The Local Oscillator

The Newsletter of Crawford Broadcasting Company Corporate Engineering

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UAVs

Radio World recently ran an excellent feature on the use of unmanned aerial vehicles (UAVs) in radio. It was my impression that the inspiration for this feature came right out of the spring NAB show, where there were many product displays of ñdronesò and cameras. I must admit, I spent some time at the show drooling over some of the hardware.

A peek at the top of KLVZ tower #1 from above. The area that Amanda just mowed is visible below on the left, and the new channel of the flooded South Platte River is visible at the top of the frame.

It would seem that UAVs would have many applications in broadcasting, most notably in newsgathering operations where a UAV could be remotely piloted over the scene of breaking news to provide video and still shots without the reporter and camera crew having to go behind the yellow tape. Of course that kind of operation could potentially interfere with police aircraft and perhaps police UAVs, but thatôs a different discussion altogether thatôs best suited for some other publication.

The application that gets my attention is the use of UAVs in tower and antenna inspection and troubleshooting. Why couldnôt a UAV be run up the side of a tower with an HD camera recording, providing a visual inspection of the tower that could later be reviewed carefully and in detail on a big screen monitor? Why couldnôt an infrared camera equipped UAV be used to inspect an FM or TV transmission line in situ for hot spots? If there were a problem, why couldnôt a UAV be sent up the tower before calling in a tower crew so that the problem area could possibly be identified and the crew be better prepared to deal with the issue? And why couldnôt a UAV be sent up a tower after the tower crew had departed to check the crewôs work?

The answer, from a practical perspective, is that a UAV could be used for any or all of these purposes. From a regulatory standpoint, however, a UAV (or UAS ï Unmanned Aircraft System in FAA-speak) cannot be used for any business purpose. There are ways around this, including special airworthiness certificates and waivers, but this is a difficult process at best. If the airworthiness certificate route is pursued, a pilotôs license is required as well. All this is to protect the National Airspace System from intrusion by a commercial UAS.

Back to practical matters for a moment, towers automatically produce a cylinder of protected

airspace around themselves. Federal Aviation Regulation §91.119(c) prohibits the operation of any aircraft closer than 500 feet to any structure, so there is a cylinder of protected airspace some 1,000 feet across from the surface to the top of any tower. Since no aircraft can operate within that airspace, why can't UAVs be deployed within that airspace for commercial purposes?

Another FAA restriction is a 500-foot height limit on UAS operation, but if a tower is higher than that and extends the cylinder of protected airspace beyond 500 feet, there's no practical reason a UAV can't be deployed higher than 500 feet up to the height of the tower.

So what we need is a rule or blanket waiver that would permit UAV operation within the existing airspace cylinder created by any tower. Not only would that give tower owners, broadcasters, carriers and tower service companies an invaluable tool, but it would also reduce the number of required climbs, thus reducing the exposure of tower climbers from the hazards of climbing.

I think OSHA and the Labor Department should get in on this and use whatever pull they might have with the Department of Transportation and FAA. If reducing risk to workers is the stated goal, permitting UAV use in tower work is a no-brainer.

A UAV's-eye view of Keith Peterson mowing the antenna field at KLVZ.

Last month we had the towers painted at the KLVZ transmitter site north of Denver, and Amanda took the opportunity to mow the site as long as she had to be out there anyway. On the first day of the project I went out there with her to help load and unload the tractor and brush hog, and just for fun I took my DJI Phantom 2 quadcopter along. While other things were going on, I flew my quadcopter around the site and videoed the tower crew at work, got some great shots of the towers and also got a look at the flooding of the South Platte River, which had breached an embankment just south of the KLVZ property and formed a new channel. I was able to view what I was shooting on the first person view (FPV) display, but it was when I later looked at the video on the SD card on a monitor at home that I was able to really see the stunning views in 1280p high definition.

This little recreational exercise illustrated for me what could be if this kind of UAV operation was permitted as a commercial venture. You can bet that I will be beating the drum for new regulations that make such an allowance.

If you want to see my whole fun video, I posted it on YouTube at:

https://www.youtube.com/watch?v=FztDGoleW68.

Keep in mind that YouTube degrades the quality to reduce storage and bandwidth requirements, so what you see online is nowhere near the quality of the original video. Still, it's pretty cool!

Resolution

At long last, the tower 2 phase drift in the KBRT directional array has been fixed!

Readers of these pages may recall that we have been dealing with some minor phase drift in that one parameter since almost day one (February 2013), and that the drift has gotten progressively worse in recent months so that we had to keep the phase adjusted to the upper limit during daytime 50 kW operation so that it would not drop below the lower limit during low-power night operation.

When Bill Agresta was still here, he did some troubleshooting, using a heat gun on suspect components to see if he could replicate the problem. That produced very little in the way of results. Later, contract engineer Fred Folmer put a small space heater in the ATU and set it for 80 degrees or so to see if that would stabilize the phase. Again, there was no change (meaning that the phase continued to do a slow drift +/- six degrees when going from low power to high and vice versa).

So in an effort to figure out what was going on, I created a circuit model of the entire phasing and coupling system, from transmitter to towers, and ran a series of nodal analyses on it, making minor changes to the values of different components to see what effect that had on the operating parameters, particularly the phase of tower 2. One component jumped out at me, the input leg capacitor in the ATU network for tower 2. A very small change in capacitance, well within the manufacturer's

published tolerance, produced swings in the tower 2 phase of several degrees with very little or no impact on other parameters in the model.

I zeroed in on that component because it was one of just four mica capacitors in the system. All the other capacitors were Jennings vacuum caps and should not be drifting around. So I ordered a replacement vacuum capacitor, and to prevent future issues also ordered vacuum replacement capacitors for the shunt leg as well (those were the only other micas in the system). The caps all arrived after many weeks of delay from the manufacturer, and I was watching for an opportunity to make a trip out west to install them.

Fred Folmer, bless his heart, asked me if he could take a shot at it. Knowing what I do about the tower 2 network and how difficult to adjust it is, I was reluctant, but again relying on model data as well as my own experience with the network, I concluded that if Fred replaced only the input leg capacitor, which was my #1 suspect as the cause of the drift, he should be able to trim out the phase of the tower with just the phasor control and not have to touch the other components in the matching network. If he carefully logged all the turn counter indications before he started, worst case he could simply put the mica cap back in, reset the phasor controls and be back where he started.

So thatôs what he did. The replacement cap had exactly the same rated capacitance as the mica cap. The mounting was a little different, but our friends at Kintronic Laboratories provided us with a new mounting plate and standoff insulators that would fit the same holes as those for the mica cap. Fred swapped out the cap and turned on the system at low power.

The antenna monitor initially indicated a nine-degree difference in tower 2 phase from where it had been just moments before with the mica cap. That indicates a pretty good difference in reactance. Iôm eager to put the old cap on the network analyzer and see how far off it was. I suspect that itôs well outside the manufacturerôs published tolerance.

Fred was able to quickly adjust the phasor to get the phase back on the licensed value without touching any components in the antenna tuning unit. Weôve been watching it for a month now and observe maybe a one-degree change from low power to high, some of which may be in the antenna monitor itself. We can now park the tower 2 phase on the licensed value daytime and not worry about where it will go at night.

At some point, during my next west coast trip, I will swap out the shunt leg capacitors, a trio of

All green! The KBRT operating parameters are all back to normal after the tower 2 capacitor change.

0.001 uF micas, with a pair of 1,500 pF vacuum capacitors. That shunt leg is very critical in adjustment ï it took Amanda and me most of a day to get it tweaked during array tune-up ï so I will have to use the network analyzer to carefully measure the leg reactance with the micas, swap out the caps and then tweak the leg for exactly the same reactance. I canôt afford to take the station down for several hours while I play hide-and-seek with the operating parameters with that network.

For the moment, however, the problem is solved. Thanks to Bobby Cox at KTL for his wise counsel in troubleshooting this issue and for getting us the replacement capacitors.

Anyone need a slightly used 0.002 uF 294 capacitor with a little wobble in its value?

Microwave Problems

Last month we developed a problem with the 11 GHz Part 101 microwave link from KBRTôs Costa Mesa studios to the mountaintop transmitter site. It initially manifested itself as dropouts in the audio. Todd Stickler heard the issue on the air and switched the Omnia processor input to the backup satellite feed.

I looked at the microwave link remotely and found tons of receive error blocks and receive frame errors. We did a lot of troubleshooting, including running some in-depth diagnostics on the microwave radios and running loopbacks. We concluded that there was a problem with the radio at the studio end.

Todd swapped out the radio with our ready spare, but he couldnôt get it to come up and operate. After trying everything we could think of, I had him ship the spare to me in Denver. Amanda and I spent some time with it on the bench and got it working. Iôm still not sure what the issue was. At any rate, I

shipped the spare back to Todd and he installed it without issue. The errors, which were incrementing every second, immediately disappeared. Problem solved. Or so we thought.

I watched the unit all that afternoon and evening, looking at it one last time at about 9:00 PM Mountain Time. No errors.

First thing the next morning, I looked at it again and saw about 25,000 receive block errors. With 32QAM modulation, thatôs less than one second of total issues, but it was troubling nonetheless. I pulled diagnostics on the link and found that all the errors had occurred over a four-second period at about 11:30 Pacific the previous night. No errors since.

The next day was a repeat of that ï zero errors all the live-long day but a 30-second period of errors (75,000 or thereabouts, which is a little over two seconds of loss) at ï you guessed it ï about 11:30 PM.

The third day the errors happened at 8:30 PM. There were no errors the fourth or fifth night, but the sixth night there were a few seconds of errors at about 11:30 PM. Since then itôs been hit or miss, and always well after dark. Some nights we get a few errors, some nights we donôt.

The errors are in both directions, which either indicates interference on both frequencies (not likely) or something in the path. My guess is that it is something biological, and itôs probably happening at the studio end. Maybe a flock of birds chasing a nightly hatch of insects or something like that.

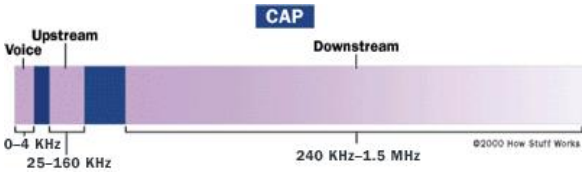
The reality is that these short outages result in not much in the way of on air interruption, maybe a syllable or two lost. I suspect that the problem will clear up in time.

Until then, we are installing some TieLine Bridge-IT XTRA (STL) codecs on the link. Those include a five-second buffer and error correction, so we can ride through a few lost packets without any issue.

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

Hello to all from Western New York! In last monthôs report, I touched upon several Internet issues we have been experiencing lately, and the results of Internet providers throttling Internet connections they deem are using too much bandwidth. This month, I would like to take a look at Internet service options available to us and make a comparison as to which is better. Weôll start off with comparing a DSL (Digital Subscriber Line) service to Cable Internet service.

DSL incorporates an existing copper pair in a telephone service to a given location. This copper pair has a much greater bandwidth available than what is being utilized by voice transmission. This ñextraò bandwidth allows the service provider to take advantage of the additional unused bandwidth and carry information without disturbing the óvoiceô portion of the signal. This is accomplished by limiting the frequencies that the switches, telephones and other equipment will carry. The voice portion of the copper pair will handle frequencies from 0 to 3.4 kilohertz. The upstream portion of the line utilizes frequencies from 25 to 160 KHz, the download utilizes from 240 KHz up to 1.5 MHz of bandwidth. In many cases, a filter is used to insure that no cross talk is injected into either signal.



ADSL is the most common type of DSL in North America. ADSL is short for Asymmetrical Digital Subscriber Line. ADSL supports downstream data rates from 1.5 to 9 mbps and upload speeds from 16 to 640 kbps. Using ADSL requires a specialized modem usually supplied by the Internet provider. This method of providing service is good, due to the fact that it is not a shared connection, as is Cable Internet service.

The downside of DSL is your location. DSL can operate sufficiently to distances up to 7000 feet from the central office. The further you are from the provider, the capacitance in the wire drops the amount of signal you are able to send/receive. The maximum distance for a minimal service is 18,000 feet from the central office. Some vast improvements to ASDL are available in some areas that increases download speeds to 12 Mbps and upload speeds from 640 kbps to 1 mbps. This increased service is referred to as ASDL2 and ASDL2+. ASDL2+ can increase download speed from 9 mbps to as much as 24 mbps and upload speeds to 3 mbps.

The question most people have is, ñWhy can the óPOTSô service travel much farther than the Internet service? If they share the same copper pair, why canôt they travel as far?ò The answer is that itôs due to the fact that the telephone company utilizes ñloading coilsò or amplifiers to boost voice signals. These coils are incompatible with ADSL signals. Therefore, wherever the loading coils are used, DSL service is not available.

There are other factors that can determine whether DSL service is available at your location. One is the use of bridge taps in the service line, which extends service to other locations. Another deterrent in obtaining DSL service is the use of fiber optic cable. The DSL signal cannot pass through the conversion from analog to digital and back to analog. Typically, the cost of a 10 mbps down, 640 kbps upload service is in the $70 to $90 dollar range.

Cable Internet service has speeds typically two times faster than the best DSL service. The one thing to note when deciding on Cable Internet service is that the technology is based on *shared bandwidth*, which means that the speed is dependant upon the number of subscribers on the network. Also, many providers offer ñbundling,ò which sends Internet, TV and telephone service over a single coaxial cable.

Letôs take a look at the standard coaxial cable used in cable service, typically an RG-6 coax. The cable company typically uses a 6 MHz channel on the cable for each television channel. A standard coax cable can handle hundreds of channels. When injecting Internet onto the cable system, the supplier simply provides a 6 MHz channel for the download Internet signal to travel. On the upload end, only 2 MHz of bandwidth is needed, as typically, upload speed is much lower than download speed. On the cable, the Internet data looks just like a TV channel.

The cable company utilizes two types of equipment to supply Internet service to you: a cable modem on the customer end, and a cable modem termination system (CMTS) on the supplierôs end. Between these two types of equipment, all the computer networking, security and management of Internet access over the cable television is generated. A CTMS can handle as many as 1,000 users at any given time, the downside of this is, the greater the number of users on simultaneously, the slower the speed. The upside of this is, when the cable supplier determines that the number of users has reached capacity on the coaxial cable, they simply add another 6 MHz channel to offset the load on the 1st channel.

Now that we have discussed how Cable Internet works, letôs compare bandwidth available on coaxial cable. First off, a standard cable service can travel up to 99 miles on a single cable. It is without saying that the farther the distance, the service bandwidth will drop due to capacitance in the cable. Generally, the conductor in the cable wire is significantly larger than copper wires used in telco systems, therefore signals traveling on the cable can traverse a lot further without degradation of the signal.

In a typical cable system, download speeds can be as high as 35 mbps and upload speeds in the neighborhood of 5 mbps. This is considerably higher than the 12 mbps down and 640 kbps upload speeds on a DSL. The generalized cost of a commercial cable service with the above speeds is in the neighborhood of $200 monthly, roughly 2-1/2 to 3 times the cost of DSL. Due to advances in technology, soon Cable Internet providers will be able to offer upload and download speeds closer to fiber-optic systems.

The additional bandwidth (SPEED) and reliability of cable Internet service, along with no distance limitations makes for a good argument that Cable Internet is the better of the two. A lot of factors will determine pricing in your area, one being how much competition is in your area, set up or installation fees, whether you can bundle services in order to obtain discounts, and the amount of bandwidth you require.

Next month weôll take a look at fiber-optic Internet service, how it works and the advantages over copper-based service.

Just about time *The Local Oscillator* went to press last month, we had a major catastrophe at the WDCX-FM studios. On Sunday morning, May 31st, I received a call from the board operator that we had lost power at the WDCX-FM/WDCZ studios. The cause of the outage was a fire on the electrical feeder pole that supplies power to our building. I instructed him to call the fire department while I phoned National Grid to report the outage.

After arriving at the studios, I spoke with the crew chief from National Grid about the duration of the outage. He stated that the damage to the pole was extensive, and it would have to be replaced. Restoration time was estimated to be at least 24 hours. In order to get back on the air, I ran to Home Depot and purchased a 6800-watt generator and several extension cords to power up essential equipment to get us back up.

The first problem I encountered was the fact that the electrical wiring in our studio complex has been altered/added to so many times over the years, there was no simple way to get us back on the air by feeding the breaker box directly with the generator. We have as many as 4 different breaker boxes feeding the air studio and rack room, so the only alternative was to plug each piece of essential equipment individually into the extension cords.

From the time I received the initial call until we were back on the air was almost four hours. Luckily, I had purchased enough fuel for the generator to last us until 6:30 the next morning, when the power was restored. We ran the NexGen automation system in Emergency Control Room mode, so we had enough programming to run well into Tuesday if needed.

This was definitely a wake-up call, so we are now in the process of making an emergency power-up checklist in case we ever encounter another lengthy power outage.

Another strange occurrence happened while I was on vacation in mid-June. On Wednesday night, June 25th, the board operator called about midnight and reported that he was unable to take readings on the WDCZ remote control. I assumed that it was only an Internet connection problem, and told him I would check it out first thing in the morning. When I arrived at the WDCZ transmitter site, I found that the Burk ARCPlus Touch had lost all its programming. The strange part of this is that I noticed the third octet of the IP address of the unit had changed by one number, from 192.168.1.100 to 192.168.0.100 in both the public and private addresses.

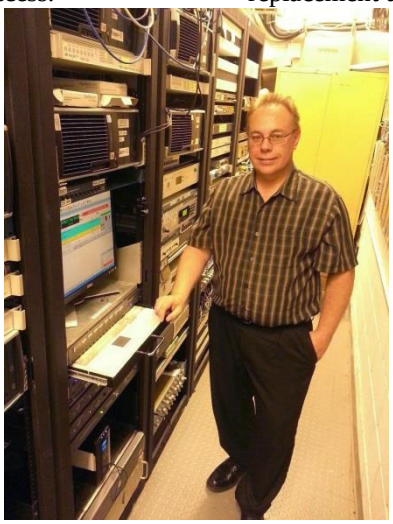
As I had saved the original configuration when it was installed, I assumed an hour to re-load all the information, re-calibrate, and I would be on my way. When I tried to upload the configuration files, it came back and said that they were corrupt. For the next three hours or so, I had to re-load the entire channel/metering/limit/control configuration from memory, and then get everything talking again and calibrated.

I am curious to see if anyone in our group has had this happen before. I could find no logical reason for the remote to dump all of the programming, and am not certain that it could happen again. I do know that the back-up configuration files I now have are good, as I saved them into the local computer, changed some of the configuration in the remote and re-loaded the saved files. Everything looked good. These unexplained failures drive me crazy, especially when there is no evidence of what caused the failure. I may never know, but I pray that this was just a single occurrence and not an indication of bad things to come.

That about wraps up another month here in the Northeast. Until we meet again here in the pages of *The Local Oscillator*, be well, and happy engineering!

The Motown Update
By
Brian Kerkan, CBTE, CBNT
Chief Engineer, CBC–Detroit

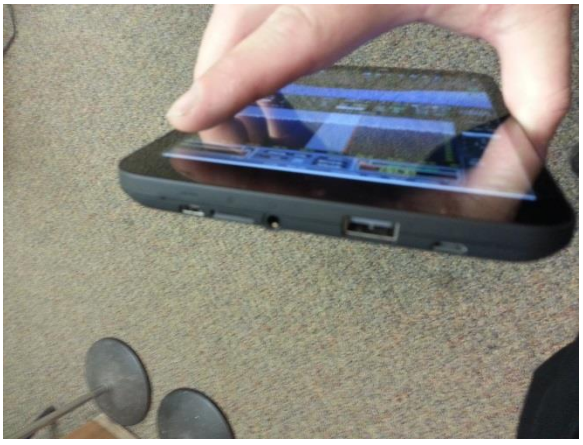
Greetings from CBC Detroit! June has been another busy month. We have completed our WheatNet-IP installation with much success.



Our writer producers are very happy with the added capability of their control surfaces, including the built in dynamics processing. *Radio World* contacted Pete Presnel, our creative director, regarding his take on the ñ*Evolving Face of Radio Production*.ò The article can be found at:

http://www.radioworld.com/TabId/64/Default.aspx?ArticleId=276113

We replaced our Liquid Compass streaming encoder with a new server. We are now using WheatNet-IP drivers instead of a sound card. We are also able to use the built in Wheatstone Aura IP audio processor to process our web streams.



The Winbook TW802 has USB and HDMI ports.

The backup IP STL for WEXL was put into service recently when the T1 line started to have problems. We were able to finally get the local telco involved in troubleshooting the issue, which ended up being a combination of a bad cable pair, and bad repeater cards. I really had to push for our telecom reseller to dispatch someone.

Burk was nice enough to provide a replacement unit for the ARC Plus Touch unit that had an issue with the way the front panel was machined. The window surrounding the touch screen had metal burrs that would cause it to respond erratically.

Our business office and traffic department switched over to Marketron Visual Traffic last month. So far, so good.

The new FCC EAS rules came out, and the national event code is now required to be programmed into our encoders. I had to add it for the recent regional EAS test. There will also be new online reporting requirements for new national tests.

It is amazing to me how low the prices are for new computers and electronics these days. I recently came across a deal at one of the local electronics retailers. I found a new Windows-based tablet for $99. The best part is that this unit has a full set of ports, including a full size and micro USB HDMI.

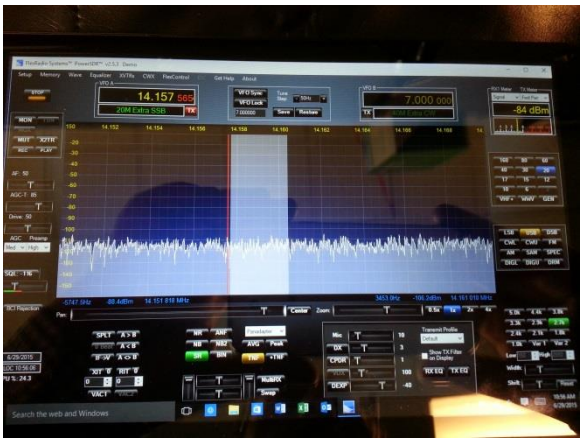
I had to buy it, just to do some experimentation. I was able to load the Windows10 evaluation release on the tablet with excellent results.

The unit comes with a yearôs subscription to Office365, including Word, Excel, PowerPoint and Access. That alone is worth half the price of the unit.

I was able to load up a number of apps that I use for engineering. The USB-to-serial adapter I have works with it. I have loaded the spectrum analyzer software that I use, and it works flawlessly. The screen is bright and clear.

The tablet is based on a Quad core Intel CPU. I bought the unit that has 2G of RAM and 32G of internal space. I was surprised at how responsive it is. The model of the tablet I bought is the Winbook TW802, it is available through Microcenter.

With a USB hub, keyboard, mouse, and HDMI-capable monitor, you have a fully functional PC. There is a micro SD card slot that can be used for additional memory.



Brian's Winbook runs his spectrum analyzer software.

For the price and functionality, it can't be beat.

At one time Radio Shack sold an HD Radio dongle that was designed to work with the IPhone and IPad.

This dongle can be found for as little as $6.00 on the Internet. It contains a fully functional HD radio receiver and communications bus. The audio is available via a 1/8ò stereo jack and the power and data connection is via the 30-pin apple connector.

I am working on getting this to work on Windows by looking at the commands sent to the unit across the data bus by the Apple HD App. I might save this for a few of the cold winter nights in a few months here in Michigan. If I can display and capture metadata it should be a cool setup on the tablet.

Upcoming projects include cleanup at our WRDT Monroe location, and a block party here at our offices with bands in August. We also have the Red Cross blood drive live and on location next month.

News From The South
By
Stephen Poole, CBRE, AMD
Chief Engineer, CBC–Alabama

As I write this, the Supreme Court Of The United States ï ñSCOTUSò if you're kewl ï has decided that men can marry men and women can marry women. (We're still awaiting a decision on livestock.) It is now the law of the land.

For just about any type of engineer, this is confusing. We have male and female connectors; we have male and female fasteners. When we join them, we say that they are ñmarried.ò One suspects that those who are less bright might try to join male to male, thus providing entertainment for the rest of us, but it's not going to happen naturally.

More to the point, when this person tries it, are you going to look at that awkward, cobbled-together connection and ñhateò it? Or even ñhateò them? Of course not. As a Christian, you'll feel sorry for them and try to explain why you can't *naturally* (there's that word again) join two male or two female connectors.

How did we get here? I can let others speak to the media aspect ï how a concerted and orchestrated effort for the past 20-30 years has slowly stifled all dissent. Spiritually speaking, though, certain passages of Scripture come to mind. Romans 1 perhaps the most appropriate, starting with verse 18 and continuing to the end of the chapter.

I encourage you to read it again. Gay marriage opponents usually quote verses 26-27, but the entire passage describes the *gradual progression* into apostasy of people who *began as* believers. Whether it is multi-generational, or happens in just a few years to a single group of people, is irrelevant.

The progression invariably *starts* with ñclaiming to be wise, they become foolsò (verse 22), continues through, ñthey decide no longer to even retain the knowledge of Godò (verse 28) ... and

finishes with, ñthey not only do these things, but approve of those who do them.ò One translation renders that last as, ñthey encourage (or even, ócheer onô) those who do these things.ò

Thatôs exactly where weôre at right now and it didnôt happen overnight. Weôre not going to fix it overnight, either. Itôs going to take prayer, repentance, self-examination and more prayer. Pray for this nation!

Lotsa Blowed-Up AC Stuff

Hot, hot and more hot. Just like most of the country, the past 30 days have been a scorcher here. Weôve had AC units failing right and left, including one of the five-ton units at each of our two big FMs. The one at WDJC needed a compressor; WYDE-FM needed a whole ónuther unit.

You see a 5-ton AC. I see my new fileservers.

Budgeting for these things is a judgment call, of course. In the case of WYDE-FM, we had already replaced the compressors and were hoping to get a few more years out of them. Alas, it wasnôt to be. Eubank (the original manufacturer) no longer makes the parts that we need, so... a new AC unit it is. We had budgeted for some new fileservers; that will wait until 2016, to make room for this unanticipated (read: unwanted) expenditure.

Mail System

A couple of weeks ago, a few of our users began getting strange-looking warnings about ñDiffie Hellmanò when they tried to log in to our mail server. This is related to the so-called Logjam vulnerability; you can Google that for more information.

Basically, older servers which use lower-bit-rate encryption could possibly be ñcrackedò because of that vulnerability. The estimates that Iôve seen are that it would take 100,000 computer hours to do it ï for *each server*, mind you ï but still, it could be done.

Now: I love Free and Open Source software (ñF/OSS,ò if youôre kewl). You know that. Todd, Jack and I are all certified Linux and F/OSS addicts. Our mail server is F/OSS. But if there is a drawback to F/OSS software, itôs this: the stuff is written by neck-bearded, Cheetos-stained geeks who just donôt think like the rest of us.

This is a perfect case in point. Again, this particular vulnerability requires at least 100,000 computer hours of cracking time. I suppose there might be a hacker out there who is absolutely obsessed with reading our email, but frankly, I think theyôll go after better targets.

The OpenSSL folks, who make the encryption software used by most F/OSS stuff, want you to be *safe.* Ergo, starting with OpenSSL version 1.0.2, if you try to connect to a site with this lower encryption rate, *OpenSSL will simply refuse to make the connection.* You canôt have it.

Weôre currently using the 32-bit version of Zimbra 7, which is written in Java, which itself is *hard-coded to 764 bits of Diffie Hellman.* OpenSSL wants at least 1024 bits now. Theyôll eventually require 2048, then 4096, then the blood of a young goat... OK, Iôm exaggerating, but you get the idea.

So why havenôt I upgraded to 64 bits? We had planned to do just that when we upgraded the mail server hardware. Iôve been planning it in my spare time for months now. But this makes the upgrade far more important and Iôve been working on it in the evenings and on weekends. If we donôt address this, more and more of our users will begin getting that error.

The quick solution is to use whatôs called a *proxy* in front of Zimbra. The proxy will make the secure connection with lots of Diffie Bits, then pass the connection on to our Zimbra server. Sounds good, right? Ah, if only it were that easy. You see, Zimbra no longer supports our 32-bit server, and making it work would require a bunch of extra effort.

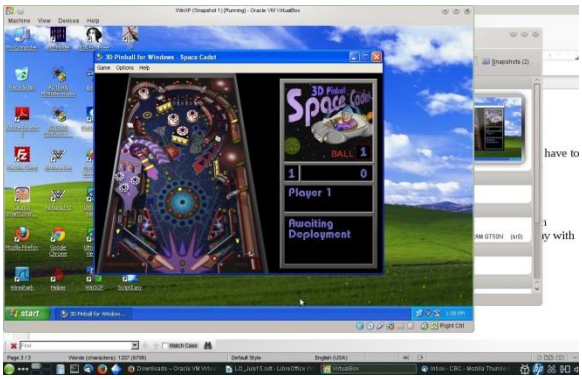
Ergo, well in advance of the original schedule, we had to upgrade. Zimbra released a new, 64-bit version 8 last year, but I held off for another reason: as a general rule, I donôt like the ñX.0ò version of anything. Iôll wait for ñX.1ò or ñX.2.ò Sure enough, the first releases of the new software had some show-stopping bugs ï including minor things like, ñHey, all my mail done got eated,ò stuff like that. Hmm.

At any rate, thus far, we have installed a new 64-bit operating system on a temporary server; installed Zimbra 8 64-bit on that temp server; enabled the NGINX proxy (ñengine-Xò ï get it?); and have transferred our 100 Gigabyte mail store containing over 500,000 messages. Weôve been testing it thoroughly. Once we bring the temp server ñlive,ò I can go back to the original ñrealò mail server, which is better hardware, and upgrade it to 64 bits.

This will take care of the Diffie Hellman thingie. We will be happy. Life will be good... at least, until the next time the Neck Beards(tm) decide that something is a menace to society. You have to love it.

Virtualization

Another project for my copious spare time is to virtualize more of our servers. Youôve probably heard of this; you can download a VM manager like VirtualBox (www.virtualbox.org/wiki/Downloads) for free and play with it. It will allow you to run one operating system atop another, as shown in figure 2.



Running Windows XP atop SuSE Linux.

This not only lets me enjoy my ancient Windows Pinball game within Linux, there are bunch of advantages to virtualization. Many folks think that virtualization is primarily for running several operating systems on a single computer, saving money on hardware. It can certainly be used for that, but thatôs not all itôs good for. In fact, we commonly use it here just to run a single ñguestò (i.e., a second) operating system atop the primary, or ñhost,ò OS.

Why would you want to do that? There are many reasons. All of us have run across this one: your existing computer, running an older version of Windows, finally bites the dust. You order a new machine and try to move that old software (which wonôt run on a newer version of Windows) onto it ... but the new hardware doesnôt include drivers for that older version of Windows.

A virtual machine will present virtual (or, really, ñpretendò) hardware to your operating system. One common setup that we use is Red Hat/CentOS for the host OS. We can easily tune it to work with most any hardware. We then install VirtualBox and tell it to present a virtual Intel network card to the guest. Itôs happy, weôre happy, and everything works.

The next reason for using virtualization is backup and recovery. With a virtual ñbox,ò you save the entire OS and all data, as a ñsnapshot.ò If the OS becomes corrupted ï whether from a Cryptolocker virus or something else ï you simply kill the box, switch to the known-good snapshot, and continue the mission. While it takes some time to make the snapshot, unlike most ñrestoreò operations, switching to the snapshot is lightning fast and youôre back up in no time.

Now: what about speed? Isnôt virtualization much slower than running ñon the hardware?ò

Emphatically not. NO. An operating system is simply an abstraction layer between your apps and the hardware. There are software libraries that know how to ñtalkò to your monitor, printer, keyboard and mouse. Your applications ñcallò those libraries to do all of that stuff. Virtualization simply adds a thin, fast translation layer so that, say, Windows calls in the guest box are translated to equivalent Linux calls on the host (or vice-versa).

When multitasking, your OS switches between many tasks, each getting a bit of processor time, so smoothly that you normally wonôt even notice. The OS has to save the state of the current process, load the previously-saved state of the next one to be executed, then continue. Modern processors (especially multicores) are heavily optimized for this.

The kicker is that multitasking nowadays, as often as not, *involves switching VMs*, anyway. So, even if youôre just running Windows, youôre still using virtual machines. Windows creates a new VM for each application. Thatôs why you can close a faulting app without having to restart the entire machine: itôs ñsandboxedò inside of a virtual machine.

So, given that youôre already switching VMs, why not install some system-level software that lets you switch some applications to an entirely different OS? When VMs are created, theyôre told which OS to ñcallò for hardware access. If a program in the guest wants to print, itôs going to ask the OS, anyway, which then takes care of translating and sending your work to the printer.

Itôs quite easy for a VM manager, instead of

sending that call to the host OS, to quickly translate and send the request to the guestôs OS, which is loaded ñinsideò the VM ñbox.ò There will be a small performance penalty if thereôs a lot of translation ï for example, if youôre sending video information that just wonôt fit on the hostôs screen without a lot of work ï but most of the time, your guest will run virtually (heh) as fast as the host.

At any rate, weôre looking at that, hard, as a way to increase reliability and to stay on the air. Just another tool for the toolbox.

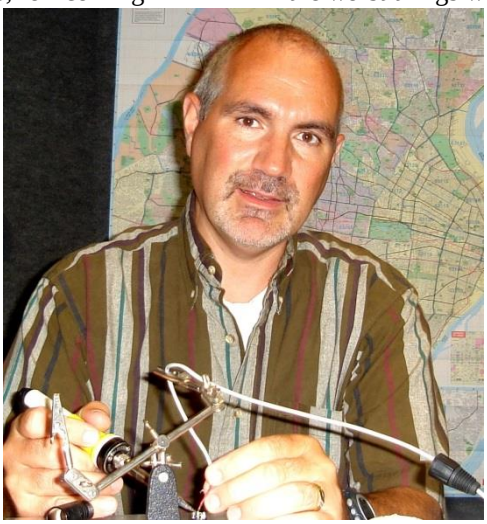
Until next time, keep praying for this nation! (Seriously!)

The Chicago Chronicles

By
Rick Sewell, CSRE, CBNT, AMD
Engineering Manager, CBC–Chicago

A Day in the Life of an Engineer

As you all know, the job description of a radio engineer really never stops. So, Iôm coming back from lunch to write my article and as I enter the parking lot, I see the automatic back gate is stuck open. So great, I have to deal with that before doing anything else. However, before I could even get to that, a mother duck and eight of her ducklings had taken advantage of the gate being open and wandered into the parking lot, taking up residence under the program directorôs car.



We couldnôt leave them in the parking lot because they had no food supply, and I needed to get that gate closed. So before I could fix the gate, I had to get a broom and chase them out. Those of you who have tried some of this are already laughing because it didnôt take long to have ducklings scattered all over the parking lot. Eventually, the rest of the engineering crew was involved along with one of our production staff members.

We had to eventually herd or grab them to get them into a box, because even if we got them out of the fence, they kept coming back under to try and find their mama. She was not even in the fence any longer because she was too busy dive bombing us as we tried to rescue her babies. For some reason, a couple of other species of birds took their turn diving after us as well.

The final outcome was that all eight ducklings were reunited with mama outside the fence. Hopefully, thatôs where they will stay.

Intermittent Issues

Besides the occasional duck chase, one of the worst things we engineers can get is those intermittent dropouts on your audio chain. These can really be just like the proverbial, ñwild goose chase.ò They happen quickly and never when youôre standing in front of the offending piece of equipment.

Programming is looking at you cross-eyed because they expect you to have an immediate answer. You can try and explain that there are twenty different places that this could be occurring across the audio chain, and unless you have something stick out like a sore thumb, it can be a nightmare to diagnose the problem that is there for only half a second.

We had one of these pop up in late June. We kept getting notifications from the WYRB transmitter site that the automatic switching equipment was getting silence alarms and switching to our backup Internet feed. That was the only clue we had that something was happening because there were no alarms on the T1 lines or even on the codecs carrying the audio. It was occurring about four or five times a day, and in each case, I had to log into the remote control to put it back to the main audio.

The Broadcast Tools switcher we use for this automatic switching is set to switch to the backup after 20 seconds of silence. Since we have a ten-second silence alarm on the Worldcast Horizon Nexgen codec, we should have seen alarms there. But there was no silence alarms, audio mismatches or IP disconnection errors.

One of the best tools for diagnosing these

kinds of problems is a tracker recording station audio. In this case, I went to the tracker and listened to the times where we had the alarms. In each case there were no 20 seconds of silence. I could hear the half-second loss of audio when the switching occurred. Finally I remembered that the Broadcast Tools switcher not only switched upon a set amount of silence, but would immediately switch when it detected bad AES audio.

This had to be what was occurring. So I could at least narrow down my search to the Worldcast Horizon Nexgen, the Broadcast Tools switcher and the wiring in between. One of our engineers checked the wiring and all looked good; nothing had come loose.

Later that night, after the switch occurred again, I decided to do a remote reboot of the Horizon through its software. Well, as I soon as it came back online, the audio wouldnôt come back up and it had a licensing error. This told me that the Horizon was probably my culprit.

The next day, I went to the site to take it back to factory defaults and reconfigure it to try and get it back going again. That worked. However, the licensing involved the Surestream codec that uses two different network paths to ensure your audio is working as long as one path is functioning.

When I went to enable the second stream, I got the error message again, but at least the audio kept working. Shortly after that, it once again did the switching upon bad AES audio, and then again a few hours later.

I finally decided to turn off the second stream and we havenôt had an issue with it since. Of course I donôt have the protection of the second stream in place right now, but I am sure that the support team at Worldcast will have this resolved shortly and will be back to business as usual.

Valley Notes

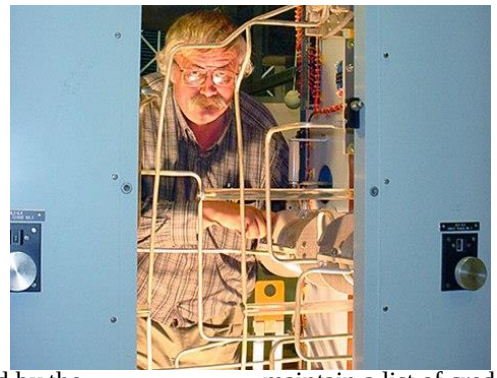
By
Steve Minshall
Chief Engineer, KCBC

Here in California, we are experiencing another year of drought and water is getting to be in short supply. So far it has little impact in our daily lives other than our lawns turning brown. With temperatures consistently over 100°, I donôt really want to mow the lawn anyway. As much as I sometimes long for the good old days, the truth is that in my early days of broadcasting we cooled the transmitter sites with blowers. The idea was to stuff as much dirt and as many bugs through the transmitter building as possible to keep the equipment just cool enough that the paint did not burn off. Now when I walk in from 105° temperatures to a nice clean and cool transmitter room, I must declare that these are indeed the good old days!

At KCBC we have had an ongoing problem with crosstalk on our good old POTS lines. The crosstalk was only on our lines and not with neighbors or anyone else. The telephone company found the problem being an underground splice that had gone bad. The lines are quiet now, but we are soon to switch to new VOIP technology to bring in the telephone lines in using modern digital techniques and leave those analog lines behind. We are just getting started on that journey, but hopefully by next month analog lines will be a thing of the past for us here.

The Portland Report
By
John White, CBRE
Chief Engineer, CBC–Portland

Just after press time for last monthôs column we learned Bill Johnstone of the Oregon Association of Broadcasters announced Governor Brown has signed the First Informer legislation. This legislation provides authorization for credentials that will assist engineers to travel during an emergency in order to repair, maintain, and restore broadcast facilities when travel is restricted. The operation of local broadcasters provides a vital public information link during an emergency that is unique and vital during an emergency.



This legislation was promoted by the Oregon Association of Broadcasters with the assistance of local broadcasters statewide and engineers from Society of Broadcast Engineers (SBE) chapters 76 and 124. A great deal of thanks goes out to Bill Johnstone and the OAB for spearheading this effort.

Michael Everhart who testified at committee hearings as an engineer with a background with a volunteer fire department commented that, ñThis was my first direct involvement in the legislative process (aside from writing strongly-worded letters...), and what an education it was.ò

Don McKay who also attended the hearings commented that he had the opportunity to speak to several Emergency Services representatives in the audience during the hearings. That provided an opportunity to understand emergency services concerns and address those concerns.

Early on in the process we were working with sample legislation that has some major defects. The definition of a ñbroadcasterò was strange at best. Phil Kane, who is an engineer and attorney, provided proper wording which corrected several defects in the initial sample legislation.

We are in the home stretch as the OAB, broadcasters and local SBE engineers develop the structure that is enabled by this new legislation. As they say, the last 10 percent of the project takes 90 percent of the work. And here, members of the local SBE chapters will need to step up if we want this credential program to work.

One area where the SBE excels is training, but training is a lot more than engineers taking classes. Someone has to keep track of training opportunities, maintain a list of credentialed individuals and expiration dates, and keep the data available for Oregon Emergency Management. The bottom line, however, is the credentials represent a level of trust that we as engineers must uphold. As Michael Everhart noted, ñThis credentialing is intended to get us engineers into areas that are being operated under an Incident Command System, in situations where a disaster has been declared é The Incident Commander has duties and responsibilities assigned to them é among those duties is to ensure the safety of the responders working the incident, and the public in the affected area.ò

As engineers, we will be partners with Oregon Emergency Management and local Emergency Managers. Our goal is to develop credential requirements, which are reasonable, achievable, and credible.

I still remember something I first heard as a potential volunteer for the Red Cross. After a somewhat lengthy familiarization class, the instructor summarized as follows: ñDuring a disaster, the Red Cross needs volunteers that will be part of the solution and not part of the problem.ò

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

Flooding

Normally by this time each year I have been able to get our tractor to all three of our sites we maintain and get the mowing done. This year, however, God had other plans.

Some of you may have heard about our record rainfall for May. Any time we get several days of rain I tend to check the camera at the KLVZ daytime site in Brighton. This site is in a flood plain and is up several feet on piers to protect it from flood waters. I noticed we had a little bit of water in the front of the property sometime in May but nothing major. After it dried up I went out and found the small irrigation ditch at the front of the property was still full of water, something I had never seen. The property itself looked fine.

A couple weeks later in June, the rains started again. I noticed more and more water standing on the property. Once again, I waited until the water went away before heading out and check on things. This time around, though, I found the road to our site was gone. A bridge had been washed out, separating us from the site. What we saw was something we hadnôt seen before. The South Platte River, which flows just west of the KLVZ property, had split. It went around the berm at the south end our property, forming a new channel to the east and washing out the bridge between us and the quarry next door. It is quite the sight. See the two photos at the end of this column.

We have our doubts the river will go back to being in just one channel as it is still roaring equally in both channels. God has really been looking out for us though, protecting our site from further damage. So while we may be inconvenienced for a while until the bridge gets fixed, it pales in comparison to the thought of having no site to get to!

Tower Work

We had a tower crew come out to paint the towers at the KLVZ site after the rains. They worked fast and did a great job. The last time we had towers painted, they didnôt care where the paint went, so it ended up everywhere. This crew was careful and I think I only saw one place where it accidentally got on the side of an ATU. It was a drip, not much. I am impressed.

We spent a day out at the site mowing and doing other work while the towers were being painted. While in the building we had a power failure. When it came back on, many of the breakers tripped. We reset everything and thought things were good. That night, however, I noticed the tower 3 lights were out. I logged into the security camera and found even the security light on the tower was out. I know the crew left their protection covers over the lights, so I assumed they turned the lights off so as not to cause a fire. I called in for a NOTAM and decided to check it again the next night.

They were still off the following night, after all the coverings had been removed. So we went out and found it was an underground electrical issue. Sometime after we left that first day, something happened in the old underground conduit between towers 2 and 3. We still arenôt exactly sure what, though. We will have an electrician come out to see if they can find the issue. If not, we will trench a new path from the building to the tower (thankfully they are close) and run a new line.

Nautel

Nautel was kind enough to send one of their local tech support guys and an engineer from Halifax to the KLTT transmitter site for several days. You may recall seeing in past issues where I mentioned the power modules failing like clockwork in the NX50 transmitter. The transmitter was good for a year after installation, but then we began experiencing power module failures about once a month since.

Weôve done all sorts of things Nautel has recommended. They sent us brand new modules for the transmitter and new drive cables. This did not fix

the issue. We finally began troubleshooting and repairing the modules ourselves ï the issue was always failed modulators -- and sending back the modulators that failed for testing.

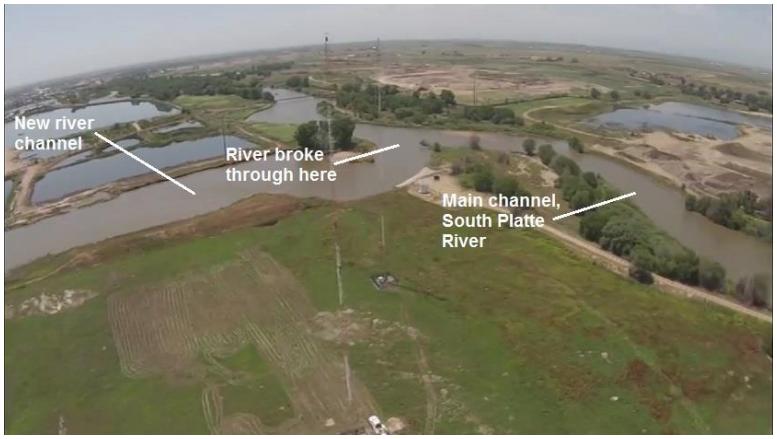
Finally, in mid-June, Joey Kloss came out with an engineer, Javhad, and began doing all sorts of work and troubleshooting on the transmitter. After a week they found no real issues other than a few moths in the transmitter. June is miller moth season and moths are everywhere right now. It will clear out soon. This still didnôt explain why the other 11 months of the year the transmitter had issues with the power modules. They did replace the PDM and drive cables with new shielded cables and did some other updates on the transmitter. They also inspected the combiner to make sure it was not having issues or getting hot.

We do appreciate them coming out and trying to figure out the issues. They made lots of changes and hopefully these changes will fix our issues.

Coming Up

Hopefully July will bring us time to catch up on mowing at the sites. We need things to get dried out so the weeds will quit growing. We will also see what the electrician finds at the KLVZ site and get that done soon. We should be getting a new phone system at the studios and offices, too. I am looking forward to moving into the VoIP world.

That about covers it for this edition so until next timeé thatôs all folks!!!



KBRT • Costa Mesa - Los Angeles, CA
740 kHz, 50 kW-D/0.2 kW-N, DA-1
KNSN • San Diego, CA
1240 kHz, 550W-U
KCBC • Manteca - San Francisco, CA
770 kHz, 50 kW-D/4.3 kW-N, DA-2
KKPZ • Portland, OR
1330 kHz, 5 kW-U, DA-1
KLZ • Denver, CO
560 kHz, 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, 50 kW-D/1.4 kW-N, DA-2
KLVZ • Denver, CO
810 kHz, 2.2 kW-D/430 W-N, DA-2
WDCX • Rochester, NY
990 kHz, 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, 5 kW-U, DA-1
WDJC-FM • Birmingham, AL
93.7 MHz, 100 kW/307m AAT
WEXL • Royal Oak - Detroit, MI
1340 kHz, 1 kW-U, DA-D
WRDT • Monroe - Detroit, MI
560 kHz, 500 W-D/14 W-N, DA-D
WMUZ • Detroit, MI
103.5 MHz, 50 kW/150m AAT
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, 5 kW-D/41W-N, ND
WYDE-FM • Cullman - Birmingham, AL
101.1 MHz, 100 kW/410m AAT
WXJC • Birmingham, AL
850 kHz, 50 kW-D/1 kW-N, DA-2
WXJC-FM • Cordova-Birmingham, AL
92.5 MHz, 2.2 kW/167m AAT

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Corporate Engineering

2821 S. Parker Road • Suite 1205

Aurora, CO 80014