The Local Oscillator

The Newsletter of Crawford Broadcasting Company Corporate Engineering

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A Summer of Projects

It has indeed been a summer of projects in Crawfordôs technical operations. I canôt recall a time in recent years when I had so many plates spinning on so many poles in so many different locations. Some of these projects have gone off like clockwork, but others have proven to be more challenging.

In Detroit, the WheatNet-IP project went fairly smoothly. We discovered a few things along the way that we had not accounted or planned for, but we quickly dealt with those issues and got the project wrapped up more or less on schedule.

One of the things that caught us unaware was failing motherboards in some of the HP machines that we were upgrading and reusing as Nexgen workstations in the new system. One failed outright, and that prompted us to look at the others more closely. A couple of the others had large electrolytic capacitors that had swollen and/or leaked. The rack room in Detroit is adjacent to the WMUZ transmitter room and it shares one A/C unit with the transmitter area. I suspect that the motherboard damage occurred during one or more of the times when we had an A/C failure and temperatures in that room rose into the high 80s or low 90s. The good news is that we caught those impending motherboard failures at a good time and were able to deal with them before they took a station off the air.

Another item was actually an oversight on my part. The Cisco SG300 switches we are using at the core of the WheatNet-IP project do not have integral IGMP queriers. I didnôt realize that. In Denver, we also have some Cisco 2960CG 8-port switches on the network, and those do have queriers. The SG300s in Denver found the queriers in the 2960s and were using them. When we started deploying the WheatNet-IP system in Detroit, we were getting significant latency in switch actions and the like, and it became clear that there was no active querier on the network. We fixed that by purchasing one 2960CG-8 and putting it on the network. The SG300s found it, mapped the querier and all was well.

With those things in mind, we launched into the Chicago WheatNet-IP project. I thought we were well prepared for the project there, but soon it bogged down with all kinds of issues.

First, we started having trouble with control surfaces and blades in the production rooms disappearing from the network. We initially believed that the problem was caused by damaged CAT6 cables ï the pulls through the existing conduits were really hard and it was possible, probably even, that those cables were not in good shape. Running new plenum CAT6 cables outside the conduit restored the surfaces and blades, and we thought all was well, but there continued to be problems with disconnects.

Weôre still working through this issue. All the disconnects are occurring on one switch; the blades on the other switch are staying connected and working fine. At press time we are trying various things, including replacing the suspect switch with our spare and doing a firmware upgrade on the switches. As in Detroit, we put a 2960CG-8 on the network and the SG300s found and mapped its querier.

Just getting in the rooms to do the work has been our biggest challenge in Chicago. That is a very busy 24-hour operation. There is very little down time to be had, and there has been reluctance on the part of the busy producers and programming people there to give up some studio time to get the upgrade done. Working around the schedules of those folks to the degree possible, the work mostly got done.

We still have some audio servers and control rooms to finish up, but those are on hold until we resolve the network issues with the production rooms.

We have a stack of shiny new IP blades, switches and Dell Precision T1700 workstations in Birmingham, ready to be installed in the WheatNet-IP project there. That project has not yet gotten underway, however, because our engineering crew there is up to its collective neck in a vexing Nexgen issue.

The WDJC-FM audio server will occasionally lock up, taking that station down until a hard reboot can be done. They have swapped out the PC, replaced the network cable and even swapped switch ports with another machine that is working fine, all to no avail. RCS support has spent countless hours remotely working on the problem, thinking on a couple of occasions that they had found and fixed it, but no ï the problem remains. Out of altitude, airspeed and ideas, we have arranged for an RCS field engineer to come to Birmingham and deal with the issue.

The KBRT WheatNet-IP equipment has been ordered and is on track for September delivery. Amanda and I plan to head out there for a few days to install it. Weôre doing two production rooms, one ASERV and one on-air workstation, so itôs not such a big project. Scheduling for that is entirely dependent on where we are with all the rest of the WheatNet projects in the company.

Companywide, weôve been making the transition from Liquid Compass to Triton Digital for our streaming services, working our way through the markets as time and resources permit. Weôre getting close to being done now, with just one market remaining ï Chicago.

The reason we have held off on Chicago is that a new four-station WheatNet-IP equipped streaming encoder is part of the big project there, and we donôt want to convert the old streaming encoder to Triton and then later have to do the new encoder. We did that in Birmingham, but it was a matter of timing there. We knew Birmingham was months away from being ready with its new WheatNet encoder hardware and we did not want to wait until September or later to make the move. I might have done the same thing in Chicago had I known that the WheatNet-IP project there would drag out for so long.

The Triton ñStation Managerò streaming encoder/user interface is fairly easy to implement and use. As with Liquid Compass in the past, Triton VNCs in and does the installation remotely. Our involvement is mostly in making changes to the Nexgen metadata export. Triton uses an XML format and fewer fields than LC used with Radius Live. Of course the audio server for each station has to be restarted after changes are made. This involves restarting only Nexgen (coyote.exe) on the audio server machines, not a full reboot of the hardware, and it generally does not interrupt audio.

There is a web-based user interface where we can customize the appearance and operation of individual players, so each station can have what looks like a custom player. There is another web-based user interface for Ando Media, where metrics and music reporting are accessed.

We are still working our way through some issues with the music reporting but should have everything working shortly.

And in Denver, the KLVZ daytime site is no longer an island. Amanda will have more on that later in these pages, but a dam was constructed to plug the breach in the riverbank that allowed the South Platte River to flow into a quarry slough and carve a new channel south and east of our property, taking over

With the breach between the riverbank and the slough now dammed off, just a trickle remains. A few days before this photo was taken it was running hard and fast with 6-8 feet of water from the South Platte River. Our perimeter fence in this photo used to be ten feet higher and on dry ground.

2,000 cubic yards of our property along with it.

Latent damage from the flood that preceded that breach caused an underground short in the electrical feed to tower #3. Last month we had an electrical contractor come out and trench in a new conduit to get that tower lit once again.

All of the above is just the big stuff. While all that is going on, weôve been dealing with the usual summer stuff ï failed air conditioners, storm damage here and there, failed Ethernet radios, problems with microwave and conventional STL links, codec

lockups, telco issues, transmitter module failures, remotes, site maintenance chores and more.

It has been and remains a very busy summer, and itôs not over yet.

Hanging Steady

The KBRT directional antenna parameters continue to hold steady since contract engineer Fred Folmer replaced the mica cap in the tower 2 ATU network input leg with a fixed vacuum capacitor. Thatôs a huge relief!

We did have one rather scary afternoon at the site in early July. The station dropped to something like 200 watts and would not go any higher in power. As soon as operations manager Todd Stickler called me with that report, I jumped online and looked at both the remote control system and the transmitter itself. The R/C showed the low power but all tower phases and ratios in the green. The transmitter, however, showed multiple ñFast VSWR Shutbackò alarms, and the power was folded way, way back.

I tried a transmitter reset to no avail. As soon as I tried bringing the power back up, the VSWR shutbacks folded the power back. Next, I put the auxiliary transmitter into the antenna and brought it up. As soon as the power passed a few hundred watts, it, too, went into VSWR shutback. Clearly something was very, very wrong at the site. And yet, at the very low power, the antenna parameters were normal.

I switched the main transmitter back into the antenna and brought it up at 200 watts. All looked normal, so I increased power to 1 kW. Everything looked okay, so I bumped it to 2 kW. Then 5 kW. Then 10, 25 and finally 50 kW. Amazingly, all was once again fine.

Fred paid a visit to the site right after that, checking every ATU, every tower base, every piece of equipment at the site. All looked pristine.

While all the VSWR problems were taking place there was a pretty good thunderstorm happening down in Orange County, between our site and the studio. As best we can tell, we had about a 15-minute period of almost continuous cloud-to-cloud lightning right over the site. I donôt think our towers were struck, but the cloud-to-cloud discharges that were probably less than 1,000 feet away (remember, the tower tops are right at 3,000 feet on that mountaintop) likely induced all kinds of energy into the towers in the array, and the ball/horn gaps were probably firing like a bunch of spark plugs. As soon as the storm moved away, the problem cleared up.

That was the first time weôve ever experienced anything like that at the site, so those were a few scary moments.

The 11 GHz microwave link between studio and transmitter has been holding steady since Todd Stickler installed a plastic owl near the front of the dish antenna on the studio roof. We had been getting link dropouts that lasted from 2 to 30 seconds just about every night at 11:30 PM ± which in turn produced dropouts in the audio. Since the owl was installed, weôve had virtually no dropouts, just a few short rain-fades.

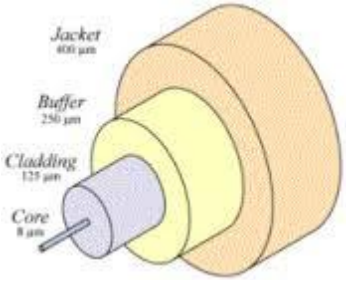
This $17 plastic owl from Home Depot cured the nightly microwave dropouts at KBRT.

One preemptive measure that I took to combat microwave dropouts was to replace the Worldcast Horizon Nexgen codec pair with a set of Tieline Bridge-IT XTRA codecs. The Tieline codecs offer forward error correction and buffering while the Horizons do not. Should we have short link dropouts again, the Tielines should ride through them without issue.

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

Hello to all from Western New York! Last month I wrote about the differences in Internet services between cable and DSL service. This month, I would like to take a look at fiber-optic delivery of Internet, how it works, and the advantages over cable and DSL.

To begin, what is fiber-optic cable? A standard fiber-optic cable consists of 100 or more glass or plastic strands about 1/10th the thickness of a human hair. Each óstrandô has the capability of handling 10 million telephone calls. Earlier variations of fiber-optic cable used glass as the óconductorô with a mirrored outer cover to reflect back the beams of light as it traveled to its destination. The inner conductor is referred to as the ñcoreò and the outer covering is another layer of glass or plastic, known as the ñcladdingò. The function of the cladding is to keep the light signals inside the core, and is accomplished by using a different type of glass than is used in the core.



The one significant advantage fiber-optic has over conventional methods of data delivery is the fact that fiber-optic cable is made of glass or plastic, and electromagnetic fields have no effect on the light signal. Interference and cable capacitance (loss) are the two main degrading factors in standard wire communications.

Fiber-optic cables carry light signals in what are commonly referred to as ómodesô. There are different ómodesô in which a signal can be sent over fiber. One mode is to travel straight down the middle of the fiber; another ómodeô is to bounce the light signals down the fiber at a shallow angle. Other modes constitute sending the light down the cable at other angels- more or less steep.

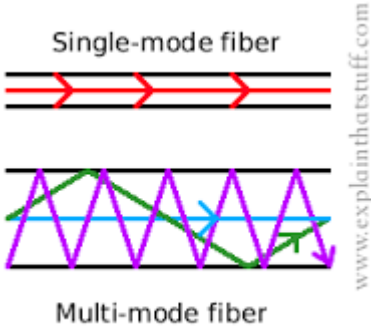
The basic form of fiber-optic delivery is called ósingle-modeô. A single mode cable can carry a signal almost 60 miles without the use of an optic amplifier or repeater. Single mode is the most commonly used method of fiber-based communications. For longer applications, a repeater or optic amplifier can be inserted into the path of the light signal and it will greatly increase or enhance the optical signal. As there is no degradation in the optic signal, the optic network can travel an infinite number of miles without any loss in signal.

Multi-mode fiber-optic cable is similar to a single-mode cable; the main difference is each strand is approximately 10 times larger than a single-mode core. The advantage is that the light beam can travel through the core by following different paths, or in other words, multiple different (single) modes. Multi-mode is the most common way of linking computer networks together.

I must note here that these two modes are somewhat similar in their applications but cannot be combined together, they are not compatible. You cannot mix multimode and single mode fiber between two endpoints.

Multi-mode can handle much more data than that of single-mode due largely to the size of the core, which is larger than that in single-mode. The larger the core, the greater number of light reflections created as the light passes through the core increases, creating the ability for more data to pass through at any given time. Because of the high dispersion and attenuation rate with multi-mode fiber, the quality of the signal is reduced over long distances. Typically, multi-mode is used for short distance applications for data/audio/video in LANs, single-mode is used for

longer distances and higher bandwidth as those required by the telco industry and cable companies.



As far as comparison of fiber-optic Internet service to that of conventional 2-wire DSL service and cable Internet services, fiber-optic wins that battle hands down. Better reliability and fast connection and data delivery speeds (some up to 10 times faster) blow DSL out of the water, and limitations of bandwidth (speed) on cable Internet due to shared bandwidth cannot come close to speeds encountered with optical delivery.

But, as in all things, better comes at a price. A typical DSL service comes in at roughly $70 dollars per month, cable Internet (business class) is $119 dollars per month, and fiber-optic comes in at $140 per month.

Deciding on which service is better for you, consists mainly on the amount of usage you plan on. For everyday browsing of the Internet and occasional downloading of small to medium size files, DSL would be your best option. If it is speed you are looking for and enough bandwidth to upload/download large files without slowing your computer down to a crawl, cable Internet service can in most cases fit the bill. And by bundling services, such as adding phone and cable TV to your Internet subscription, you can sometimes save substantial dollars overall.

If you are looking for the absolute best Internet service available today, fiber-optic is the way to go. The one good item to point out is the fact that as typical broadband speeds (demands) become faster, fiber-optic can still support up to 1000 times faster than todayôs requirements. DSL and cable have distinct restrictions on how much data can be sent over a given link, characteristics of the copper limit the amount of bandwidth available.

Heat

This past month has been a scorcher here in the Northeast. As of this writing, we have not broken the 90 degree mark in Western New York since 2013. Forecasters are predicting temperatures to break the 90 degree mark by the end of July, and the hunt for cool air is on. So far, all of our transmitter sites are holding up to this extreme heat wave, but wear and tear on the units running almost constantly will soon wear down weaker components and cause a failure.

The most important thing in commercial A/C units is in keeping the condensing coils clean and free of debris. Here in the Northeast we have many cottonwood trees, that, in the early summer months emit a cottony-type seedling into the air. Sometimes you would almost swear it was snowing when the Cottonwood trees begin their early summer discharge. This cotton-like substance gets drawn in to the condensing coils by the fan, and when they touch the cold/wet coils, stick and harden to the outer coils, eventually blocking off all air travel through the condensing coils. When this happens, the A/C quickly shuts down and the head pressure on the compressor goes high, as it is trying to make the demand for cooler air. Once this happens, a pressure washer and specific chemical solution used to break up the cellulous composition of the cottonwood must be used.

Going along with the heat is also a larger demand for electricity, as more air conditioners are running to help keep everybody cool. This past month we have had two outages at the WDCX(AM) transmitter site. The first occurred about 11:30 at night, as the remote control called me just as I was ready to sack out for the night. A call into National Grid outage center revealed that the power was expected to be off until the morning hours, so I made the trip over to the transmitter to fire up the generator.

We do not have that generator on automatic start, as every time the power goes out, the main breaker trips on the Nautel transmitter. It is extremely sensitive to power differences between phases, and will trip off with as little as 8 volts difference between phases. I have talked with Nautel on numerous occasions about this, but no one has come up with a solution to this problem. I would hope that the newer Nautel transmitters would incorporate some type of phase-loss detectors in their circuitry to shut the RF off in the event of a power imbalance or brown-out. So each time we have a power outage or increase/decrease in phase balance, someone must go out to the transmitter site and recycle the main breaker.

Mowing duties are way behind this year due to the heat, which has caused numerous thunderstorms around the area. At one point, we had areas in the WDCZ transmitter field that had almost a

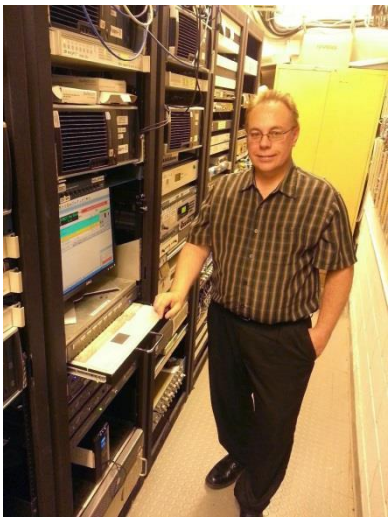
foot of standing water. Canôt mow a pond, so I am waiting for the heat to help dry up the field so it can be cut. One good thing has come out of this ï all this moisture runs the snakes off to higher ground. Fine by me. I HATE those crawly things. They are fine in the woods, but have no place amongst high power broadcast equipment.

That about wraps up another month here in the great northeast, and 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

Hello, from CBC-Detroit!

July has been hot and sticky, requiring HVAC service on some of our studio units.



There have been a number of projects underway this month. We are preparing for a block party for Revival Detroit, a revitalization project that Mr. Crawford and our company are participating in. The project involves buying, rebuilding or refurbishing homes in the neighborhood. The party will feature music, food, and fellowship. It's great to see the company make such a difference in our community.

Our recent live broadcast for the Red Cross blood drive was a success. It is an example of the power of live and local radio. We exceeded last monthôs donations, provided exposure for the station and had some great live entertainment.

I have been in the process of converting the WRDT air chain to digital. The existing Neilson encoders were analog, as well as the switching that was setup prior to the WheatNet-IP conversion. I was able to replace the Neilson encoders with AES units and go digital all the way to the STL. The utility mixer function in the blades has worked well for us.

I upgraded our Omnia.11 software to the newest version 1.6. The upgrade offers many new enhancements including ñSolar Plexusò a bass enhancement option, and what Omnia calls ñOne Louder,ò a process that will provide 1 dB of additional loudness audio according to them. I have been pleased with the upgrade.

Upgrades were also completed last month on our Tieline equipment. The Tieline Genie STL has worked well for the Bob Dutko show over the past year.

In one of my other *Local Oscillator* articles I had mentioned AM interference, and the concern for cleaning up the band by having less interference from poorly designed power supplies and electronics, and by designing better radios. There was an article that came across my desk recently regarding action taken by the ARRL against a major retailer over their practice of selling commercial lighting ballasts for consumer applications. According to the ARRL, their marketing does not provide the information necessary for the consumer to understand the difference. Click on this link to read the ARRLôs letter to the FCC: Home Depot Complaint

The lighting falls under Part18 of the FCC rules, and has much higher limits for equipment installed in a commercial application. Apparently these ballasts generate enough interference to affect an entire neighborhood across the HF spectrum, including the AM broadcast band. The conducted emissions limit for commercial ballasts is much higher than the consumer units as shown in the test chart that was contained in the ARRLôs submission to the FCC. See Figure 1 below.

It is great to see someone trying to do something about this. No matter what proposals are put forward for AM improvement, if interference is not addressed then we will have the same problems. The issue, in my opinion is a lack of maintaining and enforcing standards. Poorly designed switching power supplies, lighting (which includes noisy ballasts), bad switching supplies in new LED bulbs, and an aging electrical distribution system all contribute to these noise sources.

I feel that the FCC should do something for existing AM broadcasters, that have endured through this only to see theirs businesses impacted by poor enforcement of existing rules. Now that the ñTiger Teamò approach has been adopted by the FCC, and a hand full of Field offices will close, it seems like the opposite approach has been taken.

After adding all of these LPFM allocations, translators, and short spaced adjacent channels to the FM band, it is not long before the same thing happens on FM. Some of these smaller LPFM operations will not have the technical resources to maintain and ensure proper and legal operation, shifting the burden on commercial broadcasters to help police the band.

While there is much excitement regarding activation of FM chips on new AT&T phones and the addition of new approaches with the use of RDS2 by adding subcarriers to provide more data capacity, clear reception of these signals is critical to make any of this viable.

It has been a great year here at Crawford. I enjoy being able to have my hobby also be the work that I do every day. Until next month, I hope everyone enjoys the rest of the summer.

Appendix A

Part 18 Emissions limits for RF Lighting Devices (Including Electronic Fluorescent Light Ballasts)

Table 1A - Part 18 Conducted Emissions Limits (For RF Lighting Devices, such as CFLs and Electronic Fluorescent Light Ballasts)

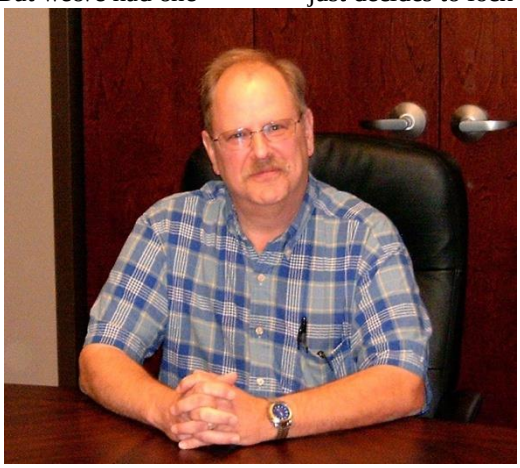
Frequency (MHz)	Maximum RF line voltage measured with a 50 uH/50 ohm LISN (uV)	Conducted limit (dBµV)
Consumer equipment:		
0.45 to 2.51	250	48
2.51 to 3.0	3,000	70
3.0 to 30	250	48
Non-consumer equipment:		
0.45 to 1.6	1,000	60
1.6 to 30	3,000	70

(d) If testing with a quasi-peak detector demonstrates that the equipment complies with the average

Figure 1 - Emissions chart from the ARRL filing

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

As usual, Iôll start with a note about the weather. We continue to be hot and humid here, much like the rest of the country. But weôve had one severe storm after another for the past few weeks. Weôve had several widespread power outages and other damage.



When I was a kid, we welcomed the storms; theyôd cool things off, making it easier to sleep at night. But these have been something else. I told Cris the other day that they looked like tropical storms ï trees swaying like mad and loose debris blowing all over the streets.

We have ñflickerò outages here at times. When these occur, the power actually flickers off and on, very rapidly, for several seconds. This plays absolute havoc with some UPS units (*cough* ... APC ... *cough*); they just canôt keep up. I donôt know whether itôs the load thatôs drawing repeated inrush current or the UPS itself, but itôs frustrating. A UPS that says itôs happy, that responds nicely when you press the ñTestò button, just decides to lock up and die when one of these ñflickerò events hits it.

I thank God that there hasnôt been that much damage. 1260 went off air during one of these storms, and when I arrived, the main breaker on the Nautel had tripped. I groaned; I just knew that weôd be replacing rectifiers. But no, when I reset the breaker, that ND-5 came right back up. Hereôs to you, Nautel!

All in all, Iôm proud of my assistants Todd and Jack, whoôve gone above the call of duty, running around the studios and from one transmitter site to the next during this horrible weather (in addition to other headaches, which I shall discuss in a moment). In fact, as I write this, we had a severe storm yesterday afternoon; the UPS units held that time, thank the Lord, though WDJC briefly

popped off when its generator spun up. We have another set of storms coming in this afternoon, followed (hopefully!) by a break over the weekend.

Mail Server: Done

As detailed last time, we had to upgrade our mail server. That has now been completed and weôre back on the original, new hardware. We were on a temporary server for a few days while we rebuilt the software from 32- to 64-bits. (Between storms. See above.)

There was a tense moment when I had to ñthrow the switchò (virtually speaking) and literally force the incoming mail stream from the old to the new. Whenever we do something like this, we *always* plan it carefully, thinking everything through, step by step. This process was complicated by the sheer size of our mail data now ï about 100 gigabytes. I would take a ñsnapshot,ò only to have a flood of new mail come in while I was doing the data copy.

Fortunately, with rsync (the standard ñcopy-between-anythingò program for Linux), you can do incremental backups. You let rsync do its thing while the server is running, then shut down the server and rsync again to get the latest changes. That way, youôre only down for a few minutes, instead of for hours. I waited until late one Saturday evening, did the final snapshot, transferred it to the new server and brought it ñlive.ò It worked! Thank you, Lord.

My only complaint is that the newest version of Zimbra is very plain looking. Almost ugly (see Figure 1). We can change the appearance, but I just havenôt had time to mess with it, what with all the other problems weôve had lately. It works, and thatôs what counts.

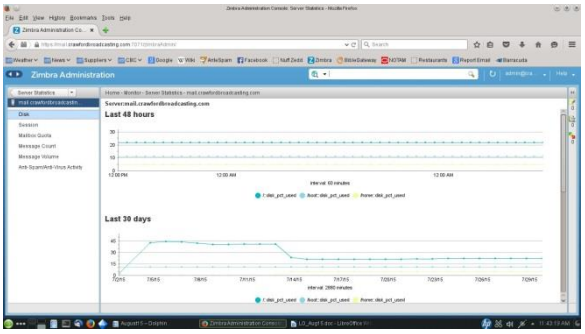


Figure 1 - The Admin interface for Zimbra 8. Ugly.

Nautel Woes

WDJCôs new GV40 began reporting low output power a couple of weeks ago. At first, it was an intermittent problem: the power would drop, then come back up. Finally, it dropped to about 70% and stayed there. The alarms that we were getting were, ñhigh reject powerò and ñmodule 7 PA failure.ò

The metering on this transmitter is amazing. Those of you who have one of the newest Nautels would doubtless agree with me: itôs fantastic. On the GV40, I can look at just about everything and anything, in detail. I can even compare the numbers from several modules side by side. In this case, sure enough, module 7 was reporting that PA1 and PA2 (there are four PAs total) werenôt drawing any current. As a result, the reject load was basically wasting all of that power to keep the output balanced. It was running hot.

I called Nautel support and they sent a replacement module for swap. Those of us whoôve had to repair the older Nautel AMPFETs and ND-series find these new transmitters to be a breeze here, too. You just pull the defective module and slip in the new one. Youôre only off air for about a minute (naturally, we switched to an aux for that) while the controller recalibrates the bias, but then youôre back in bidôness. Itôs a beautiful thing.

NexGen Headaches

Weôve received all of our equipment for the NexGen/WheatNet-IP project (see Figure 2), but havenôt been able to do much with it because of a terrible, aggravating intermittent problem with NexGen. What has been really frustrating is that it has only affected one station: WDJC. (Of course. Arguably our ñflagshipò and our bigger biller.)

Figure 2 - Getting ready to install our Wheatstone blades.

We had called RCS Support several times on this. I then sent out a call for suggestions to all of our engineers describing the problem: seemingly at random, for no good reason, WDJCôs audio server would hang. By ñhang,ò I refer to the audio server

software (i.e., NexGen; i.e.e., coyote.exe and cohorts). It would simply stop running. Windows would report the old, ñthis thing is not respondingò and weôd have to kill it and restart it. As soon as we did that, it would run again.

Our engineers are some of the sharpest in the business, but they were as stumped by this odd behavior as were we. We continued calling RCS Support; they spent quite some time with Todd working on this. Theyôve been in our system several times and the only thing they could find was database errors.

We have the dual-database arrangement: a primary and a secondary. For years now, weôve occasionally gotten the ñsecondary database is not in syncò warning, but RCS had told us that it appeared that the secondary was simply ñcatching upò with the primary during heavy loads.

Todd and I wracked our brains over this one. I remembered something from when we did our server upgrade a few years ago: one of the guys at RCS had told us, ñWhen any NexGen server starts, itôs going to latch onto the first database that it sees on the network.ò Apparently, each audio server and ECR broadcasts a request when coyote.exe starts: ñHey, whoôs got my database?ò It then connects to the first one that answers and begins updating its local database (and you can see this on the screen as it initializes: ñUpdating Local Database ...ò).

Now, RCS Support told us this at the time as a warning against leaving the old database server online while we switched to the new one. They said that we could get catastrophic, irreversible data corruption if that happened, because one audio server might be writing to one database, while a production workstation was writing to another. Chaos.

That made me think. We had already replaced WDJCôs audio server ï twice. The first time, we simply replaced the machine. The second time, we did a virtual swap: we took a known-good audio server, changed its ID and IP information to become WDJCôs audio server, then mapped WDJCôs former server in place for that other station. The only physical change we made was to move the audio and serial cables. The network wasnôt touched.

The problem followed WDJC onto the different machine, so we called RCS support again. This time, while they were working on it, something glitched and knocked all of our stations off air. We got that corrected, but needless to say, by now, we were on our last nerve, worn, pulling our hair out and very jumpy.

We also found that the network cards on the database servers kept trying to default to ñAuto,ò which, as most of you know, simply means that itôs going to connect at the slowest and most reliable speed (even though ñautoò should imply, at the *best* possible speed). We forced them back to 100MBits ... and WDJCôs audio server hung again a day later. WHIMPER.

We continued to cogitate. RCS Support never suggested this, but Todd and I began to wonder if maybe something was wrong with the way our audio servers were ñseeingò the databases. We decided to replace the cables on the databases. Then something very interesting happened: when I unplugged the cable for the *secondary* (not the primary) database, WDJCôs control room screen went blank. As soon as I plugged in the new cable, it came back up. HMMM.

With the new cables, with the audio servers and database servers on the same switch, with short, new cables, thus far, we havenôt had the problem again. To be safe, however, we have scheduled a visit from a NexGen technician for August 12. Iôll definitely let everyone know how it turns out.

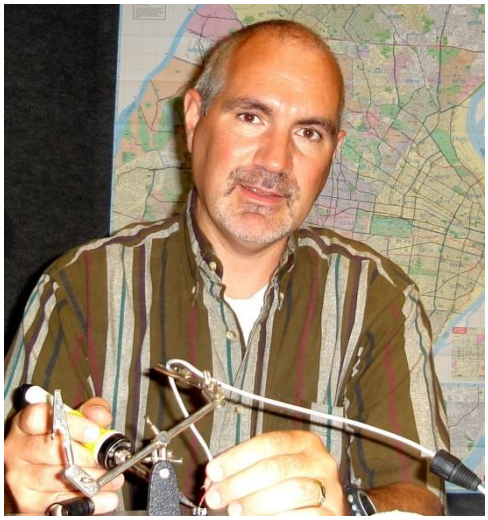
Until next time, keep praying for this nation!

The Chicago Chronicles

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

STL Issues

We had some challenging problems recently with the STL links to the WYCA transmitter site. In late June we lost the network connection from the studio to the transmitter site. We used this for not only getting data to the RDS encoders and HD exporters, but it also represented our main audio path to the site using a Worldcast Nextgen Horizon codec.



So we had to go to our backup STL using a Moseley 950 system that encodes the audio digitally. I figured we would be on it a couple of weeks until we could get a tower crew to replace the Ethernet radio on the WYCA tower. As it turned out we wouldn't be able to get a tower crew on the site for almost a month. So we were very dependent on the 950 system at that point. The good news was that this had been a very stable system for a long time.

Then the proverbial other shoe dropped. I was on my way to the site for my weekly visit as the last item on my agenda before starting the long Fourth of July weekend when I tuned in the station. I immediately wondered why I hadn't received any calls because what I was hearing on the air was unlistenable. I suspected that we had a problem with 950 STL because I was hearing digital skipping and dropping. Honestly I was surprised I hadn't received an alert from the remote control that we had a PPM alarm. The audio was that bad.

So, immediately I began trying to figure out my options as I continued to drive to the site. With the main STL going down a few weeks before and now the 950 backup having issues, I really only had one option remaining. We have a Wireless ISP that rents space on our tower and we in turn receive Internet service from them.

I considered all the changes that would have to be made at both the studio and the site to change the Worldcast Horizon Codecs from our network to the Internet. I knew this could be hours before we had it changed over and tested. I realized my quickest option was to use one of our Zephyr IP codecs we use for remote broadcasts. Since these use a server to find each other through the Internet I wouldn't have to go through all the time figuring out port forwards on routers to make it work.

So our Chief Engineer, Brian Bonds, grabbed one of the Zephyrs and met me at the transmitter site, and once we had it plugged into the router, we had it on the air in about five minutes. This allowed us time to catch our breath and begin switching the Worldcast Horizon Codecs to the Internet, which we successfully did and we had the station on that system later that afternoon.

Now we had to figure out what was going on with the 950 system. This is a 20-mile shot into a valley, so it is not without its challenges. We were getting a decent, but not great signal. We had signal lock with no bit errors but we were getting data errors. Our studio engineer, James Kelly let me know that the digital encoder going into the 950 transmitter at the studio had error lights on it and had stopped working.

I started pursuing it as an Encoder to Decoder problem. We had another Encoder on hand so we swapped it out. We still had data errors. In the meantime I had to go back to the studio to address another urgent situation. While there I noticed the transmitter had lower forward power readings on it than normal. I dialed it up a bit and we got rid of the data error.

These showed up again a week later and still thinking it was an Encoder/Decoder problem, we borrowed a spare from Brian Kerken at our Detroit operation. Once we tried this pair with no improvement, I realized we either had an interference or signal level problem.

My hope was that it was not something up on the tower. But since we had a tower crew scheduled to replace the Ethernet radio, we wanted to have them check out the cable and antenna for the

950 system. In the meantime, I wanted to pursue everything I could on the system. While I found the 950 transmitter showed hardly any reflected power on its meter, I wanted to be sure we didn't have some VSWR that wasn't showing up on the meter. When I put my hand on the RF connector on the back of the transmitter, I knew we had a problem there because the connector was very warm. The easiest thing for me to replace in that locale was the RG213 jumper from the transmitter to half-inch coax that connects to the antenna. We replaced that cable and I saw an immediate jump of the forward power meter on the transmitter. The reflected power meter never changed, so I knew that it wasn't something we could rely on in the future.

The tower crew found no issues on the tower at the transmitter site with the cables or antenna on the 950 system. It looks like my main culprit was the jumper cable. If I had not paid attention to the reflected power meter on the transmitter and had put my hand on that connector sooner I would not have chased my tail on other possibilities as long as I did. Lesson learned.

In regards to Ethernet radio, the tower crew did replace that, but we found that we also had some other problems like waterlogged cables and a damaged Transtector lightning surge protector that we still have to replace. In the meantime, we also had to replace the Ethernet radio and cable on the other side of this link on our tower in Lansing. So at the time of this writing, we still haven't been able to get that link back up. Hopefully that will be remedied soon.

Valley Notes
By
Steve Minshall
Chief Engineer – KCBC

Another month has gone by and I thought that I would have a nice new phone system to brag about. It seems that phone providers move at their own pace, and in their unique way. Our phone system project is still in process. My big contribution so far is to mount an equipment rack on the wall and provision it with power and a heavy ground connection. Next month I should have my bragging rights.

We had our annual generator maintenance done at KCBC and it was time to change the battery in the interest of reliability. In my experience, old batteries work great right up until October, then the cold zaps them and they give up. Our generator is a big diesel and thus has a big battery. For those that like numbers it is a group 4D. These things weigh 120 pounds, which would not be so bad if it was installed in a convenient location. In the case of our generator, the battery is in a tight spot. One thing is for sure, no one is going to be tempted to steal it. Now that I have the process figured out it will be much easier next time. In the end we saved almost two hundred dollars by doing it ourselves.

A tape measure with decimal inches is a cool tool indeed!

I am a tool nut and when I find something cool, I like to pass it on. One of my cool finds is a tape measure that is marked in decimal inches. The search for such a tape measure was initiated by my use of CAD software. CAD drawings come out with measurements in decimal form, not fractions. I already use various calipers and micrometers to measure things in decimal inches. My lathe also is marked in decimal parts of inches. With all my other measuring tools using decimals, I find my fractional tape measures inconvenient to work with.

With the decimal inch tape measure I figure that I can measure down to around 10-20 thousandths of an inch. I find it easy to work in terms of thousandths of an inch and the accuracy of my work is improved. I know that I could just convert to metric, but I have a lifetime of English measurements engrained in my brain and the intuition that goes with that. American life is still largely based in English measurements, and the decimal inch tape measure is a good tool for convenience and accuracy while maintaining our legacy measurement system.

Cutting copper transmission line has always been an interesting endeavor. I have used hack saws, a Sawzall, and tubing cutters in the past. These all work well if care is used. If a few cuts are needed, itôs not much of a problem, but when dozens of cuts are needed, these methods become cumbersome. This brings me to another cool tool.

A couple of colleagues told me that they had used a cutoff saw with a non-ferrous cutting blade with excellent results. With a big job coming up, I bought a non-ferrous blade, an abrasive blade. I found that this blade just melted its way through the copper yielding poor results. My misunderstanding was the problem. They meant a toothed blade.

The transmission line job was done, but I recently did a big project at home involving hundreds of cuts of aluminum tubing, so I bought one of those non-ferrous *toothed* blades. The blade I ordered was a 14ò 100-tooth blade, and boy does it cut! The blade cuts aluminum like butter and leaves a nice clean kerf. I have yet to try it on copper transmission line, but I am sure it will work well. With a 14-inch blade spinning at 3600 rpm, safety is paramount. The initial starting torque can move the saw unexpectedly if it is not secured to the work bench. Cutting round tubing with any saw can be hazardous ï it likes to rotate and things can go wrong very quickly, so secure clamping is essential.

A 14" 100-tooth non-ferrous blade is perfect for cutting tubing and transmission line.

Until next month, work and play safe and may the Lord bless you richly!

The Portland Report

By
John White, CBRE
Chief Engineer, CBC–Portland

So, the weather is hot. That happens in Portland. And itôs dry, no rain. That happens too. In Portland hot weather usually begins with a westerly flow of hot air from eastern Oregon through the Columbia River gorge. A bubble of hot dry air settles in for Portland to the east of the West Hills.

I didnôt exactly expect to talk about the weather just now. Then someone asked about some of the local 2 meter repeaters and why they werenôt working properly. That question started an investigation that produced unexpected results.

The thought came to mind, what about the LRN? The Local Relay Network is part of the EAS system which allows police, fire, and regional emergency managers to issue an alert to the public. The downlink is a 166 MHz RPU frequency. The LRN implementation is a bit unusual as the 166 MHz transmitter runs 24/7 with the audio feed from one of the FM stations. The intent is to allow stations to check their EAS downlink receivers at any time.

I checked this link and found the signal low and the audio distorted by multipath. And the hunt was on to understand the circumstances. I began making some simple spectrum analyzer measurements in the afternoons, which is the time of day the problems had been noticed. The hypothesis initially was that the high temperature was a probable cause of the VHF communications disruption.

Initially, I began by making measurements in the afternoon. These measurements indicated an unusually high noise level which suggested a wider test sample would be advantageous. One is ascertaining the ñnormalò or ñusualò conditions. To establish the base line, I took a series of measurements during the cool morning at 5AM. While based on the assumption that cooler morning temperatures represent ñnormalò conditions, that is the best possible for a series of short term measurements.

The initial results suggest an increase of 6 to 12 dB in noise floor at 140 to 170 MHz VHF frequencies. FM broadcast noise floor at 88 to 108 is harder to measure (the FM band is quite busy). Atmospheric attenuation was also observed and amounted to an observed 5 to 10 dB reduction in signal intensity and 3 to 6 dB reduction at FM broadcast.

One aspect of these observations puzzles me. Given the magnitude of the disruption, one would think that research would have been done in the past. Search of the literature did not find any research showing increased atmospheric attenuation at VHF / UHF frequencies.

One study stated that the atmosphere can contribute to system noise passively through absorption and disturbances (noise). The study continues that these sources are generally less important and the authors would assume these effects are negligible, i.e. without looking, nothing was found. At press time, KKPZ continues to suffer pattern distortion due to a nearby non-detuned tower. The tower which was to be detuned some time ago has been put off with no clear activity.

On another front, some tower tenants have taken a lackadaisical approach to detuning apparatus maintenance. With the new rules in place, that will hopefully change. One nearby tower has installed a sign indicating the need for notification and maintenance.

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

Mowing

Where has summer gone? August is already upon us. We have finally been able to get out to mow the KLVZ transmitter site. Weld County came to us and informed us about a program that allows us to buy certain commercial-grade weed killer and they will pay a portion. It is their way of helping out landowners who were affected by flooding.

Before we could put the weed killer down on the 15-acre site, we had to mow. Itôs always better to spray as close to the base of the weed as possible. Jerry Ford, a local farmer who keeps horses at several of our properties, came out and put the weed killer down. Please keep him in your prayers while he is currently dealing with cancer. I donôt know the full extent but I know he had surgery July 28.

While we were mowing, we noticed some pretty heavy machinery on the road next to the property that goes to a gas well. There were also numerous dump trucks hauling huge pieces of concrete. After speaking to the guys working over there, we found out that the quarries on either side of us were damming the river where it broke through the banks.

Once the water was blocked off we were finally able to see just how bad the damage was to the back of the property. We have a nice ten foot dropoff to where the new river bed is, and our fence is about ten feet out, hanging in the air because the ground got washed out. We were also able to see several ground radials that we will need to find a way to bury so they are out of sight. We are very grateful they fixed the flooding in the area for now. KLVZ is no longer on an island. Hopefully it holds up for years to come.

Electric Work

You may remember from the last edition that I mentioned having some sort of electrical problem with tower 3 out at KLVZ. We traced things out and found an underground leg-to-neutral short on one circuit and an open leg on another. At that point we decided we needed to have an electrician come out and trench in new conduit to that tower.

We hired Bergelectric, which has done a lot of work for us over the years, and we had them trench directly from the building to the tower. The old conduit went from the building to tower 2, then from tower 2 to tower 3. The short/open was between towers 2 and 3 somewhere, in buried PVC conduit that had been in place since the 1970s.T

Bergelectric laid the conduit and had to bring it up above the asphalt at the tower base so we wouldnôt have to tear that up. It took them two days to do the work and they did a great job. We didnôt have too many radials to repair when they were done. Our next step is to pull in some new multipair cable so we can replace the old stuff at the tower.

KLTT Mowing

We were finally able to get out to the KLTT transmitter site to do that mowing at that 50-acre site. That place is one big thistle farm. Keith had done his best to mow a path to the towers for us with the John Deer garden tractor, and it did work for the most part. Getting the big tractor out there, though, was a necessity. We werenôt able to get the whole property mowed, but we got a decent chunk done, the part that most affects our residential neighbors on the north side and the part that is visible from the road. We may try to get back out in the fall to mow down the rest when the season is over and will try to be more proactive next year and get it treated so it wonôt grow up so much.

Looking Ahead

These last several months have been crawling for me personally because my husband and I are in the process of purchasing our first house. We were supposed to close the middle of July, but anyone who has ever purchased a home knows it

never goes as planned. We were looking forward to that July 17 date. Each day at work and at home went by so slowly, and when we got the news closing was pushed out, things started moving even more slowly. As I write this we are less than a week from closing, and it sounds like we are good to go finally. We close on Monday August 3, move in that day and August 4.

I am in the office just a few days before finally heading to Lake City, Colorado for our annual vacation in that most beautiful spot. This year, though, we are staying an extra two days. I have no doubt it will be a much needed vacation.

Iôm leaving Keith in charge while I am gone. He hasnôt been a hands-on guy with the on-air technical stuff, so I always worry a little bit about if something goes wrong. Thankfully, Iôm pretty good at keeping track of issues and documenting what I did to fix them issue if they are ones that happen often. I also have some good engineer friends that will be around if Keith needs them. I know in many markets, especially the competitive ones, other companies will not allow their engineers to help the competition. I am so very grateful that in Denver we do not have that issue. I am friends with many of the local engineers and that provides me with many people I can call on for help. The same goes for them.

When I get back from vacation, Iôm guessing I will be busy doing the yearly inventory. It is always nice to make sure we have our list up to date, but it is also a pain because some things just go missing. You know you have it, you saw it last week, but where is it today? I pray we donôt have any of that but I always prepare for it.

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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