The Local Oscillator

The Newsletter of Crawford Broadcasting Company Corporate Engineering

How slow can you go?

Back in late March, we were thrilled that the FCC finally enacted new terrestrial digital rules that will allow, among other things, AM nighttime digital operation. Here we are in August, almost five months later, and the rules have still not gone into effect. The reason: the FCC staff was very slow in getting the Report & Order on the rulemaking out, and now someone (it's not clear who) is heel dragging on getting the new rules published in the Federal Register. Once published, the rules will go into effect in 30 days. That means that we're at least a month away at this point, longer if past performance is any indicator of the future.

This is aggravating for a number of reasons. Perhaps the biggest is that it delays the overall rollout and consumer acceptance of HD Radio. True, it only affects AM at night and there aren't that many listeners with HD-equipped receivers out there, but we are promoting it heavily on the air. What do those listeners that have invested $60, $100 or more on HD Radio receivers think when they tune in late in the day and find only low-fi analog AM?

Another aggravation is that several of our FM stations are operating under a Special Temporary Authority (STA) from the FCC to use the aux antenna for digital operations. Under the new rules, such will not require STAs, but until the new rules go into effect, we have to continually renew these STAs and pay the processing fees. The same goes for our FM multicasts, which are authorized under experimental authority from the FCC. We have to monitor and renew these until the new rules go into effect.

I'd hazard a guess that if this were something important to the FCC staff, it would have all been done months ago.

Back to normal…

…well, sort of. On Thursday, July 19, commercial power was restored at the KBRT transmitter site. That was ten weeks to the day after power was lost in the wildfire that swept through Santa Catalina Island and the KBRT transmitter site, taking out much of the island's interior infrastructure.

Getting power restored was quite an ordeal. The Edison power grid was restored weeks ago, with new transformers set on new poles above our site back in mid-June. After that point, the problem was on our end. Edison would not give us the three-wire delta service we had previously; they had to provide a ground somewhere, either grounding one leg or providing a grounded secondary center tap. Our c. 1952 electrical panel was configured for a straight three-wire floating delta with no ground, and that was the service that Edison had provided us all these years. Evidently the rules have changed and our "grandfathered" status went away when the old transformers hit the dirt.

With the help of Steve Minshall (CE of KCBC), we were able to map out the old electrical distribution system and come up with a plan for a new service entrance, meter socket and all. Then we had to go through the permit process. And then came the hassle of getting all the needed parts to the island to do the job, never an easy task. Finally, once the job was finished, getting the inspection done and getting Edison out to set the new meter were additional challenges. But thank God, it's done and we're back on commercial power once again.

Bill Agresta told me that for the first few days, it was eerie without the sound of the generator, and at night, it was strange having lights, hot water and a working stove in the house. No more "camping out" indoors!

Looking back, immediately after the fire, we were off the air for a few days as Bill and several others scrambled to get a working STL link, something that was finally achieved through our Ku-

band satellite system, uplinking at the Costa Mesa studios and bringing it back down at the Catalina transmitter site. We ran on our 1987-vintage Onan propane-fueled generator for a couple of weeks following that, but getting fuel was a struggle. Then on May 22, the generator failed and we were off the air for a day. A field wire corroded through, a victim of 20 years of salt air. We got it going again that evening, but it became clear that we needed a "plan B," so we arranged for a trailer-mounted diesel generator to be barged over to the island.

By early the following week, unable to get propane for the Onan, Bill connected the rental diesel gen and we began operating using that. Bill had to fuel it himself, hauling four 5-gallon cans down to the Pebbly Beach fuel depot every day, filling them, hauling them back up the hill and pouring them into the generator's tanks. It took just under 20 gallons a day to keep the generator fueled (at $5.00 a gallon). Including the propane we burned those first couple of weeks, we spent over $5,000 in fuel costs during the power outage plus the rent on the generator. Bill hauled roughly 700 gallons in fuel up the hill at about 8 pounds per gallon. If he didn't get in shape lifting those five 40-pound cans twice a day…

Back in July, the AT&T folks told us that the infrastructure for our high-cap lines (T1, DSL and ISDN) would not be restored – ever – so our plans for the future focused on the satellite system. But then in late July, the T1 came back on via cables strung over the ground. Clearly we can't count on this but we'll use it while we can for remote control and C-band backfeeds. In the meantime, we plan to beef up our Ku-band capabilities at the studio (we already have two separate downlinks at the transmitter site – antennas, LNBs and receivers) so that if the T1 is not restored to full reliability, we are set for the long term.

Bill has Internet service again after a fashion. We installed Hughesnet satellite Internet service, but it has been intermittent at best. So far, I am not impressed with satellite Internet even when it's working right. Bill says that Hughes' customer support has been an exercise in frustration. If we had another choice at this point, we'd do something else.

The regular phone lines are working, but like the T1, we don't trust them. They are supplied through the same over-the-ground cables as the T1. One errant buffalo and they will be gone. We do have one line supplied through VoIP over the Hughes satellite Internet connection. There is a significant coding and propagation delay, so communication over that line is a little frustrating until you "get your rhythm," learning to pause for a second or so after the other party stops talking before you start, and waiting a couple of seconds after you finish talking before expecting to hear any reply. But at least it provides a backup with some semi-reliable communications with the site if all else fails.

So, things are back to normal after a fashion at the KBRT transmitter site. Thank God we lost only a few days of airtime, and thank God for sending the people and supplies we needed when we needed them.

I think that we are better now than before in terms of overall reliability. We now have two generators instead of one, each fueled from a different source. The electrical infrastructure in the island's interior has been completely redone, replacing 50-year-old poles, insulators, wires and switchgear with new. And the electrical panel at our transmitter site has been brought up to date and up to current code. We also have several options for STL: satellite, T1 and Internet stream. If we ever get permanent (pole-strung or underground) telco lines installed, things should be completely back to normal.

SBE

Those of you who are SBE members have by now received your mail ballots for the 2008 slate of officers and board members. You very likely saw my name and photo in the list of candidates for the board of directors and you may be wondering why I am on that ballot.

The truth is that I am concerned about our industry and where it's going. With few exceptions, young people are not entering our ranks these days. Station engineers at any level are very likely gray-hairs like me. Attracting young people to our trade and educating them is important to me. IT and IT-related fields attract a lot of young people and higher education offers a lot to prepare students for those fields. And while there is a lot of overlap between those fields and broadcast engineering, who is going to fix the transmitters? Who will be qualified to work on the RF end of things, transmitters, transmission lines, antennas, phasing and coupling systems? Unless we take some proactive steps now, in five or ten years we may be in real trouble.

Congratulations!

A couple of our folks passed certification exams back in June and the notification letters from the SBE have been trickling in. **Ed Dulaney** attained Senior Radio Engineer (CSRE) and AM Directional Specialist (AMD) certifications, and **Larry Foltran** got his Broadcast Network Technician (CBNT) certification. Congratulations, guys! I'm proud of you

for not only attaining these certifications but also for constantly striving to improve your engineering pedigree. In this constantly-changing business, we're either growing or stagnating.

Very likely, others in our company have recently passed certification exams. Chief engineers, don't assume that SBE will let me know. You tell me who in your crew passed a certification exam and we'll get a note to that effect published in these pages.

One more congratulatory note is in order, one that is very personal to me. My daughter, **Amanda Alexander**, graduated from the Cleveland Institute of Electronics Broadcast Engineering course last month. She worked hard for two years after she finished her college studies to get some formal education in broadcast engineering under her belt. I very much enjoyed working with her in these studies, reviewing lessons with her and relearning a lot of the material myself. I know I'll miss that. With her CIE diploma soon to be hanging on her office wall, Amanda is now a fully-credentialed broadcast engineer, ready to continue her education out here in the real world. Feel free to embarrass her with notes and calls of congratulations.

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

Hello to all from Western New York!

One of the fastest-rising crimes in America today is copper theft. Criminals looking to make a fast, easy buck have been targeting vacant houses in the Buffalo area and stripping all the copper out of the dwellings to sell for scrap. Unfortunately, this problem has been noted nation-wide. This year alone, at least 14 deaths have been attributed to thieves attempting to steal high-voltage power lines. The thieves are generally after the neutral wire but sometimes make the mistake of cutting into one of the high voltage lines and are hit with over 6,500 volts of electricity.

On July 16th in a suburb of Cincinnati, a 22-year-old man was killed while attempting to steal the copper line on a utility pole. Ironically, he was caught last August with over 2,200 feet of utility line that he had stolen from poles on North 3rd Street in the St. Clair Township of Cincinnati, but was only placed on probation after his court appearance. It was reported that he used the proceeds from selling the stolen copper to support his drug habit.

Not only are electric lines the target of criminals, they also are also stealing the copper tubing out of air conditioning units, guttering, and copper decorations on homes and businesses.

As we in the broadcast industry utilize a great amount of copper in our transmission lines and ground systems, I'm sure that it is just a matter of time before these thieves begin targeting transmitter sites on a regular basis. Regular checks of your transmitter sites should be done to insure that these criminals have not destroyed your ground system or made off with several hundred feet of auxiliary coax.

The first defense is to keep your site secure with adequate fencing, and make sure that all exterior lighting is working and tamper-proof. There is nothing a criminal hates worse than a lot of bright security lighting around the perimeter of the building.

Another theft deterrent is employing the use of dummy security cameras. These can be purchased for less than $30 each, and most have a bright red blinking LED that is powered by an internal battery supply. These LED indicators use very little voltage and can run as long as six months before battery replacement is necessary. They are easy to mount, either on a rooftop or sidewall of the transmitter building, out of the reach of vandals and thieves. You will want to put these dummy cameras where they can be easily seen with signs posted around the premises noting that security cameras

monitor the site. The average thief does not know that these are not real security cameras and most will look elsewhere if they believe that they may be detected before they make off with their stash.

It is a good idea to get into the habit of checking your site for any evidence of tampering on a regular basis. A good time to do this is when you visit the site for your regular weekly maintenance. It is also a good idea to have an outside security expert evaluate your site for any possible problem areas. Many insurance companies will provide this service free if you are a customer. Another source of expert advice is your local police department. Many police departments have a crime prevention bureau and will provide a free on-site inspection of your facility, providing you with tips on keeping your site safe and secure. If your transmitter building has a monitored alarm system in place, check with the alarm company to see if they offer security inspections. Many alarm systems that were installed years ago are now not adequate to provide the heightened security needed. Perhaps your system could be upgraded with a fence alarm, outdoor sirens or actual visual off-site monitoring. Don't wait until after you have been vandalized to secure your site. Preventative measures can save you a lot of headache, time and money later!

WDCX – Buffalo

The WDCX transmitter building project is moving along at a snail's pace. As I reported in last month's newsletter, the site plan proposal was submitted to the Boston Town Board and was reviewed by the board on July 11th. The board approved the site plan and forwarded the plans on to the planning board for final approval. The planning board was supposed to meet on July 25th, but the date was moved to August 14th for some unknown reason. Our concrete contractor could not wait to pour the foundation until we received the building permit because of other commitments. So, with the town supervisor's approval, we went ahead and had the foundation poured for the new building. If we had waited until the building permit was issued, we would have to hire another contractor to do the concrete work, costing an additional $1,500 above our original estimate.

According to Doug Olsen, our salesman from Thermo Bond, the building is scheduled to ship on August 20th. Hopefully, we will have the building permit in hand by this date; otherwise we will have to delay shipment of the building for another week or so.

The new Middle Atlantic equipment racks were delivered to the transmitter site the third week of July, and our new transmission line and related Myat parts were shipped and received by Don Boye of Western Tower. We did not have the space in the old transmitter building to store the new line and parts, so Don allowed us to have the parts shipped to his shop for storage until that time comes to begin the inside plumbing of the transmitters.

WRCI / WLGZ – Rochester

In last month's column, I reported on a sample line problem with the WLGZ array. I determined the location of the sample line problem using the CBC TDR It showed to be about 90 feet from the transmitter building. We evidently were getting some moisture in the line, causing the readings for tower two to read inaccurately on both patterns. As I suspected, once the ground dried up this summer, the readings came back to normal. I will have to address this problem before winter gets here again, but for now I will put this on the back burner, which will allow me the time to take care of other pressing issues.

The new road at the AM transmitter site was installed at the end of June, and the paving contractor did a marvelous job! It has been a long time since any maintenance had been done to improve the road into the site, and the new gravel should last for a number of years to come. I hope to get some maintenance done on the outside of the tuning houses this summer, most notably painting of the exterior wood. Also, the doors could use some paint along with new weatherproofing around the interior of the doorjambs. There are several old bullet holes in the tuning house doors that need to be sealed up to keep the insects from nesting in them. A good silicone outdoor caulk should do the trick.

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
Tom Gardull, CBRE
Chief Engineer, CBC–Detroit

This month I'll take up where last month's column ended. The problem was that the WMUZ HD-2 PAD data had disappeared after installing the latest Ibiquity/BE software upgrade.

My first call went to BE customer support, who was puzzled at first. After their tech checked with others at the factory, he reported that this was indeed caused by the upgrade and needed a software patch to be provided by the audio source vendor. BE had such a patch for their Audiovault users and we needed to contact RCI for a patch to our NexGen system.

Many messages went back and forth with RCI. Their customer support people did not understand the problem. After several days, they finally concluded that they did have a patch but only if we used their model of importer. They pointed back to BE for a solution.

My argument was that the NexGen system was compatible with the BE IDI-20 importer before the upgrade. Since the upgrade was an Ibiquity code change that would affect everybody using importers, the upgrade changes would also be the same for everybody. Previous discussions with the various equipment manufacturers spoke of how protective Ibiquity is of their software and that manufacturers cannot modify the code. Manufacturers make their improvements externally to the Ibiquity code. So whatever is done to bring the equipment back into compatibility should work the same for everybody.

But WMUZ has got caught in between. BE is choosing to make the external correction at the PAD source. RCI is choosing to make the external correction at the importer. So all would be well if we used all BE or if we used all RCI, but our hybrid is not covered.

I have learned what Ibiquity did. WMUZ had a meet-and-greet visit from the Nautel district salesman. He says Ibiquity is now using the same protocols for HD-2 PAD as they were already using for HD-1 PAD. That actually sounds like a good idea. But it did cause a change for everybody sending PAD info and thus our problem.

After RCI said they would only give support to their importer, I went back to BE who was receptive. BE knows they have other customers who might be in a similar situation using NexGen as a source and BE importers, and will probably see this problem again. BE does not yet have an answer but it is working on a fix.

WMUZ is gaining a new tenant on our FM tower. The FAA is improving their radar around airports and they are installing sensors several miles out from the landing zone. They have good radar covering the airfield grounds and near approach, and they have good radar for far away. They need something more precise for the air lanes between near and far. Our tower is several miles out right under one of the flight paths into Detroit Metro airport. We are a good location for one of the new intermediate sensors.

They will build a small building next to our tower to house their equipment. They have started the foundation excavation using an interesting method. I expected the foundation to be dug by shovel, backhoe, or bobcat. They started by using a hydrological method. They shoot high pressure water to emulsify the dirt and then have a giant vacuum cleaner suck up the mud. They truck the mud away. This method was working but was taking way too long because our soil has so much clay. They had to go back to a traditional backhoe dig. They now have their opening and were to pour a six-foot deep slab the last weekend in July. They still have several weeks of work ahead.

News From The South

By
Stephen Poole, CBRE, CBNT
Chief Engineer, CBC–Alabama

Recently, Mr. Crawford visited us here in Birmingham. It was his first visit here since we moved into the new building. He spoke to the entire staff as well as spending some time with Todd, Jimmy and me, thanking us for doing such a good job on the new studios and encouraging us to do whatever it takes to keep our signals top in the market. His attitude was infectious and we were left feeling good about the future in Birmingham.

One quote from Mr. Crawford that has stuck in my mind was, "Some people are worried about the future of terrestrial radio, but I have no worries at all." And what's not to feel good about? I could go off into a dozen different directions, but I'll just pick one: HD Radio. Folks, I really believe this thing is going to work. I've already said in the past that I love it on FM, but I've become convinced that it's going to make a big difference for AM, too.

Let me put one fear – which I admittedly once shared – to rest. I was worried when I first started listening to HD-R about how limited the range seemed to be. This didn't seem to square with what iBiquity had been saying, that a fraction of the power could have the same coverage as a comparable analog signal. But then I remembered that the current HD-R receivers are first generation. Folks, there is a great deal of room for improvement. There are a number of very sophisticated, very aggressive noise-reduction and noise-cancellation techniques that can be applied to digital signals, especially those that are locked to a common "clock" (think: GPS-derived 10MHz reference). Therefore, we can expect that later generations of HD-R receivers will actually have *better* reception than the current analog system. You read it here first!

To give you an idea (so you won't think I'm just regurgitating "propaganda"), it's roughly analogous to how synchronous detection can improve regular analog AM reception, and how limiting helps remove noise from FM. Digital can combine the equivalent of both techniques. Since we're only looking for a "1" or "0" at a particular moment in time, we gain the ability to recover the digital stream from noise that would render analog completely unusable.

In the illustration below, the top row is the signal plus noise, represented as random "spikes." After "limiting" – actually, after running the data through the equivalent of a Schmidt trigger – most of the spikes are cleaned up, leaving only a few false highs in the illustration. (In real life, you'd also get false lows, but this shows the principle.) The important thing is, with a precisely synchronized receive clock that takes brief "snapshots" of the data stream, most of the false spikes will be ignored. The valid data can literally be stripped out of the noise and interference.
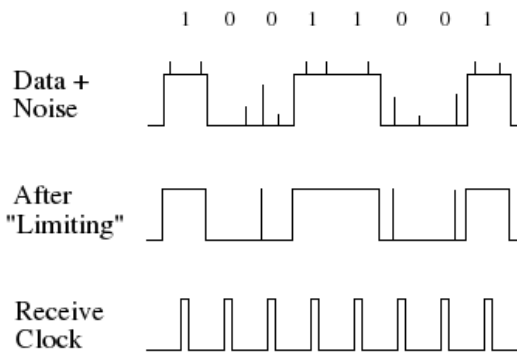
That was a (very) crude illustration, but it demonstrates the main point: *If I know where the data should be in a field of noise and interference, I can optimize the recovery of it.* The same principle is used daily with everything from satellite signals to high-speed serial data, so we know it works, too.

The current generation of HD receivers is okay in city-grade coverage, but these receivers are admittedly not quite so good when you get into marginal signal areas. That's because they're essentially just analog designs with HD added (or "tacked on," to be blunt). Right now, most of the ready-made components for radio receivers are optimized for band-limited AM and FM, because that's where the demand has been for many decades. That's what's available to build the current generation of receivers.

Further, the HD receivers that I've looked at to date all use the same module. For example, the Boston Acoustics receiver is essentially just the standard iBiquity HD-R module with a power supply and an amplifier for the speakers; the Kenwood in my truck has that same module as an outboard add-on accessory. But as the demand for HD Radio increases, and especially once the Japanese "kaizen" the thing, new techniques will be applied, new components will be developed that are optimized for HD-R and most of the current complaints about reception will disappear.

We're back to the old chicken-or-egg dilemma: we need plenty of good receivers, but before they can come and before manufacturers will devote the R&D to making them better, we've got to do our jobs to create the demand. For a while, I also worried about the fact that most HD-R adoption has occurred in larger markets, but that doesn't bother me anymore, either. I have nothing against our small market brethren, but the fact is, we're the ones who will drive that demand. Trust me, if you tell manufacturers that people in the top 40 markets want the receivers (and that represents many millions of potential customers), that's more than enough to justify their attention.

The fact is, *current analog radios are designed for urban areas.* That's why a standard analog AM receiver is so crappy-sounding. It's not designed for someone in a small town in the middle of the plains with a single AM station. It's designed for worst case... which is someone in a crowded downtown region with dozens of signals, lots of metal buildings and power lines, and tons of interference. We (meaning large market broadcasters) drive the demand. Let's get busy!

Our job isn't that difficult, either. We need only to ensure that we're: (a) broadcasting in HD-R, and (b) giving it our best effort. I make poor Sandy crazy because I constantly switch the radio channel while I'm driving. I want to hear what my stations sound like against the competition, in various terrain and at different distances from the tower sites. I make

a note of those areas where I should get good reception; if that changes, I suspect a problem. (Of course I drive Sandy even crazier because I'll sometimes want to head to the studios or to a transmitter site to tweak something. But she pays me back for that because she makes me drop her off at the mall to shop while I tinker!)

I was one of the lucky few. When we installed HD-R on our two AMs here, it worked out of the box. All we had to do was tweak the magnitude and phase settings and we had lock times of under three seconds. I know that some of you other guys have had to do more – in John's case up in Portland, quite a bit more, for example. But hey; I'll take luck when I can get it. All I have to do now is ensure that it *stays* that way. Sudden failures aren't difficult to detect, but it's easy to miss slow, gradual changes, especially with a complex AM directional system. Things can drift over time and you might not even notice it at first. You'll go in once a week for maintenance, diddle the phasor to get the right numbers on the antenna monitor, adjust the common point and call it a day. If you don't keep careful records, you might not notice trends. I have recently found out the hard way that those trends really matter to HD-R, too!

In this climate with our horrible (and worse, variable) ground conductivity, I've learned to expect some seasonal variations; there's no way around it. But in the past, my adjustments were along the lines of, "decrease the power on this tower a bit during the wet summer months, then back up again for the fall and winter." I noticed most recently, though, that my "up and down" adjustments were slowly but surely drifting away from the historical values.

Not surprisingly, this has an audible effect on AM HD-R quality, too. Receiver lock times will start creeping up and the audio will start dropping back to mono more frequently. In our case, when I noticed a bit of high-end "swishing," I knew something was wrong, so I looked at the phases and ratios. This time, I had to really tweak a couple of towers to get it back in, and I wasn't comfortable. I started looking for a real problem.

Anyone who's ever worked on an AM directional knows that if you're lucky, it'll be something obvious – typically a blown capacitor or a bad contactor. In this case, a check of all the ATUs showed a burned contactor on tower #4; I figured I'd found it. But hardwiring around the contactor didn't change the original problem, so I had to look elsewhere. Then I received a little unexpected help: when I cranked the power back up, tower #1 suddenly went way off on phase. Aha! A clue... but

nothing in the #1 ATU looked out of the ordinary, at least not at first glance.

Several months ago, we had lost a standard G3 (293) capacitor on the input T network at #1 and I had replaced it with a Jensen vacuum variable that I keep on hand for emergencies. To be honest, I got busy with one thing or another (this was right in the middle of our studio move) and never got around to ordering a permanent replacement. The vacuum cap stayed in there. But hey, those things rarely ever fail, right? If they do, it's usually because of physical damage (translation: "Oops, I dropped it!") or a direct lightning strike. But just to be sure, I turned the knob a bit... and saw blue sparks inside the glass! After I pulled the cap, I saw that it had gotten so hot that it had actually melted a plastic insulating plate. There you go!

I don't like to simply replace a failed part; I want to figure out why it died so that I can prevent the problem from occurring again. In this case, I'd already replaced that cap once, so I called Cris to pick his brain. We talked about it and guessed that it was probably due to a momentary overload. Tower #1 has the lowest power in our daytime array, so if anything happens in the system to unbalance the power distribution, #1 could receive many times more juice than it was designed for. Another clue was that I had put a small arc gap inside the phasor at the #1 feed line just for that purpose, to protect from overpower. I checked it and sure enough, it had been arcing. It looked horrible.

To be fair to Jensen, that particular variable was only rated at 10KV, and it was a used unit that we'd pulled from some of the old equipment that we'd inherited from Hibernia when we bought the station in 1999. We ordered a fixed vacuum unit, installed it and the array fell right back into line. Better yet – and here's the good part and the point of this ramble – the HD-R sounded the best it ever had. Who knows how long that old capacitor had been messing with my signal? And once again, the thing was, it slowly deteriorated over time. I guess this underscores the fact that especially with a directional AM array, you've got to keep an eye on everything. Make careful records of any adjustments that you make to the system and watch for trends.

I'll finish with one final observation on the HD Radio front. We just installed the latest iBiquity software (version 2.3.3) in our BE FM units. Is it just me, or doesn't it sound better? I don't know if iBiquity has made changes to the actual codec, or if this is just a maintenance and bug-fix, so maybe I'm just imagining it. But it does sound better to me, especially when airing audio that has already been compressed by another codec earlier in the air chain. For example, when doing a remote via dial-up Matrix or when playing a program that was received in MP3 format, the HD-R just sounds cleaner now. It's a beautiful thing.

We're gonna have to keep an eye on that in the future, too, more and more. Lossy, compressed audio algorithms reduce file size and/or bandwidth so much, everyone wants to use them. It's hard to convince a ministry, for example, that they need to use a better codec and a higher bit rate when they can save so much download bandwidth on a tightly-compressed MP3, but we have to try. When an agency sends a CD nowadays, be careful; it's probably full of MP3s. Some of the programs that we get off of satellite sound "grainy" and "swishy" nowadays, too.

What do you do? They're paying for the time, so you air it... but I have to grit my teeth and turn my receiver down on some of this stuff. All we can do, as the Digital Age progresses, is to handle these things on a case-by-case basis, pointing out to the clients that they're only hurting themselves if they use highly-compressed, very lossy formats just to save a little time or disk space. If you can, record the actual on-air sound and let them hear it. They'll get the point.

It's always something! Until next time, keep the faith and keep the HD-R as clean as you can!

Gateway Adventures
By
Rick Sewell, CBRE
Chief Engineer, CBC–St. Louis

Over the last month I have been working on some of those minor annoyances that have caused frustration at times. One of those things that has been causing me much consternation was the AM antenna feed to our EAS equipment in the studios. We use an amplified loop antenna on the roof of the three story building to feed the AM radio that we use to monitor KMOX, the primary EAS station in the market. After a set of storms about six months ago, the building air conditioning was having problems and was sending voltage spikes throughout the building that caused some minor outages, just enough to have to reset the control boards and any computer that wasn't on a UPS. The building maintenance prople eventually solved that problem.

About this time I noticed that we had interference in the audio of the AM radio used to monitor the KMOX for EAS purposes. It seemed to come and go but for the most part was an annoyance more than anything else.

Earlier this spring they decided to replace those air conditioning units on the roof. My hope was that the interference situation would be greatly improved or disappear altogether. Unfortunately, the situation actually got worse after the installation. It really got my attention when we missed a monthly test from KMOX. We still got it from the secondary station FM station and we forwarded it, but interference was obviously great enough to scramble the EAS data.

I decided to hunt down what was causing the problem. Since I had tried several different radios and the problem was still there I knew it was either in the antenna system or there was an external source.

I took down the loop antenna and went through all the components one by one but found no issues. I also took apart the corresponding amplifier and again found no problems.

My next suspicion was that one of the air conditioning units was actually spitting out RF close to our antenna and that was what caused the interference. On advice from Cris Alexander I took the station's Field Intensity Meter on the roof and sniffed around to see if I could pick up the interference on the meter independent of the our antenna system.

I got zero interference on the meter. I decided to try the meter down inside the rack room where the radio was located. Although I received a little static, most likely from all the equipment in the racks, I did not get the same type of interference.

At that point the light bulb finally went on inside my head. The FIM uses a battery and the radio and the amplifier were getting power directly from the wall outlet. I then decided to plug both of them into a very reliable UPS and with that most of the interference was gone.

I still wasn't pleased with the amount that was still there and did my best to find the culprit that was putting the interference on the power lines. I was not able to find the source of the interference. I then decided to clean the coax feed from the roof by replacing the RF connectors on both sides of the line. I also got rid of a distribution amplifier that was no longer needed.

After taking these steps I was able to bring the interference down to almost nothing. I haven't had any issues with missed EAS tests so I am fairly confident the situation is resolved. I still would like to find the source of the problem but it is most likely not emanating from inside our office suite but somewhere else in the building.

Another problem that had become an annoyance was the Internet stability at the studios/office. It seemed like at least once a week or so we would experience an Internet outage. This not only caused the staff a problem getting programs downloaded from FTP sites but would also take both stations Internet streams down as well.

The problem would usually be quickly resolved with a reset of the Internet equipment, the modem and several routers. All of these had their power source from one UPS so all that was needed was to turn off the UPS for about ten seconds. Doesn't sound like a big deal but it was located in our

locked rack room on the top of the racks so it was pain to get resolved if I wasn't around the building. I have about an hour drive from home so it could get very annoying to make that trip on a weekend to do a ten second reset.

I tried different DSL modems but the reliability was hardly different. Finally, I decided to create a way to reset the Internet remotely. Using a Wiremold utility box, I installed a relay in line with the power of the Internet equipment. Just a quick energizing of the relay and the reset is done.

Since we have a Broadcast Tools Serial Remote Control connected via network between the studios and the KJSL transmitter site, I can send a closure from the Burk remote control back to the studio, thus resetting the Internet equipment. This gives me the ability dial in and do the reset, saving me a two drive round trip. More importantly, the computer with the Burk AP3 software is at that site and I now have scripts running that will reset the

Internet equipment at 12 AM and just before 6 AM. This causes the streams to be down for about 20 seconds but this is at a time when listening is not that high. It's much better to lose 20 seconds at those times compared to much longer times during peak listening times.

I also installed reset switches in both control rooms so that if the board operators get a call about the streams being down, they can quickly reset it right then and there. So far we have not had to use these switches or dial in to do the reset. The daily reset has taken care of the problem.

I could have probably taken care of this with a $15 digital lamp timer and have it turn off for one minute at the times I mentioned above, but I would not have the ability to reset should it need to be done despite the daily reset. The reset relay box and the wiring at both sites took more than a day's work, but it was well worth it. I only regret that I didn't do this a year ago.

The Chicago Chronicles
By
Art Reis, CPBE, CBNT, AMD
Chief Engineer, CBC–Chicago

I'm sure you've all heard about it by now… you know, that EAS snafu that occurred on June 26, centered here in Illinois. Now that was a learning experience!

I was at home at the time, getting ready for work, when all of a sudden at about 8:20 AM, WBBM, which I usually have on for at least part of the morning because it's the all-news station here in Chicago, interrupted its programming to run an EAS test. And, not very gracefully, either. Odd. WBBM is indeed the LP-2 in the market, but it doesn't generally run EAS tests during morning drive, where it is consistently rated #1 or #2. On a hunch, I switch over to WGN, which is the other LP station in the market, and which is also either #1 or #2 in morning drive. They were running the same EAS – the usual annoying opening tones, then no audio, no EOM tones, nothing else. And then the morning fellow was coming on the air wondering what this was all about. That was a clue. I switched over to my favorite

station, WFMT, the classical station in town, and my suspicions were confirmed: They had the EAS test, and a few seconds of WGN's morning show, before the audio switched back to the announcer (he had just started another classical piece and came back on mike to wonder what had happened, and then started the piece again).

Apparently and indeed this was not just a test. It was sent out as a "National Emergency," and most of the stations in Illinois and a few in Missouri had run it – over 500 of them in all, a few of them for hours afterward.

I quickly called our own stations, and after several attempts I got hold of one of the announcers who said that they received the EAS incident but that it hadn't gone on the air; however, the radio was blasting the EAS in her ear during her entire live, on-mike newscast (she was the only person on the board that morning). I found out subsequently that this had happened at all three of my stations. I left instructions that the tapes from the EAS were to be stapled to the

10

daily transmitter logs, no matter what.

I had a chat that day and also the next with the head of EAS for Illinois, Warren Shulz, a good friend who also happens to be CE at WLS. The following is a mixture of his observations and mine. I hope this teaches us some things we didn't know about the system.

First, how did this happen? It started where all EAS tests in Illinois start, in Springfield, the state capital. The Emergency Services folks were testing a brand new, satellite-oriented system, which was designed to better link the state system with the Federal National system, for purposes of putting the President on the air country-wide in case of a really serious national disaster, such as a nuclear "dirty bomb" going off within Washington, DC itself. But something in the Illinois system went very wrong, because the contract company coordinating the install had failed to turn the freshly installed satellite radios off and the result was that the test "leaked out" (Warren's term). The result was, well, quite evident.

But it didn't affect just Illinois stations. As I said, a number of stations in Missouri also went along and broadcast the test, and in a number of cases, a lot of audio from the stations feeding them... one for several hours. Our Crawford stations in St. Louis were affected, but only for a few minutes. KMOX, the local lead which monitors Illinois EAS for whatever reason, picked it up but aborted it shortly thereafter. Rick Sewell did the same at KJSL/KSTL.

One area of the state which was, in effect, out of the loop for the whole debacle was Peoria. The main feed into their LP stations is the Illinois State Police's ISPERN (Ill. State Police Emergency Radio Network). However, the transmitter for the local ISPERN station was down that day for maintenance. The folks in Peoria read about the whole thing in the papers, or they would never have known. Now, that right there is an "oops!" of rather seismic proportions. Doesn't anyone with the responsibility for such things believe in backups? Now that would be federal dollars well spent, and relatively few of them at that.

For my part, a couple of stations I haven't worked for in years as a contract engineer called me that day in a complete panic, because they were broadcasting one or the other of the Chicago LP stations, and couldn't shut their EAS boxes off. I had to tell them that the only thing they could do was to pull the plug on the EAS box and wait ten seconds, rebooting it, and then plug it back in. Highly unorthodox, and maybe illegal in the strict sense of the word, but what else could they do? For one of the two stations, it was probably the first time they'd had

any English language on the air, other than the station ID, in years.

There were several things which became known out of this incident. First, there was the blunder down in Springfield. However, the blunder was compounded by the fact that no EAS EOM tones were ever issued for this false alert. The effects of this blunder on other stations could have been greatly minimized if someone, anyone along the chain, from the EOC in Springfield to any of the LP stations in the state's emergency regions had done that one thing. But no. Maybe someone had something to prove. Maybe it was impossible to issue an EOM, given the programming of the system. I don't know.

Another sidebar to this was a real corker. Several stations which tried to abort this EAN by simply pressing their EAS box's abort, exit, or reset button got a message on their readouts stating that aborting any EAN was considered to be a Federal Felony, which was punishable by.... I don't know. I'm embarrassed to say that I still haven't looked up the rules about that. Our rude awakening here in Chicago was that we had been under the false impression that an EAN was automatically aired no matter what, that the TFT EAS boxes we have were hard-wired for it. Never mind. I already had the staff go through the programming of those Model EAS 911 boxes and make such programming so. I mean, why wouldn't EANs be automatically retransmitted?

I learned a lot about EAS from this incident, and from my discussions about it with Warren Shulz. One thing is that a most useful idea came out of this incident: Rather than use ISPERN or a station-to-station hookup for the EANs, it might be better to trust such important EAS usages to the already-in-place backbone of NOAA weather radio stations scattered around the state, and around much of the country. NOAA weather radio is an alert-oriented facility anyway, it is easier to incorporate and maintain a standard operating procedure in it and it is highly reliable, with most of its facilities containing backup transmitters and a lot of overlapping coverage, at least in the high-population-concentrated centers of the country. The downside is that that last statement isn't true everywhere. There are a number of places in this country where NOAA weather transmissions don't exist at all. That is on its way to solution, so that even in Rock Springs or Rio Linda, NOAA weather radio either is or soon will be there to close the loop on EAS transmissions of all types. By the way, in this Illinois incident, NOAA weather was not involved. Yet.

The saying goes that we learn a lot from our failures. There have been some, though not many,

operational failures in EAS in the time since it was unveiled, and the good news is that we've learned something from all of them. Just how such failures and our learning experiences play with the public will go a long way toward determining the effectiveness of the system, and that is a whole story unto itself. But the one lesson we have learned is that scrapping the present EAS and starting over makes a lot less sense than tweaking and fixing what we've got. And these mistakes are, frankly, just about all we have to work with to making the system right. It is, after all, just software.

As I was about to send this on to our editor, I caught the article on this subject in the latest issue of Radio *World*. There is a quote near the end from an unnamed engineer saying that this incident "points to the fragility of EAS; the sooner the broadcast distribution of EAS is supplanted by other technologies, the better..." This comment by someone who has obviously not thought through the process at all neglects one little point: The system has never worked up to its potential, and never will, unless and until the average consumer radio, satellite radio, HD radio, and TV receiver has a built-in decoder to alert the consumer of the emergency at hand, even when the receiver is turned down and off. That still neglects the iPods, portable CD players and the like to which a lot of folks listen. Face it: EAS will never be 100% blanketing, even with alternate technology, whatever that is. Which brings up another point.

Don't you love it when someone points up the dimensions of a problem without so much a proposing a details of a solution? That's called a negative solution. If you don't have a concrete idea for a cure, treat the subject like gossip. Don't talk about it. Come up with a concrete, positive plan first, then make the complaint, and you'll be more likely to be listened to. This is no more true right now than with EAS. The NOAA idea is one such positive idea. Start there and keep going. Enough said on that issue. For now.

This is not a big year for capital expense item purchases in the Chicago market, but we have a few items on the list. One of them is a new production console for a, well, production room. Should be a cut and dried line item, right? In your dreams, Senator.

First of all, we've been on the Mackie 24.8 standard for quite a few years now. Like, who hasn't? This year, however, we got the inevitable surprise. Mackie has been in the process (and I use that term advisedly) of discontinuing the venerable 24.8, replacing it with their newer Onyx series of consoles. However, though we have decided to buy one, we are not exactly satisfied with the choices that are out there.

Simply put (and the following comes excerpted from an E-mail I recently sent to the lovely and gracious Stephanie Petruso over at Crouse-Kimzey), I have a mild but growing gripe about this issue of production consoles and it goes like this: When, oh when are the console manufacturers going to wise up to the fact that what the market needs right now is a production console which will do with AES and SP/DIF what they've done so well with analog, without the whiz-bang gizmos, such as LCD/LED readouts and all of the superfluous (and what's so super about superfluous anyway?) stuff which add very little or nothing to the utility of the console, but a lot to the cost and to the length of the learning curve? Wheatstone has learned how to make a console that is fairly straightforward and easy to learn, though let's not talk about the cost – those products are intended for control room use only. Is it asking too much to get a competent console manufacturer to produce something which makes a good audio mix, utilizing both the analog and digital domain, with both domains on both inputs and outputs? This should not be rocket science. I would suggest that by this time the state of the art should have produced DSP technology which would inherently allow, with little added vendor programming required, the ability to handle EQ, panning, and whatever else is needed. I don't know that for a fact, but you'd think that, by this time, the marketplace would be in the position to demand it.

I realize that doing audio handling (or shall we say, manipulation?) in the digital domain is inherently the better way to go, but more difficult to implement vis-à-vis analog, but I still think that for the user, operating a console which is working in the digital domain should be no more difficult than using an analog board. Now, when are the manufacturers going to make that happen?

Until next month, Blessings!

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

RF Training

It's summer vacation, school is out. Kids are at play in ballparks and on playgrounds. Surely he isn't going to bring up a training class… is he?

Well, yeah I am. I took the time this last week to attend the Society of Broadcast Engineers RF Safety Course for Broadcast Engineers. The FCC is looking to the broadcast industry to provide training and be able to demonstrate safe operating practices when it comes to RF safety procedures.

I have been around RF for years and have an excellent general knowledge of the safety issues, measurement techniques, and safety procedures. The point is, how could I demonstrate that proficiency to someone from the FCC or OHSA? The certificate from the course will show the training for an inspector.

The course was taught by Richard Strickland of RF Safety Solutions. For those of you who may not know, Richard is the original designer of the Narda personal safety monitor called the Nardalert.

One last plug: There is a second session of the course being presented on August 2 and the SBE is set up to take last minute registrations. A PDF of the registration form is at:
http://www.sbe.org/documents/rfregform_000.pdf.

Cost of the course is very reasonable at $75 if there are four or more attending, or $110 if there are three or fewer.
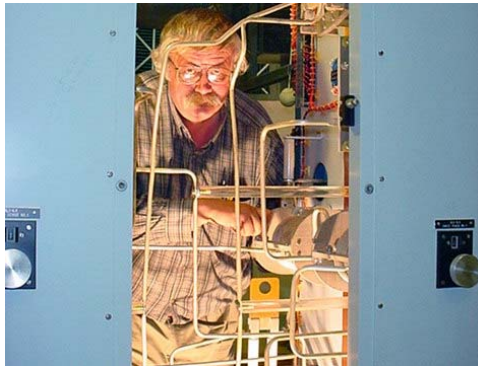
For some time I have felt a major RF safety issue involved contact currents and contact burns. Those of us in AM know of the danger and avoid contact with the tower and the feed system. What about others, like the person who ignores the caution signs and climbs the tower fence? Like, say, the copper thief. If they will break in to a power substation, getting killed in the process, why should we feel safe? So what happens after he breaks in and gets burned?

Proper signs are the solution. A sigh is very cheep protection from a lawsuit. For some time, Kintronics has used a "Do Not Touch" decal on their tower detuning boxes. Yes, the RF potential on the detuning skirt can be quite high even though there is no broadcast RF connected directly to the detuned tower. I looked not long ago for "Do Not Touch" signs with no luck. Recently they became available and I would encourage everyone to order and install one at or near the entrance to each AM tower. I understand the FCC is now checking for this sign when they inspect sign placement.

The two newest signs are the RF burn and a similar warning for tower guy cables near the anchor point. The guy cable sign will be needed when the lowest guy insulator is less than 10 feet from the ground or measurements show high contact currents.

Telos Trouble

I had an interesting chain-of-events situation develop that I thought was worth passing along. We use a Telos telephone system for locally produced call in shows. It works very well and has for the most part been very reliable. The only failure I recall was some years ago and was the loss of the 5-volt regulator in the control console. The regulator failed with supply voltage short to ground so neither of the

control consoles would work. Disconnecting the bad console was a temporary fix and replacing the regulator brought everything back to normal with the console.

Then in late July I had a series of failures. First we had a problem with the telephone audio. The audio consisted of a "thunk" about once a second. A little investigation found the problem only with hybrid 2; hybrid 1 was okay. Then the hybrid relays started clicking in time with the "thunk." Other than a as a metronome, that really wasn't interesting, so I sent the hybrid off to Telos for repair, leaving hybrid 1 to keep us on the air in a crippled mode (we can't take two calls patched together with just one hybrid).

Twenty-four hours later, the Telos was down again. The control console was dead. Back at the workbench at Mount Scott, I found that sure enough, the regulator was bad again. The console uses a low-overhead regulator which isn't commonly available, so of course I didn't have a new one. Fortunately the second console tested fine with an old Direct Interface Module (DIM) that I had on hand. I installed that console at the studio and the Telos was back up.

Another 24 hours and the Telos was down again (this was beginning to get old!). It was the control console dead again. Back to the bench with the console. No shorts, and it worked fine with my test DIM. So back to the studio with the console, a spare modular cable, and my test DIM. The console didn't work, even using the spare cable. It did work with the test DIM, so I swapped that in and put the broken DIM on the bench.

Initial checks showed the DIM power supply just fine but no supply voltage at the end of the modular cable. In bright light I could see that the modular connector on the DIM didn't look right. The contact finger wire was bent and discolored. The finger wires are chosen for their spring quality and not for low resistance. They are gold plated, but that is not low resistance, so the wire heated and cooked when the regulator went to short. It failed completely after a few hours with a good console connected.

Now I'll bet you think that story is over, don't you? Fooled you! Twenty-four hours later the Telos was down again. The connector failed in the backup DIM. Fun time in the City of Roses!

Rocky Mountain "Hi"
The Denver Report
by
Ed Dulaney, CSRE, AMD
Chief Engineer, CBC - Denver

Congratulations!

Not only has my able assistant, Amanda Alexander, become certified with the SBE, she has completed her studies with the Cleveland Institute of Electronics and is now officially "gradgeeated"! Yes, that's a word. Ask anyone in Birmingham!

I will be the first to attest to the old adage that the apple doesn't fall far from the tree. At the rate that Amanda is going she'll be ready to tune up the DA for the new KLDC signal, if the FCC approves the upgrade.

So, congratulations Amanda! You've earned both my respect and my admiration for all that you have accomplished.

An Update

Last month I told you about the new Motorola PTP400 STL we installed at KLZ. The reason that we upgraded our system is that the 5.8 GHz band has gotten extremely crowded in the Denver area and the link between the studio and the KLZ transmitter has interference that was causing a lot of dropouts on the signal.

I'm pleased to report that the new system is now clean as a whistle! We upgraded the panel

14

antennas that I wrote about last month to the three-foot dishes that were available through our dealer. The link is running with almost no errors. In fact, after 16 days of operation the system has passed nearly four gigabytes of data with a bit-error rate of zero!

There has been a lot written in the press over the past few months about the dangers of using unlicensed links for STL. And, I will admit, there are some significant problems and risks involved. Still, considering that a licensed link will cost anywhere between $25 and $50 thousand, the unlicensed systems (which can be purchased for around $5,000) are a good investment. You just have to accept the fact that at some point, the band will become crowded in your neck of the woods!

Another Update

Those pesky weeds are finally under control at all of our transmitter sites. Amanda and I have managed to beat all of them into submission with a combination of lawn mowers, brush trimmers, and Round Up. There's still a little mowing to be done at the KLDC transmitter site and the gentleman that leases our land for grazing is taking care of that as I type this column.

Never in my 16 years of living in Colorado have I seen the weeds grow this thick. Our sickle-bar mower that can cut through practically anything had a difficult time getting through the brush at KLDC. More than once I had to just shut it down and let it rest for ten minutes or so. And the KLTT site wasn't much easier! What scares me is that we could be in for a long summer, if the weather prognosticators are right. This means that the growing season for the weeds could last well into September. I guess I better start sharpening the blades on the mower!

ND-50 Oddity

I've had an interesting problem with our ND-50 transmitter at KLTT. Over the last few weeks it has blown two modules. Old timers to these columns will remember that the KLTT transmitter used to blow modules at fairly regular intervals. Back in those days I had started to wonder if it wasn't a built-in "feature" of the Nautel transmitter! Perhaps it was a way for the engineers to remember to remove the modules and clean them on a regular basis.

However, since we upgraded it to HD Radio, I haven't seen any failures... until a few weeks ago. This was the first module to fail since the upgrade. Amanda and I got that one repaired, but a couple weeks later another one popped. I repaired that one, and noticed an anomaly with the transmitter. The

power output meter was deflecting as much as 8 kW with modulation. It would sit at 52 kW, then on a modulation peak it would rise to 60 kW. This corresponded with an increase in power supply current as well, so I knew it wasn't just a metering problem.

I called Nautel asking for advice. Their thought is that it's either a processor problem or a load problem. They indicated that it could also be related to a change in the AC line voltage, but that is the same as it's always been, at least it's within 7% or so of the normal voltage. The worst part is that the problem hasn't reappeared. Now that I'm watching for it, I'll probably never see it again!

Hobbies

I've often wondered how I've managed to pick up some of these strange hobbies. I suppose that some of them are rather natural, like Amateur Radio. However, it's been a long time since I've exercised my privileges on the ham bands.

Some of the other hobbies that I've enjoyed are woodworking, guns (both shooting and gunsmithing) and music. Then, of course, there's the infamous hobby of computing, especially building computers from spare parts and watching them go.

I guess I've always been the sort of person that finds enjoyment in working with my hands. I spend most of my time at work doing "brain drain" things like solving computer network problems or figuring out why Qwest always messes up a phone circuit when it's needed most. So I reckon it's a natural thing to enjoy tasks that are more "physical" for my hobby.

I am not one that likes to sit still for long periods of time. So why is it that I keep wandering back to a hobby that has somehow held my interest, on and off, for almost 35 years? Some people say it's akin to watching paint dry, but I still enjoy doing it. That hobby would be astronomy. When I was a kid I loved looking into the night sky and ponder the possibility that there was life "out there" just waiting to be found. I'd imagine Klingons and Romulans flying their space ships around the galaxy, and in the middle of it all would be James Tiberius Kirk saving the day!

As a young adult I always wanted a bigger and better telescope. A friend and I even built a lean-to observatory in the desert north of El Paso. We'd spend hours out there at night searching for new objects in the sky. Now, over 20 years later, I still have the same thrill when I find something new. I've given up on the hope of ever seeing the Enterprise flying around out there, but I still dream about the

possibility of "aliens"!

Until next month... Energize!

Digital Diary
by
Larry Foltran
Corporate Website & Information Technology Coordinator

Surface

Microsoft recently unveiled one of its latest projects which may change the way we do a lot of things in the future. This product is essentially an advanced computer in the shape of a typical coffee table. Although that may not sound very exciting at first, I was very impressed after watching the demos available online.

Microsoft calls its product "Surface." It is basically a 30-inch touch screen powered by a computer in the table's base. Five cameras are used to track the user's hand position and movements, and can recognize certain objects when placed on the surface. Even more impressive, the system allows multiple users to use the system simultaneously without the use of any input device other than the touch screen.

Being an amateur photographer, one of Surface's most impressive features is the ability to organize digital photos as if they were placed on a table top. You can move the photos around on the surface, resize them, rotate them, and then instantly send them via email. This interface also accommodates digital video files. One demo featured a camera that could simply be placed on the surface and the photos were quickly downloaded to the "desktop".

Another application that was demonstrated was for use in restaurants. Patrons can place an order by dragging and dropping the select items from an on screen menu. When it's time to pay, the customer can simply place their credit card on the screen, adjust the gratuity amount, and charge the meal to their account.
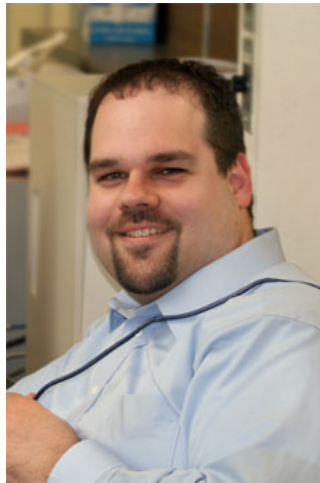
This type of technology can be adapted to many different applications. In a work environment, desktop computers may soon become a thing of the past. A Surface work area could replace the traditional office desk and desktop PC. Emails and other electronic documents could be written with a touch pen rather than a keyboard. You may also be able to tune in your favorite radio station through an on screen digital tuner. It seems as if the possibility of this product's integration could be vast.

Although multi-touch units such as this have been available to the military for some time, Microsoft seems to be trying to push this technology into everyday life. With an initial price tag of between $5,000 and $10,000 per unit, it may be some time before we commonly see these units in homes. It has been reported that one hotel chain and several restaurant chains have shown considerable interest in the Surface units, so you can expect to run into one sooner rather than later.

You can learn more about Surface at: http://www.microsoft.com/surface/

Mandylion

I recently ran across another computer related gadget that I thought was pretty interesting and useful. Mandylion is essentially a password generator and manager in the form of a basic key fob. This item was originally developed for the United States Military, but has recently been made available to the general public.

Mandylion can be used to generate passwords at any length up to 14 characters. The user can dictate whether the password should be alpha, alphanumeric, or include special characters. Once the password is created, this unit can securely store up to 50

different passwords and can prompt you to change your password at a preset time interval. This would eliminate the need for using a single password for all of your logins or keeping a collection of yellow sticky notes containing your passwords.

All of the data is stored in the unit's permanent memory and is unaffected by loss of battery power. The unit is also tamper resistant.

The Mandylion's security features can also make anyone feel like a secret government spy. The LCD has limited viewing angle to prevent any from watching over your shoulder. There is also a self

destruct option which will clear all of the data from the memory. Although this does the trick, it would have been more dramatic if the entire unit would go up in a cloud of smoke.

The unit connects to your PC via a USB cradle. It runs about $50 and is only compatible with Windows. This can be a great tool for anyone who typically juggles numerous login passwords. If nothing else, having the Mandylion in your pocket could make you feel a little "Bond-like".

Until next month…

Remotes via VoIp – A Low-Cost Alternative
By
Hue Beavers
Cumulus – Dallas

Broadcasters are continuously on the lookout for cost-efficient means of delivery of remote audio to the studio with a quality that is above the grade delivered by the public switched network or other voice grade technology. Many remote events are of short duration and often handled by air talent with little or no technical knowledge. Often these events are beyond the reach of RF remote pickup (Marti) facilities and the cost of an ISDN line cannot be justified.

The past few years has seen the development of real time transmission of quality audio from point to point via the Internet. This development was spurred by the disappearance of ISDN from the American telecom scene and the widespread availability of high-speed Internet facilities in the business and home environments. The transmission mode is via packet switched data.

Codec – As cellular phone technology has progressed, much work has been done to improve audio quality. With the current '3G' rollout, an audio codec called 'AMR-WB' has been introduced that is reasonably robust even at lower bit rates. The audio codec, labeled G.722.2 is a descendant of the G.722 family. At the top end data rate of 23.8 kbps, the audio response is 80 Hz - 7 kHz and has few coding artifacts. THD is very good (about 0.3%), but conventional SMPTE IMD measurements are not possible (because of the sharp rolloff at 7 kHz). The codec is primarily designed for speech but handles music reasonably well.

Hardware – At KAAM, initial testing of VoIp remotes has been accomplished with an inexpensive hardware-based IP phone at the remote and studio locations using the Grandstream Budgetone 101 and 102 instruments. The Budgetone was chosen due to its low cost and the incorporation of the G.722.2 codec. Reasonably easy to configure, the phones are incredibly durable for the price. Street price is somewhere around $40 each; often less on eBay.

The phones feature a 1/8 inch (3.5 mm) 3-conductor connector on the rear to facilitate the audio I/O. Audio I/O requires a "clean box" or a "match box" to interface to the broadcast console. The expected audio level feeding the Budgetone phone should be in the neighborhood of -40 dBm maximum.

Budgetone 100-series Phone

Receive level is low Z high level. I haven't been inside the phones to determine if any improvements to the analog interface are possible.

Internet Link in the Field – The ideal communications link on a VoIp remote would consist of wired high-speed Internet on each side. Given the myriad of locations the sales, programming and

promotions departments dream up for outside events, that is not always possible. Thankfully, mobile

D-Link DIR-450 Mobile Router

wideband Internet technologies have become available in many metro areas across the U.S. – at an affordable price. Verizon and Sprint are now supporting this dual-band cellular data service – usually at a fixed price of less than $70 /month. Typically, use is capped at somewhere in the 5GB region to limit folks from streaming 24/7 and other bandwidth-eating applications.

In the wireless application, an EVDO card is used in conjunction with a router configured for mobile broadband service. D-Link, Linksys, and Kyocera are three manufacturers of such routers. They retail for approximately $200. The EVDO modem cards have jacks for external (dual band) antennas. The external antenna can aid in providing a reliable RF path in congested areas.

VoIp PBX – It is possible to call directly IP address to IP address on the phones. Usually that is not possible, though. Even with static IP addresses, this method can be very challenging.

Because of firewalls, routers and other limitations in the network, it is preferred to use a 3rd party SIP (simple Internet protocol) server, such as Free World Dialup. FWD, as it is called, is owned by Jeff Pulver, one of the founders of Vonage. There is no charge currently for use of the SIP server, and it doesn't balk at the bandwidth required for a G.722.2 audio codec based call. I estimate the bandwidth to be somewhere near 32 kbps each direction.

Linux enthusiasts will note that the very popular Asterisk SIP server is used by many providers such as FWD and has quite a following.

Caveats – Wireless (via EVDO card in a mobile broadband router) is fairly robust but cannot provide the reliability required for full-time STL type applications. Pitfalls on either side of the Internet cloud usually involve running out of bandwidth.

Recently, during "Web Cam Wednesday" the DSL at Cumulus–Dallas ran out of steam with two video streams leaving the site in addition to the VoIp phone traffic and who knows what else. The audio got very choppy and was not very pleasant to listen to.

Currently at KAAM, their Internet connection to the studio is delivered via 2.4 GHz wireless and slows down to a crawl during peak traffic hours. The station is converting, thankfully, to a wired connection from another provider soon. That should remedy any possible bottlenecks at the studio side.

The subjects of latency and jitter come to mind during discussion of audio transmission via packed switched data. During Dallas Cowboy training camp, at KTCK the VoIp phone was used as backup to the conventional ISDN connection (using AAC-LD). The VoIp connection lagged the ISDN by about 80 mS in this case. Both sides were using wired Internet connectivity. Wireless on one side of the connection will add at least another 80 mS. A talk radio format with listener interaction could use this means for remote broadcast if the limitations are taken into consideration.

Field tests – The KAAM VoIp remote kit had its maiden voyage in late July when the "Saturday Night Sock Hop" went on remote at a local air museum across town. As I was on duty at the studio during the remote, I was able to get a real feel for operation on-air. Definitely a real improvement over the ad-hoc cell phone call-in remote!

Using an inverter and the "wall-wart" power supplies for the mobile router and the Budgetone phone, I have been testing the setup in the mobile environment as I drive to the various remote transmitter sites I visit. The system is reasonably robust, even in the hinterlands. To be sure, there have been times when communications have dropped when transitioning from one cell to another. Still, the guys in the shop have remarked on the good fidelity and readability even at 60 MPH on some farm-to-market road in a distant portion of the Metroplex.

Should you have questions or desire details, please contact me at hrbeavers@yahoo.com.

Many thanks to Hue for this contribution. Hue was a long-time contract engineer for CBC when it owned KAAM in Dallas. He remains a good friend of this company and a loyal L.O. reader. – Ed.

KBRT • Avalon - Los Angeles, CA
740 kHz, 10 kW-D, DA
KCBC • Riverbank - San Francisco, CA
770 kHz, 50 kW-D/1 kW-N, DA-1
KJSL • St. Louis, MO
630 kHz, 5 kW-U, 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
810 kHz, 2.2 kW-D/0.43 kW-N, DA-2
KLTT • Commerce City - Denver, CO
670 kHz, 50 kW-D/1.4 kW-N, DA-2
KLVZ • Denver, CO
1220 kHz, 660 W-D/11.5 W-N, ND
KSTL • St. Louis, MO
690 kHz, 1 kW-D/18 W-N, ND
WDCX • Buffalo, NY
99.5 MHz, 110 kW/195m AAT
WDJC-FM • Birmingham, AL
93.7 MHz, 100 kW/307m AAT
WEXL • Royal Oak - Detroit, MI
1340 kHz, 1 kW-U, DA-D
WLGZ • Rochester, NY
990 kHz, 5 kW-D/2.5 kW-N, DA-2

WRDT • Monroe - Detroit, MI
560 kHz, 500 W-D/14 W-N, DA-D
WMUZ • Detroit, MI
103.5 MHz, 50 kW/150m AAT
WDCD • Albany, NY
1540 kHz, 50 kW-U, DA
WPTR • Clifton Park - Albany, NY
96.7 MHz, 4.7 kW/100m AAT
WPWX • Hammond - Chicago, IL
92.3 MHz, 50 kW/150m AAT
WRCI • Webster - Rochester, NY
102.7 MHz, 6 kW/100m AAT
WSRB • Lansing - Chicago, IL
106.3 MHz, 4.1 kW/120m AAT
WYRB • Genoa - Rockford, IL
106.3 MHz, 6 kW/65m AAT
WYCA • Crete - Chicago, IL
102.3 MHz, 1.05 kW/150m AAT
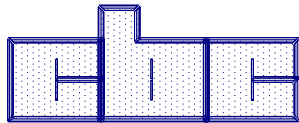**WYDE • Birmingham, AL**
1260 kHz, 5 kW-D/41W-N, ND
WYDE-FM • Cullman - Birmingham, AL
101.1 MHz, 100 kW/410m AAT
WXJC • Birmingham, AL
850 kHz, 50 kW-D/1 kW-N, DA-2
WXJC-FM • Cordova-Birmingham, AL
92.5 MHz, 2.2 kW/167m AAT

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