The Local E Oscillator

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HVAC Frustration

Normally I wouldn't get down in the weeds (or up on the roof) with HVAC issues in any of our stations, but over the past couple of months, one of our Denver sites developed a very vexing issue, one that was eating up service calls and money at an alarming rate.

The 50 kW KLTT transmitter site has two 10-ton rooftop units, one that's probably 20 years old as a backup and a much newer unit (five or so years old) as a main. Some years ago, a mechanical contractor built up a Rube Goldberg affair of an automatic failover system that used a remote-sensing electronic thermostat to detect when the temperature in the back room climbed above a set point and switch from the main to the backup unit. The changeover system includes motorized butterfly dampers in the ductwork to route supply and return air from/to whichever unit was in use.

That changeover system was frequently going over to the backup system, usually during warm weather. Sometimes when this would happen, the 5A breaker on the 480 to 24V control transformer in the main unit would be tripped, but sometimes it wouldn't. Sometimes switching back to the main would work just fine and the main would run perfectly... for a day or a week, and on two occasions, the electronic thermostat was found to be dead and had to be replaced.

Fed up with the whole thing and sensing Amanda's frustration, I jumped in and forced the issue to find out what was the cause of all the problems. What did we find? A number of things.

In the last episode with the site, the main had run for a day and a half at the end of one week and into the weekend before failing on Saturday. The backup took over and all was relatively well for the remainder of the weekend, although that old backup unit was struggling to keep up with temperatures in the mid to upper 90s.

On the following Monday, we went to the site and found that once again, the thermostat had smoked – quite literally (we saw smoke coming out of it when we powered it up). We did a number of things to troubleshoot and replaced/eliminated that control transformer, even pulling the excess thermostat cable out so we could be sure it wasn't chafing and arcing somewhere. All good.

Then it occurred to me that the utility voltage at the site was elevated and had been for months. Loyal readers may recall that a drill site just northeast of the KLTT tower site was using threephase utility power and because the 12 kV primary conductors were undersized, the utility had cranked the regulators up, giving us in excess of 525 volts at the site. Amanda had to retap the primary of the power transformer in the Nautel NX50 to keep it from kicking off the air because of the high voltage.

The drilling is long since done, and the well, which runs under our property, is being fracked right now, and the well site is not using anywhere near the amount of power that it was during the drilling phase.

So, we measured the nominal 24VAC feeding the thermostat and found it to be 29 volts. The specs on the thermostat show the acceptable input voltage range to be 20-30 VAC, so when we measured, it was very close to the upper limit. We looked at the SNMP monitor graph of the voltage sample at the site and found some relatively short duration peaks that were really high. Clearly, at least one of our problems was that excessive voltage, which I'm guessing produced more than 30VAC from that control transformer, destroying three thermostats in the process.

But that didn't really explain why at other times the auto changeover would switch to the backup and we were able to switch back without issue and no evident problems with the main, so I continued to explore and reason things out.

One thing I noticed, almost by accident, was that the three AWG#8 wires feeding out of the threepole contactor in the changeover to the main RTU were hot to the touch. The current in those conductors was only about 15 amps per leg, so why were they hot?

Whoever built that changeover had a splice in those wires, using a red wire nut on each to connect to a short piece of AWG#10 wire that had a yellow crimp lug on it to attach to the terminal strip feeding the unit. See the photo of the guts of this mess on page 13 and note the red wire nuts. Those wire nuts were HOT. So, reasoning that poor connections in the wire nuts were resulting in the heating of the wires, I did away with the splices and short pieces of #10 and crimped lugs directly onto the #8 wires and attaching them to the terminal strip. I also found that the center phase wire pulled right out of the contactor with little effort. Fixing that and checking the tightness of all the connections on both ends of all three phases, I pronounced it good.

And good it was. The heating of the wire was gone. I think that it's very likely that the heat being produced in those three phase wires was warming up the entire small NEMA box and with it, the sensor for the thermostat, causing it to switch to the backup RTU even when the main RTU was running fine and the ambient air temperature in the building was in the 70s.

Finally, I found that whoever designed that changeover was controlling the power feed to the two butterfly dampers directly from the thermostat, meaning that the dampers would move to the backup position when the thermostat sensed the elevated temperature, but once the temperature dropped below the set point and the thermostat contacts opened, the dampers would go back to the main position... with the backup still running (the 3-phase contactor feeding the backup RTU is electrically latching). That left the backup unable to pull or push air at all.

To fix this problem, I moved the control for that power feed to a different point in the circuit so that the dampers would stay in the backup position as long as the backup RTU was running. Problem solved.

At this point, we have a meeting scheduled at the site with the utility company, and we're hoping they will adjust the regulators, which are located just down the road from our site, to lower the primary voltage. Until then, we're keeping fingers and toes crossed that it won't spike and smoke another thermostat! Stay tuned...

Antenna Switch

We now have two transmitters for both of our KLVZ FM translators – the new Nautel VX transmitters as main and the original BW Broadcast transmitters as auxiliary. That's good, because these translators produce almost full-market coverage between them; each of them is important. But if we need to put the aux on the air at either site, someone has to drive to the site and move the antenna cable from one to the other before turning it on. That could mean an hour or more – maybe a lot more, depending on season, weather, traffic and the like – off the air. Not good. Clearly, we need an antenna switch that we can remotely actuate.

I found a type-N coaxial relay from Fairview Microwave that was reasonably priced and has the required power handling capability. That would easily handle switching duties, but there's more to main/aux antenna switching than energizing a relay. Safeguards would have to be in place to ensure that no RF excitation would be present when switching, and to keep the transmitter not connected to the antenna from feeding RF into the open connection. And of course something would have to keep the coaxial relay energized whenever the aux was selected.

Initially, I started out designing a circuit using discrete components to handle all this, and that can certainly be done, but as the component count and complexity began to climb, I started thinking there must be an easier way to do it. That's when I thought of the Raspberry Pi microcomputer. Stephen Poole told me that relay "hats" were available, essentially plug-in cards that could be stacked on a Pi that had several relays that could be controlled by either discrete commands or a script. So, I picked up a Pi 4 from Microcenter and Stephen ordered me a relay board. He then taught me a little of the Python language, and it didn't take long before I had a working controller.



Front panel of the antenna switch controller.

The switching sequence is as follows:

- Main to Aux
 - Pushbutton or remote command is initiated selecting aux to antenna
 - Interlocks to both transmitters are opened

- After a one-second delay, the antenna relay is energized
- After another one-second delay, the interlock to the aux transmitter is closed
- The interlock to the main transmitter remains open
- The Auxiliary-to-Antenna status relay is closed



The business side of the controller. Note the Pi with relay hat at right and the 30V switching power supply, left.

- Aux to Main
 - Pushbutton or remote command is initiated selecting main to antenna
 - o Interlocks to both transmitters are opened
 - After a one-second delay, the antenna relay is deenergized
 - After another one-second delay, the interlock to the main transmitter is closed
 - The interlock to the aux transmitter remains open
 - The main-to-antenna status relay is closed

All that was a piece of cake with a few lines of Python3 script. I built up the switcher on a 2RU blank panel, mounting the Pi with relay hat, two pushbuttons, and a 30V switching supply to power the antenna relay.

But we're all dressed up with no place to go... because the BW transmitters do not have an external interlock connection. Thankfully, the Nautels do. I've got to modify the BW transmitters to bring an RF mute to the back panel. That's the next project. Once I get that figured out and done, we'll install the switcher at the KLVZ Brighton transmitter site and test it thoroughly. Assuming it works and proves reliable, I'll build up another one for the

Lookout Mountain site, and probably another one still for the WDCX(AM) 107.1 MHz translator in Rochester. Stay tuned...

Other Possibilities

Of course, that project got me thinking that I could greatly simplify that Rube



The Fairview antenna relay.

Goldberg HVAC switching system at the KLTT site by eliminating about 80% of the relay logic components inside it and using a Raspberry Pi to handle the decision making and sequencing.

We used a relay hat with contacts rated at 3 amps for the antenna switch controller – that was plenty for the milliamp currents required for that project. But with the HVAC controller, those threepole 480-volt contactors probably draw an amp or more, and then there will be the excess voltage of the collapsing field to deal with on relay open, so something with a bit higher ratings would be needed.

Stephen came to the rescue once again with an eight-relay hat, and those relays are rated at 10 amps at 250V, which should be plenty.

I will probably leave the existing changeover alone for the summer. After all, 480V power must be removed for me to mess with it at all, and that would cause the building to heat up in a hurry. But I could get the bones of a new system built and bench tested while I wait for cooler weather to arrive.

One good project leads to another, and the more I think about the capabilities of these little microcomputers, the more possibilities come to mind. Hmmm... I wonder...

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

Hello to all from Western New York! I don't recall Western New York ever being this hot so early in the year! In June we experienced

(along with most of the U.S.A.) an extreme heatwave that lasted almost six days. The extreme heat wreaked havoc on our air conditioning system at the WDCZ, WDCX(AM) and WLGZ transmitter sites. Solly Industries were called upon to repair the downed A/C systems at each transmitter site. At WDCX(AM) and WDCZ, both cooling failures were due to bad fans in the



condensing unit and WLGZ had cottonwood fibers built up in the condensing coils, so air was not able to flow through the coils properly to keep the building cool. The only upside of all this heat, it kept the grass from growing so fast in the tower fields!

We had several issues in June with NexGen audio servers reverting to Local Database Mode at WDCX in Buffalo. Usually, a simple reboot of the audio server took care of the problem, but ASERV1, the main audio server for WDCX/WDCZ, was not as simple. I would reboot the server and an hour later, it would shut down again, and again.

Looking at the event log, there were no telltale signs of software failure, therefore NexGen OS was not the issue. It was discovered that the computer was running out of memory! A check of the task manager showed excessive memory usage for an anti-malware program that was running. What? We suspect that the anti-malware scanning program was loaded after a recent hard reboot of the server, perhaps embedded in a Windows10 update.

The program was shut down and removed so this would not happen again. We have Windows updates turned off, so we can decide what upgrade to install and when that happens. There's nothing worse than having to go into the station in the middle of the night to undo some damage that an update has caused, usually changing or deleting sound card configurations.

Other issues we encountered during the

month, which were weather related, were power outages. At the WDCX-FM site, our new Gillette 100 kW generator came on immediately when commercial power failed, and the transmitter came back on, but the audio did not! The Omnia processor hung up during the reboot, and the backup internet feed from Spectrum remained down, as it is powered from the power pole at the road,

along with our telephone, so we were off the air until I could get there and reboot the processor. The one thing we are going to budget on for next year is a UPS for essential gear at the transmitter site. After a power glitch, the generator comes right on, the transmitter soon thereafter, but the audio processors, codecs and the like take several minutes to reboot. Having these on a UPS would eliminate any reboot issues after a power event.



Replacing a solenoid on a 40-amp RF contactor at WDCX(AM).

On the night of Monday the 17th, the transmitter (array) readings were skewed on the WDCX(AM) night pattern. I made a trip over to Rochester to investigate the cause of the inconsistent readings, and I found that the RF switch at tower #5 had failed, it wasn't switching into night mode due to a burnt solenoid. Direct replacement solenoids are no longer available, so a retro-kit was ordered from Kintronics to get the array back to proper operation.

In the meantime, I put the array into night mode and disabled the macro in the Burk remote control so it wouldn't switch between operating modes. I had expected the kit to arrive on Friday the 21st, which would allow me to go over and replace it over the weekend, as I was scheduled to go on vacation the following Monday, but Murphy's Law always prevails! When the package did not arrive on Friday as expected, I phoned Kintronics to find out what happened. The order was never entered into Kintronics system, therefore, it was not shipped. It finally did arrive on the afternoon of Tuesday the 25th, so the following morning I headed back over to make the repair.

I followed the rebuild instructions to the letter, but near the end, I discovered that the blades were about a half-inch short of engaging the finger stock, so I had to tear it all back down and reengineer the placement of the mounting plate and solenoids on the switch. Finally, after six hours, I replaced the switch, tested, and deemed it repaired! I enabled the macros in the Burk remote that I disabled earlier in the week, and the array has been switching perfectly!

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

SMNP me ASAP

I've long been a fan of SNMP (Simple Network Management Protocol). I've written about it

here in prior editions of *The Local Oscillator*. I love SNMP because it gives me the ability to wire up status, metering, and commands (via GET and SET) as well as to receive alerts (via TRAPS) from equipment anywhere there's a network connection, without all the actual wire.

SNMP has evolved greatly since the time I first started to use it. So much so that I'd suggest they drop the "S" -it's gotten to be anything but "simple".

I've often mused that with any useful thing, whether it be a telephone, or the da VinciTM surgical robot, there is an inverse relationship between simplicity and functionality. Whether a designer is mindful of the users' technical prowess or not. Complexity comes with functionality – it cannot be avoided entirely.

A good product or system designer will introduce functionality in tiers. Major features will be concentrated and presented in a simply user-friendly interface whereas one must drill down to the more



complex features if need be. Some devices implement this strategy better than others, of course. I endeavor to integrate as much as possible

with our Burk ARC Plus Touch facility remote control system, whether it be by direct wiring to GPIO, or SNMP (with SNMP being the preferred method).

One reason major reason for using SNMP with transmitters is for dead-accurate metering. SNMP eliminates a frustration I've long had with such remote-control systems in that metering is often very inaccurate. I'd grown to live with the fact that when the simple 0-10 volts sample

representing a transmitter's power output was calibrated for 100% remote reading at the station's licensed TPO (Transmitter Power Output), it was always way off at other power levels. This error could be verified with outboard instrumentation as well as the indirect $P = (I \ x \ E) \ x \ Efficiency$ calculation. It was nearly always so far off as to be laughable.

For example, a power output of 50% using the transmitter's front panel power meter would yield a reading at the remote control of 70% or something similarly erroneous. I tried to linearize and match these meters using mathematical calculations, the systems built-in logarithmic conversions, etc., but never achieved satisfactory results.

WMUZ-AM Rack Outlet Controller			10:46 AM	
HDRadio Exporter ON	ViaSat Modem ON	Bench PC ON	Security NVR ON	
Off	Off	Off	Off	
Cycle Pwr	Cycle Pwr	Cycle Pwr	Cycle Pwr	
Barix ON	Plus-X IP Adapt ON	526 ON	Linksys Router ON	
Off	Off	Off	Off	
Cycle Pwr	Cycle Pwr	Cycle Pwr	Cycle Pwr	

SNMP Outlet Control Panel. A custom view made with Burk AutoPilot.

SNMP fixes the above problem by taking its numbers for metering directly from the transmitters' controllers. If you have 43% on the transmitter, you'll have 43% on your remote system. SNMP also allows you to dig into meters and statuses that an equipment manufacturer didn't put on the GPO terminal block. You want to know the speed of module 9 fan number 2, there's an OID for that. How about the on-board computer's CPU temp? There's an OID for that, too!

Burk's ARC Plus Touch has a reasonable level of SNMP support, but I'm hopeful that Burk will really focus on it in future firmware releases to polish it even further. SNMP v3 support would be my primary wish, since it supports authentication beyond basic community names (which are often left at defaults). I've been impressed with what I've been able to do with SNMP, but there's certainly far more I could do with it.

Digital Loggers, Inc.

Sometimes I'm given over to gushing about a particular product or service. Usually it's just a sandwich, or a car that's caught my attention, but this month it's a new product and company I've found: Digital Loggers, Inc. from Santa Clara, California. They make their entire portfolio of products right here in the USA and serve commercial, government, and military clientele.

I am wholly impressed by the one product I've purchased from them so far. It's called the Pro Switch, and it truly is designed for use in a professional environment, by professionals (like us, eh?).

What it does is seemingly simple – it allows a user to remotely or locally turn off or on or cycle power to eight of its ten receptacles. What makes it super cool is the number of ways you can integrate and interact with it. Along with its simple but intuitive web interface, which it supports via HTTP and HTTPS, SNMP, Rest API, SSH, SSL, Echo/Alexa, and MODBUS are also provisioned protocols. It has an internal CPU with a watchdog for reliability. It also has AutoPing, which allows a user to tell the unit to query the IP address of a connected device and if that unit has gone offline, it can automatically cycle its power. This is excellent for critical devices because it can restore functionality at a remote location without user intervention.



Digital Loggers Switch Pro

Naturally I chose to communicate with my Pro Switch into our WMUZ-AM transmitter site using SNMP. I was initially a little confused because the SNMP database (known as a MIB or Management Information Base) provided was somewhat generic and had lots of branches that weren't functional in the Pro Switch implementation. It would have been simpler if the manufacturer had provided a pared down MIB containing only operational objects (known as OIDs). Not a big worry, though, because their excellent, accessible, and super friendly support agent got me going fast.

Once I had the OIDs, I was able to set them into the ARC Plus Touch's channels and had its control and status working quickly. I also built a custom screen dedicated to controlling the Pro Switch and showing the state of each outlet in real time.

Installing the unit at the transmitter site was a snap, and I even have it probing a couple of pieces of gear. If it sees one of them has gone offline and needs to reboot anything, I'll get an email and a log message will be recorded as well.

I did run into one thing that I wanted that wasn't provided. I wanted a direct SNMP OID that would cycle an outlet rather than just the commands for OFF and ON. This way the unit could be told to cycle or reboot something in one click without a macro. I suggested this to their support agent, and he created a new extension for me that added the cycle OIDs. Wow!!



Transmitter Site Gone Rogue

I've been at Crawford Detroit for a bit over four years. By now, I'd think that I'd have laid my hands on every piece of technology at each location. Realistically, there is so much I'm certain to have missed a thing or two.

For a couple of years, I've occasionally received notice from my Ubiquiti

Hand wash station from Ho-De!

Unifi network controller warning of overlapping IP addresses. Unifi suggests that this could be due to a "rogue" DHCP server.

DHCP stands for Dynamic Host Configuration Protocol. Its job is to assign IP addresses (and other optional network related information) in real-time to new hosts as they join the network. You wouldn't want more than one such service supervising this task because they could easily assign more than one host the same IP address causing an IP address conflict.

Whenever such a conflict occurs, the router or any other network peer will sometimes resolve the conflicted host destination incorrectly. Without getting into a too technical deep dive, you can probably understand why this is undesirable.

To troubleshoot this problem, I ran a couple of different software programs designed to root out DHCP servers on the network. I needed to expose any rogue units' MAC address which I could potentially use to identify its IP address or minimally its brand name. This would give me a clue where my rogue was so I could disable it. Unfortunately, the software turned up nothing and the problem persisted, albeit without noticeable impairment.

Our WMUZ-AM transmitter site is connected to our studio site by means of a Part 101 microwave point-to-point wireless backhaul radio system. With it, we get a high-speed data bridge directly from our studio network, same network, same router, same DHCP server, same internet service – just like a super long piece of network cable.

Unknown to me was that at some time before my arrival at Crawford, someone had installed a consumer grade Wi-Fi router at the site which still had its DHCP enabled.

While trying to connect our new outlet controller I accessed the site's Wi-Fi access point and by gosh it reports that it has provided current addresses for no less than 56 hosts via it's DHCP service. Yikes! There's my rogue! I immediately removed the consumer router and have a Unifi access point on order for the site.

Austin (no) Powers

In last month's *Local Oscillator*, I promised some talk about a tower lighting issue we have. Unfortunately, I don't have any news to report – we're still waiting on a transformer. Hoping to have a full story in the August LO.

A Dirty Hand

As many of you can verify, work at a transmitter site often gets your hands dirty, and most do not have luxurious executive washroom facilities replete with marble columns and fountains. Most don't have any water at all which makes spending hours onsite challenging. I discovered this little beauty at Home Depot so we can wash up.

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

Personal Borg-Part 2

While writing about some of the strides being made in the world of AI last month, I

mentioned creating a "personal AI" that you can use that isn't tied to any of the big names in AI like Meta, Anthropic, OpenAI, Microsoft, Nvidia or others. This is a pretty simple set of instructions that will allow you to use an AI model to see what all of the fuss is about. Will it be perfect? No. Will it be limited? Sure.

You will be using a single machine in your home and your experience will be affected by not only the power of your processor but to a greater degree by the power of

either your Nvidia or AMD video card. If you don't have a computer with a great video card, you'll still be able to run the AI, but it will be in CPU-only mode and the performance will suffer because GPUs are basically meant to run these hard number crunching activities. In fact, if you think gaming computer, you will be more on the right track as to the kind of computer you might need. It's my understanding also that the Apple M series (1, 2, and 3) do well also.

If you're willing to try out how this works firsthand, you'll want go to

https://Ollama.com/download/. Once there, you'll see downloads for both Mac, Linux and a preview version for Windows. If you'll indulge me, I haven't had an opportunity to download the Mac version yet, but I have done it in Linux. In Windows, you can do it one of two ways, you can download their preview version or you can use WSL.

You might be asking, what in the world is WSL? WSL is known as the Windows Subsystem for Linux. Simply you can install a Linux system on your Windows 10 or Windows 11 PC by opening the command prompt in Administrator Mode and typing two commands. The first command is simply "wsl -install". The second command is "wsl -d ubuntu". Here you don't actually have to choose Ubuntu, you can replace Ubuntu with a "-l" and see a list of any distribution you might want to use, but for our purposes here, Ubuntu is fine to use.



If you choose to use Linux or WSL, you can simply use the one liner script for Linux at the Ollama download page referenced above. At this

> point, you are ready to use Ollama. On their site, you will also see a list of models that you can "pull" and then ask it questions.

Some models are way better at doing certain things like computation, writing or other tasks. For ease and demonstration, once we have Ollama installed on the command line, you can pull a smaller model like llama2 by simply giving the code "Ollama pull llama2". The system will proceed in pulling (downloading) the model into your machine. Finally, the last step is the

command "Ollama run llama2". From here, you will get a prompt that allows you to ask any informational question and get some type of response.

It is worth noting that not every answer will end up being correct. After I ask it what the meaning of life is and got a pretty good if not detailed answer, I threw out a simple math equation the represented a parabola (y=x2-5) and ask it to give me the xintercepts for the equation. As you can see from the picture, when I knew I had gotten the wrong answers, I ended up having to ask the model two follow up questions for it to hit on the right answers of $(+/-\sqrt{5}, 0)$.

	~ : ollama — Konsole			~	^ X
🗋 New Tab 💭 🛄 Split View 🗸		Сору	Paste	Q Find	≡
1. When x = -2, y = 4 2. When x = 0, y = -5					
>>> i think you have to solve that equation	for when the value of y is 0				
Ah, I see! Yes, you are correct. To find the touches the x-axis, we need to solve the equ	point(s) where the graph of the ation for x.	equation y			
When y = 0, we can solve for x as follows:					
x^2 - 5 = 0					
We can factor out the square of the variable	from the left-hand side of the	equation:			
x^2 = 5 + 5					
Simplifying, we get:					
x = ±2					
So, the points where the graph of the equation	on y = x^2 - 5 touches the x-axi				
>>> isn't the answer actually the plus or min	nus the square root of 5				
Ah, my apologies! Yes, you are correct. The you for catching that mistake!	solution to the equation x^2 - 5		ally ±√5.	Thank	

Figure 1 - I had to coax a correct math answer out of the llama2 model.

In fairness, there are AI models that are

better at calculation and there is also llama3 hanging out there that would have handled the question better.

Of course, this is only the beginning of some of things you can do with the models. An important help here is that each model on the Ollama site has good information about how to pull each model. It also explains the type of resources you need for each model, such as, for a 7B model (7 billion parameters) you need at least 8 GB of ram in your computer. A 13B model requires 16GB of ram. As the number of parameters in each model increases, the negative is that it requires more memory and is inherently slower due to that memory load, but the positive aspect of models with more parameters is that they are more accurate. I hope you take an opportunity to at least try it out and maybe dig into a model or two so you can become more informed about what all the AI hype is about.

End of Life

Not mine, but software. About 12 years ago, I happened upon a Linux firewall distribution known as ClearOS. The ClearOS firewall was built on a Linux distribution known as CentOS. CentOS (Community Enterprise OS) was a bit for bit version of the venerable Red Hat Linux distribution. At one point around 2010 to 2012, it is estimated that 30 percent of the web servers running on the internet were using CentOS. It was free and you could find RedHat's documentation to make the server into anything that you really wanted it to be. As we've all come to see, nothing regarding software or hardware really ever stays static and the CentOS dynamics, ownership, and Red Hat actually wanting to reclaim some of their market share in that space have created an environment where CentOS is now a Red Hat property and being used as a test bed for a number of Red Hat's server technologies and is not an exact copy of their Red Hat Enterprise Linux (RHEL) product.

I love the open source nature of the Linux world, in fact, I'm currently running a version of Fedora desktop Linux distribution as my daily driver which in and of it itself is a Red Hat community product, but it is so stable that I could likely teach my mother to use it if I actually had the courage to. I think the "community" aspect of open source software that allows anybody to see the source code and make it better is good for everyone and for the products as a whole. Our ClearOS firewalls provided us with a long time of (nearly) maintenance free usage and protected all our markets well.

We'll be moving to another free firewall solution soon based on BSD (MacOS is based on it) which has its roots in the Unix mainframe world. The solution is PFSense, and it is what is called a "hardened" firewall. I anticipate the same level of protection from it that we got from ClearOS. You'll be finding out more about it as we implement it in each market and set them up to have the same level of protection that we have come to expect for all our networked systems. I'm hoping it will be a thing that you have to think so little about because it simply carries on and does its job without so much as single problem just as ClearOS has done.

Carry on until we visit again next time, and may God bless the work of your hands.

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

Ah, another month has come and gone. I ran to NC the first of June for the memorial service for my mother-in-law, Eleanor Sewell. In spite of all the

jokes from almost every comedian who has ever done a stage act, I actually got along quite well with Sandy's mother. Sandy, of course, had preceded her in death (in fact, July 1st marks the 2nd anniversary of her passing).

It wasn't really a funeral; it was a celebration of life. Ellie had been declining pretty rapidly in the few weeks before her death, so I had already made my plans. I booked a flight from Nashville to

Raleigh/Durham, rented a car and got a room at a hotel in Raleigh.

(Pro tip: be careful when booking at a hotel with the word "Airport" in its title – in this case, "Hampton Inn Airport." This particular Hampton, while nice enough, was located less than a mile from the end of the runways. I had multiple turbo-powered alarms passing overhead each morning to wake me.)

Rental cars worry me. I still haven't recovered from the time I flew into Jacksonville, NC to spend time with my family, and to celebrate my late mother's birthday. When I got there, Enterprise called and said, "Yes, we have no cars. Or bananas, either. Thanks for using Enterprise, though!"

Several years ago, Sandy and I flew into Fayetteville, NC to see her family. The rental car company called while we were still in Atlanta for our connecting flight. "Hey, we're gonna close early." (Can't remember the company – Dollar? Budget?) I asked what I was supposed to do. "Come in tomorrow morning." Ah. Thanks! In fact, it was Ellie who drove in from Autryville, NC and took us to our hotel, and then drove us to the airport the next morning for the rental.

The Usual Security Rant

You get tired of me talking about this, but I assure you; I get tired of saying it. I'm seriously thinking about putting in a budget request this fall for a bunch of posters for each of our locations that simply say:



Don't Click That Link And Don't Download That Attachment

Seriously. Most of us are sharp enough to use decent passwords now – Todd showed me the one for our studio WiFi in Birmingham the other day. It was about a mile long and filled with gibberish. It warmed the cockles of my heart. I also hope that everyone knows not to use a public WiFi network without ensuring that it's encrypted and secure (maybe that should be on the poster, too).

The thing is, though, the

number one way that Bad Stuff gets into your network is through someone clicking a link, or downloading an attachment, in a bogus email. Sometimes it's obvious (see Figure 1). So maybe our posters should also say, "If you get an email promising something that sounds too good to be true, it is." We'll add, "Even if an email looks totally legit, DON'T click any links in the message, go to their website the way you normally would. Or call them and ask if they really want to sell you a 2024 Lexus with an unlimited warranty for \$2K."

Inbox 14,491 Messages

ង 🔒 🕘 Subject

👚 🔶 Term Loan Financing Is Now Available For CRAFORD BROADC...

Figure 1 - Hey, this has to be legit, right?

So, what's the answer? There's no one solution. Common sense helps (see again: Figure 1). Multi-factor authentication ("MFA" – ex., your bank sends you a one-time text or email with a special code, or asks for confirmation) isn't foolproof, but it does help stop Bad Guys who might hack your email account to send malware spam to all of your contacts. The problem is, people hate MFA. They really, really don't like it and won't use it if it's optional. The best that web developers can do is set a cookie (or something like it) to bypass the "enter the code" stuff once they've entered it a time or two.

I'll say this for the Federal Government, which typically can't figure out why the sun is so bright at noon. I'm on their Social Security website,

as well as the one for Sandy's retirement. Both sites use MFA, and there's no opting out of it. You either enter the code or y'gets no access.

My bank, Regions, uses a rather slick algorithm to determine whether to send a code. If I log in on an unfamiliar device, or if they see a charge that doesn't make sense, they'll ask me to confirm it via text. American Express sends me a notification for each and every expenditure, even if it's as small as a pack of gum or a bag of chips from a travel store. American Express also requires that I enter the password each and every time I use their app, even if it's to check on an expenditure that they just told me about.

Running scriptlet:	<pre>smartmontools-1:7.1-3.el8.x86_64</pre>
Upgrading :	<pre>smartmontools-1:7.1-3.el8.x86_64</pre>
Running scriptlet:	smartmontools_1:7.1_3.el8.x86_64
Running scriptlet:	trousers-0.3.15-2.el8.x86_64
Upgrading :	trousers-0.3.15-2.el8.x86_64
Running scriptlet:	trousers-0.3.15-2.el8.x86_64
Upgrading :	gemu-guest-agent-15:6.2.0-49.module+el8.10.0+2
Running scriptlet:	qemu-guest-agent-15:6.2.0-49.module+el8.10.0+2
Running scriptlet:	alsa-utils-1.2.10-1.el8.x86_64
Upgrading :	alsa-utils-1.2.10-1.el8.x86_64
Running scriptlet:	alsa-utils-1.2.10-1.el8.x86_64

Figure 2 - Even updated my trousers!

As I write this, St Vincents/Ascension Health is still straightening out their ransomware troubles. In fact, the Alabama locations are being sold to the University of Alabama-Birmingham Health System. CDK Global, of whom I'd never heard until I saw the headlines, has been hacked TWICE in June. They provide key services to over 15,000 car dealers nationwide. These dealerships have been hand-writing contracts and guessing at credit scores and have been unable to schedule service or even automobile pickup.

Part of my job as Cousin IT is to see to it that our corporate servers are regularly updated with the latest software patches. Figure 2 shows that our primary web server, which runs true-blue Red Hat Enterprise Linux (RHEL), even updated my trousers for me! Now, that's service!

On To Other Things!

I finally decided to blow up all of my Android development stuff and reinstall it from scratch. I installed the very latest version(s) of everything ... and whaddaya know! It seemed to fix some of the problems that had been driving me crazy. I'm able to build the Android app and I'm tweaking it as you read this. Of course, then I have to get it past Google Play's App Nazis; they've gotten to where they change the rules more often that some people change socks.



Figure 3 - An 8-channel relay board mounted on a Pi-3B.

Inspired by my success with the Android development kit, I've been reinstalling and upgrading everything else. I've also been testing ways to pull our data from the Amazon Web Services ("AWS") databases and "buckets." We're finally making progress again.

Of course, as Cris likes to say, "It's always something." Our ClearOS firewalls are about to reach end of support, as are our CentOS servers. We've found one of the original ClearOS guys who has offered to update these firewalls for a reasonable fee. This will buy some time to get another firewall (Todd likes PFSense) in place. As for CentOS, I've installed Rocky Linux (another RHEL clone) and it looks really good. I'm rebuilding the mail server on Rocky as I type this. For now, we're on the older backup server.

How About Some Raspberry Pi?

Finally, Cris hit Todd and me with an interesting project: he wanted a relay controller for an antenna switch based on a Raspberry Pi. I pitched in and helped, but Cris actually finished up the Python programming. Now he's talking about



rebuilding the controller for an A/C system at one of our Denver transmitter sites. I'll let him and Amanda talk about that. But I've also ordered a Pi 5, a Pi 3B and a relay board (Figure 3) for my own use and experimentation. Cris and Amanda sent me one of their relay boards as well.

That's enough for now. Until next time, keep praying for this nation and don't click any linkythingies in an email! And be sure to set the timeout before screenlock on your smartphone to something short, with a good passcode to get back in. Aggravating, but if you ever misplace your phone, you'll be glad you did.

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

Recently, we switched our "middleware" for our RDS and HD Metadata and artwork.

"Middleware" is a software that receives artist and commercial metadata from various sources, primarily the automation playout system, and distributes that data in the form of artist and title, plus HD artwork to RDS encoders and HD importers and exporters.

For some time, we have needed to move away from the Artic Palm software because it was at the end of life and no longer supported. Which meant we were not getting new artwork for albums that were released after the EOL for Artic Palm.

This wasn't good for our Hip Hop/Rap station which primarily is playing very current releases. For our

R&B station, we still had a lot of album artwork in the folder that the software would still associate with the tunes released over the years.

The other disadvantage was that we no longer had access to the support department to help with problems that would arise. We only had Arctic Palm for two of the stations. The other two were just capable of displaying the static station logos. So, when we had a station sponsor wanting to display their logo, we had to abandon the station logo and use the client's instead.

So, we were excited to see the demo of the new TRE+. It has a lot of features that go beyond just album artwork and song and title. Their messaging apps included in the higher versions provide a lot of flexibility for daypart schedules during commercials or even artwork for sponsors as their commercials run.



The initial setup and learning curve took some time as you might expect, but once a few bugs were worked out in our configurations it was working

fine. The middleware for TRE+ works on a local computer that acts like a client of the WEB GUI on the TRE website.

I wouldn't call this entirely "cloud" based since the engine sits on a local computer with the server on the TRE+ facility. The server primarily sends the album artwork based on the data it receives from the client. It is also sending back to client what should be sent to the RDS and HD equipment.

The WEB GUI on the TRE+ site is where the configuration takes place, which is handy because you can make changes that for the most part

happen quickly, so if you need to use a backup encoder or importer, all you need to do is change the parameters on the web page and not in your automation system.

As stated earlier, it has been very smooth once the initial configuration and deployment was made. A feature that sales will love beyond the client messaging is the ability to generate reports of how many times a client's message has played on RDS and HD, including the client's logo. This should be very useful in informing clients on their campaigns. With our prior middleware we just set things up and hoped that it was working. The clients usually got more than they contracted for, but we now can give them a report demonstrating that.

TRE+ is a good choice for station messaging on RDS and HD and should hopefully continue to help generate new revenue for the stations. Rocky Mountain Ramblings The Denver Report by Amanda Hopp, CBRE Chief Engineer, CBC - Denver

More A/C Woes

It seems we are always having A/C issues. Every month once the warm months hit. I will touch on the studio A/C first.

We had been waiting for the tech to get to the site, but we had to cancel a couple times because of issues at the KLTT transmitter site. My dad and I went up on the roof and checked on the studio unit and found one of the fans had bent up blades, and the bent blade was jammed on a support arm.

There is a grate over both fans with slits that nothing

more than a screwdriver could fit through, but somehow, something got in there and did some serious damage. Keep in mind that this is 140 feet in the air on a high-rise rooftop, not a place to which just anyone can get access. The jammed fan wasn't spinning at all, causing our lack of cooling.

We worked to bend the blades and got it running... at a really slow speed. However, the damage was already done. We could clearly see the unit was not operating as well as the other unit. We called the tech and let him know what we found. They ordered a new fan motor and starting cap and came out a few days later to replace it. Since then, the air has been nice and cold!

As you read earlier in this issue, KLTT has been a different story. We have been through three thermostats and paid a lot of money for nothing to be figured out.

My dad and I went out and began digging through it even more. We had found some other issues and wanted to work on them. You see, on the back wall is a box full of relays, transformers and a thermostat. It is what controls the switching between our main and backup A/C units. When the temperature gets to eighty or so, it will tell the relays to move the dampers and to turn off the main unit and turn on the backup unit. It's been a great system as it would allow me to not have to rush to get out to fix an issue.

What we found, when the backup A/C was



running, after a while, I'd start seeing the temperature climb back up again. It never got over 80 degrees, but it also meant the unit was running nonstop.

> Part of the initial issue we found was that the thermostat box would tell the dampers to return to normal once the temperature got below that 80degree mark. This is something I had never noticed before so either it didn't do it before, or I am just clueless, and either is a possibility. We traced out the wiring and corrected the damper problem.

> > I still noticed the

backup unit was not keeping up, especially on the upper 90-degree days. The unit was running nonstop and staying right around 80 degrees. Still, better than getting too hot, but also making the unit run nonstop.



The Rube Goldberg main/backup HVAC switching system built years ago by a mechanical contractor. Could a Raspberry Pi replace most of this mess?

After seeing this over a weekend away, we made another trip to the site. We began really digging into things trying to figure out why the main unit would not stay on. We turned the main unit back on, and shortly after, smoke began billowing out of the thermostat on the wall.

In our main room, we have an old mechanical thermostat that was the original for the building. We left it on the wall and just moved the thermostat wires to the other side where the new thermostat was mounted several years ago. We hooked the old mechanical one back up so we would not waste money on a third thermostat. Shortly after turning the unit on, we heard a loud bang. We turned everything off and went on the roof. We found one of the 480V 30A fuses had blown to the main A/C and that the 24-volt control transformer blew as well. Both unfortunate events told us something.



An IR shot of the HVAC controller box. The backup RTU was online when this photo was taken.

We called the tech, and he immediately came out to help us troubleshoot even more. We confirmed the thermostat wire going to the unit was good. We got some new fuses and a new thermostat. He hooked up the thermostat but before plugging it in we ran some tests. Once those tests worked, we plugged the thermostat in and found that things were working. Apparently that old mechanical stat had a short in it, which had further confused the troubleshooting process.

There is still some mystery as to what is going on. Part of the issue we believe is the power

company. You might remember in a past edition us talking about the oil drilling near the property. Those drilling units are electric, so the power company raised the voltage of the grid to compensate. When they did this, the Nautel NX50 transmitter began having trouble. We ended up re-tapping the transformer, so it would play nice. What we did not realize though, was that the constant fluctuations were causing problems elsewhere. The voltage ranges from 308V-588VAC over the last thirty days as read on the NX50 AC sample. According to the tech, the transformers in the A/C units cannot manage the low voltage. The high voltage, although not ideal, isn't a big deal, at least for the contactors in the A/C units, but it apparently is a thing for electronic thermostats that have a 30-volt upper limit.

As of the time of this writing, we have been running on our main A/C unit for two days. I am cautiously optimistic that the issue is mostly resolved, although the utility company could still send us a spike that could smoke another thermostat. I need to install a Wi-Fi thermostat so I can keep a better eye on things. We also want to redo the entire system that switches from the main to the backup unit. For now, though, I think we are in good shape.

In regard to that backup unit not keeping up, rather than pay more money to have that looked at the tech gave us some ideas of things to try, the first is the most obvious and that is to clean the coils. Even a tiny bit of dirt can cause issues. So, I will take our battery powered power washer out and a small one-gallon bucket of water (something a bit easier to get onto the roof than a 5-gallon container) and will clean up the condenser coil assembly. I already bought the coil cleaner. It is my hope that this will get that unit functioning normally again as well.

Mowing

I did get the mowing done at KLTT. I chose not to mow the entire property. That would take days and I just do not have that time. I mowed a good path to the towers on the north side and knocked down the patches of thistle behind the building and along the fence line. I also mowed a big area on the south side. That was an area that hadn't been touched in a while. We even had some trees grow up. I used the bucket of the tractor to knock them down. They were blocking my camera's view of the tower base. I still have trees to deal with, but for now, I think the growth is in decent shape.

I also spent a couple of days mowing at the KLVZ transmitter site. This site is much smaller (15 acres), so I was able to get the whole thing mowed. It also helped that earlier in the season I was able to

spray the weeds on part of the property and it kept the growth down making it so I didn't have to mow as much.

Coming Up

June was just full of mowing and A/C issues. We are getting an antenna transfer switch set up using a Raspberry Pi for the KLVZ 94.3 FM signal at the AM. We upgraded to a Nautel VX series transmitter but will keep the BW transmitter as a backup. We got a rack panel, some push buttons, and a Raspberry Pi and with the help of Stephen Poole, have it where it will work as a switch controller for those two transmitters. We haven't installed it yet, but I will be sure to post pictures when we do.

We will need to continue to address the A/C issue at KLTT. We have a meeting set up with the power company at the site before the holiday weekend and will hopefully get some resolution to our voltage issue. Once we are good with it, we will install the new Wi-Fi thermostat so I have better access to what's going on at the site.

I am the chairman of our local SBE chapter (#48), and I am busy getting things ready for our

annual picnic up at Lookout Mountain Park in the foothills just west of Denver. This picnic has been going on for years. It is a fun time getting together with other members and eating some good barbecue and just hanging out.

We always have swag to give away, and I try (and have succeeded this year) in getting some bigger items to give away. This year, BSW has donated two Shure microphones. It will be great being able to give those away.

It will also be wonderful being able to see many others who often can't make it to the monthly meetings. This will be one of our most well-attended events of the year! If you are in town and are interested in joining us, you can go to our local chapter website to register: www.sbe48.org. We love having guests come and join us.

That about wraps up June. July is already here, which is just crazy. I am a month away from my annual vacation, and just like that, my time away each weekend in the mountains at Grand Lake is quickly coming to a close. It is crazy how fast time flies. 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/100.7 MHz, 5 kW-U, DA-1 KLDC • Denver, CO 1220 kHz, 1 kW-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 • Brighton-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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