has had to rebuild what they had in place. The SSD option is not only about 10 times faster, but also can support a ton more read/write cycles than even good micro SD cards.

The Raspberry Pi foundation has said that they should get back to their standard availability sometime this year, but if you're in pinch for something similar, these boards may be exactly what you might need for your project.

Let's visit again next month and may God bless your efforts.

# Tales From Cousin IT by Stephen Poole, CBRE, AMD CBC Corporate IT Specialist

Another year has started, and Alabama has decided that we needed yet still more rainy weather. Todd's tower work at the WDJC-FM transmitter site

on Red Mountain has been delayed repeatedly by 2-3 storm days per week. As I write this, he's pulled in a tower crew from Georgia that has done a lot of work on FM and TV antennas and is very familiar with their problems. They're also familiar with that site, having done a bunch of work for us years ago. Here's hoping (and more importantly, praying!).

#### A Little Gateway

Over the New Year

weekend, I ran to the Carolinas to visit my family. I had planned to go over Christmas, but we had ice and snow, so I put it off for a week. As it turns out, that was probably a good thing, given the general meltdown in air traffic (led by Southwest) over Christmas. But because I was traveling light, I didn't take a laptop with me. Both my personal and work laptops have 17" screens, and I've had trouble finding a case to fit them. Nor will they fit in a carry-on bag.

While I was in Columbia, SC, on a whim, I stopped by a Walmart and saw the little gem in Figure 1. The first thing I thought was, "Gateway? Really?" Gateway was bought by Acer several years ago and had virtually disappeared. Then Acer worked out a deal with Walmart for some small Gateway notebooks that would sell for \$200-\$400. I bought this one and of course, immediately slaughtered Windows (as I do on all of my personal devices). I have some Windows machines now that I use for music and some games, but that's all I do on them.

So: in other news, not only is Gateway still a thing, some companies are still using Celeron processors. That's what this notebook has in it, and OpenSuse Linux (my distro of choice) just wouldn't work on it. Todd recommended an LX-QT "spin" of Fedora, so I installed that. Windows was slower than three itches on that thing; Fedora is so fast it's amazing. It's small enough to fit in a carry-on and will let me do anything I need if there's an IT emergency while I'm on the road. I've installed WireGuard, Mesh Central and RealVNC; it has OpenOffice, email and a good Web browser.



#### WDJC-FM's Audio Server

Our woes with this rascal continue. We were off air for several hours one weekend without anyone

receiving a "no audio" warning from our Inovonics receiver. Jack investigated that while Todd was looking at WDJC-FM's antenna on Red Mountain. Jack discovered that it was missing the audio on one channel ... and apparently, that was the channel that the silence sensor looks

at. It never "heard" the missing audio and never sent email alerts, so Jack sent it back to the factory for some TLC.

On the audio server, I've

been poking and using some of my High Powered Cousin IT tools to see if I can figure out what's happening. If you've been following this multi-year saga, it only happens to WDJC-FM; we've replaced everything from network cables to the computer itself; and we've called RCS Support too many times to count. NexGen will still just freeze up almost at



Figure 1 - Yes. A Gateway.

random. Poor Todd will dig and bulldog it, think he's found an answer, and it'll seem to work for a bit – until we have dead air again.

If this happens during the day, the control room screen goes black and our operators know to immediately switch to Emergency Control Room (ECR). We restart NexGen on the audio server and everything comes back. The problem is when this occurs overnight and on the weekends. I'm not promising that I can solve this, but like I said, I have some powerful debugging tools that I can toss at it.

#### Security

When you become a cousin to IT, you are naturally going to be worried about network security. I have learned more about this than I thought I would when I started – I'm at least to the point of "knowing what I don't know yet." It took a while.

I shall repeat something I have said many times over the years: you have to find a balance between convenience and security. The analogy that I always use is that of a deadbolt lock on your home's entrance: you're standing in the rain, holding a bunch of grocery bags, and boy, it sure is inconvenient (and uncomfortable) to dig for the correct key. But you'd never consider leaving the door unlocked.

The most obvious place that we can apply that analogy is to passwords. While I doubt that most of our partners would use "12345678," it's a serious mistake to use the same password for several different sites. I myself have been guilty of this one. Banned IP ltst: 31.145.142.206 43.155.173.30 141.94.175.10 5 20.87.216.93 43.135.154.52 142.93.196.106 190.221.46.78 179.43. 9.99 195.58.6.45 134.209.175.24 8.219.204.230 103.31.38.132 147.18 2.190.189 118.212.416.42 152.32.234 110 95.85 124.113 159.89.161.

- Banned TP list: 31.1482 Deel 1947 206 43.155.173.30 141.94.175.16 5 20.87.216.93 43.135.154.52 142.93.196.106 190.221.46.78 179.43.9 9.99 195.58.6.45 134.209.175.24 8.219.204.230 103.31.38.132 147.18 2.190.189 118.212.146.42 152.32.234.110 95.85.124.113 159.89.161.1 26 159.65.169.158 47.254.229.210 43.131.29.54 164.90.172.83 212.33 .245.236 164.92.253.249 93.240.81.193 94.23.27.28 164.90.172.83 212.33 .245.236 164.92.253.249 93.240.81.193 94.23.27.28 164.92.157.100 1 30.162.136.157 178.62.24.222 187.191.60.178 45.158.181.148 147.182 .246.62 220.82.130.211 79.59.125.246 188.165.34.94 92.50.249.166 1 34.209.69.41 118.201.79.222 43.154.213.115 147.139.134.124.07.66.1 97.234 41.169.129.186 167.172.54.39 142.93.245.58 95.85.27.201 201 .76.115.102 14.63.203.207 41.73.252.229 128.14.230.155 143.198.116 9.59.93.234 129.150.33 136 104.248.197.238 46.101.73.246 112.215.6 0.66 207.180.192.225 91.121.43.221 209.97.135.140 1.245.61.144 143 .110.153.156 46.101.216.241 178.128.226.21 83.262.193.24

#### Figure 2 - One hour's worth of hack attempts.

I'd come up with a good, reasonably complex password, and then reuse it for several different logins. This isn't just paranoia, folks: in my case, both the OpenSuse online forums and the Scalix forums, which (at the time) I visited frequently, were hacked. I had to scramble to change my passwords ASAP.

You've doubtless seen that many browsers will now suggest a good password when you set up a new account. It'll be a real jaw-cracker, too, with a mix of upper and lowercase letters, numerals and punctuation that might be as much as 16-24 characters long. Here's the problem with that: the various software methods – especially older ones – that are used to check passwords might truncate a really long password. Some software libraries that are still in use simply chop and ignore anything past 8-12 characters. So ... unless the first half of your password is a really good mix of characters, you're not getting as much security as you hoped. Even worse, a hacker can often tell (or at least guess) which "checker" he's attacking, so he knows that he doesn't need as many tries to get into your account.

Password managers are another approach, but they're far from foolproof. While everything is working, they're very convenient. But if someone can crack into your manager account, they'll have all your passwords! LastPass comes to mind; they were hacked last fall, and as is typical of these "compromises," they first said, "Naw, nothing important was stolen. We got this!" A few months later (in December) they coughed and mumbled some embarrassed noises about passwords and user credentials being stolen ... which were then used in phishing attacks. (Heh.)

Incidentally, it appears that some enterprises are beginning to back away from the "cloud" approach in general; too much chance for compromises and data leaks. I don't see a ground swell yet, but I've seen several articles in the mustread IT trades about companies moving everything from the cloud back in-house. Never forget: at the end of the day, a "cloud-based" system is just someone else's computer on the Internet, subject to all of the same failings and ills as any other.

There are no perfect answers. In real life, you just have to balance compromises and decide on an approach that provides adequate security. Twofactor authentication is the one that Cris and I have been looking at lately. That's probably going to be our best solution in the long run. Setting it up to send an email passcode is an easy no-brainer; sending a text to a smartphone is more complicated and will cost more, but we're taking a look at that, too.

#### The Internet

As part of my general IT education, I've taken a fresh, in-depth look at the Internet. We're all using it heavily nowadays and to help me wrap my brain around it, I needed to at least have a rough idea of what's happening behind the scenes. One thing that I wanted to learn was just how IPV6 and IPV4 addresses could talk to each other over the Internet. This led me to several articles about Border Gateway Protocols and other stuff that I won't bore you with. But I finally understood how packets might be sent through Atlanta today, Dallas tomorrow and

Paducah, KY the third day. (In other news, Paducah, KY actually has a very large Internet "nexus." Paducah.)

We have a very good firewall on our mail server; it has been set up to block any IP address from China, North Korea and a few other "bad actor" countries – and yet, we still have hack attempts from IP addresses associated with those nations (Figure 2). What these "bad actors" are doing now is setting up "zombie" computers that then run the robots that probe for vulnerabilities. These zombies can be anywhere.

Plus, it's easy to spoof an IP address, especially if you have access to a Tier 1 Internet "backbone" (read: a state-level actor like China, North Korea ... you get the idea). The attack can actually come from just about anywhere; an IP address does not positively identify the source. (Someone needs to tell the FBI about this, but I digress.) I actually gave a rueful laugh when I realized that at least some of these attacks might be coming from a compromised "bot" computer in Paducah, KY!

I disclaim: the preceding was terribly oversimplified, but it'll give you an idea. And yeah, it makes my head hurt, too. The bottom line is that the Internet is far too useful to just disconnect from it. We all depend on it now, not just in our business. All we can do is the best we can do. It's a moving target, too. If you don't believe anything else, believe this: just because your security seems adequate today, don't assume that it will still be adequate in the future.

That's it for this time. Until next time, keep praying for this nation!

## The Chicago Chronicles by Rick Sewell, CSRE, CBNT, AMD Engineering Manager, CBC–Chicago

As radio broadcast engineers, we require a lot of different skill sets. We have to have a broad knowledge base of electronics, computers,

networking and audio. I am probably missing a lot of other skills because we all find ourselves repairing things we didn't expect when we signed up for this career.

Even the general skills mentioned above are just that, general. We must have extensive knowledge in at least two or three of these areas or we are probably not going to survive. With all this knowledge, we have a lot of equipment at our disposal that helps us analyze and keep track of what is under our purview.

It's easy to get a very focused, narrow view on a day-to-day basis. After all, each day often brings

us a new set of issues that need to be resolved quickly. With that being the case, in so many different areas of expertise and skill, it is understandable that we can lose sight of our end product... audio.

We may enjoy being the computer expert, programming automation, figuring out the best script or macro that has the remote control system let us know of problems and perhaps to make corrections



when finding those problems. You might enjoy working on transmitters or specialize in keeping the older equipment going. But at the end of the day our

ultimate product is audio. We are in the audio business.

I've heard it said that the best tool that we have lies between our two ears. I believe that to be true. When it comes to radio engineers, the second best tool is probably our ears. We have many different things to analyze and track audio: silence alarms, audio meters, spectrum analyzers, etc.

All of these are great, but nothing compares to just listening. The above-mentioned tools are great for many things, but the God-given gift of ears is still the best. However, we often handicap ourselves by using the convenience of transmitter site or rack

room speakers. Those speakers are a convenience because they're right where you are working. You can quickly detect severe issues like low audio, stuttering audio or obvious distortion. But the truth is that the environment in which they are located can mask problems that are more subtle. Most rack rooms and transmitter rooms are filled with the sound of numerous fans and other noise makers.

One of the best ways, I would say the best

way, to listen is how most of our listeners consume our product: in the car. This was never better demonstrated to me than what happened recently when I was leaving the transmitter site that was 100 hundred miles away from our studio. I tuned in the station on my car radio. I make this a habit on the way in and way out.

I first thought we had lost some brilliance in our processing because something just didn't sound right. I was just in the transmitter room and had listened to the main and backup transmitters on the smaller rack mounted speakers but didn't notice anything. In my car, immediately noticed that something was wrong.

It took a minute or two, from thinking there was something wrong with the processor to finally putting my finger on the situation: the audio was all in mono. I wondered about the exciter, but noted that the car radio showed the pilot/stereo light was on.

The transmitter site was now a half hour behind me. I suspected that something really simple was at play here. I called one of my other engineers and asked him to go to the studio and check the mode button on the faders of the control surface. Sure enough, he found that someone had pushed the mode buttons of the automation faders into either mono or left and right channel only.

He put them back to stereo, and I could immediately hear the difference. As stated earlier, this site is 100 miles away, and we don't have a lot of staff that are in the immediate area. So, less ears mean that we that subtle problems may go unnoticed.

The operators at the studio are provided with a real-time monitor of the audio and return audio from a transmitter site FM monitor. They should have been able to tell that the audio was not in stereo from either of these sources. But as most of us know it's the rare operator that pays that close attention to audio unless it sounds really bad. They are too busy paying attention to content.

It's easy to take for granted that if the equipment and staff are not reporting any issues that everything is fine. There's nothing that replaces a pair of well-trained ears. While many times there are staff members at our stations who possess the skills to let us know about subtle issues, it is primarily up to us take the time to listen to our stations on a regular basis.

## Valley News By Steve Minshall Chief Engineer, KCBC -- Modesto

The big news of late here at KCBC has been the weather. California has been hit with an extreme amount of rain and snow. This "bomb cyclone"

weather system is quite an event. Lives have been lost, homes have been destroyed, and roads washed away.

One morning at 3:45 AM to be exact, my wife and I were rudely awakened by our phones blasting away with a tornado warning. When both phones started up with the alarm signal, we didn't know what in the world was going on.

Then the announcer came on and stated that there was a tornado warning and to immediately go to our basements. The problem is, this is California, and we don't have basements!

Being dazed and delirious, we went downstairs and turned on the TV to see what was going on. In hindsight, we should've just gone straight to the laundry room, the most central room in the house. The wind and lightning around us were ferocious. Several of the mainstream TV channels



had nothing but the normal infomercial programming going on, but I finally found one that had real-time weather information. Indeed, the weather radar had picked up rotation in the clouds and thus prompted a tornado warning. Fortunately, the intensity quickly died down as the storm moved on to the east. No tornado touched down.

Fortunately, California almost never gets a real tornado. The ones that we do get are so few and far between, and so anemic, that they are almost embarrassing. The worst that has happened in the last few decades was a garage door being sucked off of a house.

The thought of a real tornado running amok at the transmitter site is very scary thing to think about. That evening, we did sustain some damage. Some of the asphalt shingles on the center antenna tuning unit building were pulled off. Fortunately, there is a layer of shingles underneath and it still has watertight integrity. The repairs can wait until conditions are more favorable.

The flooding in the area is the worst that I have ever seen. Fortunately, the infrastructure at KCBC is above the high-water mark. Our antenna field became flooded the point where the water crossed the road and continued on to lower ground to the west. The irrigation district has been very concerned about the flooding and they have been to our site at least every other day in the last few weeks.

They have an irrigation canal on the north side of the property, and they say that it should have taken the floodwater away. They have figured out that there is a bottleneck in the system, and they intend to fix that. That may very well greatly reduce flooding of our property in the future. I'm very impressed with their proactive approach to alleviating the problem.

Now that we have had long periods of flooding on the property, our asphalt driveway appears to be developing cracks. I assume the ground underneath the driveway has become saturated and lost some of its firmness and thus allowing some movement of the asphalt above. When everything dries out, we will get a contractor take a look and see what it takes to repair the driveway.

Rocky Mountain Ramblings The Denver Report by Amanda Hopp, CBRE Chief Engineer, CBC - Denver

#### The Haps

I don't have a whole lot to report on for January. The month has been a blur. Not much has

gone on for me in the engineering department as I had surgery to get my tonsils removed on January 10. As I write this, I am only three days back, in person, at work.

One major thing that kept happening is our RaspberryPi that our VPN system for our transmitter and NexGen side of things is on kept losing its mind. We had to redo it before Christmas, and then on

the 9th of January I was using it and it quit working. We were able to revive it but were not really sure why it kept going crazy.

#### **Raspberry Pi!**

While I was recovering at home that next week, the unit once again lost its mind. My dad and Todd Dixon began digging into it. My dad found the power plug, a micro-USB, was not secure and would move around easily. Just touch it and the power to the unit would me momentarily lost. Any time someone would open a rack door, it would cause a disturbance that would clear the unit.



He worked on it and got the power connector and power cable secured. So far, things seem to be holding solid again. But just in case, we

> made an image file of the micro-SD card so if it gets glitched again, we can quickly burn another micro-SD and have the unit back up in minutes rather than having to rebuild it from scratch.

#### **Computers!**

I am in the process of replacing several non-critical computers. Many of our call screener computers are Windows

7 or 8 and are 7-8 years old. These machines are only used for the call screener program, but due to their age, I have been needing to replace them.

While I was out the one in the KLTT talk studio cratered, wouldn't even power on. We were able to get a replacement ordered and within a few hours of turning it on, I got it all set up and ready to go. We have gone ahead and ordered computers to replace the remaining ones so they are all current with Windows and we know they will run well.

Also on the replacement list are the computers we have at the transmitter sites. These are also not critical, but they do provide remote access to things on the different networks at the transmitter sites, and they provide me with a local means of connecting to transmitters, remote control systems, microwave radios, codecs and other infrastructure when at the sites. Plus if I ever don't have my laptop I at least have a good working computer on site to get me through to the outside world and stuff at the studio and office.

# **Power Outages**

As I write this, we are experiencing a third power outage at the KLTT transmitter site in a span of two months. Things at this site are usually stable. Power only goes out once a year typically, and to have three in the last two months is just unheard of. I'm not sure why this keeps happening, and good luck finding out why. After the first power outage, the AM-IBOC exciter for the Nautel ND-50 didn't come back to life. Thankfully, with these last two outages, everything survived. Hopefully this will be the last of the outages for a good long while.

# **Coming Up**

February will be a month of replacing the computers I mentioned above. Beyond that, we are at the mercy of the weather. I may try to get out and do some cleaning at some of the sites. I know I'm ready for spring to be here. We have had many days of snow with piles still on the ground and many roads with thick ice because they didn't get cleared properly. I am over the cold weather and really want the warmer weather to get here already. I pray you all stay safe and well.

KBRT • Costa Mesa - Los Angeles, CA 740 kHz/100.7 MHz, 50 kW-D/0.2 kW-N, DA-1 KNSN • San Diego, CA 1240 kHz/103.3 MHz, 550W-U KCBC • Manteca - San Francisco, CA 770 kHz/94.7 MHz, 50 kW-D/4.3 kW-N, DA-2 KLZ • Denver, CO 560 kHz/100.3 MHz, 5 kW-U, DA-1 KLDC • Brighton - Denver, CO 1220 kHz, 660 W-D/11 W-N, ND KLTT • Commerce City - Denver, CO 670 kHz/95.1 MHz, 50 kW-D/1.4 kW-N, DA-2 KLVZ • Denver, CO 810 kHz/94.3 MHz/95.3 MHz, 2.2 kW-D/430 W-N, DA-2 WDCX • Rochester, NY 990 kHz/107.1 MHz, 5 kW-D/2.5 kW-N, DA-2 WDCX-FM • Buffalo, NY 99.5 MHz, 110 kW/195m AAT WDCZ • Buffalo, NY 950 kHz/94.1 MHz, 5 kW-U, DA-1 WDJC-FM • Birmingham, AL 93.7 MHz, 100 kW/307m AAT

WCHB • Royal Oak - Detroit, MI 1340 kHz/96.7 MHz, 1 kW-U, DA-D WRDT • Monroe - Detroit, MI 560 kHz/107.1 MHz, 500 W-D/14 W-N, DA-D WMUZ-FM • Detroit, MI 103.5 MHz, 50 kW/150m AAT WMUZ • Taylor - Detroit, MI 1200 kHz, 50 kW-D/15 kW-N, DA-2 WPWX • Hammond - Chicago, IL 92.3 MHz, 50 kW/150m AAT WSRB • Lansing - Chicago, IL 106.3 MHz, 4.1 kW/120m AAT WYRB • Genoa - Rockford, IL 106.3 MHz, 3.8 kW/126m AAT WYCA • Crete - Chicago, IL 102.3 MHz, 1.05 kW/150m AAT WYDE • Birmingham, AL 1260 kHz/95.3 MHz, 5 kW-D/41W-N, ND WYDE-FM • Cordova-Birmingham, AL 92.5 MHz, 2.2 kW/167m AAT WXJC • Birmingham, AL 850 kHz/96.9 MHz, 50 kW-D/1 kW-N, DA-2 WXJC-FM • Cullman - Birmingham, AL 101.1 MHz, 100 kW/410m AAT



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